Social Boundaries and the Organization of Plain Ware Production

and Exchange in 14th Century Central Arizona

by

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ABSTRACT

In the proposed project I simultaneously and reflexively identify and characterize social boundaries in the archaeological record by examining material culture distributions in novel ways to re-assess the scale of the Verde Confederacy, a proposed regional-scale multi-settlement alliance in Late Prehistoric central Arizona. I focus on boundaries between entities larger than villages, but smaller than regions or culture areas. I propose three innovations to better accomplish these goals. First, unlike previous conceptualizations of social boundaries as monolithic, I argue that they are better conceived of as a heterogeneous, multi-faceted phenomenon. Second, I investigate social boundaries by examining multiple lines of evidence. Previous researchers have tended to focus on one category of data at the expense of others. Third, I associate boundaries with relational and categorical collective social identification. An alliance requires regular collective actions including communication and coordinated action between large groups. These actions are most likely to emerge among groups integrated by relational networks who share a high degree of categorical homogeneity.

I propose a plain ware ceramic provenance model. Seven reference groups represent ceramic production in specific geographic areas. The reference groups are mineralogically and geochemically distinct, and can be visually differentiated. With this provenance model, I reconstruct the organization of utilitarian ceramic production and exchange, and argue that plain ware distribution is a proxy for networks of socially proximate friends and relatives. The plain ware data are compared to boundaries derived from settlement patterns, rock art, public architecture, and painted ceramics to characterize the overall nature of social boundaries in Late Prehistoric central Arizona.

Three regions in the study area are strongly integrated by relational networks and categorical commonality. If alliances existed in Late Prehistoric central Arizona, they were most likely to emerge at this scale. A fourth region is identified as a frontier zone, where internal connections and shared identities were weaker. As seen among the League of the Iroquois, smaller integrated entities do not preclude the existence of larger social constructs, and I conclude this study with proposals to further test the Verde Confederacy model by searching for integration at a broader spatial scale.

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CHAPTER 1

INTRODUCTION

In this project I simultaneously and reflexively identify and characterize social boundaries in the archaeological record by examining material culture distributions in novel ways to re-assess the scale of the Verde Confederacy, a proposed regional-scale multi-settlement alliance in Late Prehistoric central Arizona. I propose three innovations to better accomplish these goals. First, unlike previous conceptualizations of social boundaries as monolithic, I argue that they are better conceived of as a heterogeneous, multi-faceted phenomenon. For example, members of a social group could emphasize differences between themselves and some of their neighbors, with clear borders between them, while intentionally blurring their differences with others, and generating porous and fuzzy frontiers. Instead of asking whether social boundaries are present, archaeologists should first characterize the nature of these boundaries. Second, previous social boundary researchers have tended to focus on one category of data at the expense of others (Hegmon 1998:278). I advocate a comprehensive approach to identifying and characterizing the nature of social boundaries by focusing on several material culture distributions as created by both the exchange of portable objects (trade) and the proliferation of ideas (technology and style). Third, I associate boundaries with relational and categorical collective social identification. A sustained alliance requires regular collective actions including communication and coordinated action between large groups of people. Sustained collective actions are most likely to emerge among groups integrated by relational networks who also share a high degree of categorical homogeneity (Peeples 2011; Stokke and Tjomsland 1996:29; Tilly 1978:63).

One of the primary goals of archaeology is studying formal variation across space and time to identify groups with boundaries marked by distinctive patterns in the archaeological record. Archaeologists have often looked for entities larger than a village but smaller than a region or culture area where individuals interacted on a regular basis (Stark 1998:10). I focus my analysis of boundaries at this scale. In the Southwest, these entities have been variously described as alliances (Plog 1983; Upham et al. 1994), branches (Colton 1939), clusters (Spielmann 1994, 2004), communities (e.g. Wills and Leonard 1994), local systems (Wilcox et al. 2001a, 2001b; Wilcox and Holmlund 2007; see also Stark et al. 1998) or tribes (Abbott 2014).

Despite longstanding interest in the archaeology of social boundaries, gaps in our understanding persist. Some groups signal boundaries in their material culture, but these groups often express boundaries in different ways. There is widespread consensus that boundaries can be identified in the archaeological record in cases when groups marked boundaries with material culture (Stark 1998:8-9), but there is less agreement on how best to accomplish this goal. For example, Goodby (1998:162) argues that we have no reason to expect any one category of material culture to mark a social boundary even when such boundaries existed prehistorically. But researchers armed with ethnohistoric data about pipe smoking at council and condolence rituals (Hall 1997:121; Johansen and Mann 2000:315-318), were able to trace the boundaries of the Iroquois Confederacy over time by reconstructing the pipe exchange network (Kuhn 1985, 1986, 1987, 1994; Kuhn and Sempowski 2001). Other groups divide themselves in ways that would not be archaeologically recognizable. For example, in an ethnographic study along the Sepik Coast of New Guinea, Welsch and Terrell (1998:69) found that the distribution of "objects and decorative styles does not divide up the coast into bounded, social units of any significance" despite the ethnographically known presence of several meaningful social units at various scales. Still other groups are not overtly concerned with signaling social boundaries.

The theoretical literature paints social boundaries as complex phenomena, but archaeologists and other social scientists can manage this complexity using an appropriate methodology. The first component of my theoretical approach to social boundaries includes an adaptation of Parker's (2006) Continuum of Boundary Dynamics. In the Continuum, boundaries (the interstitial spaces between groups of people) cannot be assumed to be homogenous. Individual boundaries range in nature from porous frontiers to rigid borders, and different boundary types (political, economic, social, etc.) can be associated with specific material culture distributions. The second portion of my theoretical approach is collective social identification, which was developed by historical sociologists and political scientists studying the relationships between collective action, social movements, and social identity formation involving large groups of people. There are two types of collective social identity – personal interaction networks and identities based on perceived categorical similarities.

I build on these theories and develop a method to identify and characterize social boundaries in archaeological contexts using material culture distributions. I assess the boundary nature of each material culture distribution, which can range from rigid borders to ephemeral frontiers. Spatial distributions that sharply terminate are suggestive of borders, while a gradual fall-off is indicative of a frontier. I associate each distribution with a boundary type. Groups that identify strongly both relationally and categorically are most likely to have mobilized large numbers of people for collective action (Peeples 2011; Stokke and Tjomsland 1996:29; Tilly 1978:63). Boundaries to relational networks and categorical identity have particular value in assessing the scale of group integration within bounded social entities. Boundaries are then compared to one another to identify possible bounded social entities and to characterize nature of boundaries in Late Prehistoric central Arizona.

In this chapter, I introduce the theoretical elements of my study – the Continuum of Boundary Dynamics and collective social identification. I next leverage these concepts and lay out a methodology to identify and characterize social boundaries in archaeological contexts using material culture distributions. I then summarize the culture history of Late Prehistoric central Arizona—the archaeological context in which I apply my methodology. I conclude this chapter with a summary of the organization of the overall study.

The Continuum of Boundary Dynamics

The Continuum of Boundary Dynamics is a model proposed by Parker (2006) to aid researchers in characterizing variation in social boundaries (Figure 1.1). Parker defines boundaries as the interstitial spaces between distinct groups of people. Social boundaries in the Continuum are not a homogenous phenomenon. Boundaries vary in nature; ranging from dynamic, fluid, and porous zones of interpenetration designated as frontiers, to static, fixed, and restrictive borders. The latter were probably rare in the ancient world (Ashford et al. 2000:476; Parker 2006:80). Parker proposes five broad boundary types: geographic, political, demographic, cultural, and economic. These

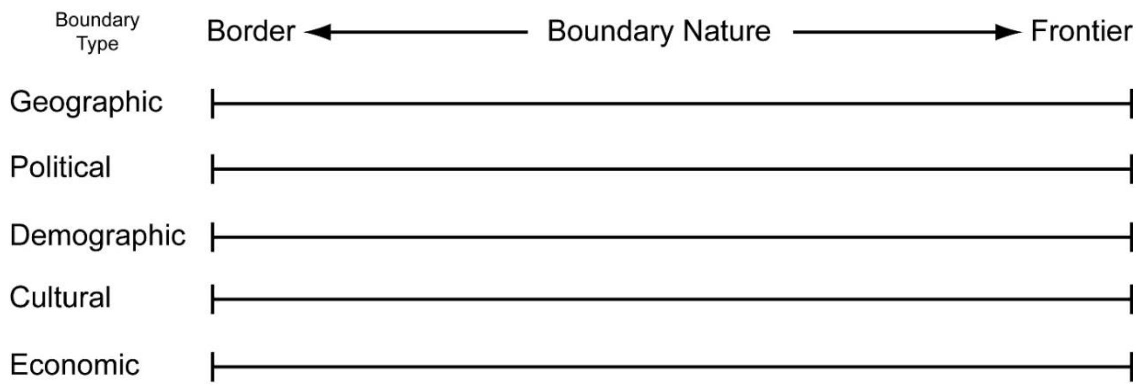

Figure 1.1. Continuum of Boundary Dynamics (Adapted and Redrawn from Parker 2006:Figure 2).

boundary types exist in the continuum simultaneously, and social boundaries are actually boundary sets that can be conceived of as the interplay between different boundary types, each with its own nature. For example, is there a social boundary between the United States and Mexico? Politically, a static border is enforced, but many speak both English and Spanish along a linguistic frontier.

In his case study, Parker applied the Continuum to characterize Assyrian expansion into the Tigris River borderlands between 911-705 B.C. Parker notes several geographic impediments between the Assyrian heartland and the Tigris Borderland, which initially contributed to a border between the two regions. Intermittent military campaigns in the region, frustrated by geography, led to a military frontier. In reaction to the Assyrian military presence, political leaders in the Tigris Borderlands entered into tribute relationships with Assyria, creating a political frontier. Assyrian leaders eventually constructed a series of border fortresses from which they staged additional military campaigns that pushed the military and political frontier deeper into the Tigris Borderland. These fortresses soon turned into settlements, bringing Assyrian culture, language, and economic ties to the region. The indigenous settlement system soon collapsed, and the region was largely incorporated into the Assyrian empire.

I propose three adjustments to the Continuum of Boundary Dynamics. First, Parker (2006:81-82) acknowledges that the boundary types in the model are very general and “may not capture all the nuances of any specific borderland,” but justifies the more general categories of data so as to avoid overcomplicating the model and to facilitate cross-case and cross-disciplinary comparisons. I embrace the idea that social boundaries are a heterogeneous phenomenon that can be characterized by examining different boundary types and by assessing boundary nature. I am less concerned with strictly adhering to Parker’s five category types as objectively significant units of analysis, some of which are difficult to assess with archaeological data. I advocate analyzing a number of material culture distributions associated with a variety of boundary types. Casting a broad net answers Hegmon’s (1998:278) call to analyze multiple lines of evidence in boundary studies, and increases the likelihood of uncovering meaningful social boundaries.

Second, social boundary heterogeneity is implied in the Continuum, but I explicitly add that boundaries can directionally vary in specific contexts. A group could emphasize differences and enforce borders with one neighbor, while recognizing similarities with another neighbor along a frontier. Instead of looking for socially bounded entities, the appropriate unit of analysis in a comprehensive boundary investigation is the relationship between a group and each of its neighbors.

Finally, I operationalize the Continuum for use with material culture distributions in archaeological contexts. Though Parker discussed geography, settlement patterns, and ceramics in his case study, he largely relied on textual data to inform his analysis. Those of us working in prehistoric contexts are much more reliant on associations between material culture distributions and boundary types. Parker also introduces the boundary nature continuum–the idea that individual boundary types range from rigid borders to fluid frontiers – but he does not explicitly lay out criteria for determining how to assess where an individual boundary type falls on this continuum using archaeological data. A discussion of how boundary type and nature can be inferred from material culture distributions in archaeological contexts is included in the methodology section below.

Collective Social Identification

Historical sociologists and political scientists have studied the relationships between collective action, social movements, and social identity formation involving large groups of people (Calhoun 1994:26, Nexon 2009; Peeples 2011:3-4; Somers 1994; Somers and Gibson 1995:64-69; Stokke and Tjomsland 1996:27-31; Tilly 1978, 2001; White 2008). These researchers posit two types of collective social identification: relational and categorical. Relational identification is a process where individuals informally identify with larger collectives based on personal relationships in interaction networks. These relationships consist of "routine and regular transactions between individuals or larger collectives which entail specific socially recognized rights and obligations" (Peeples 2011:18; see also Nexon 2009:25). Examples include kinship, trade, co-residence, and production communities. People who more formally identify with one another categorically build on perceived similarities such as political organization. Categorical associations can exist in the absence of direct interaction, and have the potential to include more people than relational networks. Many material culture distributions can be associated with relational networks or categorical identity (Calhoun 1994:26). For example, in a case study in the Cibola region, Peeples (2011) uses ceramic exchange and similarities in domestic architectural spaces and low-visibility utilitarian ceramic technological attributes as proxies for interaction frequency. He also associates ceramic design and public architectural spaces with categorical identities. I discuss how I will identify these associations in the methodology section below.

Baldassarri (2009) defines collective action as the processes executed by large, cooperative groups for public benefit. Peeples (2011:32-35) summarized the literature and discussed the likelihood of collective action emerging among groups with different configurations of collective social identification in some detail (Figure 1.2). Sustained collective action is rare among groups with a low level of categorical identity and weak relational connections. If collective action emerges in groups that have strong relational ties, but weak categorical affinity, the scale of the action tends to be limited to dense sub-groups of actors. Collective actions that tend to emerge among groups with strong categorical affinity but weak relational bonds tend to be situational and activated by a specific stimulus. Sustained collective actions are most effective among “catnets” (White 2008), groups who are strongly integrated by relational networks and share a high degree of categorical homogeneity (Stokke and Tjomsland 1996:29; Tilly 1978:63).

The Verde Confederacy Model, discussed in more detail below, proposes sustained collective action in the form of a Late Prehistoric central Arizona military alliance. Identifying the organizational potential of bounded, alliance-like polities such as the Verde Confederacy should include an investigation of both relational networks and categorical identities. "Catnets," groups that are closely integrated categorically and

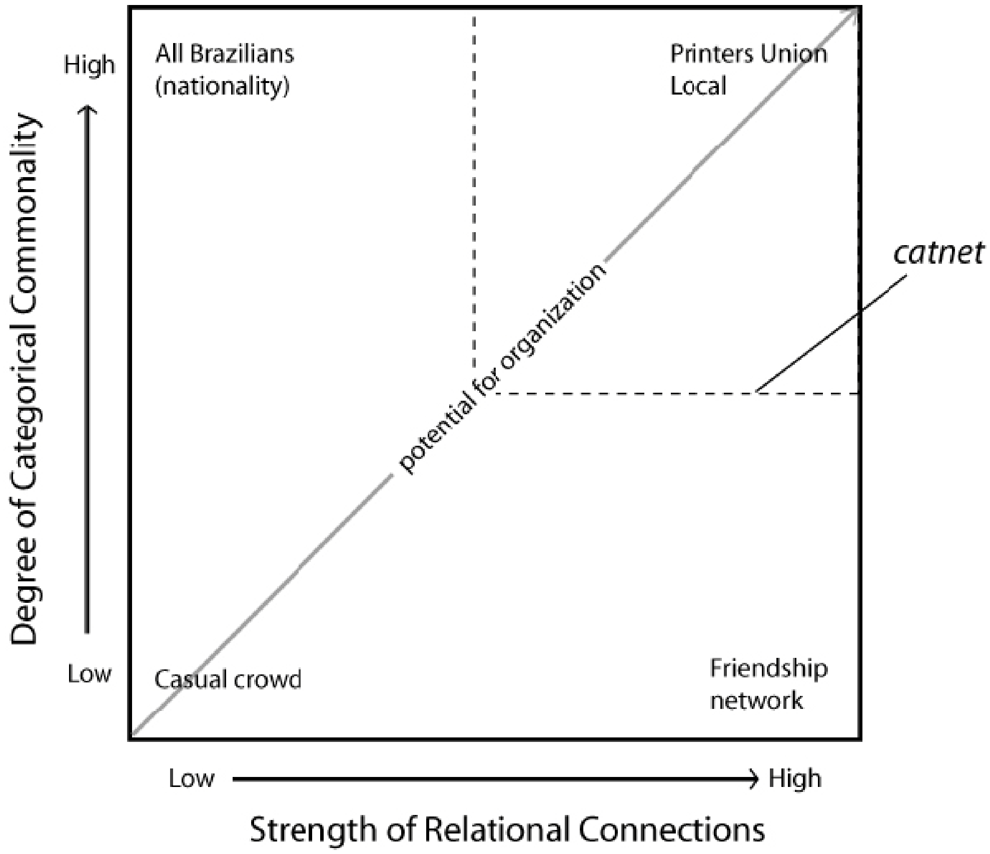

Figure 1.2. Schematic Model for the Relationships among Relational Connections, Categorical Identities, and the Organization of Collective Action (Peeples 2011:Figure 2.1, Redrawn and Modified from Tilly 1978:Figure 3-3).

relationally, are far more likely to have communicated regularly, mobilized efficiently, and coordinated large-scale actions. These collective social actions are fundamental to alliances such as the proposed Verde Confederacy, and boundaries to catnets are of particular interest to this investigation.

Methodology: Characterizing Social Boundaries with Material Culture Distributions

Boundary type, boundary nature, and collective social identification are critical concepts in moving beyond identifying the presence of purportedly monolithic social boundaries to characterizing a more heterogeneous phenomenon. I operationalize these concepts for application to material culture distributions in archaeological contexts, and propose a methodology to identify and characterize social boundaries. In the first phase of the analysis, each material culture distribution has its boundary nature assessed and is associated with a boundary type and collective social identity. The spatial relationships between the individual boundaries can then be compared to characterize the overall boundaries. I individually explain each step in this process. In this study, I cast a broad net by looking across several distributions associated with a variety of boundary types and both collective social identities.

Parker is no doubt correct about boundary nature ranging from an open frontier to closed borders, but how can boundary porosity be assessed using archaeological data? In this study, I treat boundary nature as dichotomy – associating each material culture distribution with either a boundary or a frontier. In general, I propose that boundary nature is related to the gradient, or rate of fall-off, of a material culture distribution. Clinal material culture distributions that fall-off across a broad spatial area are indicative of frontier, whereas the abrupt cessation of a distribution suggests a boundary. The distribution of Snake Valley Black-on-gray pottery, a Fremont ceramic type in present-day Utah (Janetski et al. 2011, Watkins 2006, 2009), is an excellent example of different boundary natures (Figure 1.3). The sharp termination of the distribution to the west and south of the production zone are consistent with borders. The gradual fall-off of this type to the north indicates an extended frontier. The eastern boundary is a slight fall-off that falls somewhere in between. Researchers will need to find reasonable ways to apply this general principle depending on data type (presence/absence, categorical, ordinal, count,

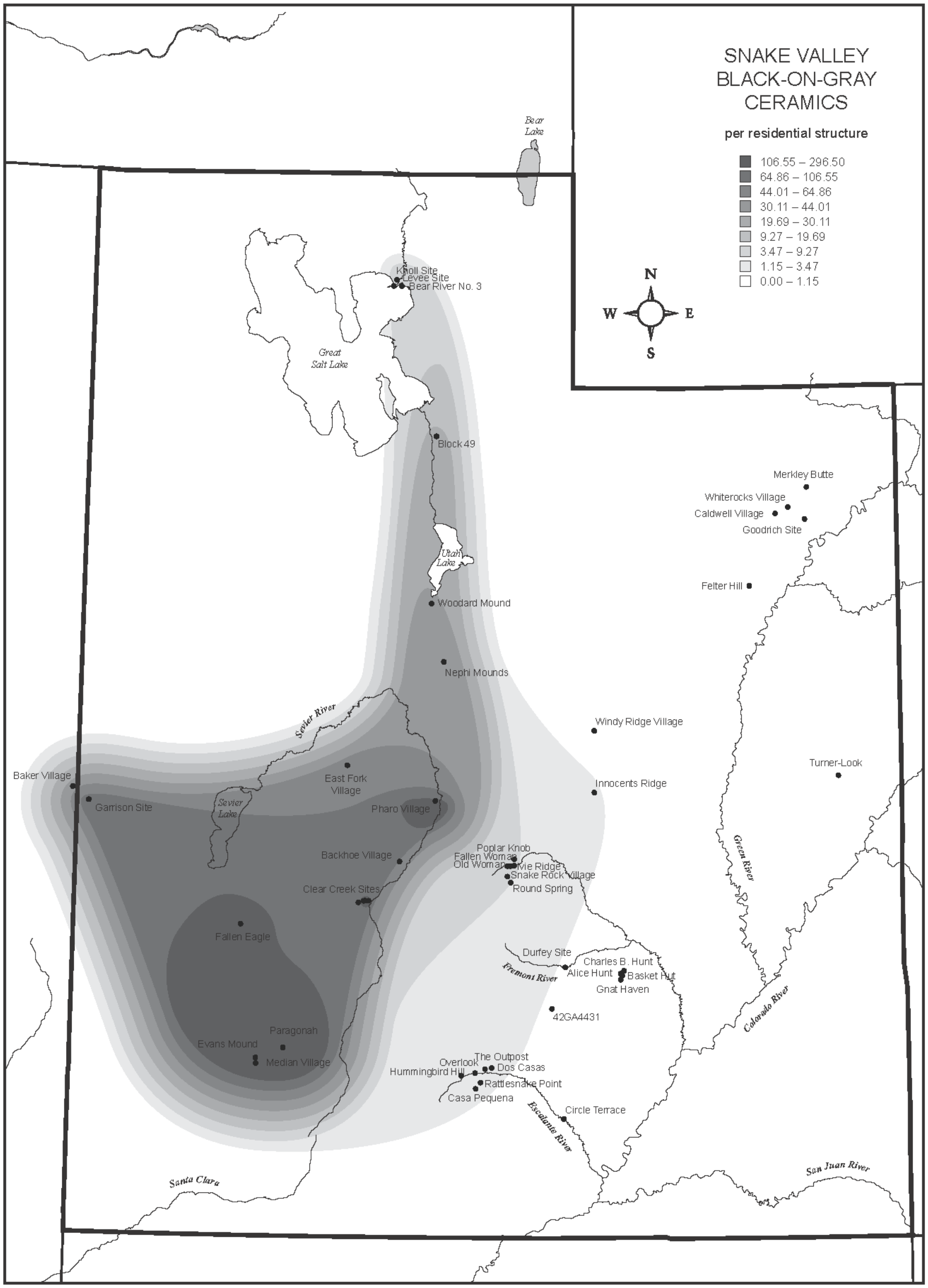

Figure 1.3. Distribution of Snake Valley Black-on-gray Ceramics from Fremont Residential Sites, Counts Standardized by Number of Residential Structures per Site (Janetski et al. 2011:Figure 9).

etc.). For example, analyzing presence/absence or categorical distributions may be as simple as drawing circles on a map (Figure 1.4). It may be appropriate to standardize or express count data as contours (e.g. Figure 1.3). More complex distributions could be assessed using multivariate statistics.

I follow previous researchers who have associated material culture distributions with boundaries using bridging arguments derived from archaeological, general ethnographic, or direct ethnohistoric data (e.g. Braithwaite 1982; Conkey 1990; Hodder 1982, 1990; Longacre 1981; Stark et al. 1998). I take the additional step of associating a distribution with a boundary type. For example, ceramic exchange clearly indicates interaction, but interaction is not a boundary type. Putting these exchanges into their archaeological context by assessing the ceramic mode of production and exchange value (Abbott 2000:130-142) enables a boundary type (economic, social, etc.) to be associated with the network. Ethnographic analogies, and direct ethnohistoric data in particular, can be especially useful in teasing out important boundary type distinctions. For example, several Native American groups in the northeastern United States participated in the communal condolence, mortuary, and alliance building rituals associated with the Feast of the Dead (Hickerson 1960; Johnson 1979; Seeman 2011). During the Feast, burials from different villages were excavated and the remains were reinterred in a communal ossuary, cementing relationships between allies. The presence of ossuaries alone is not an indicator of cooperation -- knowing which groups contributed remains to ossuaries is necessary to fully reconstruct boundaries associated with this material culture distribution. Without this information, only the absence of ossuaries associated with the Feast of the Dead is an indicator of a ritual/political boundary.

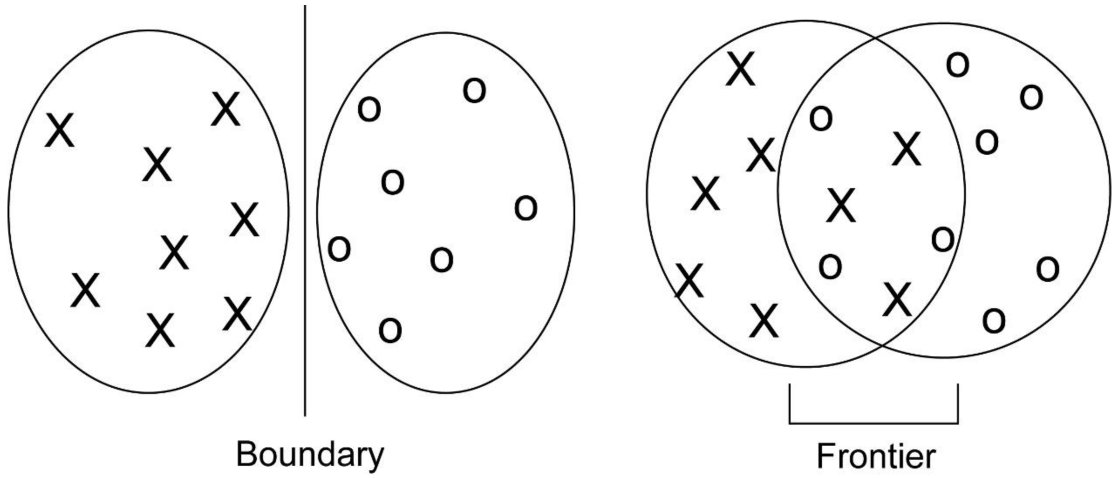

Figure 1.4. Simplified Categorical Boundary Natures.

Collective action models have recently been applied to archaeological contexts (Blanton 2010, 2011; Blanton and Fargher 2008, 2009; Feinman 2011), but these studies were primarily concerned with state formation and did not operationalize collective action at the scale of an individual material culture distribution. In this study, I follow Peeples' (2011) framework to associate material culture distributions with one of the two types of collective social identification. The strength and directionality of relational interactions can be reconstructed archaeologically as social networks. Peeples specifically invokes exchange and technological style as indicators of relational identification. In his case study, he reconstructs ceramic exchange networks and characterizes technological similarities between utilitarian pottery and domestic architecture construction techniques as indicators of different interaction networks. In addition to more traditional archaeological treatment of exchange networks, formal Social Network Analysis (e.g. Borck et al. 2015; Mills et al. 2013a, 2013b, 2015; Peeples 2011) has significant potential to inform investigations of social boundaries. Categorical associations must be symbolized so they can be recognizable (Calhoun 1995:193-250). Such symbolizations are often actively expressed, which Wiessner (1983, 1984, 1985) describes as "emblematic" style. High-visibility material culture was more likely to have been used in active expressions of emblematic style (Clark 2001:6-22) in what Peeples (2011:30) refers to as "shared public expressions of similarity among groups of people." Peeples conducts a stylistic analysis of decorated ceramics and public architecture to assess categorical identity in his case study.

The spatial distribution of each individual boundary in the analysis can finally be compared to characterize overall social boundaries in the study area. Areas where several boundaries share a common edge are more consistent with borders. Strong borders are thought to have been rare in the ancient world (Ashford et al. 2000:476; Parker 2006:80), and these areas are of particular interest. Overlapping or cross-cutting borders suggest a frontier. Teasing out the details of these latter cases allows for a more intense characterization of social boundaries. For example, a strong economic boundary could be coterminous with a ritual frontier.

Research Context: Late Prehistoric Central Arizona

The Late Prehistoric (A.D. 1250-1450) people of central Arizona have been divided into three primary archaeological cultures (Table 1.1). The Perry Mesa Tradition has been defined on and around Perry Mesa (Ahlstrom and Roberts 1994; Fish et al. 1975; Stone 2000). Material culture characteristics of the Perry Mesa Tradition include masonry pueblo architecture, extended inhumation burials, extensive agricultural features, an indigenous red ware/brown ware ceramic tradition, and the presence of imported yellow ware and polychrome decorated ceramics. In the middle Verde Valley,

Table 1.1. Late Prehistoric (A.D. 1250-1450) Archaeological Cultures in Central Arizona.

Culture Area	**Sites in Study**	**References**
Perry Mesa Tradition	Big Rosalie, Dugan, La Plata, Las Mujeres, Richinbar	Ahlstrom and Roberts 1994; Fish et al. 1975; Stone 2000
Southern Sinagua	Montezuma Castle, Tuzigoot	Caywood and Spicer 1935; Fish et al. 1980; Landis 1993; Pilles 1996a
Hohokam	Ister Flat, Mercer	Wasley and Doyel 1980; Whittlesey 1997
Unknown	Polles	Wilcox et al. 2001b:Appendix 7.2B; Shockey and Watkins 2009b

early Southern Sinagua sites are most often found in upland zones bordering the Verde River (Pilles 1996a). Material culture characteristics exhibit a strong Hohokam influence (Fish et al. 1980), including a paddle-and-anvil brown and slipped red ware ceramic tradition. After A.D. 1150, the Southern Sinagua established pueblos and cliff dwellings such as Honanki and Palatki in the Red Rock country at the base of the Mogollon Rim. Large villages such as Tuzigoot and Hatalacva were built in the lowlands along the Verde River. By A.D. 1400 or 1450, the region was depopulated (Landis 1993). As part of the Lower Verde Archaeological Project, Whittlesey (1997:74-87) synthesized previous archaeological research along the Lower Verde. The prehistoric inhabitants of the lower Verde have typically been conceived of as part of the Hohokam periphery, and generally parallel developments in the Phoenix Basin. During the Preclassic, large pithouse communities lined the river. In Classic (Late Prehistoric) period times, compounds and pueblo room blocks, including Mercer and Ister Flat, became the primary residential site types. Like the Hohokam and their neighbors to the north, ceramics included paddle-and-anvil brown wares and slipped red wares (Wood 1987).

In the centuries leading up to European contact, Southwestern peoples gathered into larger and more defensible population aggregates (Doelle and Wallace 1991; LeBlanc 1998, 1999; Lipe 1989; Upham and Reed 1989; Wilcox 2005). This regional phenomenon first manifested itself in central Arizona as defensive hilltop site complexes in the late A.D. 1200s (Wilcox et al. 2001a). Throughout the A.D. 1300s, large portions of central Arizona were depopulated, opening buffer zones between existing and emergent settlement clusters of increasing population density (Wilcox et al. 2001b; Wilcox and Holmlund 2007). These buffer zones and the positioning of settlements in defensible locations suggest an escalation of violence on a multi-regional scale. As proposed by Wilcox and others (Wilcox 2005:26; Wilcox et al. 2001a, 2001b; Wilcox and Holmlund 2007), the Verde Confederacy consisted of five of these settlement clusters, or "local systems," on or near the Verde River that were allied for war and defense beginning in the A.D. 1300s and lasting into the A.D. 1400s. Each Late Prehistoric local system included a large centrally located pueblo surrounded by smaller settlements, forts, lookouts, etc. all within a day's journey. Two local systems were located on the Middle Verde River near present-day Cottonwood and Camp Verde. Other local systems were centered on Mercer Ruin on the Lower Verde River, Polles Mesa, and Perry Mesa (Figure 1.5).

In the aggregate, some 10,000 to 13,000 people, living at approximately 135 sites, may have participated in the confederacy (Wilcox et al. 2001b:160-161). As proposed, the Verde Confederacy was highly organized, with a command structure directing

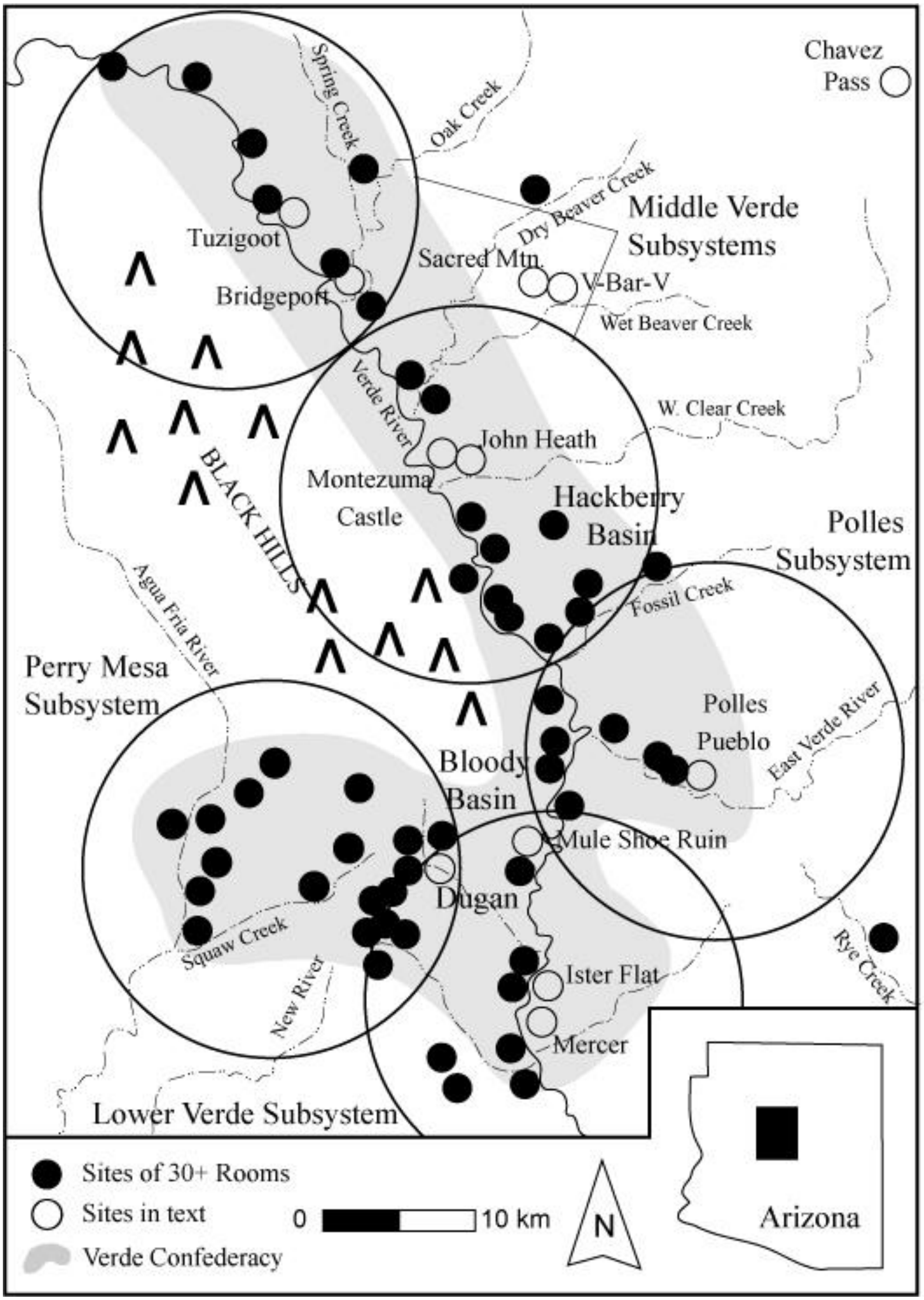

Figure 1.5. Proposed Verde Confederacy in Central Arizona. Perry Mesa Sites Labeled in Figure 1.6.

constituents in military as well as some economic matters. The model posits a directed mass migration of people onto Perry Mesa to shore up a defensive flank for the larger alliance. A "castle defense" settlement pattern was established, consisting of an integrated network of large and small sites connected by a line-of-sight communications network with larger settlements situated defensively on the edges of the steep mesas overlooking strategic access points to the mesa interiors (Figure 1.6). The line-of-site network extended beyond the Perry Mesa local system, also integrating the larger confederation, facilitating the organized deployment of combatants in the event of aggression from outsiders, notably the Phoenix Basin Hohokam. Beyond inferring regular and rapid communication from line-of-sight settlement patterns, the integrative mechanisms by which the Verde Confederacy was founded and maintained have not been explained in detail (Abbott and Spielmann 2014b:11).

Recent syntheses (Abbott and Spielmann 2014a, Russell and Hoogendyk 2012) in the area of the Verde Confederacy have explored alternatives to the alliance model. Ingram's (2010, 2012, 2014) study of the prehistoric climate of the Perry Mesa area indicates that conditions during the early 1300s were unusually favorable to agriculture on Perry Mesa, which could account for some or all of the population increase on the mesa during this time period. Kruse-Peeples (Kruse 2007; Kruse-Peeples 2013, 2014) argued that proximity to available agricultural land and water influenced the distribution of sites on Perry Mesa, in addition to available defensive positions. Abbott (2014:422-423) concludes that the scale of alliance in the proposed Verde Confederacy was larger than the co-resident community but may have been organized at a more moderate scale, that of the synonymous "tribe", "local system," or settlement cluster. Perry Mesa, Bloody

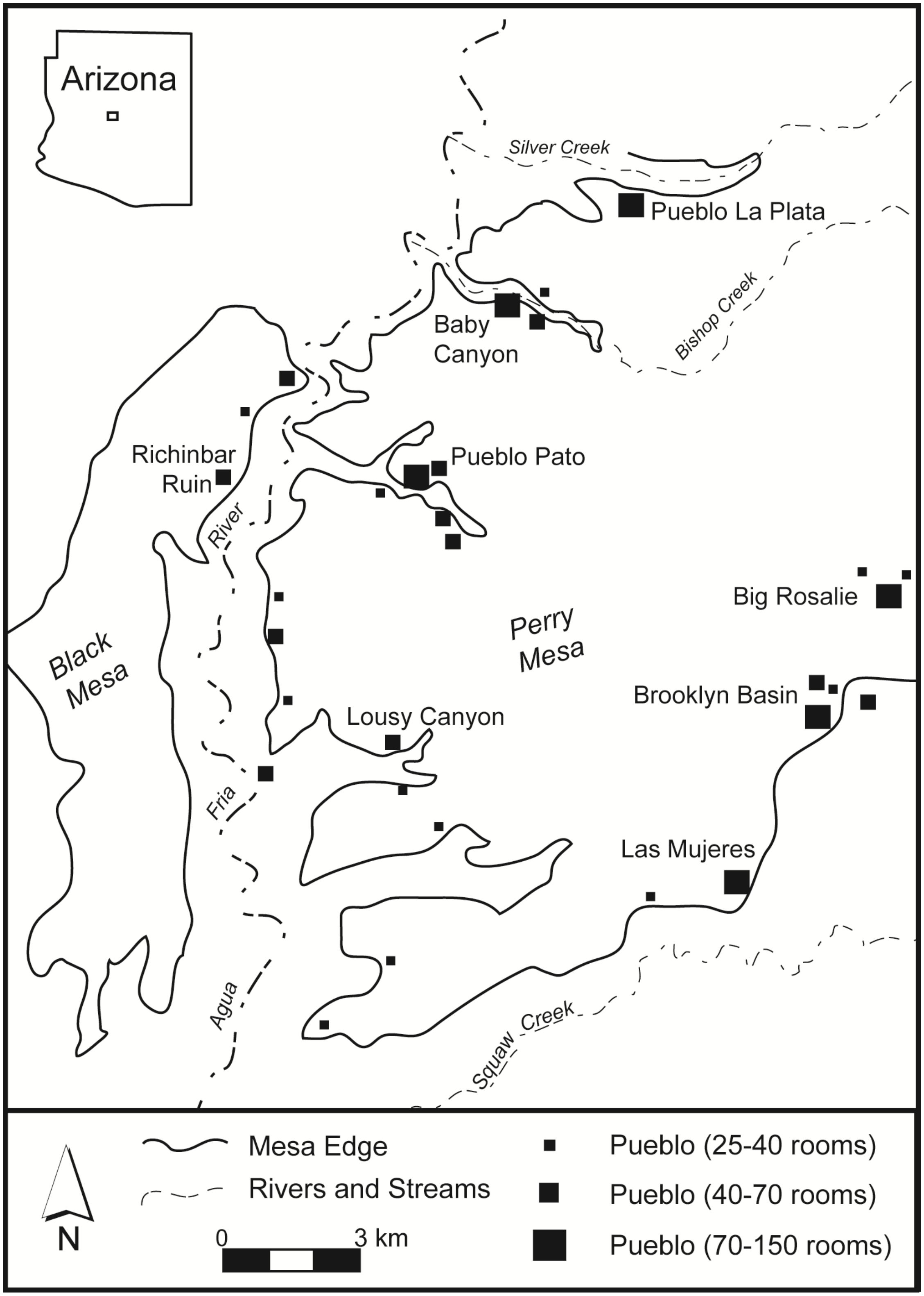

Figure 1.6. Late Prehistoric Pueblos on Perry and Black Mesas.

Basin, and Polles Mesa are specifically noted as local systems that maintained "sustained connections" with one another.

Organization of the Study

In order to identify and characterize the nature of boundaries and test the Verde Confederacy model by reassessing the scale of alliance in Late Prehistoric central Arizona, three tasks must be completed. Each task is addressed in its own chapter. In Chapter 2, a plain ware provenance model for the study area is established. The provenance model is leveraged in Chapter 3 – where I investigate plain ware production and exchange to identify and characterize socio-economic boundaries associated with exchange networks. In Chapter 4, I implement the methodology described above to identify and characterize social boundaries in Late Prehistoric central Arizona using six material culture distributions. In the concluding chapter I synthesize the three studies in a reassessment of the scale of alliance within the proposed confederacy, address how prehistoric alliances such as the proposed Verde Confederacy would have operated, and propose directions for further research.

In Chapter 2, I build on previous research conducted by myself and others (Abbott et al. 2012; Kelly et al. 2009, 2011; Watkins and Kelly 2014; Wichlacz 2006) to develop a plain ware provenance model for Late Prehistoric central Arizona. I follow methodology developed by Abbott (2000) incorporating a combination of binocular microscopy, chemical assay with the electron microprobe, and petrography. The technique has produced extremely accurate and cost-effective results, and this study is the first application of the methodology outside the Phoenix Basin. Plain ware provenance is foundational to my overall goal of identifying and characterizing the nature of social boundaries.

Utilitarian ceramics are particularly well-suited to network boundary investigations. These vessels were ubiquitous and can usually be assigned to a provenance. In Chapter 3 I build on the provenance study and argue that the organization of Late Prehistoric central Arizona plain ware production and exchange encodes information about network boundaries. Exchange networks "exist primarily because exchange activities are social as well as economic in nature, and because the social distance between participating parties is a factor that determines which aspect is stressed" (Abbott 2000:134, see also Bohannon 1955; Graves 1991; Mauss 1967; Sahlins 1972; Salisbury 1962; Stark 1992; Stilltoe 1978; Strathern 1971; Suttles 1960). Determining the nature of the relationship underlying a specific network requires an investigation of the organization of production and exchange of the item(s) being exchanged. Plain ware vessels in the study area were low-valued and widely produced – items that tend to circulate between closely cooperating kin and close friends as part of reciprocal food gifting/risk buffering strategies or feasting events (Graves 1991; Plog 1986; Stark 1992). Boundaries to plain ware exchange in this context delineate networks of socially proximate individuals and households.

In Chapter 4, I identify and characterize social boundaries in Late Prehistoric central Arizona. Using the methodology described above, six material culture distributions are associated with a boundary type, have their boundary nature assessed, and most are linked to one of two collective social identifications (categorical identity or relational network). As argued in Chapter 3, the plain ware distributions are associated with relational exchange networks. I reinterpret the settlement pattern distributions that form the basis of the Verde Confederacy (Wilcox et al. 2001b; Wilcox and Holmlund 2007). Geographic features, such as the Perry Mesa "castle defense", are physical boundaries not associated with a collective social identity. The line-of-sight settlement pattern systems are associated with military boundaries and relational networks. Rock art, public architecture, and Salado Polychrome ceramics are argued to represent categorical identity and social/ritual boundaries. Preliminary analyses of available material culture distributions suggest the presence of meaningful boundaries within the Verde Confederacy (Abbott 2014; Watkins 2014). These findings are confirmed in this analysis.

Finally, in Chapter 5, I discuss how the three studies complement one another by reassessing the scale of alliance within the proposed confederacy and propose directions for further research on social boundaries. Social boundaries are complex, but archaeologically manageable. I have developed the means to identify and characterize social boundaries in archaeological contexts. My study has not addressed what kinds of material culture distributions are most likely to indicate meaningful social boundaries in different contexts or assessed the circumstances under which social boundaries were likely to emerge. Future research should address these issues by focusing on cross-cultural boundary assessments in archaeological, ethnohistoric, and ethnographic contexts. I also discuss how the alliances such as the proposed Verde Confederacy could have operated, and the material culture correlates I would expect to be associated with alliance-like entities.

CHAPTER 2

DETERMINING LATE PREHISTORIC CENTRAL ARIZONA PLAIN WARE PROVENANCE USING BINOCULAR MICROSCOPY, CHEMICAL ASSAY, AND PETROGRAPHY

In this chapter, I develop a plain ware provenance model for Late Prehistoric central Arizona. Plain ware provenance is crucial to my overall goal of identifying and characterizing the nature of social boundaries. I argue that Late Prehistoric central Arizona plain wares encode information about two networks – exchange networks between socially proximate individuals and households and communities of practice including producers who share contexts of learning. Ceramic provenance data are critical to identifying boundaries of these networks, which are addressed in detail in Chapter 3 and are also incorporated into the synthetic analysis in Chapter 4.

I follow the methodology developed by Abbott (2000) and incorporate a combination of binocular microscopy, chemical assay with the electron microprobe, and petrography. The technique has identified ceramic production zones within a few kilometers of one another that can be differentiated in the optical microscope, and this study is the first application of the methodology outside the Phoenix Basin. Portions of the provenance model have been discussed in previous publications. Wichlacz (2006) undertook the first detailed study of Perry Mesa ceramics. With petrographic and microprobe data, she demonstrated that the most readily available tempering material, basalt, was not present in Perry Mesa plain wares. She further showed that clay chemistry was related to temper composition, suggesting the presence of discrete production sources. Kelly and others (2009) made an assessment of the geology of the study area, define temper types based on qualitative petrographic analysis, and introduced limited microprobe data confirming that pyroxene grains in Perry Mesa tempers are consistent with granitic rather than basaltic sources. In support of a proposed modification to Arnold's (1985, 1993) Exploitable Threshold Model (ETM), Kelly and others (2011) reported a detailed investigation of Perry Mesa sites focused on linking temper to geologic source and procurement behavior. We found that Perry Mesa potters were crafting ceramics in the drainages below the mesa where water, wood, clay, and temper were abundant. The most recent publications have contributed chemical analysis of the clay fraction using the electron microprobe (Abbott et al. 2012, Watkins and Kelly 2014). The chemical analysis confirmed the reference groups established on the basis of temper, supporting the idea that each reference group represents a discrete production source where potters utilized very similar temper and clay. This chapter synthesizes the previous work and introduces new information to offer a more complete provenance model, including linking temper to geologic source and discussing procurement behavior at sites beyond Perry Mesa, and verification of the reference groups at all sites included in the sample.

In this chapter, I first summarize the problematic central Arizona plain ware typology and discuss how the existing typology relates to the current study. Next, I describe the four research goals that are part of Abbott's methodology—linking temper to geological source, the establishment of procurement behavior, distinguishing exchange wares, and verifying the reference groups. Each research goal is discussed individually. I then apply this methodology to plain wares in Late Prehistoric central Arizona.

Ceramic Types in Central Arizona

Attitudes toward undecorated pottery in the Southwest have changed greatly through many years of archaeological research. The earliest antiquarians sometimes did not even collect the plain ware they encountered in their excavations. Today, sophisticated analyses of undecorated ceramics have opened new avenues of research early archaeologists could have only dreamed about. Undecorated ceramics in the Southwest have fewer attributes to track than decorated ceramics, making it more difficult to construct meaningful typologies. In the absence of obvious variation in vessel form or surface treatment, such as slip or polish, plain ware typologies typically rely on temper as the primary classificatory criterion. In a review of the historical development of ceramic typologies in Central Arizona, Walsh and Christenson (2003:47–55) recount a series of ceramic conferences held every few decades where analysts came together to look at sherds, discuss problems with the ceramic typologies, and ideally reach consensus on how ceramics should be classified in the future. The participants in these conferences consistently reached consensus on at least one issue—undecorated prehistoric ceramics of Central Arizona are difficult to classify. Descriptions of intergrades and type-busting sherds and vessels appear repeatedly in the accounts of these meetings.

The typological problems associated with undecorated Central Arizona ceramics are perhaps best summed up in the report of the Agua Fria-Verde River Brownware Conference (Gratz and Fiero 1974:2), which concluded that “the Type and Ware concepts do not tend to hold up well in Central Arizona; rather, plain wares of this region all seem to follow a continuum.” Despite this and other similar observations, many researchers and subsequent regional ceramic conferences have continued to tinker with the existing type definitions in an attempt to create solvency in the typology, including the definition of several intergrade types.

Much of the difficulty characterizing undecorated Central Arizona ceramics is related to attempts to partition sand-tempered specimens. Analysts studying Southwestern plain wares have largely followed Colton in defining wares and types (Watkins 2009). Some researchers have defined broad temper categories that are easily identifiable (e.g. Watkins 2009), and others have defined narrow types covering specific temper variations (e.g. Wood 1987). Typologies based on temper variation break down in areas where tempers grade into one another. As discussed by Walsh and Christenson (2003:47–55), researchers in Central Arizona have spent decades attempting to prop up typologies by defining intergrade types. Despite extensive research and regular ceramic conferences, significant typological ambiguities and confusion persist. These on-going issues suggest that alternative taxonomic solutions should be explored.

Renewed interest in the archaeology of Central Arizona (Abbott and Spielmann 2014; Anduze et al. 2003; Leonard and Robinson 2005; Motsinger et al. 2000; Neily 2006; Wilcox 2001a, 2001b; Wilcox and Holmlund 2007; etc.) has led to refocused attention on the ceramics of Central Arizona, most of which are undecorated. In revising ceramic typologies, care should be taken to avoid nullifying decades of previous research by completely abandoning extant types (Watkins 2009). Complementary or supplementary schemes can be devised that contribute useful information without totally supplanting existing types. In the Phoenix Basin, wares are broadly defined based on surface treatment, firing atmosphere, and paste (plain wares, red wares, red-on-buff wares, etc). Undecorated pottery types are defined by broad temper categories (Abbott and Gregory 1988; Schroeder 1940; Weaver 1973), such as Gila Plain and Red, Salt Variety (sand tempered), Gila Plain and Red, Gila Variety (mica schist tempered), and Wingfield Plain and Red (phyllite tempered). More specific variations in temper are called out as temper types (Abbott 2000). For example, sand-tempered plain ware in the Phoenix Basin can be classified as Gila Plain, Salt Variety, but more detailed analysis can further identify the vessels as belonging to the South Mountain Granodiorite or Estrella Gneiss, among other temper types.

In this study, I follow the structure of the Phoenix Basin Hohokam plain ware typology. Unpainted paddle-and-anvil ceramics are collectively thought of as sand tempered plain ware. Temper type is added to the central Arizona plain ware typology to characterize meaningful variation in ceramic temper without obscuring long-standing ceramic types. Ceramic type is listed along with temper type in Table 2.1. Ceramic types with broad temper descriptions, such as Verde Brown, have been subdivided into multiple temper types. Ceramic types with more narrowly defined temper descriptions, such as Tonto Plain, Polles Variety, are associated with a single temper type.

Because all of the sherds in my study have been identified to temper types that have been extensively investigated, ceramic type names will not be used in the remainder of this study. Is the central Arizona plain ware typology solvent? I think not, but testing the typology would require a synthesis of attribute-based analyses that have recently been favored in studies of central Arizona ceramics (Christenson and Leonard 2005; Lack and Watkins 2007; Walsh 2006; Walsh and Christenson 2003; Whittlesey et al. 2007). Such a study would be worthwhile, but is beyond the scope of the current research.

Table 2.1. Reference Groups Identified within the Verde Confederacy.

Reference Group	**Thin-Sections/ Probe Rounds**	**Kelly et al. 2009 Designation**	**Petrographic Temper Description**	**Traditional Ceramic Type**
Mercer/Ister Flat	7 Mercer, 10 Ister Flat	Granite V	Large potassium feldspars represent half or more of the temper composition. Wavy alteration of plagioclase feldspar grains.	Verde Brown (Whittlesey et al. 1997:13-14) or Tonto Plain, Verde Variety (Wood 1987:13-14)
Dugan	18 Dugan	Schist and Phyllite	Large pieces of schist and phyllite dominate the temper. Relatively few individual mineral grains, although large unaltered quartz grains are present.	Tonto Plain, Perry Mesa Variety, Bloody Basin Sub-variety (Wood 1987:33)
Perry Mesa East	20 Las Mujeres, 19 Big Rosalie	Schist and Granite	Smaller grain size than other reference groups. Characterized by schist mixed with heavily weathered arkosic sands. Almost no phyllitic textures present.	Tonto Plain, Perry Mesa Variety (Wood 1987:15)
Perry Mesa West	20 Richinbar, 20 Pato	Granite I	Characterized by relatively large unaltered quartz and plagioclase feldspar grains. Very little potassium feldspar. Large pieces of biotite are present as well as large, altered mafic grains.	Verde Brown (Whittlesey et al. 1997:13-14) or Tonto Plain, Verde Variety (Wood 1987:13-14)

Reference Group	Thin-Sections/ Probe Rounds	Kelly et al. 2009 Designation	Petrographic Temper Description	Traditional Ceramic Type
Polles	13 Polles	Volcanics	Temper dominated by a mixture of porphyritic basalt with vitrophyric texture and fine-grained, felty volcanics. Various stages of alteration present. Composition varies, and the group can likely be subdivided.	Tonto Plain, Polles Variety (Wood 1987:16)
Montezuma Castle	20 Montezuma Castle	Granite III	Large plagioclase feldspar and quartz grains dominate. Smaller and less abundant potassium feldspar grains present. Pyroxene grains appear in trace amounts. Temper is composed of both lithic and mineralic grains.	Verde Brown (Caywood and Spicer 1935; Wood et al. 1987:13-14)
Tuzigoot	17 Tuzigoot	Grog	Characterized by crushed-sherd temper as well as a variety of other lithic grains, including basalt.	Tuzigoot Plain (Caywood and Spicer 1935; Wood 1987:48-49)

Ceramic Compositional Analysis

Abbott's (1994, 2000) ceramic provenance research strategy incorporates four goals that are examined concurrently in a recursive analytical process. Information gathered in the pursuit of one goal informs the investigation of the others. First, the constituents of the pottery (primarily the temper fraction) must be linked to the raw material sources on the natural landscape. Second, the raw material procurement behavior of the pottery makers must be established. Third, locally made ceramic vessels must be distinguished from those that were imported. Fourth, reference groups associated with each production source are verified. Ideally, the production sources of the imported and locally produced vessels are identified, enabling the reconstruction of pottery exchange networks. Groups of sherds that are both petrographically and geochemically distinct should be subjected to on-going verification as a quality control check on the model and on the ability of the analyst(s) to correctly assign sherds to the appropriate group in the optical microscope.

Linking Temper to Geological Source

Effective provenance studies rely on identification of discrete production sources. The scale at which production locales can be identified based on temper is directly related to the range of geological variation presented on the investigated landscape. Ideally, individual potting communities would have exploited geologically distinct temper sources. In reality, the geological terrain may be homogeneous, and multiple potting communities may have exploited similar or identical temper sources, making differentiation between potting communities difficult. Understanding the geology of a study area and knowing what geological maps are available are critical for assessing the mineralogical variation and predicting the precision at which pottery exchange can be monitored archaeologically. Geological maps and descriptions were not created with ceramic compositional analyses in mind, and for the purposes of this methodology, meaningful mineralogical diversity must be observable both in ceramic thin sections and with standard optical microscopy.

Ceramic temper must be adequately characterized before it can be linked to geological sources. It is best characterized in petrographic thin section under polarized light. Subtle differences in temper composition may be apparent only after the analysis of quantitative data generated by point-counting, manually counting the occurrences of different grain types in thin section along a systematic grid. Characterizing the mineralogy of temper fractions qualitatively may be sufficient when temper compositions are more distinct. Geological maps are critical components for "matching" temper composition and geological sources, but some raw material sampling may also be required. Depending on temper composition, analysis of bedrock and/or sand samples may be appropriate. Raw material samples can also be thin-sectioned to facilitate comparison between temper and geological source.

Temper categories confirmed by petrographic analysis have their greatest utility when they can be inexpensively differentiated under low magnification using a standard binocular microscope. Analyst accuracy is improved by training with type collections, including "remnant" sherd samples that have also been analyzed petrographically. It may also be useful for analysts to review previously characterized sand samples as part of their training, particularly in cases where temper distinctions are subtle. Analytical quality can be maintained with ongoing quality control checks using supplemental thin-section analysis.

Establishing Procurement Behavior

In his exploitable threshold model, Arnold (1985, 1993) uses procurement behavior from several ethnographically known, traditional pottery manufacturing communities to determine limits on the distances potters will travel to procure raw materials. The energy required to transport clay, temper, and pigment increases with distance from potters' homes. The vast majority of potters in Arnold's sample procured "locally available" temper near their dwellings, typically within 1 km (Threshold A) but no more than 7 km (Threshold B) in the vast majority of ethnographic cases. Sand temper is particularly prone to localized procurement, and potters would often collect material immediately adjacent to their homes (Miksa and Heidke 1995). A few artisans were occasionally willing to travel to more distant locations to procure their temper, but these longer trips were uncommon. Individuals without appropriate locally available temper or other raw material often chose to forgo pottery production, obtaining their needed pots from specialists in areas more conducive to ceramic manufacture.

Raw material procurement behavior can be inferred by comparing ceramic temper with the locally available raw materials. Sherds from each sampled site are examined with an optical microscope and sorted into groups based on observed temper characteristics. These temper varieties are compared to the local geology to determine whether the temper is locally available. Often the most abundant temper category at a sampled site contains locally available temper, implying that the vessels were produced locally. Ceramics with temper types that are not locally available are further investigated to determine if they were imported from other production areas.

Distinguishing Exchange Wares

The establishment of reference groups is a critical step in distinguishing between locally produced vessels and imported wares. A reference group consists of ceramic samples whose temper and clay compositions are analytically homogeneous and are the best candidates for local production at a given location. The temper constituents identify them as representative of an abundant (usually the most abundant) pottery variety at that locality, and their rock and sand inclusions are mineralogically consistent with raw materials located within the radius described in Arnold's exploitable threshold model for procuring "locally available" tempering materials.

Microassays of the clay fraction are also critical for verifying the reference groups. It is expected that a set of locally manufactured ceramics will include not only locally available temper but also clay fractions that are homogeneous within the reference group and distinctive from those in reference groups from other places in the study area. As argued in Arnold's ETM, potters tend to select clay close by their settlements, clay that presumably has its own chemical signature. This expectation that extra-source variation will exceed intra-source variation is a fundamental proposition for sourcing archaeological artifacts (Weigand et al. 1977), and its application independently to the temper and clay fractions provides a double measure of analytical assurance that the reference groups are well defined.

Once compositionally distinct reference groups are differentiated for each portion of the study area, the analysis can proceed to distinguishing locally made ceramics from imported wares and establishing the production source for the latter. Candidates for imported wares at a particular location are initially identified based on their temper inclusions, which vary mineralogically from the temper fraction in the local reference group. If a candidate's temper is consistent with the nonplastic inclusions that typify the pottery in another reference group, its provenance can be verified with chemical assays of its clay fraction. A "match" of both temper and clay between the candidate and a particular reference group would confidently establish the production source of the imported ware.

Verifying Reference Groups

As described above, a ceramic provenance model defined using Abbott's (2000) methodology includes one or more reference groups built on data gathered from chemical assays, petrographic thin sections, and the optical microscope. These reference groups are also ideally tied to specific production zones by comparing temper to local geology. One of the strengths of Abbott's methodology is that once a model is defined, a trained analyst can assign sherds to a reference group using the optical microscope, but how can the analyst be confident in these assignments in the absence of petrographic and/or chemical data? Provenance models defined using Abbott's methodology should be verified by subjecting a sample of sherds assigned to non-local reference groups in the binocular microscope to further petrographic and/or chemical analysis. Verification tests both the solvency of the reference groups and the analyst's ability to successfully differentiate between reference groups by way of the optical microscope. Verification should continue to be conducted as quality control during subsequent investigations using Abbott ceramic provenance models.

Plain Ware Provenance in Central Arizona

Linking Temper to Geological Source

The geological diversity of the proposed Verde Confederacy and the results of the petrographic analysis have been previously reported in detail (Kelly et al. 2009) and are briefly summarized here. Initial investigations of the study area indicated that sufficient geological and temper diversity existed to permit high-resolution provenance determinations (Castro-Reino n.d.; Wichlacz 2006; Wilcox and Holmlund 2007:76-79; Wood 1987). In the middle Verde Valley, Montezuma Castle and Tuzigoot are located in the Verde formation, Miocene-Pliocene limestones and siltstones deposited by the Verde River (Nations et al. 1981; Pearthree 1993; Royce and Wadell 1970). Along the lower Verde River, Mercer and Ister Flat Ruins are located in an area characterized by sediment eroded from Tertiary and Quaternary basalt lava flows from nearby mesas (Pearthree 1993; Royce and Wadell 1970; Wilson et al. 1957). Perry Mesa is capped by a basalt lava flow that overlays outcrops of granite and schist which are exposed in the steep river canyons surrounding the mesa (Lindgren 1926; Jaggar and Palache 1905; Wilson et al. 1958). In Bloody Basin, Dugan rests on large Quaternary silt, sand, and gravel deposits that have eroded from basalt-capped mesas that once surrounded the basin (Brand and Stump 2011; Rhys-Evans 2007; Wrucke and Conway 1987). Polles Pueblo is located on a basalt-capped mesa north of the East Fork of the Verde, a major tributary of the Verde

River. This mountainous terrain also includes Precambrian granite and metamorphic rocks (Pearthree 1993; Royce and Wadell 1970; Wrucke and Conway 1987).

Several temper varieties were characterized during the petrographic analysis of 185 plain ware thin sections from 10 sites within the proposed Verde Confederacy. The petrographic analysis was performed by Sophia E. Kelly. Temper categories could be differentiated qualitatively, and no point counting was required. Seven of these temper varieties dominated the ceramic assemblages from at least one site, as identified with the binocular microscope (Table 2.1). These temper types represent the reference groups distinguished for this study. Tuzigoot, Montezuma Castle, Polles Pueblo, and Dugan Pueblo are each represented by a separate reference group. The same reference group dominated at both Mercer and Ister Flat Ruins. On Perry Mesa, one reference group was abundant in the west at Pueblo Pato, Richinbar, and Pueblo La Plata. A second reference group dominated in the east at Las Mujeres and Big Rosalie.

Tuzigoot Plain is primarily tempered with grog (Christenson 1999, 2003; Kelly et al. 2009). As a composite, man-made material, sherd temper cannot be linked to a geologic source in the same way as sand or crushed rock. Noting the ubiquity of volcanic rock in central Arizona watercourses (Christenson 2000:157, 160) Christenson (2012) suggests that the presence of small quantities of basalt in the aplastic fraction of Tuzigoot Plain (as identified in thin-section) indicates the alluvial clays were utilized in their construction. The basalt would have been included in the alluvial clay matrix and not added as temper. Christenson does not indicate which drainages may have been the sources for these alluvial clays, and suggests additional petrographic analysis is needed to associate Tuzigoot Plain with clay sources. Such a study is beyond the scope of the current research effort. For the purposes of this paper, I assume that large residential sites where the plain ware assemblage is dominated by Tuzigoot Plain were locations where these vessels were manufactured. Anvil stones and polishing pebbles are common at Tuzigoot (Caywood and Spicer 1935:72) – additional evidence for ceramic production at the site.

I collected a single sand sample from Beaver Creek at Montezuma Castle. The sand included a significant limestone component, which was not observed in the granitic temper in the Montezuma Castle reference group. Again citing the near-universal presence of volcanic rock in central Arizona drainages (Christenson 2000:157, 160) and the absence of volcanics in Verde Brown, Christenson (2012:5) argues that these vessels were made with residual clays "formed in the immediate vicinity of bedrock or in drainages coming out of bedrock that have not yet intercepted other formations." The aplastic fraction of ceramics derived from these clays would have been composed of decomposed granite already present in the clay matrix. Christenson (2012) thin-sectioned a sand sample from Cherry Creek and found it to be relatively free of volcanics and similar to Verde Brown granitic temper. He suggests that the volcanic "contamination" along Cherry Creek would decrease farther up the drainage, and proposes the Cherry Tonalite formation (DeWitt et al. 2008) as a likely geologic source for Verde Brown ceramics (Figure 2.1).

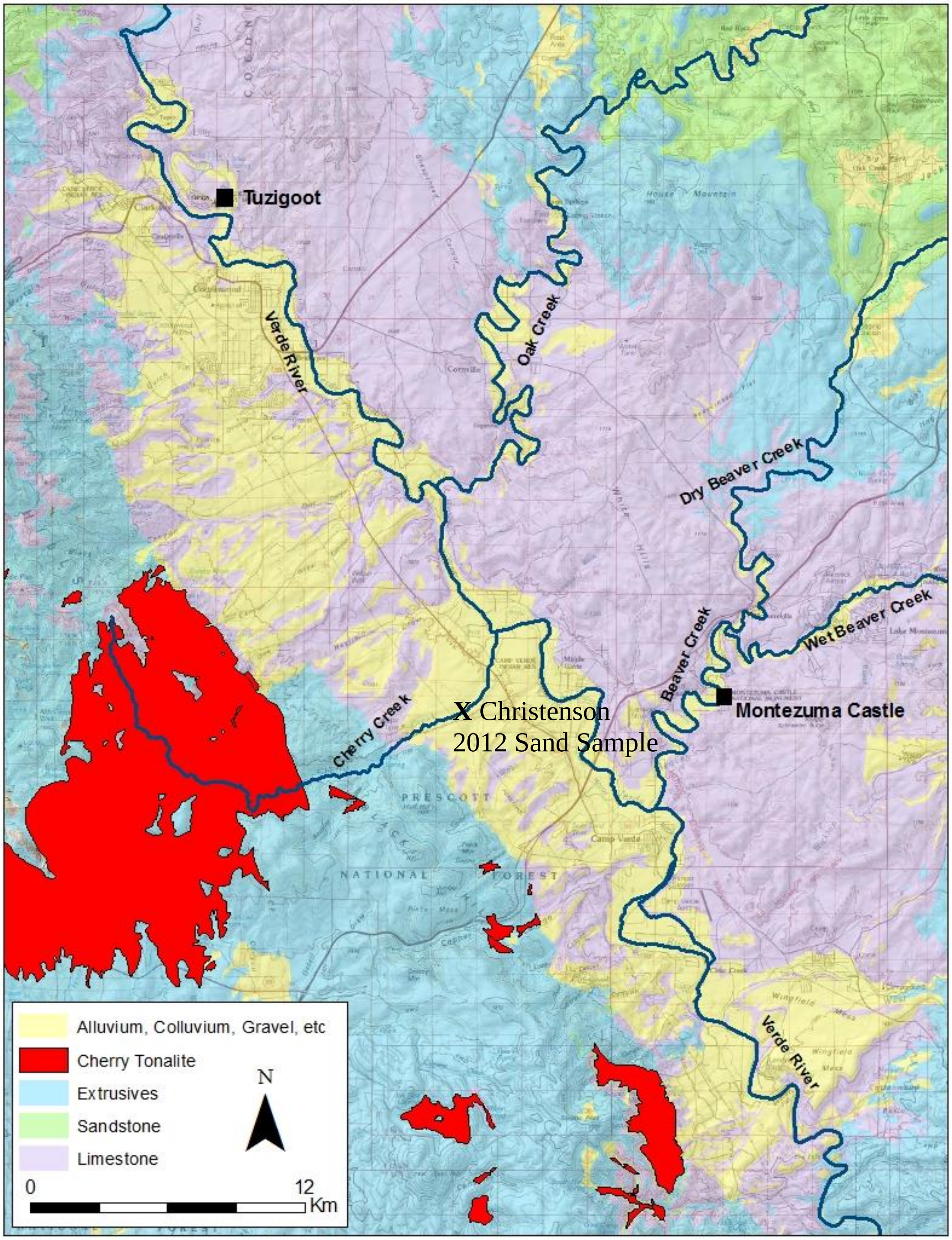

Figure 2.1. Geology of the Middle Verde Valley.

As part of the Lower Verde Archaeological Project (LVAP), Heidke and others (1997) developed a petrofacies model for the Lower Verde River including Mercer and Ister Flat. A petrofacies is a distinctive sand composition zone defined by collecting sand samples, point-counting thin-sections created from the sand, and a running a series of detailed statistical analyses (Miksa and Heidke 1995; Miksa et al. 2004). Ceramic temper can then be matched to a petrofacies in thin-section and/or in the binocular microscope. Mercer and Ister Flat are located in the basalt-rich sands of Petrofacies H (Figure 2.2). Basalt is not present in the Mercer/Ister Flat reference group, and Petrofacies H is not a candidate for the source of these vessels. Two granitic petrofacies are located near Mercer and Ister Flat. Petrofacies J is just across the Verde River from both sites, and Petrofacies F is approximately 7 km down river from Mercer. Vessels tempered with both Petrofacies J and F are present at Classic Period LVAP sites around Horseshoe Reservoir (Heidke et al. 1997). The Mercer/Ister reference group (Granite V) can be correlated with Petrofacies F.

Petrographic analysis of 26 sand samples collected in the vicinity of Perry Mesa was used to assess whether the reference group tempers were available locally (Figure 2.3). A comparison of the petrographic analysis with geologic survey data of the surrounding region (Wilson et al. 1958) suggests that the two Perry Mesa reference groups were derived from sands in the vicinity of Perry Mesa. The Perry Mesa East reference group contained schist-and-granite temper, probably from along Squaw Creek, directly below the eastern portion of the mesa top. The Perry Mesa West reference group

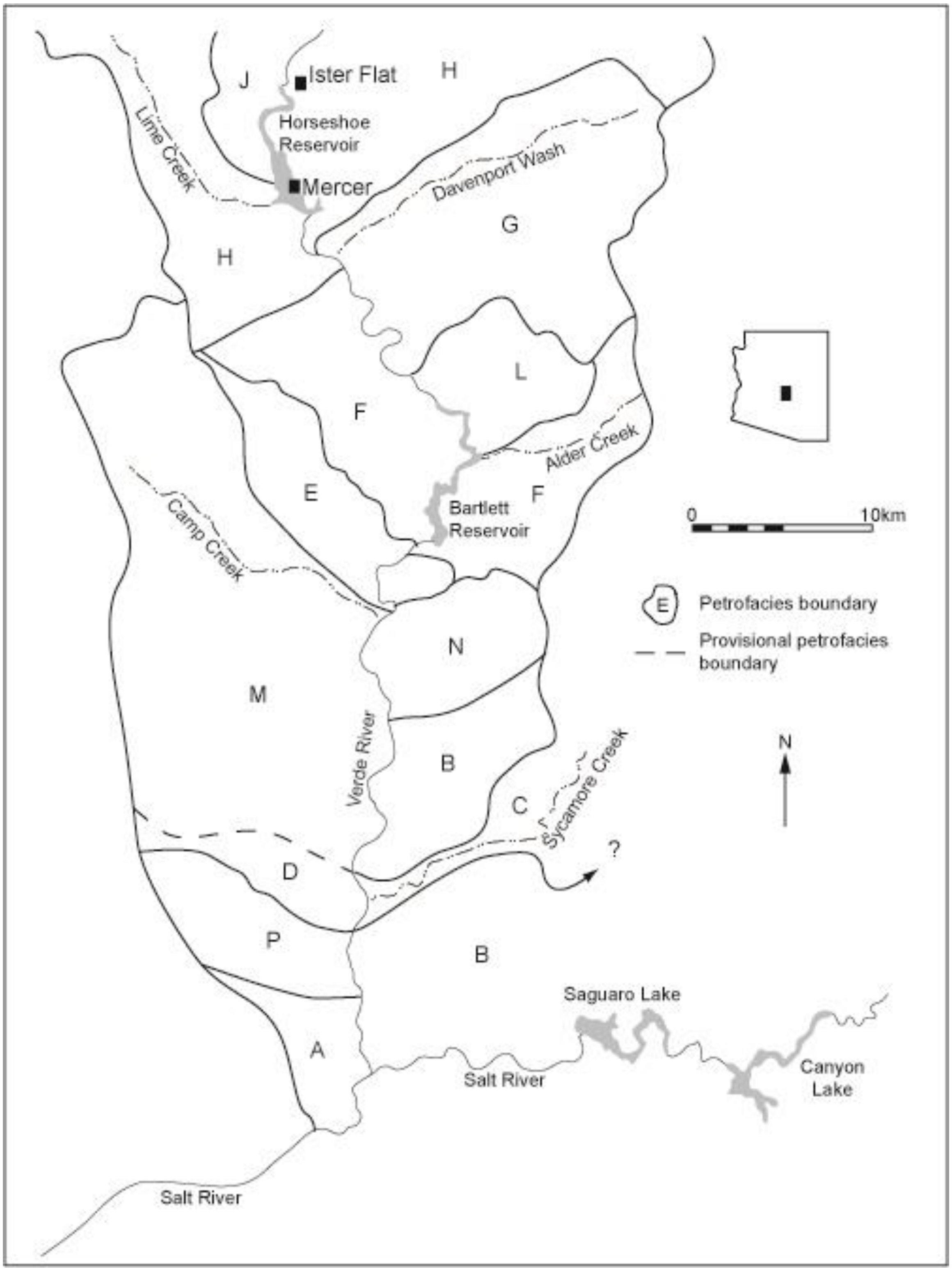

Figure 2.2. Lower Verde Petrofacies Model Adapted from Heidke et al. 1997:Figure 2.

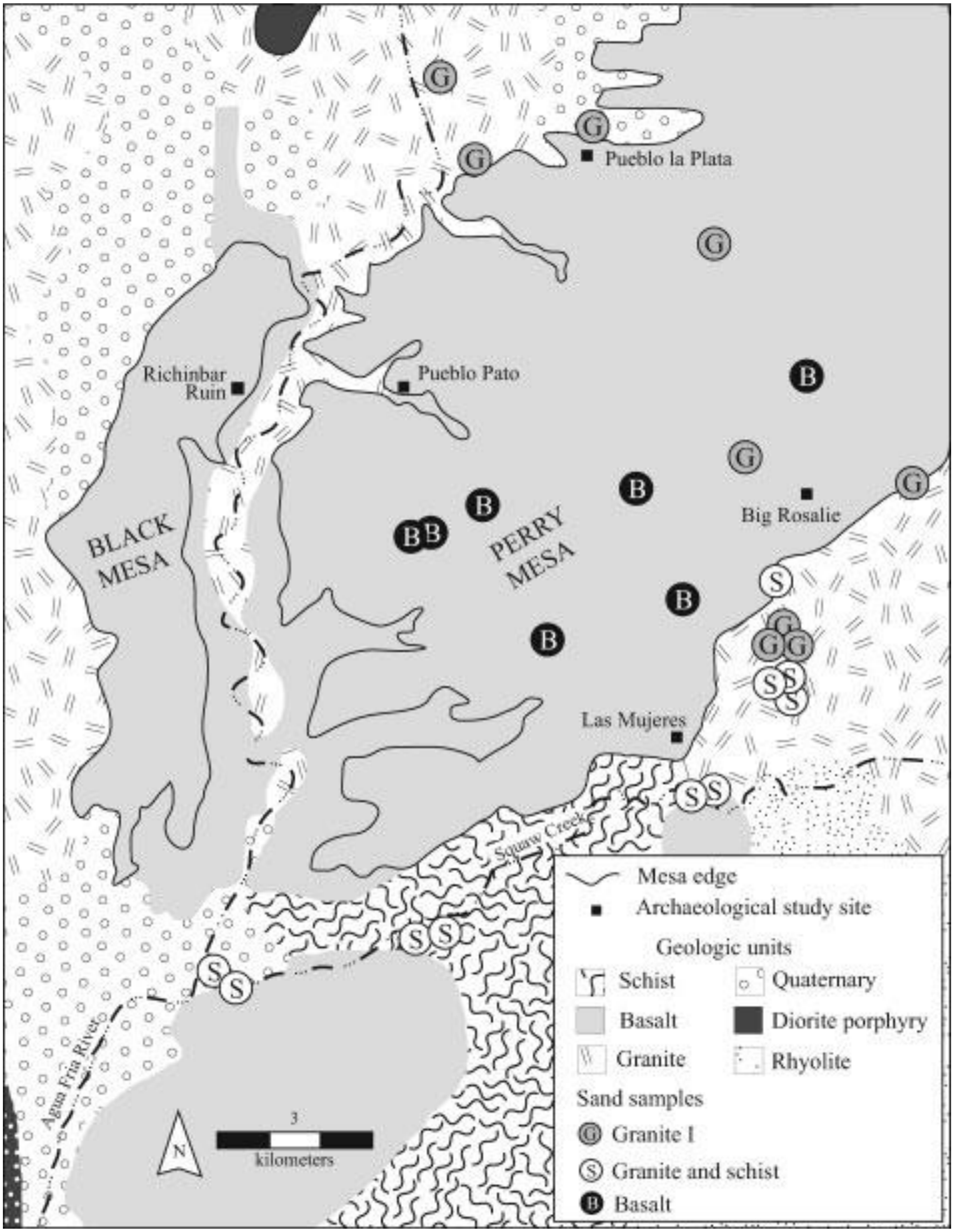

Figure 2.3. Geology and Raw Material Samples in and Around Perry Mesa, after Kelly et al. 2011:Figure 3.

contained granitic-dominated sand similar in composition to the sediments found along the Agua Fria River and Silver Creek. These findings are confirmed by the unpublished, preliminary Agua Fria Petrofacies Model developed by Desert Archaeology (Figure 2.4). The schist and granite Perry Mesa East reference group is consistent with Petrofacies C, and the granitic sands from the Perry Mesa West reference group compares well with Petrofacies A and B (Mary Ownby, personal communication 2016).

Raw material sampling at Dugan and Polles has been limited to inspection of the nearby drainages under a hand lens. Dugan overlooks a terrace of Tangle Creek. Approximately 5 miles upstream from Dugan, Hutch Gulch, Mud Spring Creek, South Fork Creek, and smaller unnamed tributaries converge to form the headwaters of Tangle Creek. These drainages intersect units of granite, granite rich conglomerate, and chlorite-mica schist (Figure 2.5). After reviewing the geologic description of the chlorite-mica schist unit (Rhys-Evans 2007), petrographer Sophie Kelly (personal communication, 2016) surmised that this unit was consistent with the schist and phyllite in the Dugan petrographic description (Table 2.1) that I utilized as a key grain to identify this temper type. These geologic units are the likely source of the Dugan reference group schist and phyllite described in thin section and observed in the optical microscope. The metallic silver chlorite mica-schist is particularly distinctive, and is the only possible source of schist within a reasonable distance from Dugan.

Polles Mesa is intersected by numerous shallow unnamed drainages – tributaries of the East Verde River. The drainages contain subangular basalt sands derived from the

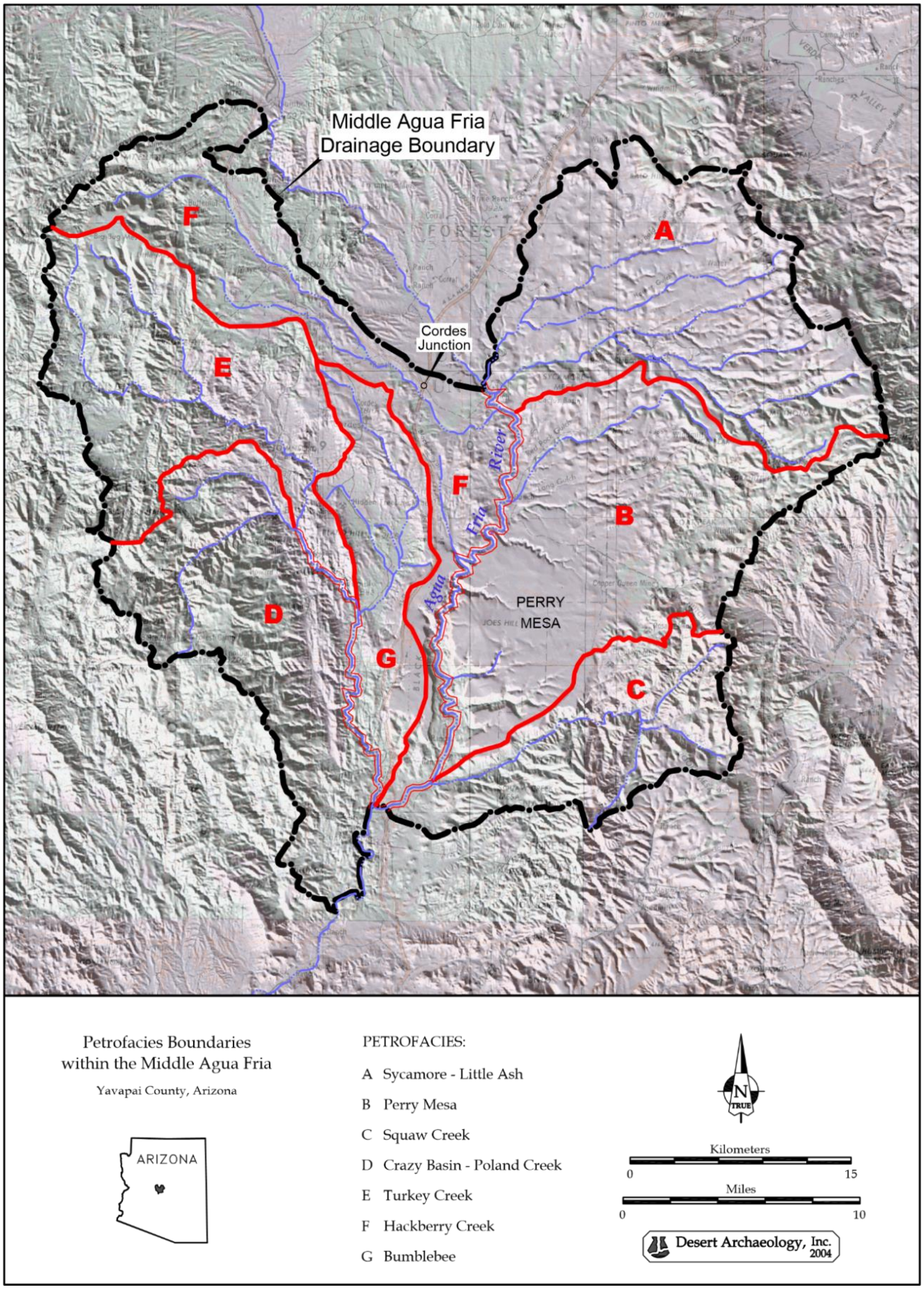

Figure 2.4. Preliminary Agua Fria Petrofacies Map.

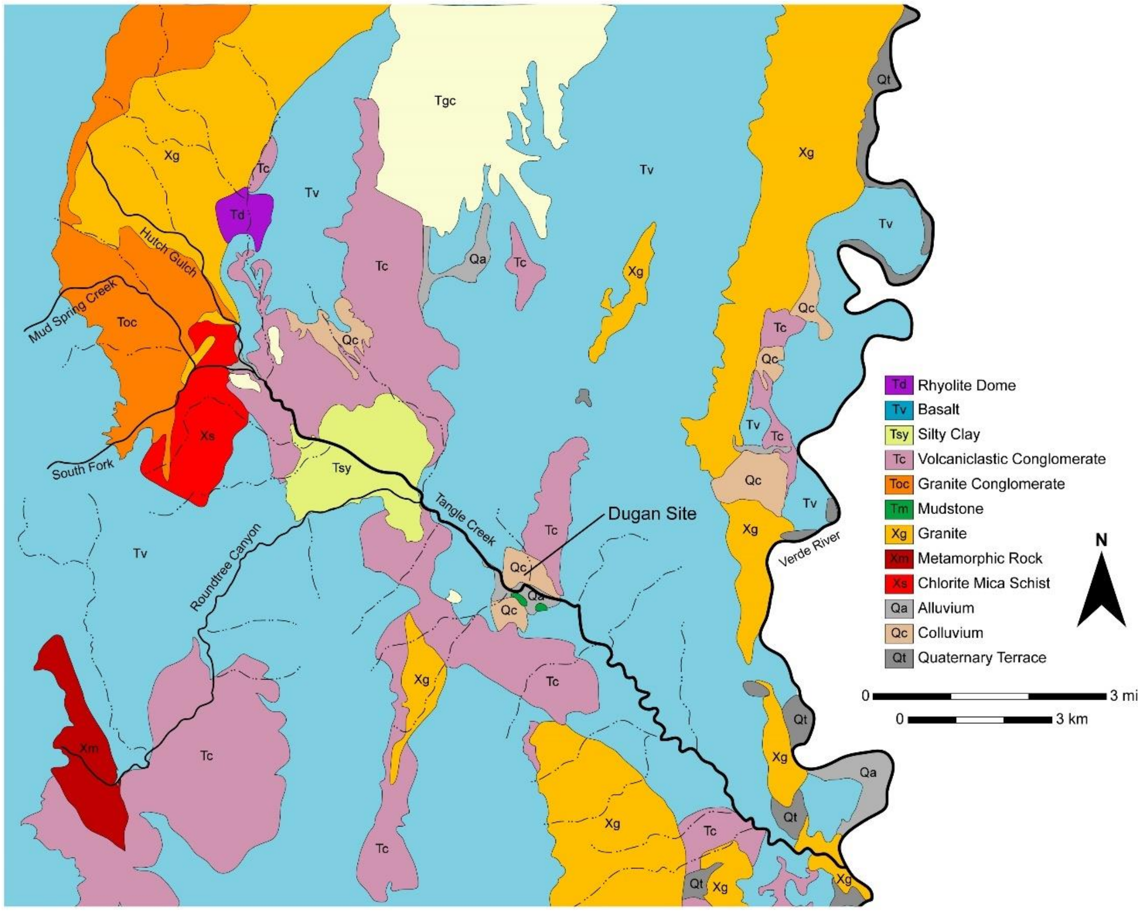

Figure 2.5. Bloody Basin Geologic Map Adapted from Brand and Stump 2011, Rhys-Evans 2007, and Wrucke and Conway 1987.

basalt cap. The igneous temper dominating the Polles Pueblo reference group was likely procured from one or more of these drainages.

Establishing Procurement Behavior

Limestone and basalt are widely distributed in the middle Verde Valley (Figure 2.1), and dominates sands that were locally available to Tuzigoot and Montezuma Castle potters. Although limestone-tempered ceramics are more resistant to thermal shock than vessels tempered with grog or granitic sand, limestone causes pots to spall if fired to over 600°C (the low-end temperature for open firing; Hoard et al. 1995). As recently summarized by Kelly et al. (2011), there are functional trade-offs to tempering ceramics with basalt. The apparent avoidance of limestone and volcanic temper throughout much of prehistoric central Arizona is an interesting phenomenon worthy of future research, but for the purposes of this paper I assume that perceived negative functional characteristics of limestone and basalt temper prompted prehistoric middle Verde potters to turn to alternative materials, even when these materials were significantly more difficult to procure. Grog is readily available at any archaeological site with sherds, and potters at Tuzigoot would have had no problems in procuring their temper of choice (Table 2.2). If ceramics were made at Montezuma Castle, potters apparently traveled upwards of 12 km to procure sand temper derived from the Cherry Tonalie formation (Figure 2.1, Table 2.2), a distance well beyond the upper threshold potters are typically willing to travel to procure temper as predicted by the ETM (Arnold 1985, 1993). Ceramics may not have been manufactured at Montezuma Castle, and the production zone for this reference group is likely located closer to the Cherry Tonalite formation. Alternatively, yet-undocumented granitic outcrops may underlie the surface geology and are exposed in drainage profiles nearer to Montezuma Castle, a phenomenon documented at Perry Mesa (Kelly et al. 2011) and discussed in more detail below. Testing this idea would require a geologic survey of Beaver Creek and its tributaries within a few kilometers of Montezuma Castle.

Mercer and Ister Flat are located in the basalt-rich Petrofacies H (Figure 2.2). Like many of their central Arizona contemporaries, Late Prehistoric potters at these settlements avoided tempering their ceramics with the immediately available basaltic

Table 2.2. Temper Procurement by Reference Group.

Site	Reference Group	Temper Source	Geodesic Distance from Site	ETM Assessment[1]
Mercer	Mercer/Ister Flat	Lower Verde Petrofacies F	7 km	Below threshold B
Ister Flat	Mercer/Ister Flat	Lower Verde Petrofacies F	12 km	Above threshold B
Dugan	Dugan	Tangle Creek Sand	<1-6 km	Below threshold B, may be below threshold A
Las Mujeres	Perry Mesa East	Squaw Creek/ Agua Fria Petrofacies C	<1 km	Below threshold A, but see Kelly et al. 2011
Big Rosalie	Perry Mesa East	Squaw Creek/ Agua Fria Petrofacies C	3 km	Below threshold B, but see Kelly et al. 2011
La Plata	Perry Mesa East	Drainages east of Agua Fria Agua Fria Petrofacies A/B	<1 km	Below threshold A, but see Kelly et al. 2011
Richinbar	Perry Mesa West	Drainages east of Agua Fria Agua Fria Petrofacies A/B	<1 km	Below threshold A, but see Kelly et al. 2011
Pato	Perry Mesa West	Drainages east of Agua Fria Agua Fria Petrofacies A/B	<1 km	Below threshold A, but see Kelly et al. 2011
Polles	Polles	Polles Mesa Basalt	<1 km	Below threshold A
Montezuma Castle	Montezuma Castle	Cherry Tonalite/Cherry Creek	12 km	Above threshold B
Tuzigoot	Tuzigoot	Sherd	<1 km	Below threshold A

[1] In the overwhelming majority of ethnographic cases, potters procure temper within 1 km (Threshold A) of their home villages. Potters were sometimes willing to travel up to 7 km for temper (Threshold B) (Arnold 1985, 1993).

sand. Interestingly, they also eschewed the granitic sand of Petrofacies J, located immediately across the river from both sites. Petrofacies F is still within the distances predicted by the ETM (Arnold 1985, 1993), but an explanation for why Petrofacies J was not exploited is not readily apparent.

Procurement strategies of Perry Mesa potters has been discussed previously in detail (Kelly et al. 2011), and the results of that study are summarized here. Although Perry Mesa settlements were built atop an extensive Quaternary basalt flow that covered the mesa, potters tempered their wares with nonbasaltic sands available in the steep valleys below their villages. Less than 1 percent (n = 4) of the sherds analyzed from the Perry Mesa sites contained significant quantities of basalt temper. Some washes atop the mesa contain some granitic sand but are still composed of approximately 50 percent basalt grains (Kelly et al. 2011). The absence of basalt grains in the vast majority of the pottery suggests that potters did not use mesa-top washes for pottery raw materials. Although basalt is a commonly used temper cross-culturally, it was not used by the prehistoric potters on Perry Mesa. The sand tempers used by Perry Mesa potters were technically locally available, being found within a kilometer or two of the sampled sites (except for Big Rosalie) (Figure 2.3, Table 2.2). These raw materials were in each case located in the canyons bisecting Perry Mesa, some 300 vertical meters below the pueblos on the mesa top. At first glance, hauling temper up 300 vertical meters to manufacture pottery near the mesa-top residences, when acceptable basalt temper could have been obtained in the immediate area, is a puzzling behavior. However, such behavior may not have happened at all. Other necessary raw materials, including water, fuel, and possibly potter's clay, were relatively scarce on the mesa top but co-occurred in relative abundance in the side canyons surrounding Perry Mesa. The availability of resources and the arduous ascent required to transport them to mesa-top work areas apparently motivated Perry Mesa potters to manufacture their wares in the canyon bottoms closer to the required raw materials, after which the completed vessels were carried up to the mesa communities.

Under a hand lens, the sand in Tangle Creek at Dugan includes granite and schist similar to the temper observed in the Dugan reference group in thin section and in the optical microscope. Between the units of granite and schist and the Dugan site, Tangle Creek intersects units of basalt (Tv), volcanic conglomerate (Tc), and clay (Tsy) (Figure 2.5). Basalt was not present in the Dugan reference group, and the hand lens inspection was insufficient to determine whether small quantities of basalt had "contaminated" the Tangle Creek sand at Dugan. The sand included in the Dugan reference group was procured from Tangle Creek somewhere between the Dugan site and a few kilometers upstream. Determining exactly where the sand was procured would require collecting and thin sectioning sand from this portion of the creek, but the sand was most likely procured within a few kilometers of the Dugan site as predicted by the ETM (Arnold 1985, 1993) (Table 2.2). Basalt was readily available at Polles Pueblo, and the potters there apparently exploited the most immediate tempering materials. Additional sampling in these areas is needed, but for the purposes of this study I assume that the temper utilized in these reference groups was procured from drainages located on or below the mesa top near the sites.

Distinguishing Exchange Wares

As discussed above, a reference group of plain ware specimens associated with each subsystem of the proposed Verde Confederacy was established on the basis of temper-fraction distinctions. To verify these reference groups, I relied on electron microprobe assays of the clay fractions in the ceramic specimens of each reference group.

Microprobe Procedures

The microprobe directs a stream of high-energy electrons onto a small spot on the sample's surface and analyzes the wavelengths of emitted x-rays produced by the bombardment. The relative intensities of the x-rays created at each wavelength indicate the relative abundance of each chemical element in the sample (Birks 1971). Its advantage for ceramic studies over similar but bulk type techniques, such as x-ray fluorescence analysis and neutron activation analysis, is the probe's capacity to select tiny areas of a sherd's cross section for study, permitting, for instance, the assay of just the clay fraction with only minimal contamination from temper particles (Freestone 1982).

Spots approximately 0.1 mm^2 in area (about the size of a period on this page) were assayed using 300X magnification. Each spot was carefully selected to avoid nonplastic inclusions, although silt-sized particles were almost always unavoidable. The effects of these tiny inclusions on the analysis of heavily tempered plain ware ceramics were checked experimentally and were found to be inconsequential (Abbott 1994). A JEOL JXA-8600 electron microprobe with an automated energy-dispersive analysis system was used to perform the assays. Each potsherd was cut to extract a thick slice of its cross section, which was then mounted on a circular glass slide. The thick section was then ground, polished, and coated with a 400-angstrom-thick layer of carbon.

All samples were analyzed using 15-kV filament voltage and a 10-nA defocused beam current. The x-ray detector was mounted at a take-off angle of 40 degrees. Matrix effects were corrected with a ZAF algorithm, and the equipment was calibrated with a Kakanui hornblende standard. Five clay spots were assayed for each sample. The detector live-counting time was 50 seconds. The percentages of eight chemical elements (Na, Mg, Al, Si, Ca, K, Ti, and Fe) were determined. The percentages of four other minor elements were also measured by the microprobe, but those data were not used because the precision of their measurement was insufficient for statistical analysis. I performed the assays in the Department of Chemistry and Biochemistry at Arizona State University, Tempe.

Microprobe Results

The reference groups in the clay chemistry analysis contained between 13 and 40 samples per group (Table 2.1). Each reference group sample was thin-sectioned and had probe rounds cut for chemical analysis. The raw chemical data is reported in Appendix B. The clay fractions in the basalt-tempered sherd from Polles Pueblo, the grog-tempered wares from Tuzigoot, and the granitic-tempered specimens of the Perry Mesa West group were recognizable as geochemically distinct in bivariate plots of specific elemental concentrations. The Polles and Tuzigoot reference groups were distinct in a bivariate plot of iron and magnesium (Figure 2.6), and the Perry Mesa West group was distinct in a bivariate plot of potassium and calcium (Figure 2.7).

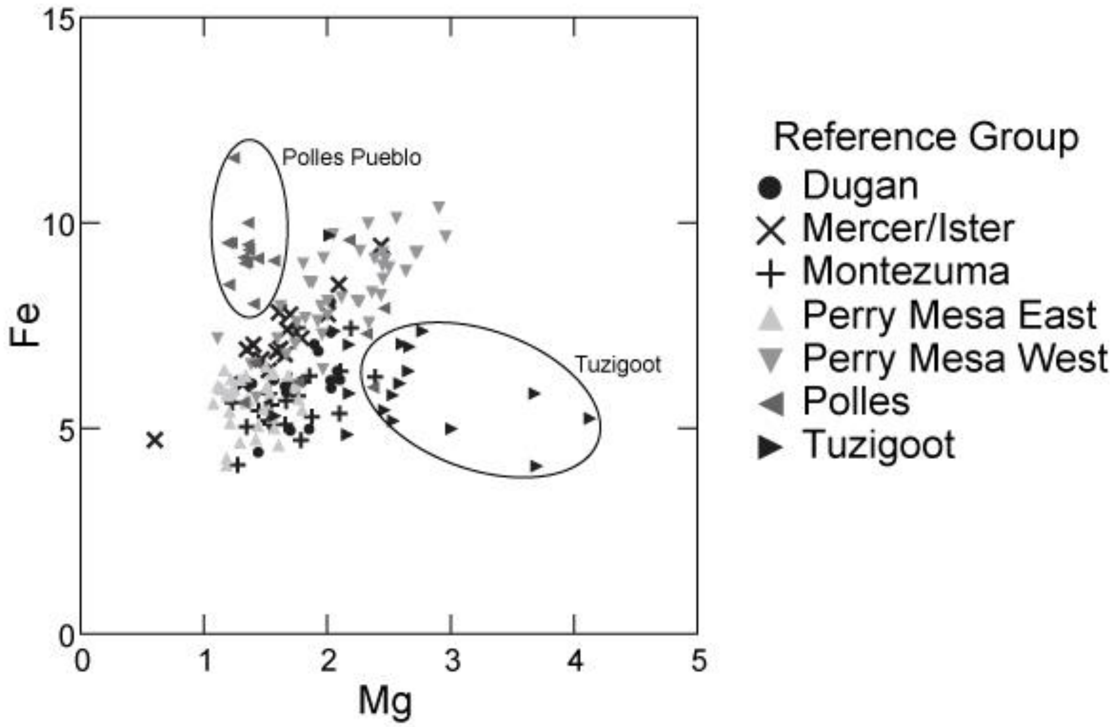

Figure 2.6. Bivariate Scatterplot of Assayed Samples Showing Iron and Magnesium Percentages, after Kelly et al. 2014:Figure 6.1.

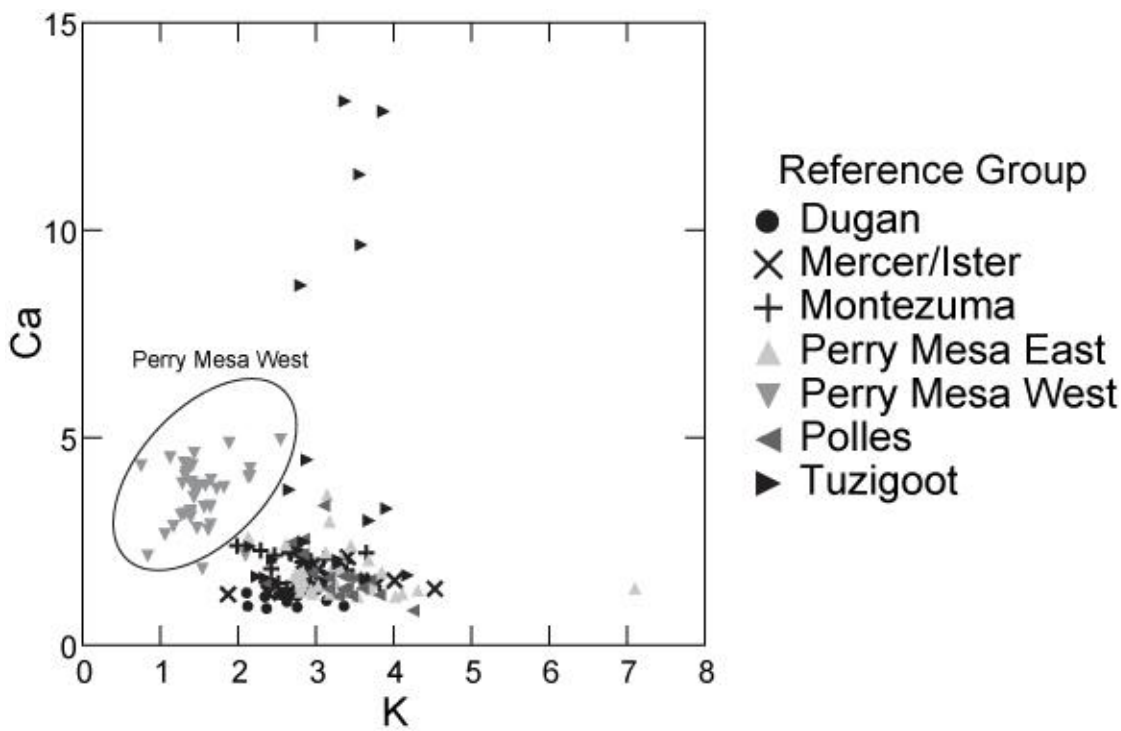

Figure 2.7. Bivariate Scatterplot of Assayed Samples Showing Calcium and Potassium Percentages, after Kelly et al. 2014:Figure 6.2.

The remaining four groups were included in a discriminant analysis (Johnson and Wichern 1982:461-531). The four groups were entered to create a discriminant factor space in which the reference group centroids were maximally separated by appropriately weighting and linearly combining the eight chemical variables. All eight variables were entered simultaneously. Three discriminant factors were extracted. Two of the remaining four groups, Dugan and Montezuma Castle, were geochemically distinct in the resulting factor space. The final two temper groups, Mercer/Ister Flat and Perry Mesa East (including samples from Las Mujeres and Big Rosalie), overlapped in the factor space (Figure 2.8). The temper types associated with these two groups were quite distinct both in thin section and with the optical microscope (Table 2.1). The ceramics in the two overlapping reference groups are thought to have been manufactured more than 30 km apart, and although the clay sources are apparently geochemically similar, they were not likely procured from the same location. This overlap is likely due to insufficient chemical diversity manifested in the eight elements assayed by the electron microprobe.

Verifying Reference Groups

Thirty sherds thought to represent “non-local” production were analyzed chemically and are here compared against the reference group samples to verify the provenance model (Table 2.3). Twenty-three of the 30 sherds (77%) were consistent with the reference groups. Three samples from Tuzigoot (TUZ0003, TUZ014, and TUZ019) were assigned to the Polles reference group based on observations in the optical microscope and in thin section. None of these samples were consistent with the Polles reference group clay chemistry (Figure 2.9). Twenty Polles reference group sherds were

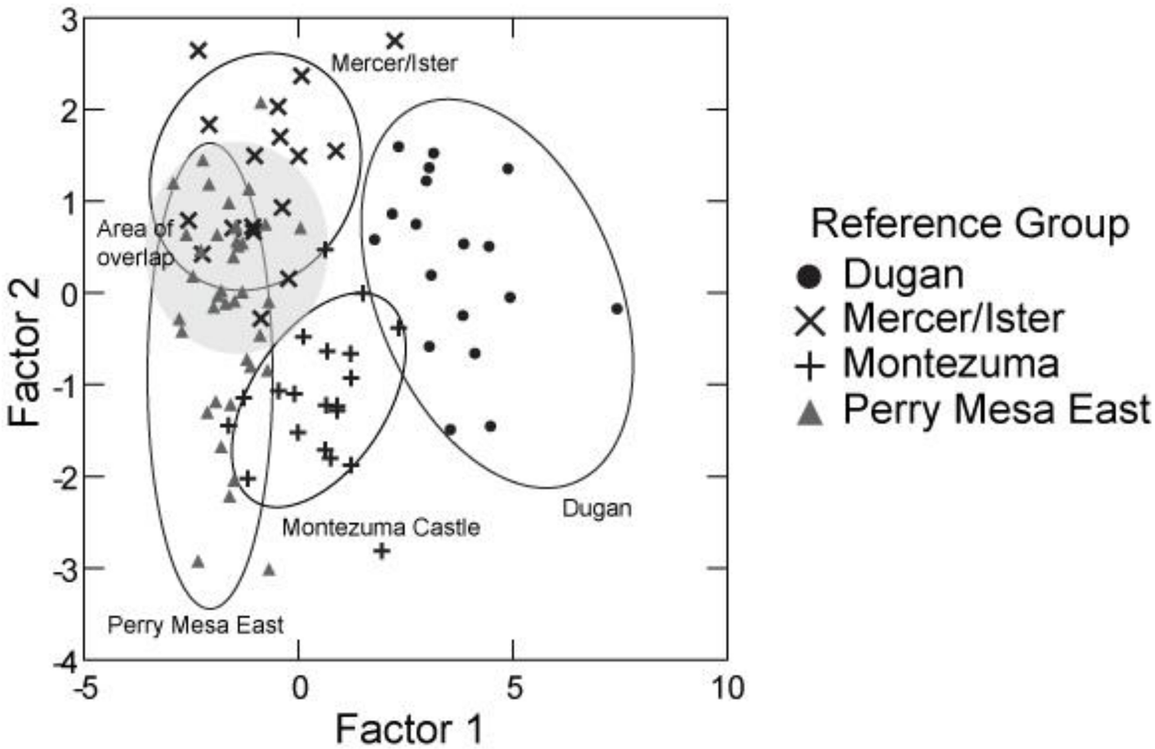

Figure 2.8. Discriminant Analysis of Four Reference Groups, after Kelly et al. 2014:Figure 6.3.

included in the chemical analysis. Thirteen of these sherds formed a distinct cluster in a bivariate plot of magnesium and iron. In this same figure, TUZ003 appears in a cluster of four other Polles reference group samples while TUZ019 and TUZ014 form a cluster with the remaining three reference group samples. These three clusters suggest that basalt-tempered ceramics were produced in at least three areas using chemically distinct clays. I propose that the cluster of 13 samples from Polles represents production at Polles, and that the other two clusters are from production sub-sources near Polles who supplied both Polles and Tuzigoot with plain ware pots. The Polles Mesa basalt includes distinctive dark green phenocrysts (Wrucke and Conway 1987), and future analysts may be able to parse out the variation in basalt-tempered central Arizona ceramics by

Table 2.3. Reference Group Verification.

Sample	Site	Ref. Group	Assignment Method	Confirmed?	Comment
DUG008	Dugan	Mercer	Optical scope	Y	Mercer – PM East group overlap
DUG031	Dugan	PM East	Optical scope	N	Sparse phyllite temper fraction
DUG032	Dugan	PM East	Optical scope	Y	Mercer – PM East group overlap
DUG033	Dugan	PM East	Optical scope	N	Sparse phyllite temper fraction
DUG034	Dugan	MOCA	Petrography and optical scope	Y	
DUG035	Dugan	Tuzigoot	Optical scope	Y	
LPL050	La Plata	Dugan	Petrography and optical scope	Y	
LPL051	La Plata	Dugan	Petrography and optical scope	Y	
LPL052	La Plata	Dugan	Petrography and optical scope	Y	
MOC001	MOCA	PM West	Petrography	N	Incorrect initial determination
MOC003	MOCA	PM West	Petrography	N	Incorrect initial determination
MOC004	MOCA	PM West	Petrography	N	Incorrect initial determination
PAT001	Pato	PM East	Petrography and optical scope	Y	
PAT003	Pato	PM East	Petrography and optical scope	Y	
PAT028	Pato	Dugan	Optical scope	Y	
PAT029	Pato	PM East	Optical scope	Y	Mercer – PM East group overlap
PAT030	Pato	PM East	Optical scope	Y	
POL004	Polles	Tuzigoot	Petrography and optical scope	Y	
POL018	Polles	Tuzigoot	Petrography and optical scope	Y	Outlier
RCH004	Richinbar	PM East	Petrography and optical scope	N	Sparse phyllite temper fraction
RCH028	Richinbar	Dugan	Optical scope	Y	
RCH029	Richinbar	Dugan	Optical scope	Y	
RCH030	Richinbar	PM East	Optical scope	Y	
RCH031	Richinbar	PM East	Optical scope	Y	
RCH032	Richinbar	PM East	Optical scope	Y	
TUZ003	Tuzigoot	Polles	Petrography and optical scope	Y	Secondary basalt clay source

Sample	Site	Ref. Group	Assignment Method	Confirmed?	Comment
TUZ005	Tuzigoot	MOCA	Petrography and optical scope	Y	Mercer – PM East group overlap
TUZ012	Tuzigoot	MOCA	Petrography and optical scope	N	Unexplained
TUZ014	Tuzigoot	Polles	Petrography and optical scope	Y	Tertiatry basalt clay source
TUZ019	Tuzigoot	Polles	Petrography and optical scope	Y	Tertiatry basalt clay source

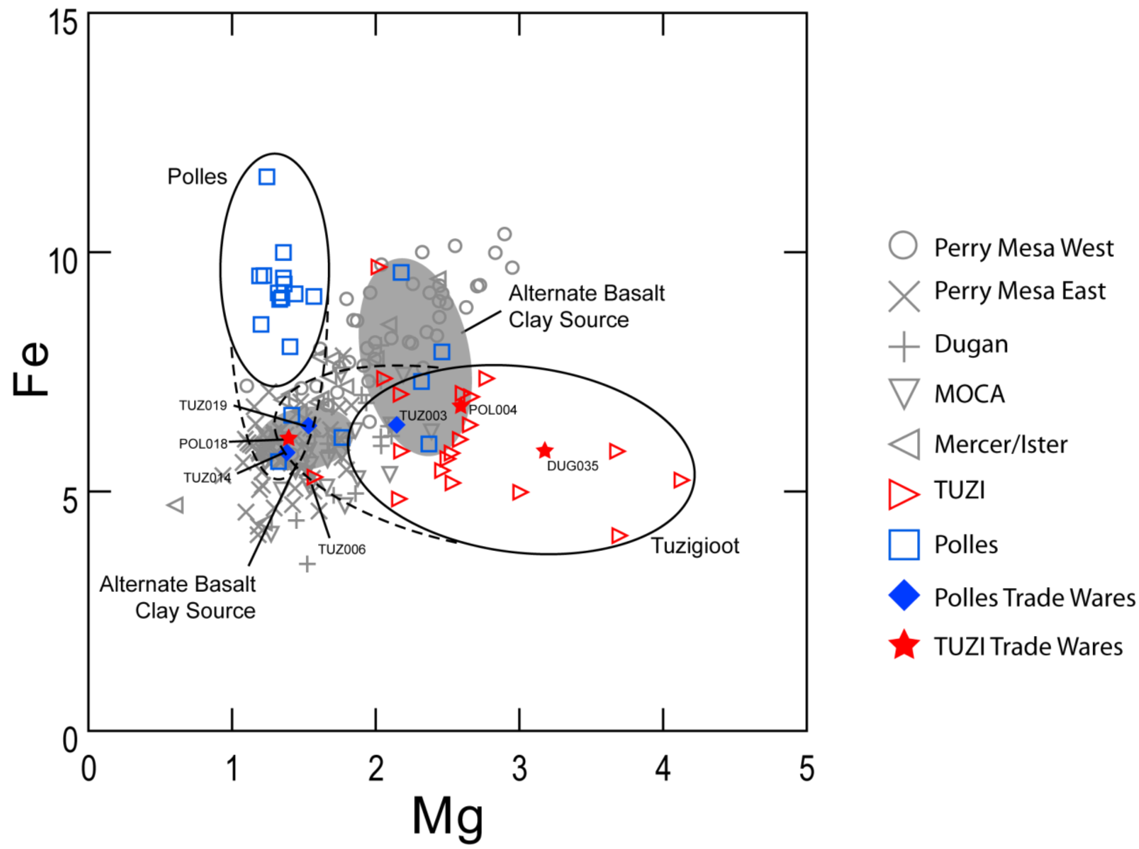

Figure 2.9. Bivariate Scatterplot of Assayed Samples Showing Iron and Magnesium Percentages Including Trade Wares.

differentiating between basalt inclusions in thin section (Geib and Lyneis 1996) with an expanded sample.

Three of the non-local samples were assigned to the Tuzigoot reference group in the optical microscope (DUG035) and in the optical scope and thin section (POL004 and POL018). The clay chemistry of DUG035 and POL004 were consistent with the reference group. POL018 plots just beyond the cluster alongside an outlying reference group sample (TUZ006) in a bivariate plot of magnesium and iron (Figure 2.9). The low iron value in POL018 compares well to TUZ006. These outlying samples may be related in some way. An explanation for these lower than expected values is not readily apparent.

Three samples from Montezuma Castle (MOC001, MOC003, and MOC004) were assigned to the Perry Mesa West reference group during the petrographic analysis. None of these samples were consistent with the Perry Mesa West reference group clay chemistry (Figure 2.10). These samples were designated as unknown granitic sand during the initial sort in the optical microscope. During the initial petrographic analysis, Sophia Kelly first classified these samples as a sub-variant of the Perry Mesa West reference group, later folding them in to the larger reference group. Kelly's first impression, my designation in the optical scope, and the variation in clay chemistry suggest that these samples should not have been assigned to the Perry Mesa West reference group. I suspect that the temper originates from a source that happens to be similar to the Perry Mesa reference group, likely somewhere in the middle Verde Valley.

The remaining 21 non-local samples were included in the Dugan, Montezuma Castle, Mercer, and Perry Mesa East discriminant analysis (Table 2.4). The chemistry of 13 samples was clearly consistent with the group identified in thin-section or in the binocular scope. DUG008 and TUZ005 were assigned to the Mercer reference group in the optical scope, but the samples were placed in the Perry Mesa East group by the discriminant analysis. The opposite was true for DUG032 and PAT029, which were initially sorted into the Perry Mesa East group but was most chemically consistent with Montezuma Castle and Mercer, respectively. These four sherds are plotting into the overlapping space between the Perry Mesa East and Mercer reference groups described above and shown in Figure 2.8. As described above, the two temper groups are vastly different in appearance, and I consider these four samples to have been sorted correctly.

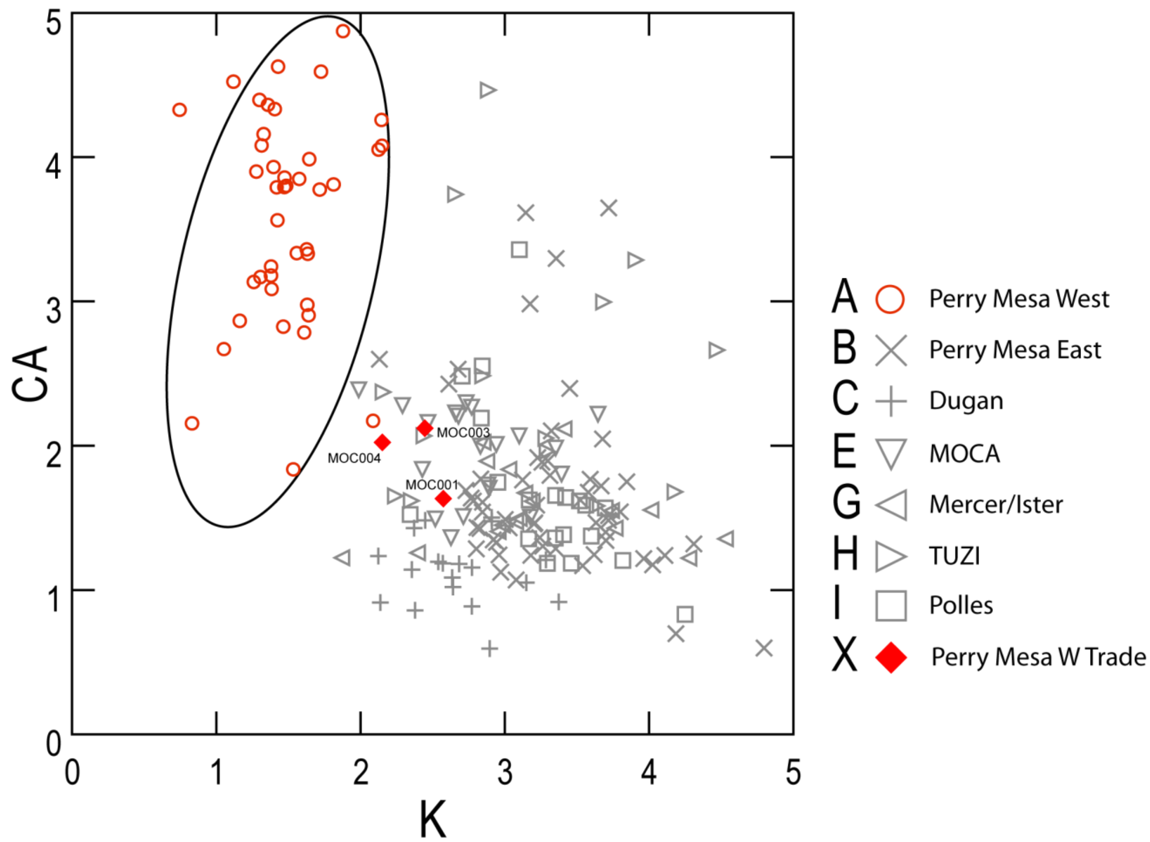

Figure 2.10. Bivariate Scatterplot of Assayed Samples Showing Calcium and Potassium Percentages Including Trade Wares.

Three sherds (DUG031, DUG033, and RCH004) were assigned to the Perry Mesa East reference group in the optical microscope. All three sherds were consistent with Dugan clay chemistry. The temper in the Dugan and Perry Mesa East reference groups is dominated by flat, plate-like particles, phyllite and schist respectively. The phyllite in the Dugan reference group is a distinctive metallic-silver color. The phyllite fraction in these three sherds was relatively small and sparse, and I mistook them for Perry Mesa East in the binocular scope. This pattern may extend throughout the assemblage, and an unknown fraction of the Perry Mesa East ceramics may actually belong to the Dugan group. The final sample, TUZ012, was assigned to the Mercer group in thin section but

Table 2.4. Results of Discriminant Analysis for Unknown Sherds.

			Highest Group			Second Highest Group			
Sample Number	Assignment Method	Initial Group	Predicted Group	P	Mahalanobis Distance	Predicted Group	P	Mahalanobis Distance	Comments
DUG008	Optical Scope	Mercer	PM East	.503	14.784	Mercer	.494	14.820	Confirmed, Mercer-PM East overlap
DUG034	Optical Scope	Mercer	Mercer	.938	.267	PM East	.050	6.120	Confirmed
DUG031	Optical Scope	PM East	Dugan	.847	4.136	MOCA	.151	7.580	Light phyllite temper fraction?
DUG032	Optical Scope	PM East	MOCA	.720	1.833	Dugan	.187	4.528	Confirmed, Mercer-PM East overlap
DUG033	Optical Scope	PM East	Dugan	.416	7.353	Mercer	.388	7.490	Light phyllite temper fraction?
LPL050	Petrography	Dugan	Dugan	.993	3.815	MOCA	.007	13.738	Confirmed
LPL051	Petrography	Dugan	Dugan	1.000	12.227	Mercer	.000	34.657	Confirmed
LPL052	Petrography	Dugan	Dugan	1.000	21.450	MOCA	.000	47.767	Confirmed
PAT001	Petrography	PM East	PM East	.573	2.277	MOCA	.214	4.244	Confirmed
PAT003	Petrography	PM East	PM East	.898	1.584	MOCA	.097	6.044	Confirmed
PAT028	Optical Scope	Dugan	Dugan	.993	.217	MOCA	.007	10.020	Confirmed
PAT029	Optical Scope	PM East	Mercer	.786	26.029	PM East	.214	28.632	Confirmed, Mercer-PM East overlap
PAT030	Optical Scope	PM East	PM East	.784	3.929	Mercer	.154	7.185	Confirmed
RCH004	Petrography	PM East	Dugan	.986	1.257	MOCA	.011	10.238	Light phyllite temper fraction?
RCH028	Optical Scope	Dugan	Dugan	.993	1.021	MOCA	.007	11.043	Confirmed
RCH029	Optical Scope	Dugan	Dugan	1.000	2.660	MOCA	.000	20.823	Confirmed

			Highest Group			Second Highest Group			
Sample Number	Assignment Method	Initial Group	Predicted Group	P	Mahalanobis Distance	Predicted Group	P	Mahalanobis Distance	Comments
RCH030	Optical Scope	PM East	PM East	.602	1.524	MOCA	.300	2.915	Confirmed
RCH031	Optical Scope	PM East	PM East	.763	5.266	Mercer	.179	8.165	Confirmed
RCH032	Optical Scope	PM East	PM East	.996	2.512	Mercer	.003	14.367	Confirmed
TUZ005	Petrography	Mercer	PM East	.686	2.293	MOCA	.308	3.898	Confirmed, Mercer-PM East overlap
TUZ012	Petrography	Mercer	MOCA	.634	3.223	Dugan	.365	4.328	Unexplained

was sorted chemically into the Montezuma Castle group. No explanation for this deviation is readily apparent.

Other Central Arizona Temper Types

Two temper types were regularly encountered in the assemblages that do not appear to have been produced at any of the sampled sites. Kelly et al. (2009:255) describe Granite II as having “No potassium feldspar and only trace amounts of mafic minerals. Plagioclase feldspar is heavily weathered.” As discussed in Chapter 3, this temper type is in the minority in Perry Mesa assemblages, particularly at La Plata. Based on similarities in temper descriptions, Mary Ownby (personal communication 2016) suggests Agua Fria Petrofacies G and D as the likely source of this temper group (Figure 2.4). During the initial analysis, I suspected that Granite II may have been the reference group for La Plata, and a number of Granite II samples were analyzed with the electron microprobe. Initial analysis suggested that the clay chemistry was not distinct from the Perry Mesa West reference group. I dropped the Granite II samples from the chemical analysis when I determined that it did not represent a reference group, but the chemical data appear in Appendix B.

Granite IV is a minority temper type at Mercer, Ister Flat, and Dugan. Kelly et al. (2009:255) describe The temper includes large monomineralic grains of plagioclase feldspar with distinctive wavy alteration. Potassium feldspar is absent, and mafic minerals are rare. Most temper grains are monomineralic. Based on similarities in temper descriptions, I associate this temper type with Lower Verde Petrofacies J (Figure 2.2). A

Granite IV reference group was not established, but four Granite IV samples from Dugan were analyzed with the electron microprobe, and the data are reported in Appendix B.

Summary

Seven ceramic reference groups representing local plain ware production have been defined in the study area (see also Abbott et al. 2012; Kelly et al. 2009, 2011; Watkins and Kelly 2014). The reference groups can be visually differentiated in the binocular microscope, and are petrographically and geochemically distinct from one another. The plain ware assemblages from Tuzigoot, Montezuma Castle, Polles Pueblo, and Dugan Ranch Ruin are all dominated by a single temper type associated with “local” plain ware production. The assemblages at Mercer Ruin and Ister Flat Ruin are dominated by one temper type, and the Perry Mesa site assemblages are dominated by one of two temper types that also represent “local” production (Table 2.1). Twenty-three of the 30 non-local sherds (77%) had clay chemistry consistent with the initial temper assignments. The remaining 7 sherds (23%) were apparently misclassified based on temper.

CHAPTER 3

POTS, PEOPLE, AND PROXIMITY: CERAMICS AND BOUNDARIES IN 14TH CENTURY CENTRAL ARIZONA

I investigate the organization of plain ware production and exchange in Late Prehistoric central Arizona to identify exchange network boundaries. Utilitarian ceramics are particularly well-suited to this kind of analysis. These vessels were ubiquitous and can usually be assigned to a provenance. In many contexts these pots are produced by all or most households. As a low-value item, these pots tend to circulate between kin and close friends as part of reciprocal food gifting/risk buffering strategies or feasting events, and boundaries to exchange delineate networks of socially proximate individuals and households. In this chapter I first discuss the sampling and analytical strategies, followed by an investigation of plain ware production and exchange. I follow the methodology described in Chapter 1, and associate plain ware exchange boundaries with a boundary type and collective social identity before characterizing the nature of the boundaries.

Sampling Strategy and Ceramic Analysis

Ceramics have been collected from at least one site in each of the proposed Verde Confederacy local systems (Figure 1.5, Table 3.1). Perry Mesa will be investigated in detail, and samples have been drawn from five sites within this local system (Figure 1.6, Table 3.1). Plain ware from Tuzigoot and Montezuma Castle were borrowed from, analyzed, and returned to the National Park Service (NPS) Western Archaeological and Conservation Center (WACC) in Tucson. Plain ware samples were also obtained from the excavated Dugan Ranch Ruin collection, which is currently curated at ASU. Field

Table 3.1. Sampled Sites, Local System, and Locally Produced Temper Type(s).

Sampled Site	**Local System**	**Locally Produced Temper Type(s)**
Pueblo la Plata	Perry Mesa	Granitic Sand (Perry Mesa West)
Richinbar Ruin	Perry Mesa	Granitic Sand (Perry Mesa West)
Pueblo Pato	Perry Mesa	Granitic Sand (Perry Mesa West)
Big Rosalie	Perry Mesa	Schist and Granite (Perry Mesa East)
Las Mujeres (Squaw Creek Ruin)	Perry Mesa	Schist and Granite (Perry Mesa East)
Dugan Ranch Ruin	Perry Mesa/ Bloody Basin	Schist and Phyllite
Mercer Ruin	Lower Verde	Lower Verde Petrofacies F
Ister Flat Ruin	Lower Verde	Lower Verde Petrofacies F
Polles Pueblo	Polles Mesa	Volcanics
Montezuma Castle	Middle Verde (South)	Granitic Sand
Tuzigoot	Middle Verde (North)	Sherd temper

excursions to Mercer, Ister Flat, Polles Pueblo, La Plata, Richinbar, Las Mujeres, and Big Rosalie were undertaken as part of the ASU SHESC “Alliance and Landscape” project administered by Drs. David R. Abbott and Katherine Spielmann (BTS- 0613201). Plain, red, and decorated ceramics were systematically surface collected from each of these sites (Shockey and Watkins 2008a, 2008b). The collection strategy included circular collection units 3 m in diameter positioned along transects radiating from the outermost pueblo walls. Collection transects extended outward from the pueblo until the artifact density dropped to zero. The primary collections were supplemented by the addition of large plain ware sherds as isolated finds. Large specimens from each site were required to prepare petrographic thin-sections and electron microprobe rounds. UTM coordinates for each collection unit were mapped using a Trimble GPS device. Every sherd larger than a US penny was collected.

During the ceramic *Rough Sort*, each sherd was classified by ware based on surface treatment and paste characteristics. The major categories included wares likely to have been locally produced: plain (unslipped brown wares), red (brown wares with a red-slipped exterior), and white-on-red (red slip with white paint). Other wares (largely decorated vessels) included Jeddito Yellow (Hopi), polychrome (Salado Polychrome or White Mountain Red Ware), and gray wares (Prescott) (Appendix A). These were classified to type whenever possible. Sherds that were smaller than a thumbnail were not analyzed. Sherds that refit or were determined to belong to the same vessel were counted once and bagged together. Most of the sherds were examined on a fresh break without the aid of the binocular microscope or hand lens, although sherds that were particularly difficult to classify were briefly viewed under low magnification. This portion of the Rough Sort has been previously reported for the newly made collections (Shockey and Watkins 2009a, 2009b). Plain wares were further identified to one of the temper types defined during the provenance study (Chapter 2). Sherds that could not be confidently placed in a temper group were categorized as "unidentified". Some temper type data have been previously reported (Abbott et al. 2012; Kelly et al. 2009; Watkins and Kelly 2014). All the sherds were reexamined as part of this study in an attempt to associate "unknown" temper types identified early in the analysis with temper types that became better known as the analysis progressed. The final temper type classifications are reported in Appendix A.

A *Detailed Analysis* of vessel form and technological attributes was conducted for all plain ware rim and shoulder sherds larger than 9 cm^2. The coding packet and variable definitions are included in Appendix C. All plain ware rims larger than 9 cm^2 were included in the detailed analysis. The raw data from the detailed analysis are reported in Appendix D. The variables in this packet were originally developed by Abbott (1994) as part of his dissertation research. They have been refined over the years, and are now utilized with some variation on most of the analyses undertaken in his Laboratory of Sonoran Ceramic Research at Arizona State University.

The Organization of Plain Ware Production and Exchange in Central Arizona

Plain ware ceramics in the study area are part of a larger paddle-and-anvil tradition that was utilized across large portions of the southern Southwest. Pots in this tradition are roughly hand formed from slabs or large coils of moist clay before being finished by applying pressure with a wooden paddle on the vessel exterior and a flat stone or palm on the interior. The vessels are fired in an oxidizing atmosphere, and plain ware paste and surface colors range from brown to light yellow to tan, sometimes in the same vessel. In the most comprehensive description of central Arizona plain wares, Wood (1987:9) describes these pots as “local expressions of a single overall ware or ‘model’.”

Boundary Type

Understanding the type of boundaries associated with an exchange network requires an exploration of the contexts of production and exchange. In developing such a context for plain ware pottery in the contemporary Phoenix Basin, Abbott (2000:134) explains that exchange networks “exist primarily because exchange activities are social as well as economic in nature, and because the social distance between participating parties is a factor that determines which aspect is stressed” (see also Bohannon 1955;

Graves 1991; Mauss 1967; Sahlins 1972; Salisbury 1962; Stilltoe 1978; Stark 1992; Strathern 1971; Suttles 1960). The social relationships between parties exchanging ceramic vessels are tied to the pottery's mode of production and exchange value – attributes that can be inferred from archaeological data (Abbott 2000:130-142). Drawing on a rich data set from well-provenanced, excavated collections, Abbott (2000) has developed a model of plain ware production and exchange for the Late Prehistoric Hohokam in the nearby Phoenix Basin. I have based this study on Abbott's model, and in each section below I compare the data from central Arizona to the Phoenix Basin.

Plain Ware Mode of Production

Assessing the mode of production requires information about both the natural and social environments (Costin 1991). In the Late Prehistoric Phoenix Basin, Abbott (2000) establishes that plain ware ceramics were produced in several villages. He first demonstrated that there was a strong correlation between temper type and clay chemistry. Ethnographically, potters are willing to travel farther from their primary residence for temper than for clay (Arnold 1985, 1993). Potters could have utilized more than one type of temper with local clays. The strong association between the local clay chemical signature and a single temper type in the Phoenix Basin meant that temper could be equated with local production. Second, local tempers dominated at the various sites across the Basin, indicating that pots made using local materials were primarily locally consumed. Third, imported Late Prehistoric plain wares in the Phoenix Basin were from a variety of places and vessel forms, a pattern inconsistent with economically motivated specialized production and exchange. How does the Phoenix Basin plain ware mode of production compare to the situation in Late Prehistoric central Arizona?

As demonstrated in Chapter 2 (see also Abbott et al. 2012; Kelly et al. 2009, 2011; Watkins and Kelly 2014), plain ware ceramics in the study area were produced in in at least seven locations. Two additional probable production sources were identified, but not fully investigated. Clay chemistry and temper type were strongly associated among sherds in the seven reference groups, suggesting that potters utilized local clays. At Pueblo Grande in the Phoenix Basin, approximately 40.0% of the plain ware assemblage was locally produced (Abbott 2000:107). Pain ware tempers consistent with locally available materials dominate the assemblages at each of the sampled sites except for La Plata, where over 90% of the plain ware appears to have been imported (Table 3.2). The degree of dominance varies significantly at the remaining sites, ranging from 80.1% at Polles to 40.0% at Pato with an average of 55.7%. The least dominant locally produced plain ware group compares well to Pueblo Grande, suggesting a similar context of production and exchange. As in the Phoenix Basin, plain ware ceramics in the proposed Verde Confederacy were produced with local materials in a variety of locations, and were largely consumed at or near the point of manufacture, suggesting widespread production.

Evidence for the production of the entire suite of vessel forms within each Verde Confederacy provenance group would confirm household-level, or at least a widespread mode of ceramic production. Unfortunately, a large corpus of whole vessels from the study area is not available for analysis, and the complete suite of vessel forms is

Table 3.2 Plain Ware by Site and Temper Type, Local Reference Group in Gray.

	Dugan*	PM East*	PM West*	MOCA*	TUZI*	Mercer*	Polles*	Lower Verde J	Phyllite	Granite II	Unknown	Prescott	Total
Dugan	200	4	1		3	19		177	4	11	12		431
	46.4%	1.0%	0.2%		0.7%	4.4%		41.1%	0.9%	2.5%	2.8%		
Big Rosalie	11	526	18			2	5	6	63	273	51		955
	1.1%	55.1%	1.9%			0.2%	0.5%	0.6%	6.6%	28.6%	5.4%		
La Plata	75	291	57				7	1	3	179	47		660
	11.4%	44.1%	8.6%				1.1%	0.1%	0.4%	27.1%	7.1%		
Las Mujeres	12	334	23				1	2	39	175	46		632
	1.9%	52.8%	3.6%				0.1%	0.3%	6.3%	27.7%	7.3%		
Richinbar	7	173	262					1	15	80	35		573
	1.2%	30.2%	45.7%					0.2%	2.6%	13.9%	6.2%		
Pato	23	311	387			1	6	2	9	188	39	1	967
	2.4%	32.2%	40.0%			0.1%	0.6%	0.2%	0.9%	19.4%	4.1%	0.1%	
MOCA		5	8	280	108				15	1	50	2	469
		1.1%	1.7%	59.7%	23.0%				3.2%	0.2%	10.7%	0.4%	
TUZI		4		62	329	2	22		2		45	41	507
		0.8%		12.2%	64.9%	0.4%	4.3%		0.4%		8.9%	8.1%	
Ister Flat	1	25	2			282	4	66	10	3	2		395
	0.2%	6.3%	0.5%			71.4%	1.0%	16.7%	2.6%	0.8%	0.5%		
Mercer	2	9	4	1		187	18	46	78	2	10		357
	0.6%	2.5%	1.1%	0.3%		52.4%	5.0%	12.9%	21.8%	0.6%	2.8%		
Polles		1	1	2	11	3	427	27	9		52		533
		0.2%	0.2%	0.4%	2.1%	0.6%	80.1%	5.1%	1.6%		9.7%		
Total	331	1683	763	345	451	496	490	328	247	912	389	44	6479

* Reference Group

unknown. With the data that are available, I can make some inferences about the mode of plain ware production in Late Prehistoric central Arizona. I focus on the most intensive exchange relationship in the study area that has sufficient rim data to assess the forms of exchanged vessels – Montezuma Castle and Tuzigoot (Table 3.3).

During the Depression-era excavations on the Middle Verde, Caywood and Spicer (1935) suggested that vessels from the Montezuma Castle production source (Verde Brown) were primarily large jars, and that Tuzigoot pots were principally bowls and small jars. Two-thirds of the bowls recovered at Tuzigoot were locally produced (Figure 3.1). Half of the Montezuma Castle bowls were from the Montezuma Castle production source (Figure 3.2). Clearly bowls were being made in both production sources. A variety of jar sizes from the Tuzigoot production source were identified at Tuzigoot (Figure 3.3), but only two small Montezuma Castle jars were in the sample. At Montezuma Castle, a similar range of jar sizes were recovered from both the Tuzigoot and Montezuma Castle production sources. Jars did not sort by size between those specimens made at Tuzigoot and Montezuma Castle. These data are not consistent with the specialization hypothesis.

How are these results relevant to the current study? Bowls and a variety of jar sizes were manufactured in both production sources. The imported vessels do not represent a limited set of vessel forms. These results are not consistent with specialized production and exchange. A larger sample of rim sherds are needed to assess specialization arrangements in other portions of the study area, but for now, I assume widespread, non-specialized production.

Table 3.3. Source to Source Plain Ware Exchange Summary.

Site A	Site B	A to B	B to A	Total	Category
MOCA	Mercer	1	0	1	1
MOCA	Polles	2	0	2	1
TUZI	Mercer	0	2	2	1
Dugan	TUZI	0	3	3	1
TUZI	PM East	0	4	4	1
MOCA	PM East	0	5	5	1
PM West	Mercer	6	1	7	1
Polles	PM West	6	1	7	1
MOCA	PM West	0	8	8	1
Polles	PM East	13	1	14	2
Dugan	Mercer	3	19	22	2
Mercer	Polles	3	22	25	2
Dugan	PM West	30	1	31	2
TUZI	Polles	11	22	33	2
PM East	Mercer	34	2	36	2
Dugan	PM East	98	4	102	3
MOCA	TUZI	62	108	170	3
PM East	PM West	484	98	582	3

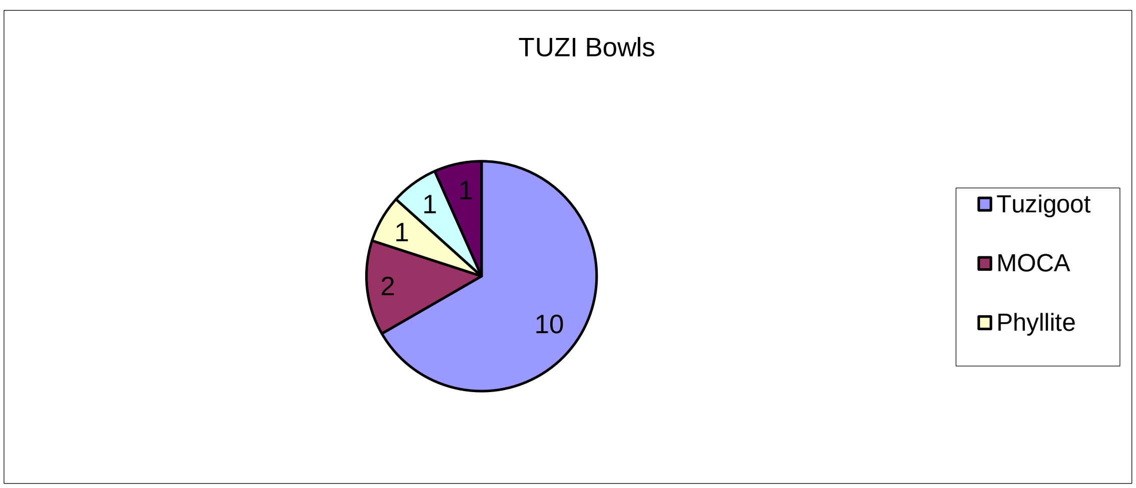

Figure 3.1. Bowl Rims Recovered from Tuzigoot by Temper Type, Numbers Pertain to Sample Size.

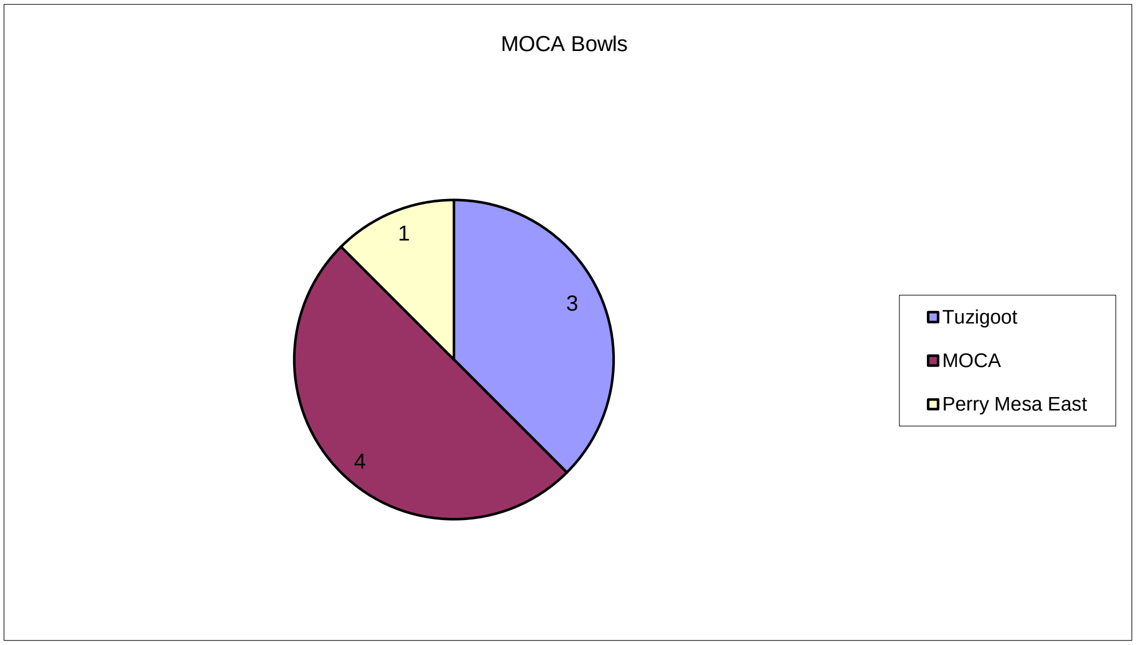

Figure 3.2. Bowl Rims Recovered from Montezuma Castle by Temper Type, Numbers Pertain to Sample Size.

Plain Ware Exchange Value

Abbott (2000:135-140) argues that the exchange value of a ceramic ware can be evaluated by assessing the cost of producing the ware and its utilitarian and social values. The production step measure of ceramic manufacture (Feinman et al. 1981), an ordinal index of production costs, explains that a vessel with more steps involved in its production will have a higher production cost and thus an increased value. In the Phoenix Basin, plain and red wares were locally produced. Abbott demonstrated that red wares required more production steps than plain wares, including acquiring red pigment, slipping, smudging, and polishing; and were thus more labor intensive to produce.

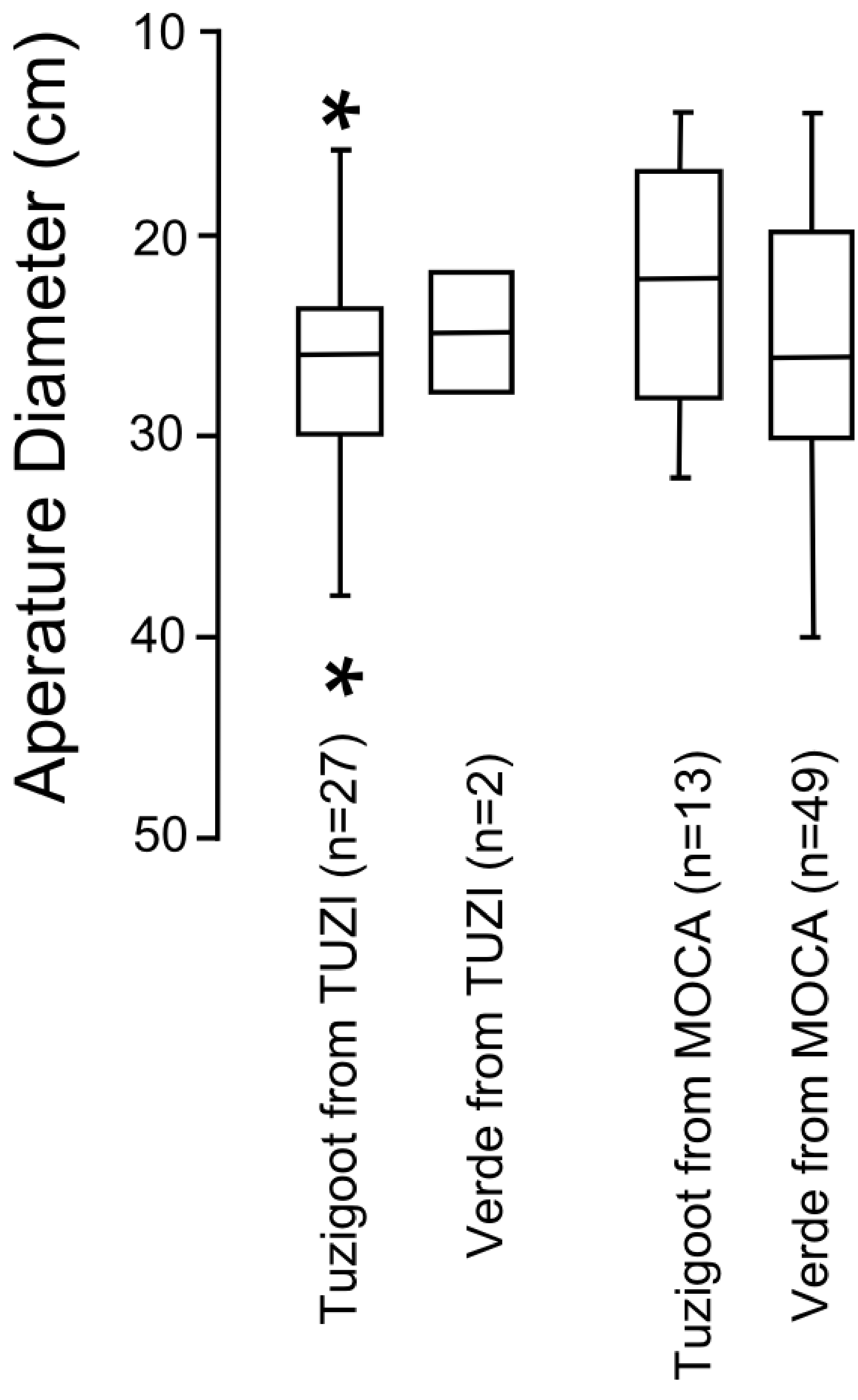

Figure 3.3. Middle Verde Jar Aperture Diameter.

In Chapter 2, I demonstrated that plain wares were produced in several locations across central Arizona. During the rough sort, I also inspected several red and a more limited number of white-on-red sherds from each of the sampled sites with the exception of Tuzigoot and Montezuma Castle. I did not quantify the data, but the vast majority of these sherds appear to belong to one of the temper types identified in Chapter 2, and I can say with some confidence that these wares were also produced "locally." As I will discuss in Chapter 4, preliminary observations suggest that Salado Polychrome was manufactured within the proposed confederacy, but this argument is more tenuous and Salado Polychrome production is not considered further in this chapter.

As in the Phoenix Basin, central Arizona plain ware had the fewest production steps and was the least labor intensive to produce. Red ware production included the additional steps of acquiring and applying red pigment, and white-on-reds required the additional steps of acquiring white pigment and painting. At Late Classic sites on the Lower Verde near Mercer and Ister, Late Prehistoric plain wares (59%; Whittlesey et al. 1997:Table 3.1.3) were more likely to be polished than red wares (30%; Whittlesey et al. 1997:Table 3.1.9), but 25% of the plain wares were smudged, while 75% of the red wares exhibited smudging (Whittlesey et al. 1997:18). An unpublished preliminary analysis of the Dugan collection was conducted by a series of undergraduate lab classes taught by Abbott and myself. That study suggested that Dugan red wares were more often smudged and polished than plain wares.

Caywood and Spicer (1935) describe Tuzigoot plain wares as typically "smoothed but not polished." Vessel interiors are described as "generally rough and unsmoothed, showing many irregular depressions.” This plain ware description is inconsistent with smudging. Red ware bowls are “often polished on both interiors and exteriors” and were “frequently smudged black on the interiors.” Red ware jars were also “frequently highly polished.” The available data suggest that, as in the contemporary Phoenix Basin, Late Prehistoric plain wares in central Arizona had the lowest production cost of the three locally produced ceramic wares.

Utilitarian value, or utility, is “the performance of a vessel as a utilitarian item (Abbott 2000:138). In the Phoenix Basin, Hohokam potters “improved the technical performance of their [red ware] pottery by adding more production steps, but they did not create red ware pots to perform tasks that plain ware pots were technologically incapable of accomplishing” (Abbott 2000:138). Plain and red ware vessel forms were interchangeable, were used to perform many of the same tasks, and thus had comparable utilitarian values. Additional research is required to establish utilitarian value of plain ware in the Verde Confederacy. I did not systematically study red ware vessel form as part of this study, and I am unable to determine whether plain and red ware vessel forms were interchangeable.

Social Value is subjective, and can be “determined by attitudes regarding the item’s worth and want gratification (Abbott 2000:138; see also Haney 1939:14-20). Archaeologically, social value can be determined by examining context. In the Phoenix Basin, plain and red wares were of comparable vessel forms and sizes, served the same utilitarian tasks, and were found together in trash deposits. Functionally, they appear to be interchangeable; however, red wares were two to five times more likely to be included as mortuary offerings than plain wares. These different ritual distributions indicate that a higher social value was placed on red wares.

Some mortuary data from the study area are available. As recently summarized by Spurr and Deats (2015), hundreds of burials have been excavated in the Middle Verde. The majority of these burials were from Tuzigoot (Anderson 1992). Ceramics are by far the most common accompaniment in Late Prehistoric burials on the Middle Verde (Spurr and Deats 2015:38). Approximately 30% of the burials at Tuzigoot included at least one vessel (Anderson 1992:31). One-hundred and one of the Tuzigoot burials included 135 pots. Caywood and Spicer (1935) identify 106 red ware pots, 2 plain ware pots, and 27 painted bowls. Anderson (1992:28-29) indicates that these original type IDs are contradicted by a more recent analysis. Unfortunately, he does not report the revised data. Jerry Jacka recalls that 99% of the mortuary vessels on Perry Mesa were slipped red wares (Abbott 2014:205; Jacka 1980:282). Five Late Prehistoric burials were excavated at Roadhouse Ruin on the Lower Verde (Neily 1997:170-171). Four burials were associated with pots. Features 7 and 16.02 each included one plain ware bowl, Feature 10 had one red ware bowl, and Feature 16.01 had three red ware bowls. During a field excursion to Polles, I observed a relatively recently disturbed burial was associated with red ware sherds. As in the Phoenix Basin, the available mortuary data suggest a preference for red ware bowls in central Arizona, indicating that red wares had a relatively high social value. The social value of plain ware, in comparison to red ware, was relatively low.

Interpretation

In the absence of close social relationships without responsibilities of underlying reciprocal support, exchanges between individuals who are more socially distant tend toward each party maximizing their own economic benefit. Low value, utilitarian items such as plain ware ceramics, tend to be exchanged among closely cooperating, socially proximate individuals, such as kinsmen (Graves 1991; Stark 1992). Abbott (2000; Abbott et al. 2006) demonstrates that this context applies to the Late Prehistoric Phoenix Basin, arguing that plain ware exchange networks are a proxy for the distribution of socially proximate individuals and/or households. As summarized above, these plain wares were widely produced at most villages and had a low exchange value due to fewer production steps than any other ware, high utility, and low social value. Similar arguments have been made for utilitarian ceramics across the Southwest (Brunson 1985; Duff 2002:25-26; Peeples 2011; Reid and Montgomery 1998; Zedeño 1994). Does this context also apply in Late Prehistoric central Arizona? The argument is not as rigorous due to a lack of data, but the available evidence indicates plain ware production and exchange in Late Prehistoric central Arizona was comparable to what Abbott (2000) observed in the contemporary Phoenix Basin. I interpret plain ware exchange networks as evidence for social proximity between residents of the production zone and the recovery location.

Collective Social Identity

Peeples (2011:131) argues that “settlements involved in common spheres of ceramic circulation likely represent groups of individuals who were interacting on a regular basis, suggesting strong relational connections.” He supports his argument by first referencing the widespread consensus that ceramic exchange is both a social and economic process (e.g. Abbott 2000; Adams et al. 1993; Bernardini 2005; Bishop et al. 1998; Braun and Plog 1982; Clark 2006; Crown 1994; Duff 2002; Huntley 2008; Plog 1977; Plog and Upham 1983; Rautman 1993; Triadan 1997; Upham 1982; Zedeno 1994). As explained above, utilitarian goods tend to move between socially proximate people and groups. Social proximity is the result of "sustained, informal relationships and shared historical connections which form the basis for strong and tight-knit relational connections" (Peeples 2011:134-135).

Boundary Nature

Plain ware exchange in the study area is summarized in Table 3.3. I added the total number of sherds exchanged between each pair of production sources, and divided those totals into three categories based on natural breaks in the data distribution (Figure 3.4). The low category includes 1-8 sherds, medium 14-36, and high 102-582. These categories of exchange are mapped in Figure 3.5 using conventions developed in social network analysis (SNA), which has recently been increasingly applied to archaeological contexts (e.g. Borck et al. 2015; Mills et al. 2013a, 2013b, 2015; Peeples 2011). As previously documented (Abbott et al. 2012; Kelly et al. 2009; Watkins and Kelly 2014), the bulk of plain ware ceramics traded within the proposed Verde Confederacy appear to have moved within two interaction spheres. The northern interaction sphere includes Montezuma Castle and Tuzigoot in the Middle Verde Valley. The southern interaction sphere includes the Perry Mesa sites and Bloody Basin. Reanalysis of the Polles, Mercer, and Ister Flat collections indicate less-intensive exchange extending south from the

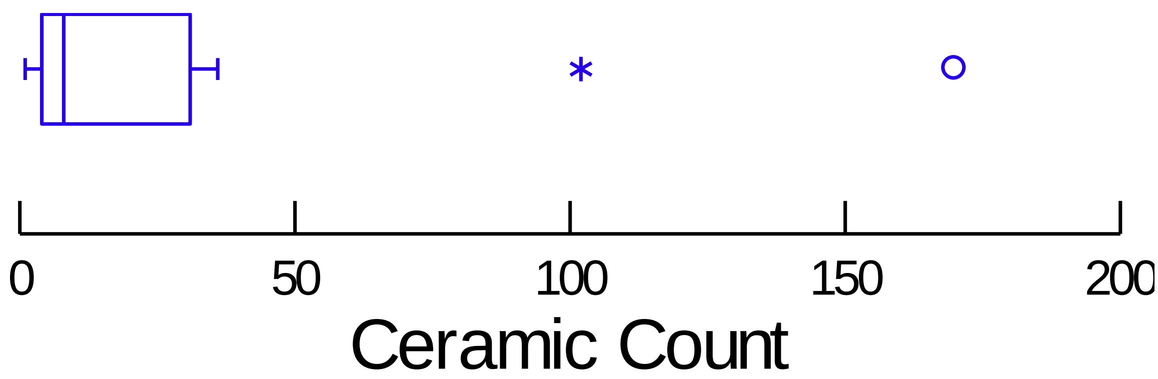

Figure 3.4. Source to Source Plain Ware Exchange Counts (n=18). One Extreme Outlier Omitted.

Polles and the Mercer/Ister Flat. A handful of sherds traveled farther distances across the proposed confederacy, suggesting a tertiary interaction network. The simplified boundaries of the three networks are summarized in Figure 3.6. In general, the intensity of interaction falls of as a function of distance from the primary interaction networks. Polles residents maintained some relationships with people in both the Middle Verde and Perry Mesa/Bloody Basin interaction spheres, but these relationships were not as extensive as those within the interaction spheres. Polles participated in, but was not fully integrated into either interaction sphere, and can be characterized as a frontier between the two networks.

Summary

In this chapter, I reconstructed the organization of plain ware production and exchange in Late Prehistoric central Arizona. I associated the distribution of plain ware with a boundary type (socially proximate individuals and households) and with a relational network. Plain ware exchange was intense in two portions of the study area, before falling off as a function of distance from the primary interaction zones. In Chapter 4, I use the

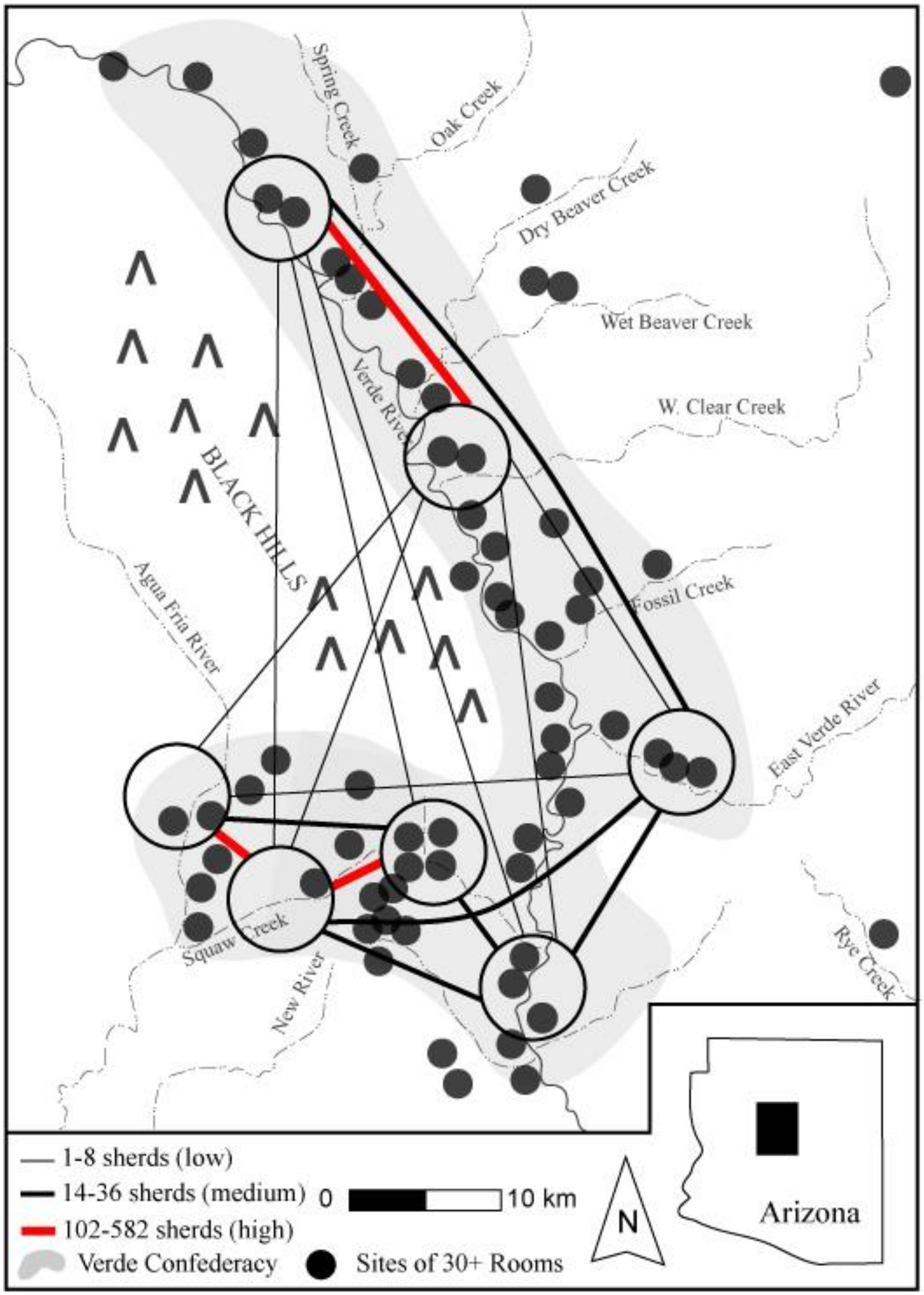

Figure 3.5. Social Network Analysis (SNA)-style Map of Plain Ware Exchange.

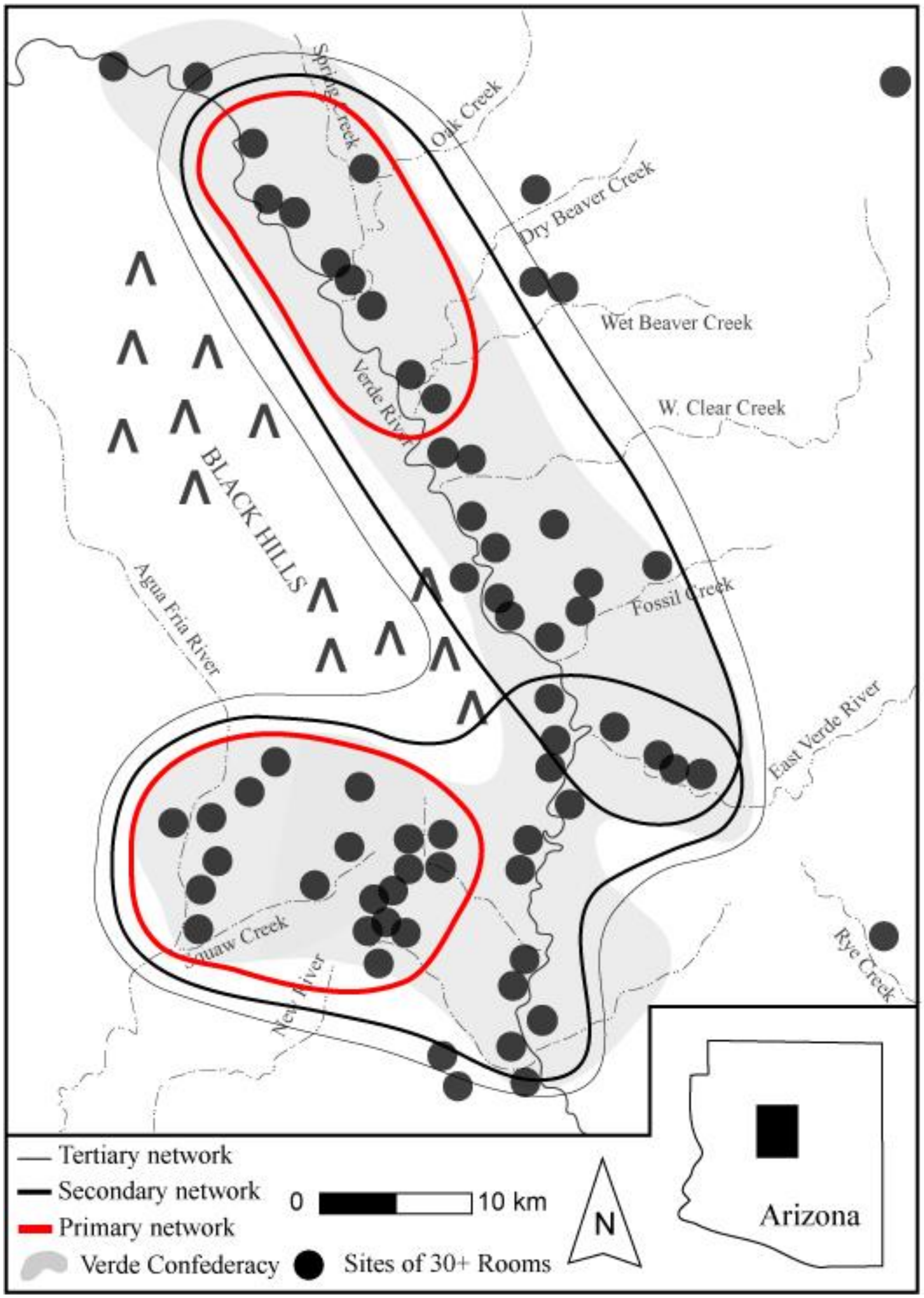

Figure 3.6. Simplified Plain Ware Interaction Networks.

plain ware study as a model and associate a boundary type, collective social identification, and boundary nature with five additional material culture distributions from the study area: settlement patterns, rock art, public architecture, and Salado Polychrome ceramics.

CHAPTER 4

BOUNDARY DYNAMICS IN 14TH CENTURY CENTRAL ARIZONA

Wilcox and others (Wilcox et al. 2001b; Wilcox and Holmlund 2007) have set boundaries for the proposed Verde Confederacy based on geography and settlement pattern data. Settlement patterns are important components in hypothesizing social boundaries, but are by themselves inadequate to delineate meaningful social entities (Bernardini 2005). Parker (2006) argues that multiple lines of evidence associated with a variety of boundary types are needed to accurately identify and characterize social boundaries. Preliminary analyses of available material culture distributions suggest the presence of meaningful boundaries within the proposed Verde Confederacy (Abbott 2014). In this chapter, I examine a number of material culture distributions to comprehensively identify and characterize social boundaries within the proposed confederacy. In the concluding chapter, I use these data to reassess the scale of group integration in Late Prehistoric central Arizona.

I investigate six material culture distributions associated with different boundary types (Table 4.1). As argued in Chapter 3, the plain ware distribution is associated with social/economic boundaries and a relational exchange network. These boundaries will be compared to those identified below in Chapter 5. I re-interpret the geographic and settlement pattern distributions that form the basis of the Verde Confederacy as physical and military boundaries. Three other known distributions, rock art, public architecture, and Salado Polychrome ceramics are argued to represent social/ritual boundaries. In each

Table 4.1. Material Culture Distribution Summary.

Material Culture Distribution	**Collective Social Identity**	**Boundary Type**	**Summary**
Plain ware	Relational Network	Social/Economic	The organization of production and exchange suggests a low-valued good exchanged between the socially close
Line-of-sight		Communication	Allied signaling network
Buffer zones		Physical	Increased distance also increases transportation costs associated with conflict
Rock art	Categorical Commonality	Ritual/Ideology	Relative motif homogeneity is associated with group membership
Public architecture		Ritual/Social	Different contexts for group ritual performance
Salado Polychrome		Ritual/Social	Presence indicates participation in the Southwestern Cult

section, I first briefly describe each material culture distribution. As explained in Chapter 1 and demonstrated in Chapter 3, each distribution is associated with a boundary type. When possible, the distributions are also associated with a relational network or with categorical identity. Finally, I examine the spatial distribution of each material culture data set and assess the nature (frontier-border) of each boundary. The study area is the proposed Verde Confederacy, and I am searching for the presence of boundaries within this area. External boundaries of the proposed confederacy are beyond the scope of this research.

Material Culture Distributions

Geography

Geography played an important role in the development of the Verde Confederacy model, and some discussion of the topic is warranted here. Parker (2006:83) envisioned geographic boundaries to be in one of two classes. The presence or absence of prominent physical features, such as mountains and rivers, are more easily interpreted as impediments or encouragements to the movement of goods and people. The second class includes variation in physical character or climate, such as weather patterns, soil composition, water availability, vegetation type, and the distribution of natural resources. Interpreting these boundaries is much more nuanced. Parker was more concerned with large-scale societies and the pull that resources may have on territorial expansion. Some of his examples include the fur trade encouraging European movement into the North American interior (Wishart 1977) and states pursuing metal deposits such as Mesopotamian incursions into Anatolia throughout its history (Yener 2000). As summarized below, the framers of the Verde Confederacy were more concerned with the first class of geographic boundaries. A detailed investigation of the second class of geographic boundaries in central Arizona may prove useful in refining Late Prehistoric boundaries, but such an analysis is left to future researchers.

Late Prehistoric settlements in the Perry Mesa area are located along the edges of the sheer cliffs of Black and Perry Mesas. The Verde Confederacy model (Wilcox et al. 2001b; Wilcox and Holmlund 2007:19) refers to these cliffs and the associated network of line-of-sight forts and outposts as the "Castle Defense." The Castle Defense has been interpreted as a topographic and military boundary where residents turned their backs on one another and collectively focused their attention outward against external threats (Wilcox et al. 2001b; Wilcox and Holmlund 2007:19; though see papers in Abbott and Spielmann 2014 for alternative explanations). The cliffs associated with the Castle Defense face south and west of the Perry Mesa local system, presumably so as to defend against incursions from the Phoenix Basin Hohokam. The topography to the north and east of the Perry Mesa, facing the other local systems in the proposed alliance, is much more gradual and should not be considered a geographic boundary in the same sense. Noting the absence of Late Prehistoric sites west of the Middle Verde River (despite the presence of well-watered arable land), Wilcox et al. (2001b:159-160) identify the Middle Verde River as the western defensive boundary between the Tuzigoot and Montezuma Castle local systems and unspecified assailants. The Castle Defense is discussed in more detail in the Line-of-sight section below.

Buffer Zones

The proponents of the Verde Confederacy (Wilcox et al. 2001b; Wilcox and Holmlund 2007) bounded the alliance based on settlement patterns, specifically the distribution of sites into clusters surrounded by buffer zones. Wilcox and Haas (1994:230) define buffers as "zones between settlement clusters that are habitable but not occupied." Buffer zones have been discussed in the Southwest for over 80 years (Mera 1935, 1938, 1940), and the proposed Verde Confederacy is a local manifestation of a larger-scale pattern of increasing aggregation and the abandonment of previously occupied areas over time (Doelle and Wallace 1991, LeBlanc 1998, 1999; Lipe 1989; Upham and Reed 1989; Wilcox 2005).

In speaking of Chacoan great house communities in the northern San Juan, Hegmon (2002:273) observed that "although settlements were clustered, some clusters are more tightly defined than others." Hegmon's statement is an apt description of the phenomenon observed by the framers of the Verde Confederacy model. The Verde Confederacy is bounded by three external buffer zones; Middle Verde – Chavez (70 km), Polles – Tonto Basin (30 km), and Lower Verde – Phoenix Basin (67 km) (Wilcox et al. 2001b:162). Sufficient distance for a buffer is defined as approximately half a day's walk (Jewett 1989; LeBlanc 1999; Upham 1982; Wilcox 1991; Wilcox and Haas 1994; Wilcox et al. 2001b:143). Drennan (1984) gives that distance as 22 miles or 36 km. Initially, the longest distance between internal confederacy sites was thought to be 8 km (Wilcox et al. 2001b:158) – an insufficient distance for an effective conflict buffer. As discussed below, chronological refinements during follow-up field work in the Hackberry Basin revealed the emergence of a Late Prehistoric buffer zone. The local systems were defined by centering a 36 km diameter circle on five particularly large sites. Each of these sites is about 32 km from the central node of the adjacent local systems (Wilcox et al 2001b:183-185). Boundaries between local systems do not meet the buffer zone criteria, and are not considered further in this analysis.

Peterson and Drennan (2005:23) argue that researchers can define clusters of human activity at a variety of scales using both subjective and objective criteria, but these clusters are not meaningful unless they can be correlated with social interactions that can be observed in the archaeological record (see also Bernardini 2005). Buffer zones will be more meaningful when compared to other boundaries defined with direct evidence for human interaction.

Boundary Type

Buffer zones are often interpreted as administrative or political boundaries that discourage conflict through increased transportation costs (DeBoer 1981; Hally 1991; Hickerson 1962, 1965; Johnson 1973; LeBlanc 1999; Mera 1935; Rowlands 1973). Chagnon (1996) describes the process by which these buffer zones form. As social relationships between groups deteriorate, or if one group is perceived to obtain superior numbers or a military advantage, adjacent communities increase open space to minimize interactions and chances for attack. The open space also provides places to flee in the event of aggression. Other researchers have argued that buffer zones are associated with secondary ecological benefits such as a steady game supply (Steffian 1991), or with jointly managed common pool resources available for logistical exploitation by multiple groups (Eerkens 1999). Such interpretations have been largely applied to mobile foraging groups, and are less-relevant to the sedentary farmers of Late Prehistoric central Arizona. I follow the proponents of the Verde Confederacy by interpreting buffer zones as indicators of strained relationships between groups.

Collective Social Identification

"In the absence of modern technologies of transportation and communication, the costs and inconvenience of interaction increase substantially with distance" (Peterson and Drennan 2005:5). Ethnographic data indicate that people who lived within 2 km of one another interacted directly on a regular basis (Murdock 1949), but beyond that threshold we can only be certain that interaction costs increase as a function of resident distance (Peterson and Drennan 2005). In other words, spatial proximity greater than 2 km is not direct evidence for regular interaction, but it would have been less expensive and more convenient for people living near one another to interact. It would have been costlier for people living on either side of a buffer zone to interact regularly, and buffer zones are interpreted here as indirect indicators of relational network boundaries.

Boundary Nature

Wilcox and others (Wilcox et al. 2001b:183; Wilcox and Holmlund 2007:23-26) have documented a Late Prehistoric buffer zone between the Polles and Montezuma Castle local systems (Figure 4.1). In the years leading up to the Late Prehistoric period, this region included a line-of-sight network of approximately 80 forts, look-outs, and defensive residential sites. This network was abandoned around A. D. 1250, leaving the "Hackberry Buffer Zone" unoccupied. The buffer zone is approximately 20 km wide as measured from Salome and Boulder Canyon Ruin near Fossil Creek to West Clear Creek and Mindeleff Pueblo. Although this distance is shorter than the half-day's walk initially endorsed by the framers of the Verde Confederacy Model, the distance is much longer than any other gap in the proposed confederacy. The abandonment of the fortification system further supports the interpretation of this area as a buffer zone.

Line of sight

The second settlement pattern that contributed to the boundaries of the Verde Confederacy is line-of-sight networks. Many of the settlements and hilltop forts in Late

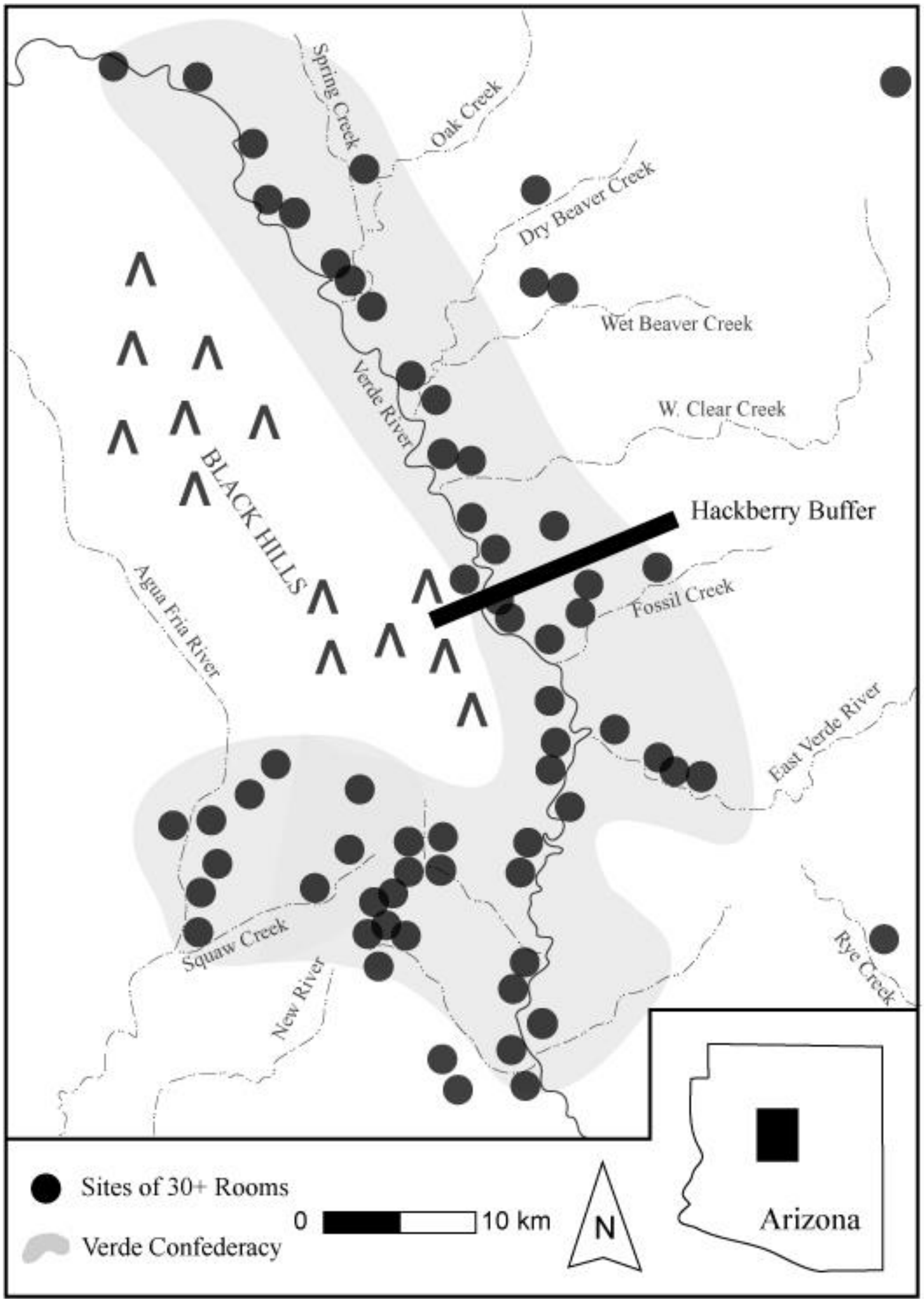

Figure 4.1. Late Prehistoric Buffer Zone Boundary.

Prehistoric central Arizona are connected by line-of-sight relationships Several line-of-sight networks pre-dating the Late Prehistoric have been examined in detail (Wilcox et al. 2001a; Wilcox et al. 2001b:183; Wilcox and Holmlund 2007:23-26). Wilcox et al (2001b:185) note that other networks exist in the proposed confederacy, but he does not say where they are located, only that they have yet to be sufficiently documented. The only Late Prehistoric network investigated in detail thus far is on Perry Mesa (Wilcox and Holmlund 2007:19; Wilcox et al. 2007).

Boundary Type and Collective Social Identification

Wilcox and others (Wilcox et al. 2001b; Wilcox and Holmlund 2007) interpret line-of-sight relationships in Late Prehistoric central Arizona as evidence of a wide-ranging administrative, military, and signaling network of strategically constructed settlements and hilltop forts. The network(s) are a form of long-distance visual communication. Messages were most likely sent via smoke during the day or fire by night. Smoke signaling networks were common worldwide (e.g. Richmond 1935), across North America (Beers 2014), and in the Southwest (Beers 2012, 2015; Swanson 2003). As discussed in Chapter 1, relational identification is based on routine and regular social interactions associated with specific social rights and obligations. Participants in these communication networks would have accepted obligations to provide guard labor, and agreed to watch for mutual danger and signal neighbors in the event such danger became apparent. The communication network(s) implicit in the line-of-sight arrays are consistent with a relational network.

Boundary Nature

As discussed above, the Castle Defense, a combination of cliffs and defensive perimeter sites along the edges of Black and Perry Mesa, is a defensive border that suggests a mutual non-aggression pact where people agreed not to attack one another and to watch out for common enemies. The Perry Mesa line-of-sight network has nodes around the edges of Black and Perry Mesas, including some additional line-of-sight paths cross-cutting the mesas. The perimeter of the Castle Defense is shown in Figure 4.2.

The cross-cutting sight-lines are of particular relevance to this study, as they suggest communication throughout the local system. The Horseshoe Peak site is a central, critical node in the interior Perry Mesa line-of-sight network as proposed by Wilcox and Holmlund (2007:19). As the largest and most defensible site on the Mesa, Las Mujeres is proposed as the command center of the Perry Mesa local system. There is a direct line-of-sight from Las Mujeres to Horseshoe Peak, which in turn has direct line-of-sight to most of the large pueblos in the system. Horseshow Peak is proposed as a relay station where messages could have been passed from one large settlement to another. Horseshoe Peak had been previously field checked and dated to the Late Prehistoric period by Wilcox and others (Russell et al. 2012:165-167). Russell et al. (2012) recently re-recorded and analyzed the features at Horseshoe Peak. They compared room morphology, wall height, masonry technique, and defensive features to Apache and contemporary Late Prehistoric Perry Mesa sites, arguing convincingly for an Apache cultural affiliation post-dating Late Prehistoric times. A few sherds of Late Prehistoric plain ware were observed at Horseshoe Peak, and although they argued strongly for the Apache affiliation,

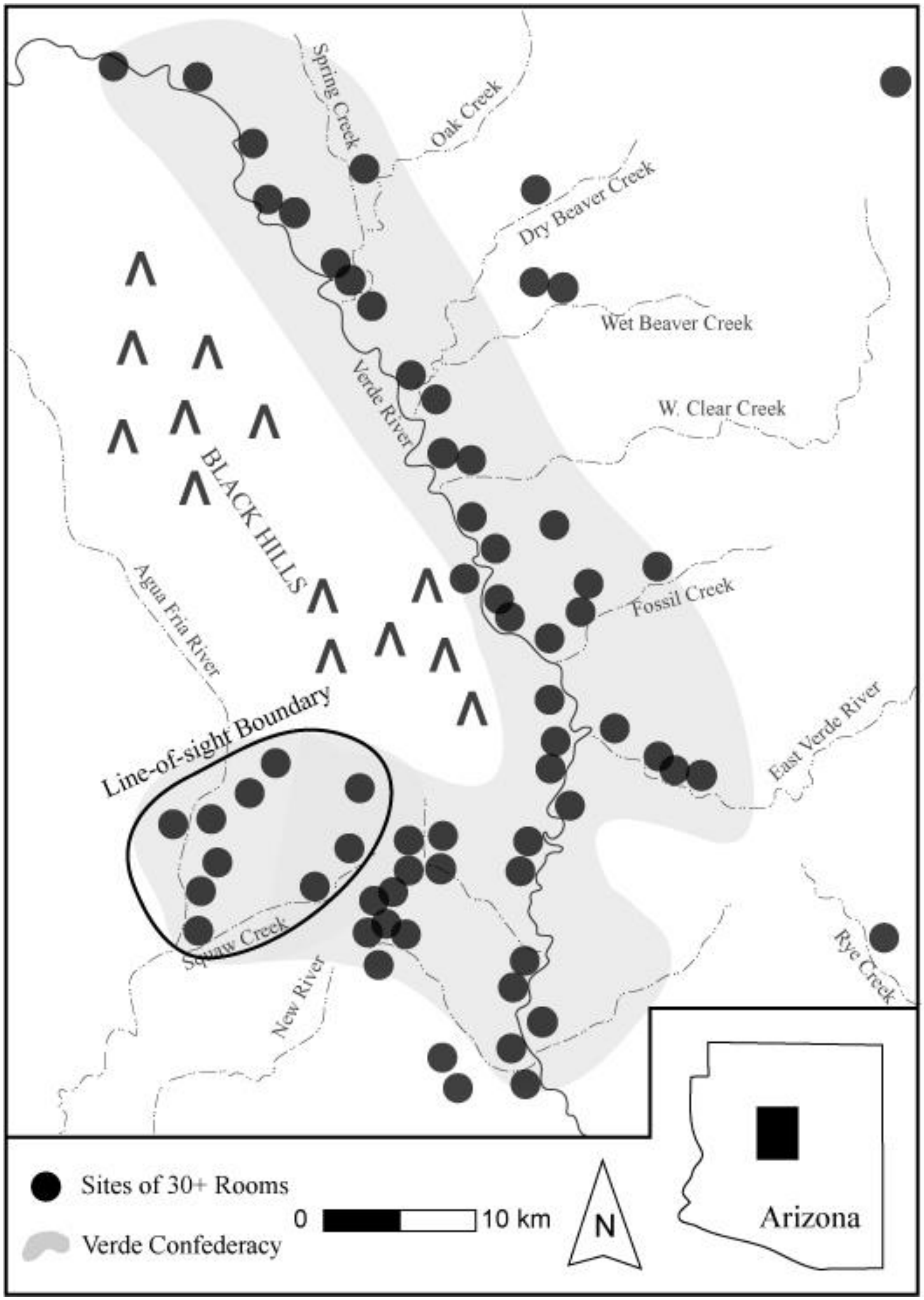

Figure 4.2. Late Prehistoric Line-of-sight Boundaries.

Russell et al. could not rule out the presence of an earlier Late Prehistoric fort that was stone-robbed to construct the later Apache walls.

To what extent does the Perry Mesa line-of-sight network represent an integrative communication network? With Horseshoe Peak, the framers of the Verde Confederacy envision the Late Prehistoric inhabitants of Perry and Black Mesas integrated by a defensive line-of-sight signaling network. Without Horseshoe Peak, a critical node in the internal signaling network, Russell et al. (2012:163) argue that the Perry network "as envisioned by [Wilcox and others] ceases to exist as a comprehensive, functioning system." At least some smaller Later Prehistoric sites in the mesa interiors seem to have been strategically located to facilitate rapid communication. Additional investigations to confirm that the smaller nodes in the signaling network date to the Late Prehistoric are required before the extent of the communication system can be accurately assessed. For now, I primarily associate the boundary in Figure 4.2 with defense, and tentatively associate the boundary with communication pending additional field investigations.

Rock Art

In a 1995 overview, J. Homer Thiel lamented that rock art in Arizona had not been well-published or extensively studied, particularly considering the large number of sites statewide. Since that time, additional studies have been conducted that have enabled this analysis. Some regions, such as Bloody Basin and Polles Mesa, have yet to be studied in sufficient detail to support comparisons with surrounding regions, and this study is restricted to Perry Mesa, the Middle Verde, and the Lower Verde. Simon et al. (2014) conducted new field work and summarized several rock art survey projects conducted on Perry Mesa over the last several years. They conclude that while the immigrant population drew on a variety of Southwestern rock art motifs and techniques, Perry Mesa rock art is “not stylistically unique within central Arizona,” and “a separate ‘Perry Mesa style’ has not been defined and may not be warranted (Simon et al. 2014:219). The various Perry Mesa rock art localities tend to have their own “theme” dominated by one or more motifs. Despite some localization, commonalities between surveyed areas have been identified sufficiently for Simon et al (2014) to conclude that the comingling of rock art motifs on Perry Mesa are consistent with disparate influences being synthesized into a local tradition. Pilles (1996) inventoried the rock art at the V-Bar-V rock art site (Figure 1.5) in the 1990s shortly after the site was acquired by the US Forest Service. V-Bar-V is considered typical of the Beaver Creek Style, but is also irregular in its large size and its absence of rock art from earlier and later time periods. Beaver Creek is occasionally referred to as a formally defined style (e.g. Malotki 2007:117; Pilles 1996b:3-4), but an extensive search of the literature turned up only a brief description, “discrete generally small forms (lines, discs, spirals, etc), human and animal forms (quadrupeds, foot prints, human-like stick figures, etc.) and occasional larger complex geometric forms pecked primarily into sandstone cliffs” (Weaver 2000:209). As part of the Lower Verde Archaeological Project, Wallace (1997) investigated four rock art sites around Horseshoe Reservoir. Stylistically, this rock art most resembled the Hohokam Petroglyph Style of the Phoenix and Tucson Basins (Thiel 1994) with a several regionally distinct elements that suggest a local stylistic variation of a larger Hohokam tradition.

Boundary Type

Rock art in central Arizona functioned as signaling devices/trail markers; commemorations of historical, mythical, astronomical, or cosmological events; location markers for the same events; commemorations of ceremonial activities; or marking boundaries in land tenure systems (Bostwick 1989; Bostwick and Krocek 2002; Bruder 1983; Thiel 1994; Wallace 1983; Wallace and Holmlund 1986). Simon et al. (2014:118-119) propose that the reiteration of rock art motifs in Late Prehistoric Perry Mesa "suggests cooperative interaction and shared knowledge," whereas contrasting motifs "call into question the connectedness among…areas postulated by the Verde Confederacy Model." Pilles (1996b) suggests that rock art at V-Bar-B is associated with clan symbols and ritual performance (shamanism) while also functioning as a boundary and trail marker. Rock art on the Lower Verde is thought to "function primarily in a ritual context" (Wallace 1997:26). I interpret similarities in rock art a common system of belief and ritual practices that integrated the population.

Collective Social Identification

After McDonald (1998, 2000, 2012), I interpret homogeneity of rock art motifs as an indicator of shared collective identity. McDonald (2000:55) uses Wobst's (1977) style as a social strategy to extract identity from prehistoric rock art, arguing that rock art motifs are more homogenous when groups of people are emphasizing social bonds. Stylistic heterogeneity is relative, in that it can only be defined in comparison to stylistic activity which is more homogeneous. Comparisons of stylistic heterogeneity can be made at regional and local levels using varying scales of inclusion (Conkey 1987). Specifically, McDonald (2012:226) argues that first; motifs/ assemblages that are more visible are viewed often by more people, and are the most appropriate sources of stylistic messages. Second, motifs/assemblages that are viewed by fewer individuals will reveal clinal social messaging between social groups. Third, more widely broadcast motifs/assemblages are most likely to be associated with social group affiliation and boundary maintenance. McDonald's approach mirrors Peeples' (2011:262) recent argument that "patterns of similarity and difference in highly visible objects and designs, when appropriately contextualized, can be used as one indication of patterns of shared categorical identities at various social and spatial scales."

The rock art from the three regions for which sufficient data are available can be partially placed into context as McDonald suggests. The majority of the rock art in each of the three regions is highly visible, and is an appropriate source for stylistic messages. The ubiquity of various element types across the different regions is at present unknown, and McDonald's third criterion (more widely broadcast motifs/assemblages are most likely to be associated with social group affiliation and boundary maintenance) will not be considered further.

Perry Mesa rock art is located in one of four general contexts (Simon et al. 2014:115-117), all of which were intended to be viewed by many people. Large rock concentrations are located near villages in "openly visible areas so that inhabitants and visitors would readily view the motifs and their associated messages." Other rock art extends away from the pueblos along canyon walls – which were obvious travel corridors. Smaller concentrations of rock art are typically located between villages and water sources, and would have been seen regularly by village residents during water collection trips. Other panels are located below the villages along the canyon bottoms near water sources, signaling the water rights of the pueblo to any travelers. Overall, Perry Mesa rock art is thought to have "conveyed information not only about location but, significantly, about individual or group identity" (Simon et al. 2014:117).

V-Bar-V is the largest petroglyph site in the Verde Valley. The site is adjacent to Sacred Mountain, one of the largest Late Prehistoric pueblos on the Middle Verde and the most notable village on or around Beaver Creek. The outcrop is extremely prominent, and Pilles (1996b) describes the site as being "highly visible" to anyone walking along Beaver Creek, a heavily trafficked transportation corridor used by people coming or going to Sacred Mountain. Clearly this rock art was intended to be seen by large numbers of people.

The rock art from the four sites examined by Wallace (1997) on the Lower Verde was primarily located in prominent, highly visible locations including large cliff-faces and boulders "among the largest or most obtrusive in their areas" (Wallace 1997:10). Many of the panels are thought to have been visible from some distance away. This rock art was intended to be seen by passers-by, with one exception. Boulder A-1 at the Crash Landing site is located in a natural alcove described as a "partial enclosure."

Boundary Nature

A detailed comparison of the Lower Verde, Perry Mesa and Beaver Creek Style rock art of the Middle Verde Valley is beyond the scope of this research, but there is sufficient data to make an assessment of motif homogeneity between the three regions. I follow Simon et al. (2014:106) in comparing proportions of element classes (geomorphic, zoomorphic, anthropomorphic, amorphic) as "general indicators of whether there are dominant themes at the various… locations and how these are shared with or differ from one another." I supplement these comparisons with qualitative data where available. Two studies have noted significant contrasts between the rock art of Perry Mesa and the Lower Verde.

Simon et al (2014) note significant contrasts between the rock art of Perry Mesa and the other participants in the proposed Verde Confederacy. Geomorphic elements dominate on the Middle Verde, followed by a nearly equal distribution of anthropomorphs and zoomorphs. Zoomorphs dominate on Perry Mesa, and while geometric elements are also common, anthropomorphs are relatively rare. Lower Verde rock art is roughly evenly divided between geomorphic, zoomorphic, anthropomorphic, and amorphic design elements, but the rock art of Perry Mesa is dominated by geomorphic and zoomorphic elements (Table 4.2). Wallace (1997:19) offers qualitative contrasts in element morphology, noting that Perry Mesa "birds, anthropomorphs with footprint feet, complex geometric forms, and shield-like framed motifs are all markedly different from the material seen either to the south [Hohokam] or in the [Lower] Verde sites."

Geomorphic elements dominate at on the Middle Verde, as compared to the evenly balanced element distributions on the Lower Verde (Table 4.2). The design styles on the Lower Verde "are closely allied to that seen in the Phoenix area and Northern Periphery" (Wallace 1997:18). They are essentially a local manifestation of the broader

Table 4.2. Central Arizona Rock Art Element Types.

Element Type	Perry Mesa Simon et al. 2014:107	Lower Verde Wallace 1997	Beaver Creek (Middle Verde) Pilles 1996
Geomorphic	639	45	352
Zoomorphic	789	42	197
Anthropomorphic	151	42	171
Amorphic	201	38	114
Plant-like	8	1	0
Total	1788	168	834
Geomorphic	35.74%	26.80%	42.21%
Zoomorphic	44.13%	25.00%	23.62%
Anthropomorphic	8.45%	25.00%	20.50%
Amorphic	11.24%	22.60%	13.67%
Plant-like	0.45%	0.60%	0.00%

Hohokam tradition, and contrasting Beaver Creek rock art against the Lower Verde is essentially analogous to a comparison with Hohokam. Thiel (1994:110) briefly discusses Middle Verde (or Southern Sinagua) rock art as part of a larger Anasazi tradition he calls out as distinct from Hohokam. Malotki (2007:116-127) discusses Beaver Creek (and Perry Mesa) rock art as part of the Central Arizona Rock Art Province, which is also called out as distinct from Hohokam.

The rock art between Perry Mesa, the Middle Verde, and the Lower Verde is noticeably different. The lack of data in Bloody Basin and the Polles local system make it impossible to determine exactly where these contrasts begin and end, so they are shown as parallel dashed lines in Figure 4.3. The area between Perry Mesa and the Middle Verde is unpopulated during the Late Prehistoric, and this line can be shown as solid.

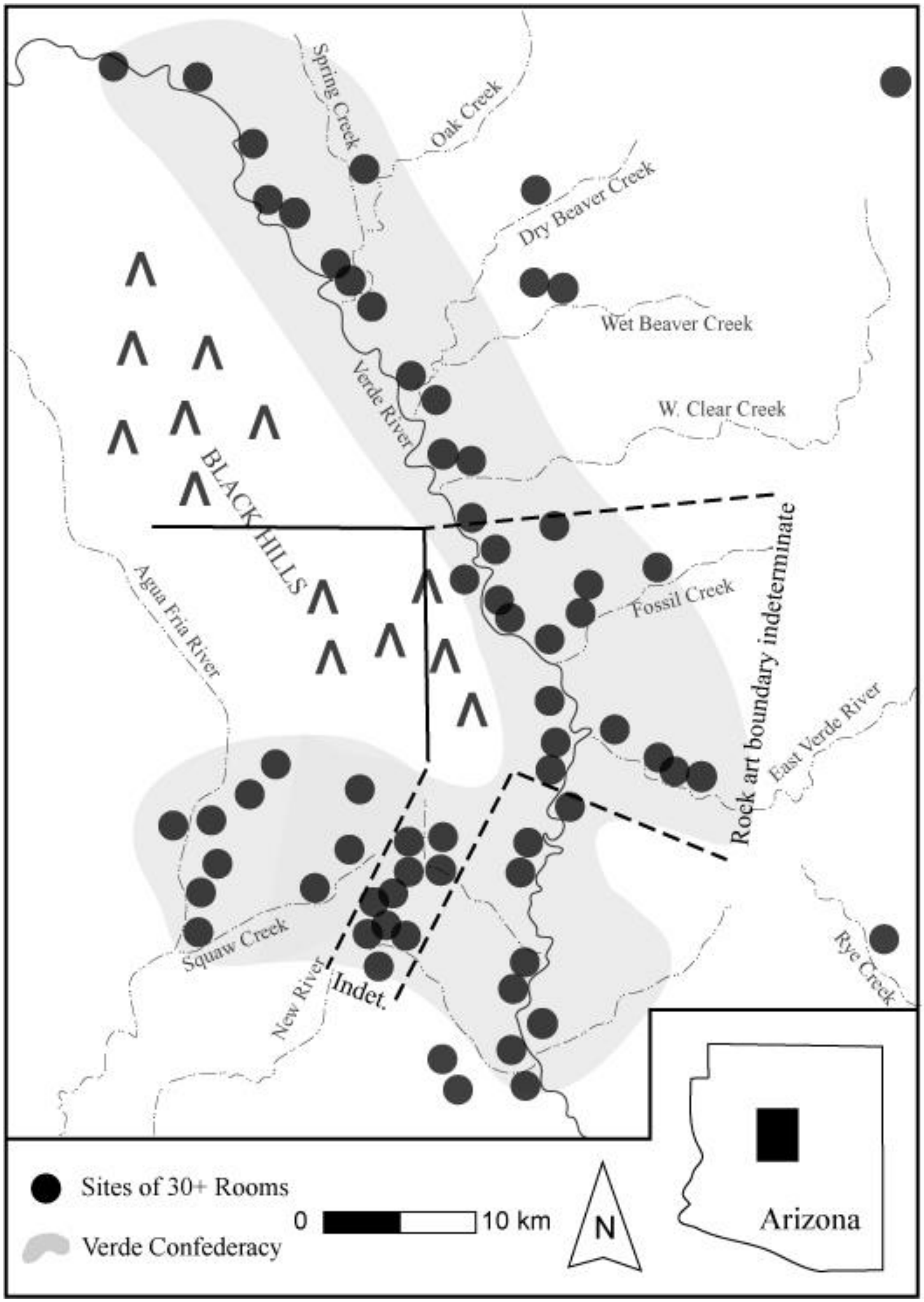

Figure 4.3. Late Prehistoric Rock Art Boundaries, Dashed Areas Indicate Indeterminate Boundary Locations.

Public Architecture

Four suites of public architecture have been identified in Late Prehistoric central Arizona; racetracks, plazas, oversized community rooms, and platform mounds. In a series of studies, Russell and others (Russell 2008, 2014; Russell and Nez 2012; Russell et al. 2011) argued that the linear, cleared features archaeologists have called racetracks were used for ceremonial and integrative functions including feasting, settling disputes, large group gathering, exchange, and gambling. Racetracks were easy to construct, and racing was a relatively simple ritual practice that could have been easily adopted by a diverse group of people. As recently summarized by Pilles (2015), integrative architectural features on the Middle Verde include formal plazas and/or oversized "community rooms." Plazas are large areas of open, unroofed space within the interior of a pueblo. Community rooms are unusually large rooms that are found embedded within a roomblock, at the edge of a pueblo, or as freestanding structures adjacent to other architecture (Pilles 2015:106). Pilles argues that settlements on the Middle Verde were organized as linear communities anchored by one large site with a plaza or community room where members of adjacent smaller villages could gather. As in the contemporary Phoenix, Tonto, and Tucson Basins, Late Prehistoric peoples on the Lower Verde constructed platform mounds. Platform mounds are not a homogeneous phenomenon and were probably used in multiple ways. In a cross-cultural ethnographic investigation of middle range societies, Elson (1998:101) showed that "platform mounds are often multifunctional and the specific use of a mound may change over its lifetime," but that "ceremonial activities… are involved with all aspects of mound construction and use." In central Arizona, agave knives occur in higher density at platform mounds, suggesting the preparation of feasts to satiate large groups (Rice 2000:149) gathering to participate in integrative ritual observances (Rice 2000:144-151, 148) including the rain-bringing wine ceremony and post-harvest purification (Rice 2016:43).

Boundary Type and Collective Social Identification

Following Peeples (2011), I interpret mutual forms of public architecture as shared contexts for public ritual performance and an indication of common categorical identity. Shared forms of public space suggest communities participated in comparable spheres of public ceremonialism (Adams 1991; Herr 2001:30-31; Stein and Lekson 1992). As Peeples (2011:312-313) argued for the Cibola region, the scale of public spaces in Late Prehistoric central Arizona "suggests that public architectural features may have provided formal contexts for the active expression of identities in gatherings above the scale of co-residing units" (see also Kintigh et al. 1996; Mills 2007a; Potter 2000).

Russell (2014:354-355) argues that racetrack distribution "help[s] define an interconnected population with shared ideology (or parts thereof) and some degree of social cohesion." Platform mounds were centers for small territorial units (Fish and Fish 1992). Rice (2016:42-43) has compared the villages within the catchment of a platform mound to the 19th century pan-village alliances of the O'Odham. These alliances would come together to perform large, group ceremonies and to cooperate during times of war (Rice 2016:24; Underhill 1939:57-58, 70). Ritual specialists from each village in the alliance would lead the collective alliance members in the saguaro wine rain-making (Underhill 1969:135-136; Underhill et al. 1979:22) and prayer stick ceremonies

(Underhill 1969:135; Underhill et al. 1979:82). A communal function for community rooms on the Middle Verde is inferred from their oversized nature (Pilles 2015). Plazas in the Southwest have been associated with two general "functions." First, the closed layout of plaza-oriented sites has been argued to be defensive in nature (Bernardini 1998; Caperton 1981; LeBlanc 1999:56-63). Second, a central plaza "fosters and maintains social relationships among the site's inhabitants" through internal monitoring of daily activities and public communal ritual (Rautman 2000:271; see also McGuire and Saitta 1996). Plazas emerge in Southwestern architecture during a time of increasing aggregation. Populations were likely to have been concerned with both defense and social cohesion, and the two plaza functions were not necessarily mutually exclusive. Public architecture in Late Prehistoric central Arizona probably served similar integrative purposes, but the four types of architecture indicate that people were integrating in different ways. Different forms of public architecture in the proposed Verde Confederacy indicate boundaries to ritual practice and social integration.

Boundary Nature

The distribution of Late Prehistoric public architecture is shown in Figure 4.4. Racetracks, platform mounds, and community rooms form three discrete clusters, while plazas crosscut these clusters along the Verde River and a few tributaries. The distribution of these feaDuring the Late Prehistoric, "the racetrack network was becoming increasingly focused on the Perry Mesa-Black Mesa area while maintaining an integrative corridor through Bloody Basin and onto Polles Mesa" (Russell 2014:178). Most of the large Late Prehistoric pueblos in the Perry Mesa local system are associated

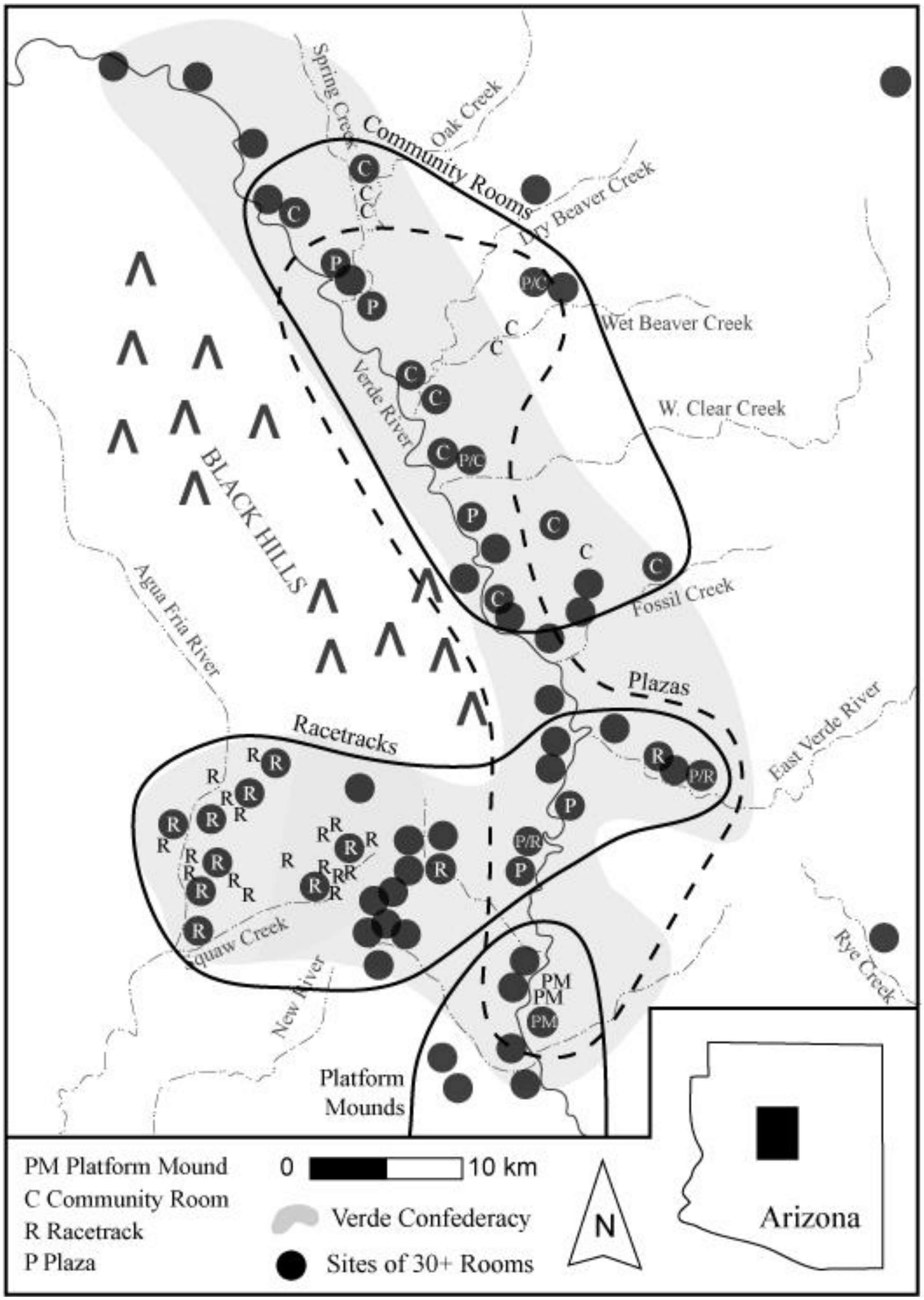

Figure 4.4. Late Prehistoric Public Architecture Boundaries.

with at least one racetrack. Other Late Prehistoric racetracks have been identified in Bloody Basin and on Polles Mesa.

Ciolek-Torrello (1997:573-574) summarized previous research on Lower Verde platform mounds as part of the Lower Verde Archaeological Project. Researchers are divided as to whether the large central component of Mercer Ruin is a platform mound and/or great house (Crary 1991; Mindeleff 1869; Russell 2014:180; Wilcox et al. 2001b:183; J. Scott Wood, personal communication 2016) or two-story rooms on the high point of a hill (Macnider and Effland 1989:1976; Whittlesey 1997:76). Both the pro- and con-factions invoke Mindeleff (1896:196), the original recorder of the site, as support for their view. In a brief description, Mindeleff indicates that this portion of the ruin is likely two stories tall, but does not go into any significant detail. A smaller platform mound has been documented approximately 1.25 miles northwest of Mercer Ruin at AZ O:14:34(ASM)/ AR-03-12-01-116 (Neily and Donta 1993:135; Rice 1986:204). Rice (1986:204) indicates a third platform mound at AZ O:14:42 (ASU). The legitimacy of these platform mounds has not been disputed.

Approximately 20 community rooms have been documented (Pilles 2015:106). These features are restricted to the Middle Verde in both the Tuzigoot and Montezuma Castle local systems. They are found along the Verde River and a few major tributaries including Fossil Creek, West Clear Creek, Wet Beaver Creek, Oak Creek, and Spring Creek. Community rooms are located between Fossil Creek to the south and the confluence of Oak and Spring Creeks to the north (Figure 4.4).

The three discrete groupings of public architecture are consistent with different ritual integrative complexes in central Arizona. If members of the proposed Verde Confederacy were looking to ritually cement alliance relationships, racetracks would have been a particularly convenient mechanism for peaceful interaction. Ceremonial racing is tied to “an ideological suite shared, at least historically, throughout the Southwest” (Russell 2014:180). Racetracks were also present on the Lower and Middle Verde in earlier time periods, and would have been known to Late Prehistoric people on the Middle Verde and Lower Verde. The abandonment of ritual racing on the Middle and Lower Verde during the Late Prehistoric was a conscious rejection of racing and its integrative functions – an act of intentional differentiation (Russell 2014:180). The three groupings of public architecture do not overlap, and as explained in Chapter 1, reflect ritual borders in the study area.

Plazas cross-cut the three discrete distributions described above. The Verde River included some of the most fertile and well-watered agricultural land in central Arizona, and would have been highly sought after by prehistoric farmers. This was the case during the Late Prehistoric, and Wilcox and others (2001b) note the near-continuous distribution of pueblos from this time period along the Verde. I found 10 plazas in the study area, all located in this area of high population density along the Lower and Middle Verde and a few tributaries (Figure 4.4). A mechanism for conflict resolution and peaceful interaction would have been required for this settlement pattern to persist considering the high population density and the need to share or manage resources with close neighbors, including the water of the Verde River. Plazas and their associated group ritual practices may have served this purpose. Plazas were not distributed across the study area, and were not an integrative mechanism at the scale of the proposed Verde Confederacy – a point I return to in Chapter 5.

Five sites along the Verde include a plaza and one additional type of ritual architecture (Figure 1.5; Figure 4.4). Polles Pueblo and Mule Shoe Ruin have a racetrack and a formal internal plaza. A platform mound and plaza are present at Mercer, and Sacred Mountain and John Heath Ruin each include a community room and a plaza. The Late Prehistoric inhabitants of these five sites, and presumably the surrounding communities within the catchments of these central places, participated in more than one ritual system. As discussed in Chapter 1, the cross-cutting distribution of plazas and the appropriation of more than one type of public architecture indicate that this portion of the study area was a ritual and ideological frontier.

Salado Polychrome

The prehistoric inhabitants of central Arizona are noteworthy for largely eschewing the manufacture of decorated ceramics. Several Late Prehistoric decorated types have been documented in the proposed confederacy, and many sites include a combination of Jeddito Yellow Ware, White Mountain Red Ware, Winslow Orange Ware, and Salado Polychrome (Shockey and Watkins 2009a, 2009b; Wilcox and Holmlund 2007:Appendix E). In this section I focus on the distribution of Salado Polychrome, also referred to as Roosevelt Red Ware. Several temporally diagnostic types have been defined within this ware. The earliest type, Pinto Polychrome, was manufactured between A.D. 1280-1330 and its distribution was limited to the few areas in which it was produced, all of which are beyond the study area (Neuzil and Lyons 2005:34). Gila and Tonto Polychrome, the most commonly encountered Salado Polychrome types, were manufactured from A.D. 1330-1450 (Dittert and Plog 1980) and were widely produced and distributed across the Southwest (Crown 1994). Other types associated with the latter end of the sequence, such as Los Muertos Polychrome, have also been defined (Lyons 2004; Neuzil and Lyons 2005). These types were not as widely distributed as Gila and Tonto Polychrome, but are still regularly recovered across large portions of the Late Prehistoric Southwest.

Boundary Type

Beginning with Gila and Tonto Polychrome in the mid-A.D. 1300s, Salado Polychrome has been associated with the "Southwestern Cult," an integrative ideology and associated ritual complex employed by diverse peoples who were gathering into increasingly larger aggregates. Crown (1994) describes the Southwestern Cult as a deeply-rooted religious phenomenon associated fertility, rain, and community well-being. If Salado Polychrome was used by the Late Prehistoric inhabitants of central Arizona in an expression of the Southwestern Cult, the presence of Gila, Tonto, and later Salado Polychrome types indicates the existence of a context where friends and strangers could have interacted peacefully. The absence of middle (Gila and Tonto Polychrome) and late (e.g. Los Muertos Polychrome) Salado Polychrome on the Middle Verde during the Late Prehistoric suggests the presence of a social and ritual boundary.

Noting the absence of decorated ceramic production and the paucity of Salado Polychrome (and Jeddito Yellow Ware) ceramics from Late Prehistoric surface contexts in and around Perry Mesa, Spielmann (2014:217) argues that people likely had some knowledge of but did not fully adopt the Salado Polychrome ritual system. She proposes that the smaller number of vessels is consistent with gifted items acquired by people emulating but not fully understanding ritual complexes elsewhere in the Southwest. This scenario is reminiscent of the Iroquois Confederacy, where marine shell (wampum) (Ceci 1982; Englebrecht 2003:133-144) and smoking pipes (Kuhn 1985, 1986, 1987, 1994) utilized in consensus building and alliance re-affirming rituals circulated between League leaders. The shell and pipe distributions are argued to be manifestations of social relationships between leaders who regularly gathered to communicate and ritually renew and reinforce the alliance.

Spielmann's argument is based on two ideas, both of which require additional research before Salado Polychrome can be conclusively associated with a boundary type. First, she joins many researchers in assuming that Salado Polychrome was not produced in the proposed confederacy. I formerly shared this assumption, but during my plain ware analysis I made a cursory examination of Salado Polychrome temper from sherds collected at Verde Confederacy sites. Temper from several Salado Polychrome sherds were similar to the Polles, Lower Verde, and Perry Mesa East plain ware reference groups identified in Chapter 2. Thin sections and chemical analysis are needed to make a definitive assessment, but my preliminary investigation suggests that Salado Polychrome could have been produced in the study area. Second, while acknowledging that painted ceramics are significantly underrepresented in the Late Prehistoric central Arizona surface assemblages, Spielmann posits that that Salado Polychrome occurs there in significantly lower frequencies than in other areas of the contemporary Southwest. In my discussion of Salado Polychrome Boundary Nature below, I summarize the previously documented incidence of Salado Polychrome ceramics in Late Prehistoric central Arizona (Table 4.3). In my judgment, the distribution of Salado Polychrome in Late Prehistoric central Arizona is fairly extensive, with the important exception of the Middle Verde.

Excavation data are sufficient to assess the ubiquity of Salado Polychrome in the Middle Verde, but additional excavations are required on the Lower Verde, Polles Mesa, Bloody Basin, and Perry Mesa. Additional field work will assist in identifying the type of boundary associated with this ware, but the nature of the boundary associated with Salado Polychrome ceramics in the study area is unlikely to change. Either way, there is a boundary between the Middle Verde and the rest of the proposed confederacy. The question becomes whether there is a boundary to the Southwestern Cult, or a boundary to an elite gift-giving network. For the purposes of this study, I tentatively associate Salado Polychrome in the portion of the proposed Verde Confederacy south of Fossil Creek with the Southwestern Cult, with the caveat that additional excavation data are required to fully differentiate between the Southwestern Cult and Spielmann hypotheses.

Collective Social Identification

In order to be understood by members and non-members of social groups, social identity must be symbolized. These active expressions of social identity can be manifested in archaeologically observable material culture. Several ethnoarchaeological studies indicate that publically displayed, highly visible objects or designs are expressions of social identity (e.g. Bowser 2000; Carr 1995; Hodder 1982; Mills 2007a,

Table 4.3. Known Salado Polychromes in the Verde Confederacy by Local System.

Local System	Salado Polychrome	References
Tuzigoot	10	Caywood and Spicer 1935:48; Pilles 2015; Schroeder 1960:Figure 1
Montezuma Castle	3*	Jackson and Van Valkenburgh 1954:43
Perry Mesa	698	Fiero et a. 1980:93; Kruse-Peeples et al. 2009:132; North 2002:34; Watkins and Shockey 2009a:9, 2009b:12; Wilcox and Holmlund 2007:Appendix E
Bloody Basin	219	Courtright and Neily 2012; Unpublished analysis in possession of the author; Wilcox and Holmlund 2007:Appendix E
Polles Mesa†	250	North et al. 2003; Pilles 2015; Shockey and Watkins 2009b:12; Wilcox and Holmlund 2007:Appendix E; Wilcox et al. 2001b:176, 182
Lower Verde	448	Arizona Site Steward File; Lerner 1984; Neily and Donata 1993; North et al. 2003; Whittlesey and Montgomery 1997; Wilcox and Holmlund 2007:Appendix E

* There are 14 sherds representing 3 vessels (Pilles 2015)
† Includes Hackberry Basin and Sycamore Canyon

2007b; Wobst 1977). Building on this concept, Peeples (2011:262) has recently argued that "patterns of similarity and difference in highly visible objects and designs, when appropriately contextualized, can be used as one indication of patterns of shared categorical identities at various social and spatial scales." Specifically, highly visible Late Prehistoric polychrome vessels used in group rituals are a public expression of shared categorical identity. I interpret the presence of Salado Polychrome ceramics as an indication of shared categorical identity. Conversely, groups eschewing Salado Polychrome set aside a seemingly obvious integrative tool, and the absence of this ubiquitous ware during the 14th century in central Arizona suggests a conscious declaration of categorical "otherness" from those who identified with the Southwest cult.

Boundary Nature

Table 4.3 pools known Verde Confederacy Salado Polychromes by local system (see Appendix E for a detailed breakdown). The majority of these sherds were collected or identified in the field as part of unsystematic surface investigations. Only a few excavated collections were available for inclusion, such as those at Tuzigoot, Montezuma Castle, Dugan Ranch, and some small sites on Perry Mesa. This unrepresentative sample is not appropriate for statistical comparisons, but some qualitative observations can be made. Each local system is discussed in detail below.

As first observed by Pilles (1976:119; see also North et al. 2003:198; Pilles 2015; Wilcox and Holmlund 2007:27-28), Salado Polychrome is extremely rare at Late Prehistoric Middle Verde sites including Tuzigoot and Montezuma Castle. Collectors tend to focus on painted ceramics, and surface observations will always tend to under-represent decorated sherds, but the near-absence of Salado Polychrome in the more representative excavated ceramic collections at Tuzigoot (n=6) and Montezuma Castle (n=14 sherds from 3 vessels). The only other examples from the Middle Verde are in the Tuzigoot local system– three sherds from the surface of Spring Creek Ruin and one bowl from Bridgeport. Salado Polychrome is common at Late Prehistoric sites across the proposed confederacy (Table 4.3) and the greater Southwest (Crown 1994). The near absence of this ware in the Middle Verde is a significant deviation from a widespread phenomenon discussed in more detail below.

With the exception of a few sites from a transmission line corridor, known Salado Polychrome ceramics from Perry Mesa are from surface collections or observations (n=698). In recalling his 1950s experiences on Perry Mesa, Jacka (1980:276-277) remembers Salado Polychrome as common, comprising approximately 5% of the overall ceramic assemblage. Salado Polychrome is much less common in the surface collections of today, likely a result of illegal collections, but examples are nearly always present on the surface of large pueblos on Perry Mesa (Shockey and Watkins 2009a, 2009b). Encountering a sherd or two at smaller fieldhouse sites is also fairly commonplace (e.g. Kruse-Peeples et al. 2009). The presence of Salado Polychrome at logistical sites is of particular interest. If Salado Polychrome was circulating between elites, it would likely have been concentrated at larger settlements. Its presence at ephemeral limited activity sites suggests the ware was more readily available.

Bloody Basin has not been investigated as intensively as some of the other local systems. Dugan was excavated by a high school field class during the 1950s. The collection was never analyzed, and is currently housed at Arizona State University. When selecting plain ware to analyze as part of this dissertation, I observed at least 200 Salado Polychrome sherds from Dugan. A number of Salado Polychrome vessels photographed during the field school are not present in the curated collection, suggesting that 200 sherds is a low estimate of the number of Salado Polychromes recovered during the excavations. Nineteen sherds from surface collections at five other Bloody Basin sites have also been collected. Unpublished site notes made by retired long-time Tonto National Forest Archaeologist J. Scott Wood (personal communication 2016) note the presence of Salado Polychrome at 17 additional sites in and around Bloody Basin. If the pattern observed in the excavated collections from Dugan persists across the region, then Salado Polychrome was likely common in the Late Prehistoric Bloody Basin.

A total of 250 Salado Polychrome sherds have been identified in the Polles local system. During a field visit to Polles, I was struck by how common Salado Polychrome was on the site surface, likely in part due to pueblo's remote setting discouraging casual collection. We collected a sample of 95 specimens, but I am confident that the Salado Polychrome sherds at Polles number in the hundreds. Several large residential sites were documented along the Lower Verde in the Polles local system as part of the Verde Wild and Scenic River survey. These pueblos had between 20-50 sherds of Salado Polychrome each – a low estimate of the actual quantities of this ware given the extensive looting at each site. Small quantities of Salado Polychrome are reported from Judges Stand on, or near Polles Mesa and at settlements in the Hackberry Basin or along Sycamore Canyon, which are located near the intersection of the Polles and Montezuma Castle subsystems. Several researchers have identified these settlement systems as the edge of the Salado Polychrome distribution and as a boundary between the Middle and Lower Verde Valleys (Pilles 2015; North et al. 2003; Wilcox 2014; Wilcox and Holmlund 2007:21-23), a point I revisit below.

The large, Late Prehistoric sites in the Lower Verde local system have been extensively picked-over by vandals (Personal communication, J. Scott Wood 2014), but many sites still include at least some Salado Polychrome in their surface assemblages. A total of 448 Salado Polychrome ceramics have been observed in the Lower Verde local system. Approximately half of these were observed on the surface of Mule Shoe Bend. This site has been extensively looted and is not obviously different from any of the other pueblos in the area, and an explanation for the higher frequency of Salado Polychrome is not readily apparent. In a quantitative analysis of Salado Polychrome in the Lower Verde local system, Lerner (1984:220-222) concluded that Salado Polychrome occurs on Late Prehistoric sites in the Lower Verde local system "in great quantity, especially in comparison to other artifact types." This pattern would likely hold up in systematically excavated collections.

Wilcox (2014:19) acknowledges that Salado Polychrome is nearly absent from Tuzigoot Phase sites in the Middle Verde but is present in the other portions of the proposed confederacy, noting that "A good explanation for this pattern remains elusive." Salado Polychrome is one of the most widely distributed ceramic wares in the prehistoric Southwest. Given its ubiquity across central Arizona and a large portion of the greater Southwest, I argue that the inhabitants of the Late Prehistoric Middle Verde could have obtained Salado Polychrome, but instead made a conscious decision not to utilize these vessels. In rejecting Salado Polychrome, the prehistoric inhabitants of the Middle Verde intentionally set aside an obvious integrative tool, indicating a border to ritual practice, ideology, and categorical identity between this region and the rest of the proposed Confederacy (Figure 4.5).

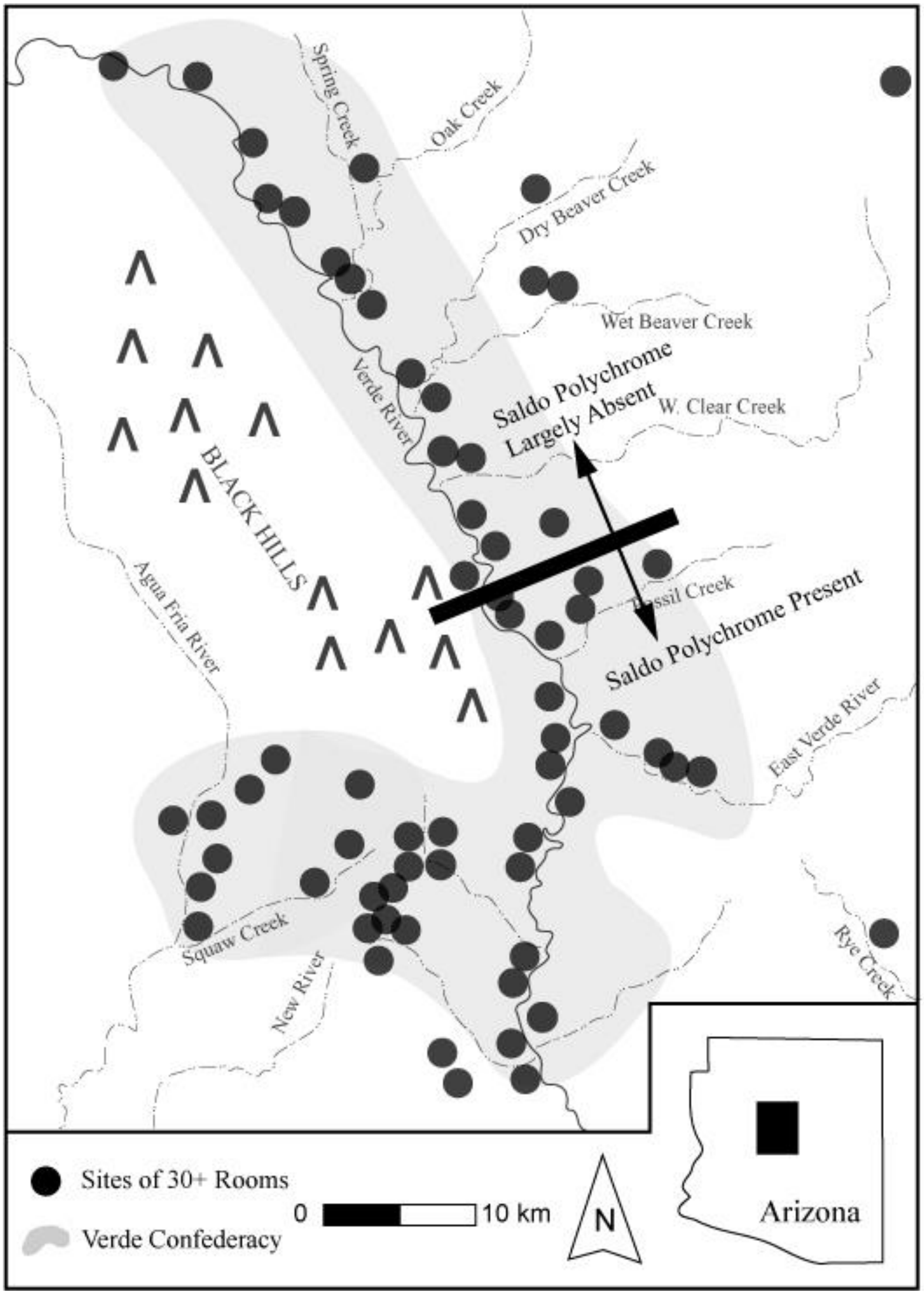

Figure 4.5. Late Prehistoric Salado Polychrome Boundary.

Summary

In this chapter, I examined five material culture distributions in the study area to characterize boundary dynamics in Late Prehistoric central Arizona. Two settlement patterns, rock art, public architecture, and Salado Polychrome ceramics were associated with a boundary type, collective social identification, and had their boundary nature assessed. In the concluding chapter, I synthesize these boundaries, and those identified in Chapter 3, to reassess the scale of alliance in Late Prehistoric central Arizona. I also discuss the theoretical and methodological implications the study has for future archaeological investigations of social boundaries. Directions for further research pertaining to the Verde Confederacy model and to the larger issue of social boundaries in archaeology are also addressed.

CHAPTER 5

PICKING UP THE PIECES: REASSESSING THE SCALE OF INTEGRATION IN THE PROPOSED VERDE CONFEDERACY

In this chapter, I synthesize the boundaries discussed in Chapters 3 and 4 and reassess the scale of alliance in Late Prehistoric central Arizona, arguing for the presence of integrated entities smaller than what has been proposed by the framers of the Verde Confederacy. To investigate whether these boundaries preclude social integration at larger scales, I introduce the League of the Iroquois, an ethnographically and archaeologically known alliance. Following a demographic comparison of the League and the Verde Confederacy, I argue that expectations drawn from the Iroquois case apply in Late Prehistoric central Arizona, and propose that smaller-scale catnets are not necessarily inconsistent with the confederacy as proposed. I propose future investigations of material culture distributions that may reveal categorical and relational integration at this larger scale.

The Scale of Integration in Late Prehistoric Central Arizona

In order for alliances to persist, participants must regularly maintain and re-affirm social relationships. LeBlanc (1999:305) suggests that "the implementation of integrating mechanisms to keep communities and alliances together may have been the most important determinant of survival." Upham et al. (1994) generally describe this necessary alliance maintenance as "persistent interconnectivity" and coordinated political or economic action. As discussed in Chapter 1, members of political alliances must communicate regularly, mobilize efficiently, and coordinate large-scale actions (Upham et al. 1994). These kinds of organized collective activities are most likely to emerge among people who are integrated both relationally and categorically – a configuration that White (2008) refers to as a "catnet." Relational identification is built on personal relationships between people who interact directly with one another. Categorical identity is an active expression or group or role affiliation often symbolized with material culture. In the remainder of this section, I synthesize the boundaries identified in Chapters 3 and 4 and re-assess the scale of integration in Late Prehistoric central Arizona. My synthesis is a two-step process. First, I describe smaller-scale entities delineated by the boundaries referenced above. Second, I describe the collective organizational potential between each neighboring region based on the collective action schematic model (Figure 1.2).

Evidence for integration at the scale of the proposed confederacy remains elusive, but smaller-scale catnets are indicated by a number of material culture boundaries associated with social, economic, political, and ritual integration. A comparison of the boundaries discussed in Chapters 3 and 4 (Figure 5.1) reveals the presence of four regions of interest. Late Prehistoric catnets were centered on the Lower Verde, Perry Mesa/ Bloody Basin, and the Middle Verde local systems. The bulk of the Polles local system falls into an area I characterize as a frontier. The Middle Verde catnet and Polles frontier are separated by the Hackberry Border, an unusually hard boundary warranting special attention. These regions are shown in Figure 5.2, a simplification of Figure 5.1. The potential for each region to have sustained internal (Table 5.1) and external (Table 5.2) collective social actions are discussed below.

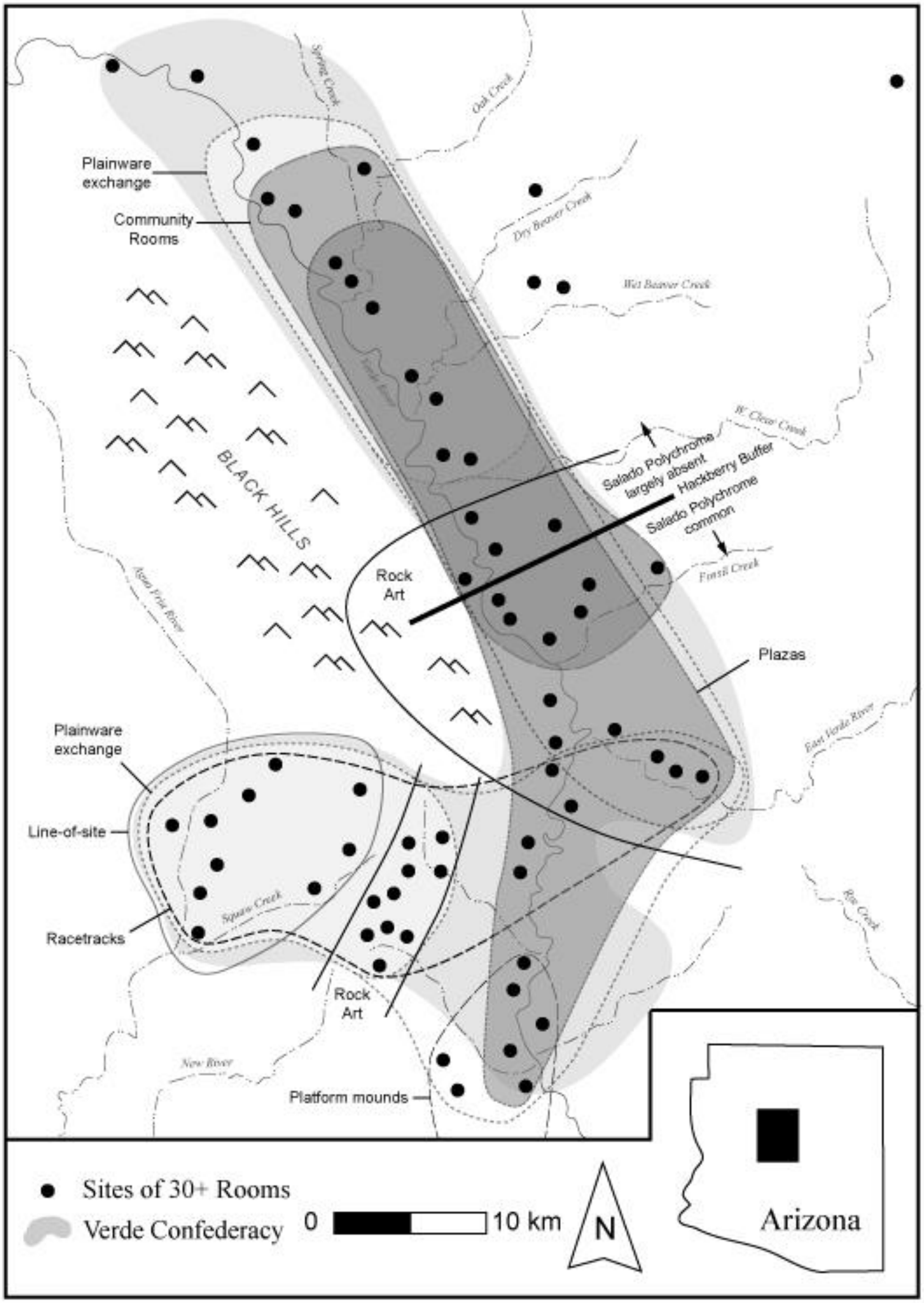

Figure 5.1. Late Prehistoric Central Arizona Boundaries.

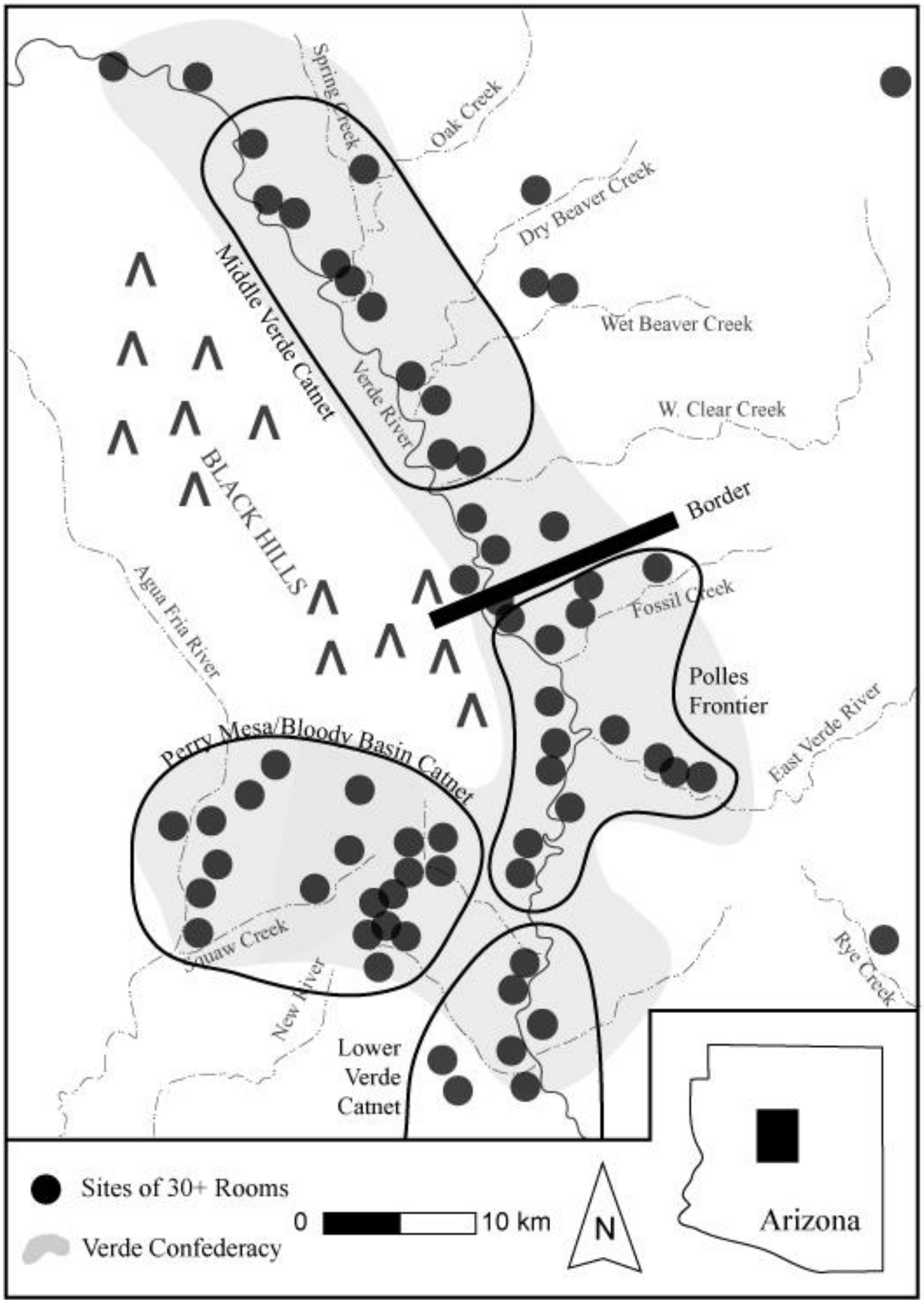

Figure 5.2. Smaller-scale Central Arizona Catnets and Frontiers.

Table 5.1. Internal Organizational Potential of Central Arizona Catnets and Frontiers.

Region	**Relational Connections**	**Categorical Commonality**	**Organizational Potential**
Perry Mesa/ Bloody Basin Catnet	Substantial internal plain ware circulation indicating large numbers of socially proximate individuals and households	Racetracks, rock art[1], line-of-sight network[2], and Southwestern Cult indicates strong categorical commonality	Sustained collective actions are effective
Lower Verde Catnet	Substantial internal plain ware circulation indicating large numbers of socially proximate individuals and households[3]	Platform mounds, shared rock art style, and Southwestern Cult indicates strong categorical commonality	Sustained collective actions are effective
Middle Verde Catnet	Substantial internal plain ware circulation indicating large numbers of socially proximate individuals and households	Community room network and shared Beaver Creek rock art style indicates strong categorical commonality	Sustained collective actions are effective
Polles Frontier	Unknown. Only one internal ceramic production source has been identified, though variation in the clay chemistry of basalt-tempered ceramics suggests the possibility of multiple internal sources	Salado Polychrome and multiple forms of ritual architecture. Rock art unknown.	Unknown

[1]Bloody Basin rock art has yet to be assessed

[2]Line-of-sight network excludes Bloody Basin

[3]Internal exchange indicated by ubiquity of plain ware tempered with Petrofacies J at Mercer and Ister Flat. Though Petrofacies J was not included as a referecne group in this study, it was shown to have been produced in the Lower Verde local system during the Lower Verde Archaeological Project

Table 5.2. External Organizational Potential of Smaller-scale Central Arizona Catnets and Frontiers. Relational Connection Categories Based on Table 3.3 and Figure 3.4.

Features	**Relational Connections**[1]	**Describe**	**Categorical Commonality**	**Describe**	**Organizational Potential**
Perry Mesa/Bloody Basin - Middle Verde	Low	A handful of plain ware exchanged	None	No shared categorical identity	Sustained collection action rare
Perry Mesa/Bloody Basin - Polles	Moderate	Moderate quantities of plain ware exchanged	Moderate	Racetracks in both regions, Southwestern Cult	Moderate potential for sustained collective action
Perry Mesa/Bloody Basin - Lower Verde	Moderate	Moderate quantities of plain ware exchanged	Low	Southwestern Cult	Collective action limited to dense sub-group
Middle Verde - Polles	Moderate or None	Moderate quantities of plain ware exchanged or exchange pre-dates Hackberry Border	Low or None	Plazas cross-cut both regions, but they may have been constructed/ used before Hackberry Border	Collective action rare or limited to dense sub-group
Middle Verde - Lower Verde	Low or None	Low quantities of plain ware exchanged or exchange pre-dates Hackberry Borde	Low or None	Plazas cross-cut both regions, but they may have been constructed/ used before Hackberry Border	Sustained collection action rare
Polles - Lower Verde	Moderate	Moderate quantities of plain ware exchanged	Moderate	Plazas cross-cut both regions, Southwestern Cult	Situational responses to stimulus by dense sub-group

[1]Categories based on Table 3.3 and Figure 3.4.

The Hackberry Border

A number of boundaries parallel one another in the vicinity of the Hackberry Basin, indicating the presence of a hard border. This border has been noted by several researchers (Abbott 2014:422-423; North et al. 2003; Pilles 2015). The framers of the Verde Confederacy date the emergence of the buffer zone to A.D. 1325-1350 (Wilcox et al. 2001a:183; Wilcox and Holmlund 2007:21-23). As discussed in Chapter 1, this phenomenon is thought to have been rare in the ancient world, and the presence of a border within the boundary of a proposed political alliance is surprising.

The four parallel distributions that define the border are a buffer zone, integrative architecture, Salado polychrome ceramics, and rock art. Indirect evidence for a relational network boundary is indicated by the 20 km spatial buffer that opened in the Hackberry Basin during the Late Prehistoric, suggesting increased violence or threats of violence. Boundaries to integrative architecture parallel the Hackberry Border, with racetracks extending to the southwest and community rooms to the north. Salado Polychrome is not found in any significant quantity north of the Hackberry Border. The boundary between Lower and Middle Verde rock art also occurs somewhere nearby, indicating further categorical and ritual differentiation.

A moderate amount of plain ware exchange and plazas cross-cut the border. There are two possible explanations for the cross-cutting distributions. First, the ceramic exchanges and plaza construction took place before the establishment of the border in A.D. 1325-1350. If the ceramic exchanges took place after the buffer zone opened, then some friends or kin managed to maintain relationships across the Hackberry Border. It is impossible to differentiate between these two possibilities with the available data, and I consider both possibilities in the following discussion.

The Perry Mesa/Bloody Basin Catnet

As noted by Abbott (2014:422-423), residents of Perry Mesa and Bloody Basin are more socially integrated with each other than with their neighbors on the Middle and Lower Verde. Individuals in this group were socially close, as exhibited by intensive plain ware exchange, and participated in at least two integrative complexes – the Southwestern Cult and ritual racing. The shared categorical commonality and relational integration indicates the presence of a catnet where sustained collective actions were likely to emerge and persist. Perry Mesa is further integrated by the line-of-sight network surrounding the perimeter of Perry and Black Mesas. The residents of Bloody Basin were excluded from this relational network, and were not as closely integrated with the rest of the catnet. As discussed below, an investigation of Bloody Basin rock art will help resolve the ambiguity of Perry Mesa-Bloody Basin boundaries. Similarities between the rock art of the two regions indicates additional categorical integration, while differences would suggest a more meaningful border between the two areas.

Perry Mesa and the Lower Verde

Relational connections between the socially close in this region were not uncommon as evidenced by the moderate quantity of plain ware vessels that were exchanged. Both regions participated in the Southwestern Cult, suggesting some degree of categorical commonality. Collective action between these regions would have been restricted to dense sub-groups of actors. In the event of violence, friends or relatives may have come to the support of their attacked or threatened neighbors, but people without kin connections would have been unlikely to intervene.

Polles and Perry Mesa/Bloody Basin

A moderate amount of plain ware ceramics circulated within this region, indicating some connectivity between the socially proximate. A few racetracks were present in the Polles frontier, and both regions were involved in the Southwestern cult, indicating a moderate degree of categorical commonality. These two regions may have coordinated sustained collective actions, though the connections are not as strong as the regions I describe as catnets.

Perry Mesa/Bloody Basin and the Middle Verde

Plain ware exchange between these areas was restricted to a few sherds, indicating few socially close connections. No evidence for categorical commonality is apparent. Relational connections were weak and categorical commonality was non-existent between these two regions, and sustained collective action would have been rare.

The Middle Verde Catnet

On the Middle Verde, Late Prehistoric people were socially close and integrated themselves in a relational network as indicated by extensive plain ware exchange. Their shared categorical identity is indicated by a network of oversized community rooms and shared rock art iconography. As a catnet, sustained collective actions within the Middle Verde, such as a political alliance, were likely to emerge. Inhabitants of the Middle Verde had knowledge of and experience with racetracks and Salado Polychrome ceramics (and the associated integrative rituals) utilized by neighbors south of the Hackberry Border, but they consciously rejected these practices.

Middle Verde and Polles

A moderate amount of plain ware pots were exchanged between these areas, but it is unknown whether these exchanges pre- or post-date the Hackberry Border. Relational connections may be moderate to non-existent. Plazas are also located in both regions, but the relationship between their construction and use in relation to the Hackberry Border is also unknown. Collective social action may have been rare, or included dense sub-groups of friends or kin.

Middle and Lower Verde

These regions are on opposite ends of the proposed confederacy, and it is not surprising to find significant differences between them. As in the previous case, the handful of plain wares moving between regions may pre- or post-date the Hackberry Border, and relational connections are either uncommon or non-existent. Plazas may have provided some categorical commonality, but as discussed above, the relationship between their construction and use and the Hackberry Border is unknown. In either case, sustained collective actions would have been rare between these areas.

The Lower Verde Catnet

The Lower Verde catnet includes Mercer, Ister Flat, and the surrounding Late Prehistoric settlements. Although not included as one of the reference groups in Chapter 2, plain ware ceramics tempered with Lower Verde Petrofacies J are known to have been produced in the Lower Verde local system (Heidke et al. 1997). Ceramics tempered with

Petrofacies J are present at both Ister Flat (n=66, 16.71%) and Mercer (n=46, 12.89%) (Table 3.2). A fair amount of plain ware was circulated within the Lower Verde catnet, indicating large numbers of socially proximate individuals and households. The people of the Lower Verde had a high degree of categorical homogeneity, indicated by shared ritual performances associated with platform mounds, plazas, rock art, and the Southwestern Cult. As a catnet, sustained collective actions would have been effective.

Lower Verde and Polles

A moderate amount of plain ware pottery moved between these regions, indicating the presence of some friendships or kin bonds linking the regions. Plazas and the Southwestern Cult provided some degree of categorical commonality. Dense sub-groups from these two regions were likely to have responded collectively to situational stimuli.

The Polles Frontier

The strength of the relational connections within the Polles frontier is currently unknown. Only one internal ceramic production source was identified in Chapter 2, making it impossible to assess how many plain ware vessels circulated within this area. As discussed in Chapter 2, variation in the clay chemistry of basalt-tempered ceramics suggests the possibility of multiple internal sources that could be investigated as part of future research. The Southwestern Cult was present within the Polles frontier, suggesting some degree of categorical commonality. Multiple forms of ritual architecture are present, sometimes at the same site. It is unclear whether any kind of shared internal categorical commonality is indicated, or if people in this region were maximizing relationships on all sides at the expense of internal cohesion. The internal organizational potential of the Polles frontier cannot be assessed with the currently available data. The relationships between Polles and its neighbors were described in the previous sections.

Several boundaries, including indicators of categorical identity and relational networks, cross-cut and overlap one another in the Polles local system. The Late Prehistoric inhabitants of the Polles region were maintaining some connectivity with neighbors on all sides, and do not appear to have forged an internally coherent social identity. These characteristics are consistent with a frontier zone, where people experimented or attempted to maximize opportunities to interact with neighbors on both sides of the frontier. Examples include the inclusion of more than one type of ritual architecture at several sites, maintenance of different ritual architecture forms common with neighbors on all sides (racetracks and plazas), and participation in moderate exchange with socially proximate relations to the north, south, and west.

Boundary Dynamics in the League of the Iroquois

I have identified bounded social entities in Late Prehistoric central Arizona at a smaller scale than the proposed Verde Confederacy. Do these boundaries preclude integration at a larger spatial scale? The League of Iroquois is a case study that can help answer this question. The League of the Iroquois, Iroquois Confederacy, or *Haudenosaunee*, is a large Native American political alliance historically centered in upstate New York. The League originally included five constituent nations: Seneca, Cayuga, Onondaga, Oneida, and Mohawk. A sixth nation, Tuscarora, was added to the confederacy in 1722. As a case study, the League of the Iroquois illustrates that identifying higher-order socio-political boundaries (including alliances) using archaeological data is not a simple matter. Over a century of intensive research has resulted in detailed archaeological (e.g. Englebrecht 2003) and ethnohistoric/ ethnographic (Fenton 1998) records related to League formation and maintenance. There is some consensus that the ethnohistorically known League began to emerge prior to European contact during the A.D. 1400s (Englebrecht 2003:112-113; Snow 1996), but dating the emergence of this known confederacy remains an unsettled research question (Johansen and Mann 2000:151-153; Kuhn and Sempowski 2001; Tuck 1971:128-9; Warrick 2000).

Dating ambiguity aside, it is clear that the League of the Iroquois emerged during a period of increasing intercommunity violence (Tuck 1971), population size, and population density (Jordan 2004). Aggressive actions following the founding of the League were refocused beyond alliance boundaries (Otterbein 1964, 1979). Evidence for violence or the threat of violence (Ember and Ember 1992) is an important indicator of this and other emerging and continuing political alliances. Iroquois villages were palisaded and often located on defensible hilltops with line-of-sight to surrounding settlements (Jones 2006, 2010). Buffer zones of approximately 20-40 miles separated the village clusters of the allied nations at the time of European contact (Englebrecht 2003:1). As discussed in more detail below, the Iroquois Confederacy has much in common with Late Prehistoric central Arizona, and if a large-scale multi-system political alliance such as the proposed Verde Confederacy did emerge the Iroquois model would be an excellent comparative case.

Among the Iroquois, conflict was resolved and alliance relationships were maintained at the scale of the village, nation, and confederacy via a series of institutionalized and ritualized events, including councils, condolence ceremonies (the Feast of the Dead), medicine society gatherings, and calendrical observances (Johansen and Mann 2000:315-318; Keely 1996:127; Trigger 1976:162-163). These gatherings included pipe smoking, gift-giving, feasting, mediation, game playing, and other event-specific ritual observances.

Individual households tended to participate in smaller-scale events held close to their home village. Participants included fellow clan members and affinal kin who had relocated to other communities as a function of matrilineal inheritance and matrilocal residence patterns (Englebrecht 2003:113; Johansen and Mann 2000:51-61). Food-sharing and gift giving in these contexts typically resulted in the movement of more utilitarian items such as ceramic vessels (Kuhn 1985, 1986, 1987, 1994). Larger-scale gatherings were attended by representatives of increasing spatial and social distance. These gatherings included elements of smaller-scale events, but with a greater emphasis on male non-utilitarian gifting of pipes and marine shell/wampum.

Tobacco smoking was a key component of many aspects of Iroquois ritual practice. Pipes were associated with power (Kuhn 1985, 1986) and were used in diplomatic contexts and formal councils (Kuhn and Sempowski 2001), welcoming visitors (Hall 1997:121), and in the important mortuary condolence ceremonies (Johansen and Mann 2000:315-318). Pipes were smoked and often gifted between men at all social scales, including kinsmen, neighbors, council participants, and Anglo visitors at the village, national, and international scales (Kuhn 1985, 1986). In contrast to the more regionally-distinctive styles of Iroquoian ceramic vessels (Kuhn 2004), pipe styles are consistent across the confederacy (Kuhn 1994). Local and confederacy-wide pipe exchange between known League sites was extremely common, but no pipes moved between ethnohistorically known enemy Algonquian groups and the League nations (Kuhn 1985, 1986, 1987, 1994).

The marine shell exchange network predates European contact (Englebrecht 2003:133-144), but wampum rose in prominence as an exchange/gift item following the establishment of the fur trade (Ceci 1982). In addition to serving as a medium for friendship maintenance between indigenous groups and Euro-Americans, gifting wampum eventually became linked to the condolence ritual (as the traditional gift between nations at the death of a previous chief) and to the subsequent installation of new leadership (Hall 1997:58).

Boundaries and Catnets in the League of the Iroquois

From the ethnographic and ethnohistoric data, we know that people in the Iroquois Confederacy identified as members of lineages, villages, nations, and the League. These expressions of identity are not directly observable in the archaeological record, but ethnographic and ethnohistoric documentation describes the same integrative rituals (notably pipe-smoking and the Feast of the Dead) were observed at each social scale to express and reinforce these categorical identities. These rituals have correlates in the archaeological record, and are the material culture expressions of shared ideology and ritual observances (categorical commonality) manifested across Iroquois society.

Relational networks further integrated the League of the Iroquois across social scales. For examples, pipes were exchanged or gifted during many ritual observances at the level of the lineage, village, nation, and League resulting in a confederacy-wide distribution of pipes from various production sources.

Nested segments within the Iroquois Confederacy were integrated both relationally and categorically, ranging from the entire League, to the five nations, and down to the village and longhouse levels. In other words, catnets were present at a variety of social scales, each of which had high potential to coordinate sustained social actions. These nested catnets are evidence that there may be boundaries to relational or collective identity within larger social groups. For example, among the Iroquois the relational networks associated with ceramic exchange did not extend beyond the boundaries of individual nations. Internal boundaries do not preclude the presence of catnets at larger social scales. In the search for catnets, evidence for categorical and relational integration at the same scale is more important than internal boundaries.

Comparing the League of the Iroquois and the Verde Confederacy

The League of the Iroquois and the Verde Confederacy are both multi-community political alliances with constituent nations (or local systems) largely concerned with mutual defense, but is the former a good case study to derive expectations for the latter? I compare three demographic variables from both entities; population size, size of territory, and number of villages. There is an ethnographic correlation between population size and organizational complexity (Feinman 2011). When people are spread out across larger areas, their potential for interpersonal interaction significantly decreases (Bowden 1972;

Carneiro 1967:238; Fletcher 1995:71; Mayhew and Levinger 1976; Naroll and Margolies 1974). The costs of maintaining regular communication between settlements would be comparable between entities of similar population and territory size. The number of villages represents the number of nodes in the communication and relational networks. Networks of similar size have comparable potential for complexity. These variables are summarized in Table 5.3. As discussed in Chapter 1, the Verde Confederacy is thought to have been home to 10,000-13,000 people in 135 villages spread over a 5,000 km^2 area. In general, the League of the Iroquois is larger than the proposed Verde Confederacy, but this does not prohibit deriving reasonable expectations for alliance function. If the larger, more complex League was integrated categorically and relationally, I expect the same from a smaller alliance where the logistics of integration would, if anything, be simpler in a smaller area with fewer people.

Population Size

The League of the Iroquois reached its pre-modern maximum in A.D. 1450-1650, after which a series of epidemics decimated the population. Using detailed site plan data, Snow (1995) argued that the Mohawk nation reached a maximum of 2,653-4,575 people in A.D. 1614. In that year, a Dutch trading post was established in Mohawk territory, prompting a mass migration that inflated the population to 7,740. Citing insufficient data, Snow (2001:266) declined to speculate on the population of the other four nations of the League, characterizing any attempts to make an estimate as haphazard, rough guesses. In light of a decisive statement from a scholar of Snow's stature, I will not attempt to further estimate the population of the League, but this limitation does not prohibit comparing

Table 5.3. Demographic Comparison of the Verde and Iroquois Confederacies.

	Verde Confederacy	Iroquois Confederacy
Population	10,000-13,000	2,653-4,575[1]
Number of Villages	135	125
Size of Territory	5,000 km^2	9,000 km^2

[1]Population estimate only for the Mohawk, one of the five nations of the League

population size with the Verde Confederacy. Snow's high estimate for the Mohawk (4,575) is nearly half the low population estimate for the entire Verde Confederacy (10,000). Even if the Mohawk was the most populous nation of the League, the addition of the populations of the other four nations would likely significantly exceed the population of the Verde Confederacy.

Territory Size

The five nations are largely located on an east-west axis approximately 275 km from edge to edge. With the exception of the Cayuga, the nations of the League were distributed in an area measuring approximately 25 km north to south. Accounting for the more dispersed Cayuga (approximately 75 km north to south); I measure the territory of the League to be approximately 9,000 km^2, including significant internal buffer zones between each nation (Jones 2010:7). The League's territory was almost double that of the Verde Confederacy.

Number of Villages

In a recent synthesis, Jones (2010) noted 125 individual villages occupied within the boundaries of the League in the time period of interest. Most researchers have reached a consensus that additional villages from this time are unlikely to be discovered given the extensive archaeological investigations in the region over the last century, the large amount of land exposed by agriculture, and the large percentage of villages named in the historic record that have already been matched to archaeological sites (Snow 1995). The number of villages in both confederacies is comparable. As members of a political alliance, villagers would have been required to maintain regular communication with allied communities. In this sense, villages are nodes in an alliance-wide communication network. A near-equal number of nodes suggest that network complexity in the two confederacies were analogous.

Implications for the Verde Confederacy

Wilcox acknowledges that groups within the Verde Confederacy may have maintained independent identities while remaining politically integrated (Wilcox and Holmlund 2007:82). This was certainly the case among the Iroquois, where people maintained identities as members of a lineage/longhouse, village, and nation, but League participants also maintained an identity as members of the Iroquois Confederacy. Regardless of whether smaller-scale identities were maintained, an alliance at the scale of the Verde Confederacy would require regular maintenance and reinforcement through categorical (shared ritual) and network (persistent interconnectivity) integration at the scale of the alliance. The available evidence indicates the presence of catnets at a scale smaller than that proposed by Wilcox and others. Do these boundaries suggest that the Verde Confederacy did not exist? Catnets in the Iroquois Confederacy were nested at increasing social scales. Boundaries to a smaller-scale catnet did not inhibit relational and categorical integration at a larger social scale. The Late Prehistoric central Arizona catnet boundaries identified above do not preclude the future discovery of relational and categorical integration at a larger scale—even at the scale of the proposed confederacy. Below, I return to a discussion of integration at larger scales in the study area.

Confederacy Revisited

The greatest weakness of the Verde Confederacy Model is the absence of explanations as to how an alliance of this scale would have functioned. Abbott and Spielmann (2014) recently argued that the Verde Confederacy would have required constant maintenance and re-affirmation, regular communication, efficient mobilization, and coordinated action. Following Peeples (2011), I built on Abbott and Spielmann's foundation and argue that these alliance maintenance activities are collective social actions that are most likely to emerge within a catnet. These catnets can be identified archaeologically by investigating collective social identification and relational network boundaries. In the Iroquois case, ethnohistoric and ethnographic data alerted archaeologists to the material distributions that were associated with confederacy level relational networks and categorical identity. Archaeologists were then able to trace these networks back in time. Direct historic analogs are not available in the study area. I examined a number of distributions in Chapters 3 and 4, but I may not have selected the "right" material culture class(es). In this section, I discuss additional material culture classes that could uncover confederacy-wide relational networks and categorical association, if such distributions exist. The material culture classes include rock art in Polles and Bloody Basin, Salado Polychrome production and exchange, slipped red ware, obsidian, and Jeddito Yellow Ware.

Polles Mesa and Bloody Basin Rock Art

Due to a lack of data on rock art in Bloody Basin and the Polles local system, I was unable to concisely assess the nature of ritual and ideological boundaries in the central portion of the proposed confederacy. Additional rock art documentation is less critical in Bloody Basin, where the area of uncertainty is relatively small and Bloody Basin and Perry Mesa are already categorically integrated via the racetrack network. Rock art documentation in the uncertainty of the Polles Frontier could reveal additional categorical commonality with surrounding regions, and be should prioritized.

Salado Polychrome Production and Exchange

In Chapter 4, I focused on presence/absence data and associated Salado Polychrome ceramics with categorical identity and the Southwestern Cult. I also acknowledged that excavation data were required to fully differentiate between the Southwestern Cult and the elite gifting scenario proposed by Spielmann (2014), a task left to future researchers. I also presented preliminary evidence that Salado Polychrome ceramics may have been produced in portions of the study area. Additional categorical boundaries would be apparent between producers and non-producers of this ritually charged ware. An investigation of the relational networks associated with Salado Polychrome exchange in central Arizona would also be of great relevance to future boundary research in the region.

Slipped Red Ware

In the Late Prehistoric Phoenix Basin, plain and red ware pots had very different modes of production (Abbott 2000). Red wares were more labor-intensive to produce than plain wares, and were far more commonly encountered in mortuary contexts, indicating a higher exchange value. A large proportion of the red ware vessels in the Phoenix Basin were produced by specialists in a few locations for a wider exchange market. Thus the circulation of red ware in the Phoenix Basin represents exchange between more socially distant parties as well as the socially close. As discussed in Chapter 3, many aspects of red ware production in the study area mirror the Phoenix Basin. Central Arizona red wares were also more expensive to produce than plain wares, and more commonly occur in mortuary contexts, suggesting a higher social value. The plain ware temper groups defined in Chapter 3 likely compare well to red wares. The organization of red ware production and exchange in the study area could be reconstructed with additional petrographic thin sections, electron microprobe analysis, and investigation of red ware vessel form. As in the Phoenix Basin, boundaries to red ware exchange could reflect different kinds of relational networks that would further inform boundary dynamics in Late Prehistoric central Arizona.

Obsidian

Obsidian flows are geochemically distinct, and individual samples can be assigned to one of several well-characterized sources in central Arizona and the greater Southwest (e.g. Shackley 2005). Three general obsidian procurement zones are relevant to the current project (Figure 5.3). Sources from the Coconino Plateau are north of the study area, and are closest to the Middle Verde local systems. Obsidian sources in this region include Partridge Creek (which also includes Presley Wash and Black Tank) and the San Francisco Volcanics (Government Mountain, Sitgreaves Mountain, RS Hill,

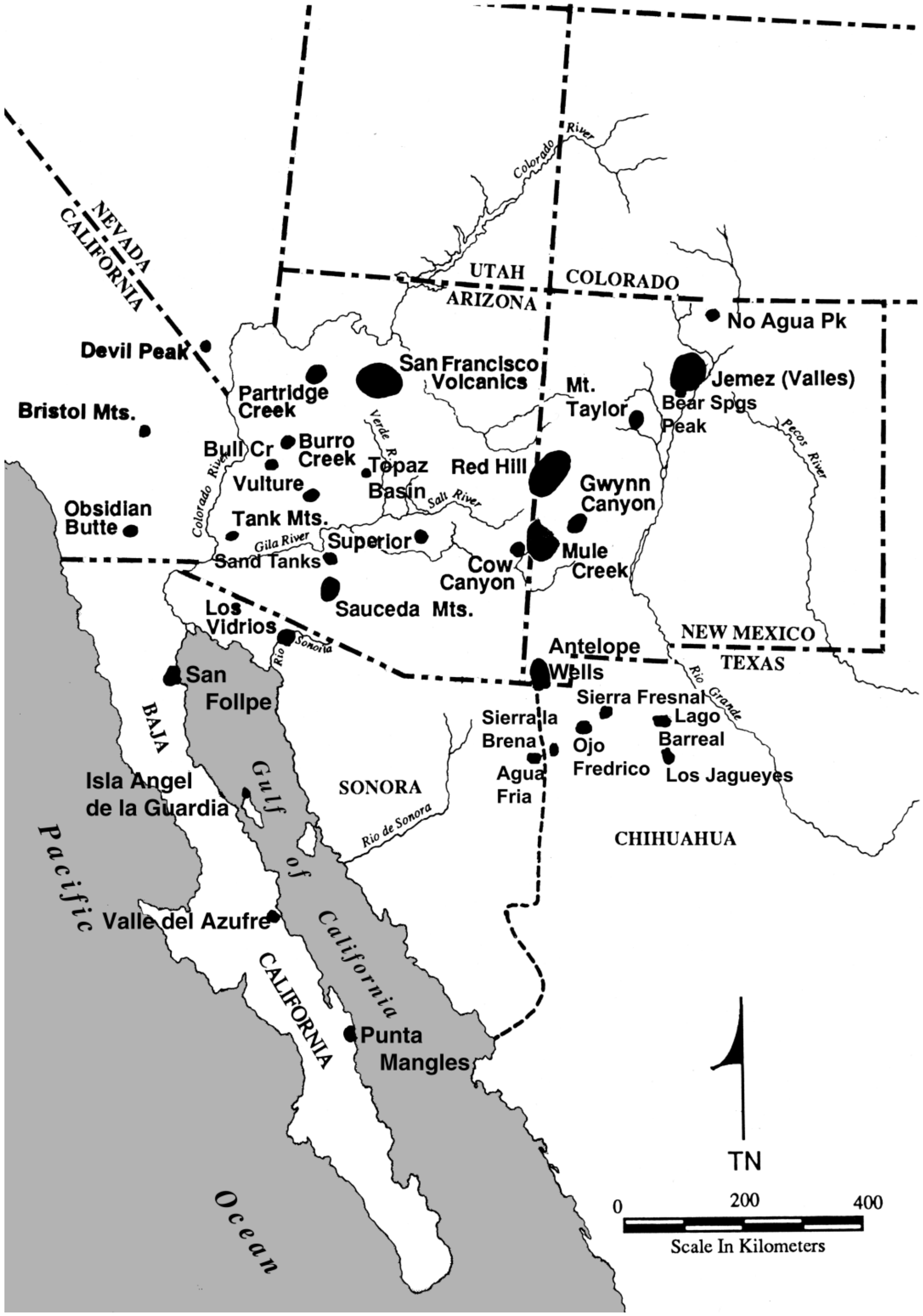

Figure 5.3. Obsidian Sources in the Greater Southwest (Shackley 2009:Figure 1).

Kendrick Peak, Slate Mountain, San Francisco Peaks, and O'Leary Peak/Robinson Crater). Superior is south of the study area, and is the closest regularly exploited source to the Lower Verde and Perry Mesa local systems. The Topaz Basin source was recently discovered near Perry Mesa. The source rarely appears in the archaeological record, probably because the small sized nodules are not ideal for making stone tools (Shackley 2009). Vulture is one of several sources west of the study area. Obsidian is used to make stone tools, including arrowheads, and would have likely circulated between adult men who could fight and hunt. This material could potentially have circulated amongst alliance leaders as nodules or finished tools in relational networks analogous to Iroquois pipes. Known sourced obsidian from the study area is summarized below.

Two obsidian sourcing studies on the Lower Verde have been conducted. Twenty-five samples were submitted as part of the Lower Verde Archaeological Project, 16 of which were from Late Prehistoric contexts (Towner et al. 1997). Fifteen of these samples were from Government Mountain on the Coconino Plateau, and the one remaining sample was from Superior. Lerner's (1984:229) 14 Lower Verde samples were largely from sources in New Mexico and Colorado, with only three samples from Superior and one from Government Mountain. Towner et al. (1997:105) conclude that "differences between our [LVAP] sourcing data and Lerner's results are not readily explained." Lerner's study was published in 1984, well before the development of Shackley's (2005) detailed methodology and extensive comparative source collections. These results are extreme outliers when compared to other investigations of obsidian in central Arizona, and I do not consider it further in this analysis. On Perry Mesa, 200 of 205 (97.5%)

obsidian samples from Late Prehistoric contexts were from Coconino Plateau sources in northern Arizona (Shackley 2009; Wilcox and Holmlund 2007). Of the remaining five samples, one was from the southern Vulture source and four were from the nearby, but rarely exploited Topaz Basin. Jack (1971) sourced 11 obsidian objects from Bridgeport on the Middle Verde. All were associated with Government Mountain.

In his assessment of the Perry Mesa obsidian sourcing project described above, Shackley (2009:345) concludes that the study "will not solve the controversy surrounding the validity of the 'Verde Confederacy' or Southwestern warfare but does provide insight into spatial patterns of socioeconomic interaction." I agree with Shackley in that obsidian alone is not an answer to the Verde Confederacy, but relational network boundaries derived from these spatial patterns are an important component in testing for integration at the scale proposed by the model. Based on the available evidence, obsidian assemblages in the proposed confederacy are overwhelmingly dominated by Coconino Plateau sources. The sample size in the Middle and Lower Verde local systems is extremely small, and no samples have been run from the Polles local system. These data gaps require filling before obsidian exchange networks can be bounded and assessed in the proposed confederacy.

A large number of people across central and northern Arizona began exploiting Coconino Plateau obsidian during the Late Prehistoric. Mills et al. (2013a) tested whether transportation costs were the primary driver in obsidian procurement and exchange during this time period by comparing the actual obsidian distributions against simulated assemblages based on spatial proximity from sources. A large number of central Arizona obsidian assemblages deviated significantly from the simulation, indicating other factors were contributing to obsidian circulation in the study area. This phenomenon is thought to be associated with outward migration from the Coconino Plateau across the Southwest (Mills et al. 2013a, 2013b), and it may be impossible to disentangle obsidian circulation at the scale of the Verde Confederacy from a much larger pattern. Despite this problem, assemblages across the study area dominated by Coconino Plateau obsidian would not be a smoking gun, but they would provide some support for a confederacy-wide relational network. Late Prehistoric obsidian assemblages with significant representation from non-Coconino Plateau sources would be inconsistent with a relational network at the scale of the proposed confederacy.

Jeddito Yellow Ware

Jeddito Yellow Ware (JYW) was made exclusively on the Hopi Mesas (Bernardini 2005) and was one of the most widely distributed wares during Late Prehistoric times (Schaefer 1969). Bernardini (2014:145) proposes that JYW in Late Prehistoric central Arizona was a high-value good from a distant and restricted production source likely to have been circulated between socially-distant alliance members. JYW is more likely to have been circulated at the scale of the confederacy, and network connections associated with this ware could be analogous to smoking pipes or wampum among the Iroquois.

Wilcox and others (Wilcox 2014; Wilcox and Holmlund 2007:98-104) have proposed the 'Hopi Macroeconomy,' an economic system including Hopi, Homol'ovi, Chavez Pass, and the Verde Confederacy. Winslow Orange Ware and Hopi Yellow Ware would have moved south through the system, while cotton, salt, copper pigment, obsidian, and food moved north). Bernardini (2005, 2014) is conducting on-going research into the organization of production and exchange of JYW ceramics, which are present at most of the sites in the proposed Verde Confederacy (Shockey and Watkins 2009a, 2009b; Wilcox and Holmlund 2007). A major component of his research has been the definition of a number of chemically distinct production sources for JYW at the Hopi Mesas (see also Bishop et al. 1988). Bernardini (2014) recently sampled JYW from several sites in the proposed Verde Confederacy, including sites on Perry Mesa, Dugan, and Polles Pueblo. The Jeddito Yellow Ware from these sites largely originated from Second Mesa at Hopi. The Perry Mesa, Bloody Basin, and Polles Pueblo assemblages were consistent with one another, but were not a subset of the Chavez Pass assemblage, suggesting they were acquired directly from Hopi, or perhaps via trade routes independent of Chavez. The sites sampled thus far were not part of the Hopi Macroeconomy as conceived of by Wilcox and Holmlund. If the JYW from the currently unsampled portions of the confederacy were a subset of Chavez Pass, then those settlements may have been participating in the Hopi Macroeconomy.

The relative homogeneity of JYW from Perry Mesa, Bloody Basin, and Polles is consistent with vessels acquired from Hopi and then circulated internally (Bernardini 2014:321-322), but did JYW circulate at the scale of the proposed confederacy? This question cannot be answered until JYW from the Lower Verde and Middle Verde local systems has been sourced. The ware is ubiquitous in both regions, and sufficient samples could likely be drawn from existing collections. JYW from the Middle and Lower Verde could compare well with those from Perry Mesa, Bloody Basin, and Polles, indicating the presence of a relational network at the scale of the proposed confederacy. Boundaries to JYW exchange are a proxy for relational network boundaries. JYW network boundaries paralleling those of the Middle Verde, Lower Verde, and Perry Mesa/Bloody Basin catnets would strengthen the potential for collective action within these regions, whereas crosscutting distributions may prompt revaluation of regional boundary dynamics.

Summary of Future Research

Future research on these material culture distributions will refine the boundaries identified above, and could provide evidence for relational networks and categorical commonality at the scale of the Verde Confederacy. Rock art in Bloody Basin and Polles Mesa is relatively unknown, and additional research in these regions will solidify boundaries that can only be estimated with the currently available data. The distribution of Salado Polychrome and slipped red ware can likely be associated with different kinds of relational networks once the organization of production and exchange of these wares has been reconstructed. Obsidian and JYW ceramics from a large portion of the proposed confederacy have already been sourced, and running additional samples from the Middle Verde will provide additional information on relational networks in Late Prehistoric central Arizona.

Summary and Conclusions

In this study, I followed Parker (2006) in referring to specific kinds of boundaries as types – which could be associated with geography, politics, demography, culture, economics, etc. Parker (2006) introduced two additional concepts to the archaeological studies of boundaries. First, the nature of a boundary can vary from a rigid border to a porous frontier. Second, in order to understand social boundaries as a larger phenomenon, researchers must examine the interplay between several individual boundaries, a concept referred to as boundary dynamics. The latter two concepts have not been widely incorporated into archaeological studies of social boundaries, but all three concepts are necessary to approach this topic comprehensively. Parker did not operationalize these three concepts for use with archaeological data, which may explain why they have not been adopted. This research is a case study demonstrating how this can occur.

Wilcox and others (Wilcox et al. 2001b; Wilcox and Holmlund 2007) have proposed the Verde Confederacy, a large-scale political alliance encompassing a significant portion of Late Prehistoric central Arizona. To test this model, I followed Peeples (2011) by associating material culture distributions with one of two types of collective social identification. Relational networks include individuals who had regular face-to-face interactions with one another. Categorical commonality is based on perceived similarities between individuals or groups. This type of collective social identification needs to be symbolized in order to be communicated. Because it is not dependent on face-to-face interactions, categorical affinity can be easily shared by large groups of people. Both relational networks and categorical affiliation are manifested in the archaeological record. Collective social actions, such as the regular communication and connectivity required in a political alliance, are most likely to emerge among people who are integrated by relational networks and shared categorical identity (White 2008).

Social boundaries are not a homogenous phenomenon, nor are they merely present or absent. Archaeologists should describe the boundaries that are identified and place them into their cultural context. Boundary type, boundary nature, and collective social identification provide that context, and can be operationalized for use with archaeological data. A comprehensive investigation of social boundaries will include several material culture distributions from a variety of boundary types. These boundaries and their natures should be compared to characterize social relationships between groups. I approached my comprehensive investigation via three interrelated studies; a plain ware provenance model, a reconstruction of plain ware production and exchange, and an analysis boundary dynamics derived from several other material culture distributions.

Seven plain ware production zones were defined in the study area. Ceramics from each production zone are geochemically and mineralogically distinctive, and can be identified be consistently identified in the binocular microscope by a trained analyst. The plain ware provenance model covers a large portion of central Arizona, and this model is likely to prompt additional archaeological research in this region. This study is the first application of Abbott's (2000) methods beyond the uniquely variable geology of the Phoenix Basin. There are a number of advantages to these methods. The model is temper-based, and production sources can be reliably differentiated in the binocular microscope by a trained analyst. Once a model is established, only a small number of electron microprobe and petrographic analyses need to be performed as a quality control check on analyst accuracy. Large ceramic assemblages can be provenanced at a relatively low cost.

The successful implementation of these methods in central Arizona demonstrates that the methods, and their associated advantages, could be applied in other regions.

I leveraged the provenance model to reconstruct the organization of plain ware production and exchange in the study area. These plain wares were low-valued, widely produced utilitarian items likely to be exchanged between social proximate individuals and households such as kin or close friends. Plain ware ceramics largely circulated in two exchange spheres centered on Perry Mesa/Bloody Basin and the Middle Verde, suggesting these regions were integrated by strong relational networks. A moderate amount of plain ware circulated between Perry Mesa/Bloody Basin, the Lower Verde, and Polles as well as the Middle Verde and Polles. Fewer close social relationships were maintained across these secondary interaction networks. A handful of ceramics circulated between sites at the scale of the proposed confederacy. These exchanges were likely associated with occasional, incidental interactions that were not sustained over time.

Five other material culture distributions were investigated in order to more comprehensively characterize boundary dynamics. Perry Mesa is surrounded by defensive fortifications, and is integrated internally by a line-of-sight network connecting major settlements via hilltop forts and signaling outposts, indicating defensive and communication integration. A 20 km buffer zone opens between the Middle Verde and Polles local system in the early A.D. 1300s. This buffer zone is a boundary to relational networks. The cost of interaction rises as physical distance increases, and these buffer zones are often ethnographically associated with violence or the threat of violence. Rock art varies significantly between the Middle Verde, Lower Verde, and Perry Mesa, indicating boundaries to categorical commonality, ritual practice, and ideology. Four types of public architecture are present in the study area. Racetracks are found on Perry Mesa, Bloody Basin, and Polles. Platform mounds are present in the Lower Verde, and community rooms are found in the Middle Verde. These three distributions do not overlap, suggesting boundaries to categorical commonality, ritual practice, and large group activities. The fourth type of public architecture, plazas, crosscut these discrete distributions, suggesting the possibility of a ritual frontier. Salado Polychrome ceramics are widely distributed in the Late Prehistoric Southwest, and have been associated with a suite of integrative ritual practices and ideologies known as the Southwestern Cult. Salado Polychrome is almost absent in the Middle Verde, indicating a boundary to categorical identity, ritual practice, and ideology.

I identified three smaller-scale regions on the Middle Verde, Lower Verde, and Perry Mesa/Bloody Basin that were integrated by relational networks and shared categorical commonality. Sustained collective actions, such as those required in a political alliance, would have been most likely to emerge within these "catnets." A fourth region, Polles, is a frontier zone where relationships cross-cut and categorical identities overlap. The presence of catnets at a scale smaller than the Verde Confederacy does not preclude larger-scale social integration, but evidence for relational and categorical integration at this larger scale would need to be uncovered in future research efforts. I proposed investigations of several additional material culture distributions to refine the boundaries I have proposed, and to investigate the possibility of relational or categorical integration and the scale of the proposed confederacy.

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APPENDIX A

ELECTRON MICROPROBE DATA

Table A.1. Electron Microprobe Data.

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
DUG001	Dugan	Petrography	Y	1.10398	1.86022	21.94725	65.96335	2.12399	1.23496	0.30187	4.95582
DUG002	Dugan	Petrography	Y	1.28048	1.52275	23.46252	63.19376	2.44869	1.48261	0.33398	5.52173
DUG003	Dugan	Petrography	Y	1.50937	2.03585	24.05158	61.43352	2.77277	1.15541	0.29559	6.14062
DUG004	Dugan	Petrography	Y	1.09678	2.08992	23.09528	62.73638	2.13755	0.91285	0.46078	6.36326
DUG005	Dugan	Petrography	Y	1.21858	2.03637	25.40424	58.59742	2.68401	1.18097	0.76058	7.30401
DUG006	Dugan	Petrography	Y	1.83540	1.67608	23.98390	61.81098	2.57050	1.18480	0.46219	5.85483
DUG007	Dugan	Petrography	Y	1.83133	1.21565	24.12160	62.90073	2.35648	1.14100	0.38942	5.67778
DUG008	Mercer	Petrography	N	1.61827	1.98906	16.78836	65.85442	2.93184	1.99126	2.65703	5.58601
DUG009	LV J	Petrography	N	1.92269	1.82576	17.62012	67.07588	2.69555	2.05981	0.79764	5.48109
DUG010	LV J	Petrography	N	2.31003	1.18578	19.06770	65.54280	2.97600	1.23113	0.83142	6.47123
DUG011	LV J	Petrography	N	1.71953	1.35856	19.16398	66.04906	3.41256	1.21693	0.65873	5.92837
DUG012	Dugan	Petrography	Y	1.15341	2.03905	25.28644	60.71964	2.63599	1.08624	0.42796	5.95224
DUG014	Dugan	Petrography	Y	1.33338	1.57502	23.96880	61.37040	3.28477	1.20868	0.46756	6.15319
DUG015	Dugan	Petrography	Y	2.26785	1.39740	25.65183	58.90093	2.90928	1.50215	0.57234	6.06091
DUG016	Dugan	Petrography	Y	1.77855	2.11034	25.37514	59.23418	3.14961	1.05053	0.66713	6.15714
DUG017	Dugan	Petrography	Y	1.70661	1.80365	24.78763	60.02038	3.37448	0.91724	0.63333	6.12155
DUG018	Dugan	Petrography	Y	2.09662	1.93443	22.28753	62.37608	2.37847	0.85929	0.65578	6.85028
DUG019	Dugan	Petrography	Y	1.74816	1.44825	22.91228	64.78154	2.37169	1.42855	0.35858	4.39341
DUG020	Dugan	Petrography	Y	1.73994	1.66661	28.27090	57.34713	2.77228	0.88707	0.51253	5.99663
DUG021	Dugan	Petrography	Y	1.65968	1.90330	25.26024	59.07274	2.53980	1.19545	0.66269	7.01676
DUG022	Dugan	Petrography	Y	2.04652	1.70812	23.66650	63.18238	2.64134	1.02058	0.27964	4.91979
DUG024	Dugan	Petrography	Y	2.65340	2.03563	24.09170	56.84103	2.91080	1.47634	1.00207	8.05111
DUG031	PM East	Optical Scope	N	3.51320	1.63892	22.83202	62.11530	2.72564	0.88809	0.42391	5.31262
DUG032	PM East	Optical Scope	N	1.92517	1.86746	22.64396	61.28592	3.52806	1.34155	0.55177	6.24060
DUG033	PM East	Optical Scope	N	0.99347	1.59951	23.27998	61.19122	5.19538	0.84601	0.60928	5.56384

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
DUG034	MOCA	Optical Scope	N	1.83605	1.59301	22.13250	60.69868	3.42132	1.48513	0.67175	7.47013
DUG035	TUZI	Optical Scope	N	2.02997	3.17714	17.61026	64.01134	3.00146	3.16858	0.57211	5.84841
IST001	Mercer	Petrography	Y	1.68703	1.69877	21.74882	58.88232	4.53067	1.35495	0.81650	7.76504
IST002	Mercer	Petrography	Y	1.72408	2.09295	22.81020	58.69710	3.14078	1.67279	0.77965	8.49002
IST006	Mercer	Petrography	Y	1.29578	1.58889	19.82480	64.34082	3.07648	1.47276	0.95809	6.86559
IST008	Mercer	Petrography	Y	2.02287	1.79263	21.89126	61.35184	2.87656	1.89295	0.50226	7.19037
IST009	Mercer	Petrography	Y	1.01224	1.60749	25.92974	58.49410	2.39604	1.25767	0.90961	7.81662
IST010	Mercer	Petrography	Y	1.44269	1.40225	21.57674	62.73672	2.95436	1.40583	0.90298	7.02984
IST011	Mercer	Petrography	Y	2.22848	1.61985	22.01004	60.39696	3.41096	2.11620	0.94048	6.93554
IST012	Mercer	Petrography	Y	0.87713	2.43532	24.92608	55.87185	2.85102	2.02373	0.71998	9.44089
IST013	Mercer	Petrography	Y	1.79029	1.46829	20.42284	63.87236	3.19105	1.61544	0.54910	6.67086
LMJ001	PM East	Petrography	Y	2.05519	1.55994	21.89436	59.54682	7.10111	1.36515	0.41829	5.27265
LMJ002	PM East	Petrography	Y	2.76477	1.56238	22.06464	61.03020	2.61265	2.42691	0.58229	6.36554
LMJ003	PM East	Petrography	Y	3.90512	1.36388	20.46022	62.77162	2.13112	2.59867	0.53576	5.68969
LMJ004	PM East	Petrography	Y	3.02442	1.50260	20.86885	60.99420	3.32318	2.10248	0.79584	6.50544
LMJ005	PM East	Petrography	Y	3.39916	1.18180	18.86465	66.08350	3.22814	1.91739	0.27088	4.09604
LMJ006	PM East	Optical Scope	Y	3.41942	1.43913	19.03998	62.17954	2.76705	1.63748	0.43002	5.06348
LMJ007	PM East	Optical Scope	Y	3.18575	1.76679	19.19594	62.58980	2.80780	1.43324	0.43492	5.71402
LMJ008	PM East	Optical Scope	Y	2.67067	1.33768	19.34225	61.87240	3.29819	1.89497	0.57281	5.61251
LMJ009	PM East	Optical Scope	Y	2.41074	1.68469	22.45398	59.45380	3.24216	1.36306	0.70182	6.29238
LMJ010	PM East	Optical Scope	Y	2.21247	1.22919	20.96530	60.95480	4.31071	1.31951	0.48428	5.91964
LMJ011	PM East	Optical Scope	Y	3.17189	1.74654	20.67016	59.79746	3.72007	1.51537	0.58816	6.11626
LMJ012	PM East	Optical Scope	Y	3.51800	1.42148	20.76054	58.67424	3.84613	1.75030	0.38165	4.72654
LMJ013	PM East	Optical Scope	Y	2.27862	1.48287	20.20152	61.68820	3.63290	1.46615	0.58690	5.48658
LMJ014	PM East	Optical Scope	Y	2.28204	1.56909	19.73858	60.65770	3.14553	3.61425	0.57457	5.00470
LMJ015	PM East	Optical Scope	Y	2.62484	1.60605	21.43662	59.82460	3.17534	2.98308	0.48100	4.59256

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
LMJ016	PM East	Optical Scope	Y	3.36788	1.79713	20.24174	60.54024	3.12667	2.23636	0.43969	5.45304
LMJ017	PM East	Optical Scope	Y	2.61332	1.24858	18.49726	63.86600	2.80262	1.28522	0.32563	5.94852
LMJ018	PM East	Optical Scope	Y	1.62961	1.53456	18.97992	63.49332	3.31344	1.79428	0.77602	5.87651
LMJ019	PM East	Optical Scope	Y	3.02420	1.33972	20.61074	61.21858	3.53981	1.16867	0.45038	5.67583
LMJ020	PM East	Optical Scope	Y	3.28442	1.33853	20.95146	61.07216	3.18090	1.24057	0.42460	6.29189
LPL050	Dugan	Petrography	N	2.36519	1.58416	24.27968	62.15518	2.70914	1.49147	0.34683	4.43246
LPL051	Dugan	Petrography	N	0.75073	2.12111	30.37603	52.55317	4.06141	0.78427	0.21070	8.82605
LPL052	Dugan	Petrography	N	4.13945	1.68253	29.54200	56.21533	1.97818	1.30566	0.13565	4.58334
MER005	Mercer	Petrography	Y	1.28905	1.67438	24.09303	58.55098	3.76584	1.42821	1.00191	7.39849
MER006	Mercer	Petrography	Y	1.28905	1.67438	24.09303	58.55098	3.76584	1.42821	1.00191	7.39849
MER007	Mercer	Petrography	Y	4.57258	0.60373	21.42708	63.12114	2.98446	1.44942	0.59012	4.71504
MER008	Mercer	Petrography	Y	2.25439	1.31350	23.27460	60.38416	3.74102	1.55025	0.66496	6.07284
MOC001	PM West	Petrography	N	1.71742	2.12471	19.49212	63.10898	2.57407	1.63323	0.89417	7.68334
MOC002	MOCA	Petrography	Y	2.49004	1.44344	21.87312	62.41680	3.09990	2.06817	0.49746	5.42715
MOC003	PM West	Petrography	N	2.23541	1.77883	21.78200	62.00538	2.44610	2.12112	0.69322	6.37962
MOC004	PM West	Petrography	N	2.24108	2.11898	21.95900	63.96233	2.15176	2.02297	0.56509	4.63665
MOC005	MOCA	Petrography	Y	2.38524	2.19221	24.24078	57.51253	2.29108	2.27877	0.63285	7.43293
MOC006	MOCA	Petrography	Y	1.78330	1.70316	20.90248	64.04268	2.42878	1.83576	0.56813	6.16713
MOC007	MOCA	Petrography	Y	1.73582	1.76345	23.15096	62.00312	2.71333	1.50955	0.61491	5.78842
MOC008	MOCA	Petrography	Y	1.74731	1.75847	25.06208	57.52040	2.73213	2.29761	0.76770	7.43434
MOC009	MOCA	Petrography	Y	1.78122	1.66571	19.53535	65.68908	2.46738	2.16109	0.54753	5.66183
MOC010	Unknown	Petrography	N	1.74085	1.68224	21.11546	64.18402	2.41815	1.97215	0.63240	5.81369
MOC011	MOCA	Petrography	Y	2.35306	1.78570	22.29670	63.04910	2.77009	2.26722	0.39912	4.70562
MOC012	MOCA	Petrography	Y	2.00471	1.85677	20.48864	63.43070	2.89167	1.70530	0.60450	6.26995
MOC013	MOCA	Petrography	Y	1.52753	2.10732	21.12476	62.73796	2.67908	2.20531	0.73298	6.38714
MOC015	MOCA	Petrography	Y	2.10732	1.53052	22.26094	63.19286	2.62737	1.36255	0.45161	5.84620

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
MOC016	MOCA	Petrography	Y	3.47979	1.23042	19.96862	64.15526	1.98765	2.38833	0.45156	5.62171
MOC020	MOCA	Petrography	Y	3.43808	1.34580	23.96906	60.13262	2.83132	1.99789	0.55227	5.03459
MOC021	MOCA	Optical Scope	Y	2.68441	1.54130	22.32088	57.80160	3.39353	1.80364	0.48875	5.10268
MOC022	MOCA	Optical Scope	Y	3.35670	2.38827	23.85196	56.22416	2.94110	2.00973	0.50710	6.24725
MOC023	MOCA	Optical Scope	Y	2.39825	1.82155	23.04936	57.99628	3.22202	1.60909	0.46662	6.81255
MOC024	MOCA	Optical Scope	Y	2.55188	1.87530	20.56700	59.38366	3.64651	2.21886	0.46679	5.27091
PAT001	PM East	Petrography	N	1.73815	1.35572	19.29757	66.79488	2.82853	1.36398	0.48421	5.67676
PAT002	Granite II	Petrography	N	2.80477	1.12273	21.13600	65.39897	1.86324	1.34333	0.55751	5.43567
PAT003	PM East	Petrography	N	3.01784	1.14469	17.84790	68.74320	2.34191	1.49494	0.68412	4.36413
PAT004	Unknown	Petrography	N	1.41464	2.93518	20.89956	61.57446	1.83761	2.15314	0.60218	8.20790
PAT005	PM West	Petrography	Y	2.84121	1.62193	19.02848	62.19272	1.40457	3.92331	0.64339	7.96072
PAT006	PM West	Petrography	Y	1.59629	1.87869	21.81836	59.23444	1.82075	3.80264	0.71391	8.54445
PAT007	PM West	Petrography	Y	2.90398	2.00003	18.90008	61.53968	1.36631	4.35502	0.58317	7.74376
PAT008	PM West	Petrography	Y	1.87996	2.36317	19.68644	61.75492	1.63489	3.35311	0.55997	8.30806
PAT009	PM West	Petrography	Y	3.76363	1.59559	22.68340	55.42084	2.15374	4.24995	0.69306	7.17406
PAT010	PM West	Petrography	Y	2.23653	2.04772	21.79295	57.76993	1.43196	3.55498	0.57222	9.71516
PAT011	PM West	Petrography	Y	2.14714	2.45055	21.99682	57.17326	2.15739	4.07089	0.67220	8.61854
PAT012	PM West	Petrography	Y	2.95734	2.25945	22.80478	57.24122	1.58362	3.84107	0.56401	8.07281
PAT014	PM West	Petrography	Y	4.25516	1.74021	20.30230	59.64623	1.48019	3.78498	0.52050	7.04725
PAT016	PM West	Petrography	Y	2.76567	2.23970	20.80038	58.69755	1.43655	4.61951	0.56351	8.09887
PAT017	PM West	Petrography	Y	1.64311	2.45187	22.71128	57.72004	1.28524	3.89239	0.62769	9.27455
PAT018	PM West	Petrography	Y	2.82540	1.38172	23.87540	56.67725	2.54792	4.94566	0.49500	6.55336
PAT019	PM West	Petrography	Y	1.64442	1.85366	25.70224	56.09548	1.26820	3.12772	1.17395	8.55365
PAT021	PM West	Petrography	Y	1.69661	2.90420	20.88046	57.07838	1.30715	4.38854	0.84597	10.35533
PAT022	PM West	Petrography	Y	1.93430	2.26645	23.01913	56.32075	1.33629	4.15212	0.89409	9.31339
PAT023	PM West	Optical Scope	Y	2.65657	2.50062	23.98284	51.17024	2.13249	4.04434	0.65765	8.90554

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
PAT024	PM West	Optical Scope	Y	1.51393	2.63794	22.47400	54.64846	1.88617	4.86556	0.69416	8.82143
PAT025	PM West	Optical Scope	Y	2.94693	2.11619	22.86190	54.27592	1.65261	3.97881	0.44897	8.18007
PAT026	PM West	Optical Scope	Y	2.32330	2.56074	23.85284	52.35952	1.41333	4.32520	0.54161	10.10840
PAT028	Dugan	Optical Scope	N	1.67027	2.09747	26.19558	55.70398	3.10362	1.45202	0.32523	6.65968
PAT029	PM East	Optical Scope	N	2.33170	0.92392	20.56290	59.36158	2.09857	1.06818	0.58814	9.05766
PAT030	PM East	Optical Scope	N	2.38850	1.55883	21.73048	59.76782	3.21300	1.04174	0.55976	6.27515
PAT031	Granite II	Optical Scope	N	3.06283	1.41542	19.64754	63.39482	3.13851	1.35153	0.47068	5.89651
PAT032	Granite II	Optical Scope	N	2.55004	1.62221	23.72026	59.11858	3.26879	1.37693	0.26842	5.36240
POL001	Polles	Petrography	Y	1.10012	1.36344	19.80862	62.12934	3.17032	1.62383	0.80127	9.33672
POL002	Polles	Petrography	Y	1.71462	1.35763	22.06486	58.10266	2.83780	2.19199	0.65296	9.99356
POL003	Polles	Petrography	Y	1.59210	1.34818	18.92074	63.01362	3.29619	1.18448	0.83278	9.04358
POL004	TUZI	Petrography	N	1.66552	2.59204	17.40906	63.94226	3.11689	2.44311	1.25885	6.78526
POL005	Polles	Petrography	Y	1.05208	2.31882	18.02014	62.72014	3.10170	3.35835	1.27911	7.29814
POL006	Polles	Petrography	Y	1.11590	1.35736	21.33240	60.22258	2.95215	1.74700	0.77149	9.46185
POL007	Polles	Petrography	Y	0.87531	2.17753	23.05243	58.82938	2.34408	1.52329	0.70467	9.57620
POL008	Polles	Petrography	Y	0.87531	2.17753	23.05243	58.82938	2.34408	1.52329	0.70467	9.57620
POL009	Polles	Petrography	Y	1.21554	1.56943	19.45736	62.06906	3.35218	1.65540	0.82598	9.07252
POL010	Polles	Petrography	Y	0.90175	1.76459	18.53878	66.18152	3.51791	1.61726	0.87563	6.12660
POL011	Polles	Petrography	Y	0.91975	1.20200	19.50088	63.20440	3.69700	1.56872	0.88158	8.48979
POL012	Polles	Petrography	Y	1.00522	1.40396	19.64168	63.24174	3.42305	1.64084	0.88761	8.02399
POL013	Polles	Petrography	Y	0.76911	1.24339	20.53848	59.40705	3.59990	1.37365	0.70439	11.57298
POL014	Polles	Petrography	Y	1.22441	1.19222	19.92624	62.05912	3.35103	1.35982	0.59427	9.50535
POL015	Polles	Petrography	Y	1.20051	1.33156	21.08568	61.31292	3.46128	1.18481	0.58178	9.01287
POL016	Polles	Petrography	Y	1.07116	1.22220	20.25161	61.25031	3.56175	1.58776	0.81355	9.51002
POL017	Polles	Petrography	Y	1.40700	1.32255	20.89166	60.98014	3.40775	1.38339	0.68332	9.14845
POL018	TUZI	Petrography	N	1.72185	1.39477	19.07523	64.04115	3.89205	2.31398	0.80759	6.11117

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
POL019	Polles	Petrography	Y	0.85247	1.41537	20.03652	61.15848	3.81846	1.20498	0.76117	6.59225
POL020	Polles	Petrography	Y	1.00051	2.37097	19.57410	60.13396	2.84370	2.55272	0.62325	5.99359
POL021	Polles	Petrography	Y	1.34174	2.46048	19.81042	59.30640	2.70435	2.48226	0.81952	7.91586
POL022	Polles	Petrography	Y	1.53730	1.43914	18.84628	59.89796	3.16534	1.35534	0.58573	9.12915
RCH001	Unknown	Petrography	N	1.28455	1.39224	23.91694	61.80270	2.59016	1.49216	0.59838	6.52726
RCH002	PM West	Petrography	Y	1.77210	2.44930	22.49934	57.89944	1.42655	3.78310	0.76258	8.95217
RCH003	Unknown	Petrography	N	3.01394	1.80504	20.52838	59.32926	0.75342	4.32058	0.61337	9.00011
RCH004	PM East	Petrography	N	1.28796	1.32917	24.42572	61.80494	2.79834	1.33869	0.39789	5.83911
RCH005	PM West	Petrography	Y	1.78745	2.71415	24.71133	55.25708	1.49275	3.79369	0.59200	9.26706
RCH006	PM West	Petrography	Y	2.15142	2.33130	21.34544	57.41512	1.12713	4.51521	0.70646	9.97666
RCH008	Granite II	Petrography	N	4.76440	1.35668	23.58904	58.47844	1.47331	3.28902	0.42539	5.99369
RCH010	Granite II	Petrography	N	7.16905	0.00027	22.58603	62.38310	3.91982	1.74137	0.47919	1.45328
RCH011	PM West	Optical Scope	Y	3.33684	2.33745	21.61898	55.63172	1.72508	3.76758	0.43257	7.56021
RCH012	PM West	Optical Scope	Y	4.48654	1.82220	22.44098	55.32040	1.38788	3.23449	0.64814	7.67959
RCH013	PM West	Optical Scope	Y	4.75165	1.96513	21.96290	53.58840	1.31436	3.16132	0.31722	6.43169
RCH014	PM West	Optical Scope	Y	5.53040	1.42522	22.08654	57.68768	2.09468	2.16476	0.39878	5.74956
RCH015	PM West	Optical Scope	Y	3.84760	2.38370	21.26648	56.87070	1.06089	2.66207	0.41453	9.12739
RCH016	PM West	Optical Scope	Y	3.11068	1.92402	20.83900	57.63618	1.17090	2.85812	0.73242	7.60746
RCH017	PM West	Optical Scope	Y	3.25824	1.96978	22.57610	53.98506	1.32217	4.07403	0.61338	9.13088
RCH018	PM West	Optical Scope	Y	5.86449	1.75412	21.32684	57.19936	0.83958	2.14747	0.46010	7.57158
RCH019	PM West	Optical Scope	Y	2.51149	2.47069	23.33942	53.38932	1.64244	3.32254	0.47463	9.11610
RCH020	PM West	Optical Scope	Y	2.46385	2.95838	24.26070	52.10052	1.47225	2.81728	0.49755	9.65352
RCH021	PM West	Optical Scope	Y	2.94978	2.73232	23.19542	54.92022	1.39123	3.07791	0.44321	9.28965
RCH022	PM West	Optical Scope	Y	5.12345	1.66748	24.67062	55.24744	1.64762	2.89580	0.32966	6.78466
RCH023	PM West	Optical Scope	Y	2.90141	1.94868	21.67176	52.86988	1.48115	3.85107	0.65101	7.97185
RCH024	PM West	Optical Scope	Y	4.17146	1.95810	21.77630	56.75678	1.61698	2.77702	0.56386	7.27836

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
RCH025	PM West	Optical Scope	Y	4.08137	2.00381	21.94716	55.14230	1.38728	3.17166	0.48682	8.08810
RCH026	PM West	Optical Scope	Y	5.22150	1.11064	24.80182	53.69474	1.54148	1.82822	0.51289	7.18373
RCH027	PM West	Optical Scope	Y	3.76320	2.43415	20.27308	53.70498	1.56533	3.32734	0.51610	8.23149
RCH028	Dugan	Optical Scope	N	1.07165	1.95151	25.77528	57.77708	2.78906	1.49468	0.54767	6.86213
RCH029	Dugan	Optical Scope	N	1.45481	1.83569	25.43486	58.35812	2.72532	0.92289	0.33494	5.79173
RCH030	PM East	Optical Scope	N	2.23462	1.64500	21.16784	60.90262	3.00745	1.63704	0.42373	6.16309
RCH031	PM East	Optical Scope	N	1.49430	1.48631	21.37988	60.64488	3.27211	1.18704	0.47702	5.96805
RCH032	PM East	Optical Scope	N	2.94730	1.30025	19.96818	60.75840	4.01574	2.08550	0.51308	5.34406
RCH033	Granite II	Optical Scope	N	3.57904	1.57611	21.78140	59.06162	2.83414	1.91289	0.43973	5.61547
RCH034	Granite II	Optical Scope	N	2.81346	2.28465	22.85448	54.06104	1.11799	2.48691	0.48696	8.22665
ROS001	PM East	Petrography	Y	1.72191	1.16451	22.00888	62.35802	4.02483	1.17422	0.53665	6.41577
ROS002	PM East	Petrography	Y	2.50982	1.19269	20.09266	64.51158	2.84507	1.54017	0.70652	5.79581
ROS003	PM East	Petrography	Y	2.42602	1.14678	20.14004	63.46730	3.45069	2.39696	0.59046	5.95365
ROS004	PM East	Petrography	Y	2.77793	1.29156	20.71322	63.16476	3.22142	1.58787	0.44415	6.18153
ROS005	PM East	Petrography	Y	3.26332	1.21895	19.49608	64.67362	2.94357	1.33088	0.57965	5.83162
ROS006	PM East	Petrography	Y	2.57618	1.20861	20.50292	63.59688	4.11020	1.23942	0.48344	5.40796
ROS008	PM East	Petrography	Y	3.05887	1.11144	19.64358	63.55080	3.70126	1.34309	0.56038	6.01747
ROS009	PM East	Petrography	Y	2.33437	1.18414	18.29062	68.06508	2.95989	1.24324	0.91797	4.27295
ROS010	PM East	Petrography	Y	3.12710	1.18964	21.38442	62.42192	3.05011	1.34132	1.09997	5.86067
ROS011	PM East	Petrography	Y	3.35772	1.07735	20.71402	63.52962	2.82857	1.42614	0.61522	5.60565
ROS012	PM East	Petrography	Y	2.82717	1.18592	21.16270	62.95186	3.35297	1.28613	0.66429	5.84284
ROS013	PM East	Petrography	Y	2.59476	1.12753	20.94584	63.50088	2.83396	1.76875	0.70391	5.98079
ROS014	PM East	Petrography	Y	2.43965	1.33809	20.41266	62.57054	3.71857	1.48250	0.95063	6.26764
ROS015	PM East	Petrography	Y	2.92634	1.21179	20.07460	65.05664	3.20818	1.46565	0.34223	5.13105
ROS016	PM East	Optical Scope	Y	1.26631	1.74189	20.44162	60.16566	3.67817	2.04668	0.49996	6.01591
ROS017	PM East	Optical Scope	Y	1.87566	1.52387	19.33732	61.46322	3.57895	1.67741	0.76456	5.44690

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
ROS018	PM East	Optical Scope	Y	2.51828	1.54909	21.43302	59.50644	3.25752	1.88545	0.52668	6.32010
ROS019	PM East	Optical Scope	Y	3.55803	1.50700	21.02518	59.49812	2.73062	1.68939	0.66348	5.99790
ROS020	PM East	Optical Scope	Y	4.40500	1.29306	20.96830	59.49485	2.78210	1.61627	0.47509	4.65672
TUZ001	LV J	Petrography	N	3.09188	1.61711	20.00514	62.16379	4.17518	1.14216	0.87905	7.49194
TUZ002	Tuzigoot	Petrography	Y	0.96153	3.64015	15.74760	58.45756	3.60352	10.14569	0.66289	5.89488
TUZ003	Polles	Petrography	N	1.02618	2.14620	19.76508	64.79220	3.23074	1.34933	0.58352	6.39217
TUZ004	Tuzigoot	Petrography	Y	0.89201	2.02218	21.42528	60.11062	2.24111	1.65220	1.21457	9.68997
TUZ005	MOCA	Petrography	N	3.14568	1.05163	19.13180	67.05106	2.21668	2.05444	0.50964	4.36159
TUZ006	Tuzigoot	Petrography	Y	2.53792	1.57686	22.34952	62.78414	2.15594	2.37211	0.49909	5.30027
TUZ007	Tuzigoot	Petrography	Y	1.10917	2.52284	16.65720	67.30635	2.27303	4.19046	0.59109	4.77211
TUZ008	Tuzigoot	Petrography	Y	1.04300	2.06167	18.95718	64.75104	2.35199	1.61861	1.15981	7.35999
TUZ009	Tuzigoot	Petrography	Y	0.76148	2.18013	17.15040	67.09895	2.84660	2.48445	0.81031	5.84272
TUZ010	Tuzigoot	Petrography	Y	0.93499	2.65817	19.65106	61.83706	3.90791	3.28667	0.71046	6.39006
TUZ011	Tuzigoot	Petrography	Y	0.97752	2.17602	19.47920	63.45700	3.63912	1.58315	0.96652	7.03200
TUZ012	MOCA	Petrography	N	1.64601	1.98405	21.12036	64.44376	2.38324	1.65833	0.55226	5.52972
TUZ013	Tuzigoot	Petrography	Y	0.82814	2.77257	26.84628	56.19612	2.43956	2.06846	0.84178	7.36072
TUZ014	Polles	Petrography	N	1.34502	1.38207	22.56340	65.07182	2.16691	0.99528	0.25460	5.81325
TUZ015	Tuzigoot	Petrography	Y	0.81049	2.53159	16.84916	64.77032	2.88554	4.46450	0.98170	5.80162
TUZ016	Tuzigoot	Petrography	Y	0.96765	2.16414	15.10384	70.26150	3.28464	2.05230	0.64291	4.84389
TUZ017	Tuzigoot	Petrography	Y	0.94537	4.13118	15.24498	56.09144	3.37531	13.10260	0.81342	5.23675
TUZ019	Polles	Petrography	N	0.59007	1.53278	19.82276	66.74486	2.69402	1.09534	0.40449	6.37505
TUZ020	Tuzigoot	Petrography	Y	1.32751	2.46420	16.39130	60.85823	2.80585	8.66484	0.95073	5.43810
TUZ021	Tuzigoot	Petrography	Y	0.99876	2.60790	18.86554	63.55126	3.29305	1.96022	1.04070	7.04672
TUZ023	Tuzigoot	Optical Scope	Y	1.28504	2.58821	18.08794	64.77630	4.17947	1.67971	0.63544	6.08680
TUZ024	Tuzigoot	Optical Scope	Y	1.39395	2.66705	18.68126	59.09624	3.68432	2.99588	0.73683	6.97730

Sample#	Temper	Method	Ref Grp?	Na	Mg	Al	Si	K	Ca	Ti	Fe
TUZ025	Tuzigoot	Optical Scope	Y	1.60603	3.00871	15.47478	52.95160	3.86899	12.85644	0.54454	4.98493
TUZ026	Tuzigoot	Optical Scope	Y	1.52131	3.69899	15.09260	55.86566	3.56259	11.33776	0.58258	4.07870

APPENDIX B

INVENTORY OF PLAIN WARE BY TEMPER TYPE

Table B.1. Inventory of Dugan Plain Ware by Temper Type.

Unit	Box	Dugan	Granite II	Lower Verde F	Mercer (Lower Verde J)	Phyllite	PM East	PM West	TUZI	Unknown	Total
A1	Box 23	1			2						3
A1	Box 81	3			1						4
A1	Box 3	7		2	6		1				16
A2	Box 67	2		1	8	1					12
A2	Box 68	5		1	5						11
A3	Box 19A	7	3								10
A3	Box 8	5	1		4					1	11
A3	Box 22	1		1	2						4
A4	Box 63	6		1	6						13
A4	Box 81	7			2					1	10
A5	Box 81	6			1						7
A5	Box 39	3	2		1					1	7
A5	Box 79	6								1	7
A5	Unknown	4	1								5
A6	Box 29	4			3						7
A6	Box 26	5			5						10
A6	Box 28	6			4						10
A6	Box 31	10			2						12
A7	Box 136	6		1	13	1		1	1		23
A7	Box 45	4		1	1						6
A7	Box 33	7			2				1		10
A8	Box 14	1		1	9						11
A8	Box 136	1	1	1	5					4	12
BA1	Box 103	9									9
BA1	Box 25	3			2						5
BA1	Box 17	2			4						6
BA2	Box 16	1			7					1	9
BA2	Box 104	3			6						9
BA2	Box 56	5									5

Unit	Box	Dugan	Granite II	Lower Verde F	Mercer (Lower Verde J)	Phyllite	PM East	PM West	TUZI	Unknown	Total
BA3	Box 27	3		1	1				1		6
BA3	Box 12	2			1						3
BA3	Box 137	1	1		2		2				6
BA3	Box 30	3			3						6
BA4	Box 79	1			2						3
BA4	Box 60	4			1						5
BA4	Box 101	7		1							8
BA4	Box 121	7		1							8
BB1	Box 79	1	1		6						8
BB2	Box 23	5			4						9
BB2	Box 79	12	1	4	12	1				2	32
BB2	Box 41	4		1	13						18
BB2	Box 42	7			16					1	24
CA1	Box 64	1			2		1				4
CA1	Box 79	2			5	1					8
CA1	Box 152	8		1	7						16
	Box 31, Bag 8	2									
	Box 2, Bag 13				1						
Total		200	11	19	177	4	4	1	3	12	428

Table B.2. Inventory of Ister Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	Mercer (Lower Verde F)	PM East	PM West	Phyllite	Polles	Unknown	Total
South Mound #1-Watkins		1	15	50	5		2	1		74
South Mound #1-Bone		1	20	84	5		2	1	1	114
North Mound #2-Abbott			12	62	6	1	2			83
North Mound #2-Wood	1	1	19	82	9	1	4	2	1	120
Unknown				4						4
Total	1	3	66	282	25	2	10	4	2	395

Table B.3. Inventory of La Plata Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	PM East	PM West	Phyllite	Polles	Unknown	Total
East # 1		5		6	5				16
East # 2	5	8		21	6	1	2	4	47
East # 3	3	9		11	1			4	28
East # 4	8	20		24	2			6	60
East # 5				4					4
East # 6	3	1		4		1			9
East # 7		1		5				1	7
East # 8				1					1
East # 9				2					2
East # 10				2					2
North # 1	6	9		9	4		2	2	32
North # 2	6	18		24	3		2	6	59
North # 3	5	11		23	8			3	50
North # 4	2	5		13	2			1	23
North # 5	2	1		6	1				10
North # 6				2					2
North # 7		1							1
North # 8		3		8	3				14
North # 9				5					5
North #11	1				1				2
South # 1		1		3	1				5
South # 2		2		2					4
South # 3	7			7		1		2	17
South # 4		2		10					12
South # 5	1	3		4	3				11
South # 6	1	11		6	1				19
South # 7	2	6		8	1		1		18
South # 8		1		2				1	4
South # 9				6				1	7
South #10				1					1
South #11		2		2					4
South #12				1					1
Unit 1E	1			1	1				3
Unit 5NW				1					1
West # 1				1					1
West # 2	3	13		7	4			6	33
West # 3	6	11	1	13	1			2	34

Unit	Dugan	Granite II	Lower Verde J	PM East	PM West	Phyllite	Polles	Unknown	Total
West # 4	2	6		11	4				23
West # 5	3	6		4	2			2	17
West # 6		1		4	1			1	7
West # 7	1	2		5					8
West # 8		1		2					3
West # 10	1			2					3
West # 11				1					1
IF # 1				1					1
IF # 2		1							1
IF # 3	1								1
IF # 4				1					1
IF # 5		4		3					7
IF # 6									0
IF # 7				1	1				2
IF # 8		1		1					2
IF # 9				1					1
IF # 10		1						1	2
IF # 11		1		1					2
IF # 12				3	1				4
IF # 13		3							3
IF # 14		1						2	3
IF # 15	1								1
IF # 16		2		1					3
IF # 17	2	1		1					4
IF # 18	1								1
IF # 19		2							2
IF # 20	1	1		3				1	6
IF # 21		1						1	2
Total	75	179	1	291	57	3	7	47	660

Table B.4. Inventory of Mercer Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	Mercer (Lower Verde F)	MOCA	PM East	PM West	Phyllite	Polles	Unknown	Total
Trash mound - Wood		1	12	26	1		2	20	2	3	67
Trash mound - Abbott	1	1	4	61		4	1	25	9	3	109
Trash Mound - Bone	1		13	54		2		21	7	3	101
Trash Mound - Watkins			16	39		3	1	12		1	72
Unknown			1	7							8
Total	2	2	46	187	1	9	4	78	18	10	357

Table B.5. Inventory of Montezuma Castle Plain Ware by Temper Type.

Unit	Other Provenance Information	Granite II	MOCA	PM East	PM West	Phyllite	Prescott Gray	TUZI	Unknown	Total
MOCA 554	Castle A, Box 2 of 4		3	1				2		6
MOCA 554	Castle A, Box 2 of 4		4					3	1	8
MOCA 554	Castle A, Box 1 of 4		3					1	1	5
MOCA 554	Castle A, Box 4 of 4		9					6		15
MOCA 554	Castle A, Box 3 of 4		1					5		6
MOCA 554	Castle A, Box 4 of 4		7					3	2	12
MOCA 554	Castle A, Box 4 of 4		6	1				3	2	12
MOCA 554	Castle A, Box 3 of 4		8			1		3	1	13
MOCA 554	Castle A, Box 1,2, and 3 of 4		11		1	1	1	4	2	20
MOCA 554	Castle A, Box 1 and 2 of 4		22		2			2		26
MOCA 619	Montezuma Castle, 4th room west on 3rd floor of castle, bag 1 of 2		1							1
MOCA 619	Montezuma Castle, 4th room west on 3rd floor of castle, bag 2 of 2		3							3

Unit	Other Provenance Information	Granite II	MOCA	PM East	PM West	Phyllite	Prescott Gray	TUZI	Unknown	Total
MOCA 1932	Castle A, C trench 6, 8' 8", 1 of 2		5					2		7
MOCA 1932	Castle A, C trench 6, 8' 8", 2 of 2		3					2		5
MOCA 1997	Site 20	1	7						2	10
MOCA 1993	Site 16, single room in fenced area across from castle		12					1	2	15
MOCA 1952	Site 5		9					4	3	16
MOCA 1955	Montezuma #8		16		1	4				21
MOCA 1930	Castle A, C" Trench		2					2	1	5
MOCA 1996	Montezuma Site #19, single room by telephone pole		22					2	6	30
MOCA 1906	Castle A and Castle Surface Collection		4					3		7
MOCA 1951	Montezuma Site #4		2					1	1	4
MOCA 547	Castle A, test trench 8' down, bag 2 of 2		1					2		3
MOCA 1926	Castle A, test trench 8' down		3					1	1	5
MOCA 1953	Montezuma #7		2					3	3	8
MOCA 1950	Montezuma sites #1-2		16					2	1	19
MOCA 1956	Montezuma #8		1			1		5	1	8
MOCA 1995	Montezuma #18, rockshelter		6	1	1	3		4	2	17
MOCA 1958	Montezuma site #13, cavate rooms east of Montezuma Castle		4							4
MOCA 1954	Montezuma #8, surface		2							2
MOCA 547	Castle A, test trench C, 8' down, bag 1 of 2		1					3		4
MOCA 1949	Montezuma sites #1-2		12	1	1		1	12	3	30
MOCA 1948	Montezuma sites #1-2		19					1	3	23
MOCA 1992	Montezuma Castle, talus trash		20					5	4	29
MOCA 1994	Montezuma #17		4		2			3	3	12

Unit	Other Provenance Information	Granite II	MOCA	PM East	PM West	Phyllite	Prescott Gray	TUZI	Unknown	Total
MOCA 1992	Montezuma Castle, talus trash, bag 1 of 2		18	1		4		10	5	38
MOCA 1931	Castle A B" Trench 10 base of cliff 8'7"		5					2		7
MOCA 553	Castle A, box 2 of 2		1							1
MOCA 553	Castle A, box 1 of 2		1			1		1		3
MOCA 553	Castle A, box 2 of 2							3		3
MOCA 553	Castle A, box 2 of 2		1					1		2
MOCA 553	Castle A, box 1 of 2		3					1		4
		1	280	5	8	15	2	108	50	469

Table B.6. Inventory of Las Mujeres Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	PM West	PM East	Phyllite	Polles	Unknown	Total
Corner # 1		4			13				17
Corner # 2	1	20		4	43	5		3	76
Corner # 3	1	16		2	27	2		3	51
Corner # 4		1		1	2	2			6
Corner # 5		1		3	2				6
Corner # 6		1			5	2		1	9
Corner # 7		2			2				4
North # 1	2	46	1	1	57	8		7	122
North # 2	1	5			20	4		4	34
North # 3		1							1
North # 4		1		2	12	3		1	19
North # 5		4			6	1		1	12
North # 6		3		1	9			2	15
North # 7					2			2	4
North # 8		3			4				7
Last # 1		23		2	24	4	1	5	59

Unit	Dugan	Granite II	Lower Verde J	PM West	PM East	Phyllite	Polles	Unknown	Total
Last # 2	1	17		2	14	2		5	41
Last # 3					2				2
Last # 4		1			7			1	9
Last # 5		1			2				3
Last # 6		1			3			1	5
Last # 7						2			2
Last # 8				1	6			1	8
West # 1		2						2	4
West # 2					3			1	4
West # 3	1	7	1	3	31	3		2	48
West # 4					2			1	3
West # 5		1			2	1			4
West # 6					2				2
West # 7					3				3
West # 8					1				1
IF # 1		1			1			1	3
IF # 2					1				1
IF # 3		1							1
IF # 4		2						1	3
IF # 5		1			5				6
IF # 6		3			5				8
IF # 7		1			1				2
IF # 8		1							1
IF # 9					1			1	2
IF # 10					1				1
IF # 11					1				1
IF # 11					2				2
IF # 12		1							1
IF # 13					1				1
IF # 14	5								5
IF # 15		1							1
IF # 16					1				1
IF # 17					1				1
IF # 18					1				1

Unit	Dugan	Granite II	Lower Verde J	PM West	PM East	Phyllite	Polles	Unknown	Total
IF # 19					1				1
IF # 20					1				1
IF # 21					1				1
IF # 22				1					1
IF # 23					1				1
Unknown		2			2				4
Total	12	175	2	23	334	39	1	46	632

Table B.7. Inventory of Pato Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde F	Mercer (Lower Verde J)	PM West	PM East	Phyllite	Polles	Prescott	Unknown	Total
East # 1	1	15			34	14				3	67
East # 2	2	18			28	20	1	1	1	2	73
East # 3		2			1	2					5
East # 4					1						1
East # 5					2	2					4
East # 6					1	1					2
East # 7					1						1
East # 8					2	3	1				6
East # 9		1			2	1					4
North # 1		5			8	6				1	20
North # 2	3	2			15	7				1	28
North # 3	2	5			15	9	1				32
North # 4		5			14	5	1			1	26
North # 5		4			12	6				2	24
North # 6		2			5	4					11
North # 7		2			5	4					11
North # 8					4	2					6
North # 9					1						1
North # 10											0
North # 11		1			2						3
North # 12							1				1

Unit	Dugan	Granite II	Lower Verde F	Mercer (Lower Verde J)	PM West	PM East	Phyllite	Polles	Prescott	Unknown	Total
South # 1		2			8	7				1	18
South # 2	2	5			1	8					16
South # 3		3			2	1				1	7
South # 4		2			8	7					17
South # 5	2	2			5	1					10
South # 6		2			3	5					10
South # 7		5			12	9					26
South # 8		3		1	9	9					22
South # 9		3	1	1	8	4		1		2	20
West # 1	1	20			20	17				5	63
West # 2	2	11			30	26				3	72
West # 3	2	10			22	21	1			1	57
West # 4	2	1			4	4				1	12
West # 5		4			4		1				9
West # 6		1			1	2					4
West # 7		6			1	2					9
West # 8		2			3	10		1			16
West # 9		8			9	9	1			1	28
West # 10		2			1	1					4
West # 11	1	2			4	10	1			1	19
West # 12		1			1	4					6
Midden East of Pueblo	3	24			59	53		3		12	154
IF # 1					1						1
IF # 2					1						1
IF # 3					2						2
IF # 4		1									1
IF # 5		1			2	4					7
IF # 6					1						1
IF # 7					1						1
IF # 8						1					1
IF # 9					1	1					2
IF # 10					1						1
IF # 11					2						2
IF # 12		1			1						2
IF # 13										1	1
IF # 14						1					1
IF # 15					1	1					2
IF # 16					2						2

Unit	Dugan	Granite II	Lower Verde F	Mercer (Lower Verde J)	PM West	PM East	Phyllite	Polles	Prescott	Unknown	Total
IF # 17		1									1
IF # 18						3					3
IF # 19											0
IF # 20		3			2	1					6
IF # 21						1					1
IF # 22						1					1
IF # 23						1					1
IF # 24					1						1
Total	23	188	1	2	387	311	9	6	1	39	967

Table B.8. Inventory of Polles Plain Ware by Temper Type.

Unit	Lower Verde J	Mercer (Lower Verde F)	MOCA	PM West	PM East	Phyllite	Polles	TUZI	Unknown	Total
East #1	3			1			23		1	28
East #2							30	1	2	33
East #3	1		1				36		2	40
East #4	1	1					24	2	2	30
East #5	2				1	1	15	1	1	21
East #7							4		3	7
East #8						1	3			4
South #1	1					2	23	1	1	28
South #2			1				41		7	49
South #3							11		1	12
South #4	1						22			23
South #5						1	14		2	17
South #6							6			6
South #7	1						11			12
South #8							3			3
West #1							7		5	12
West #2	1						11		1	13

Unit	Lower Verde J	Mercer (Lower Verde F)	MOCA	PM West	PM East	Phyllite	Polles	TUZI	Unknown	Total
West #3							11		2	13
West #4	1						8		2	11
West #5	1	1					29	2	6	39
West #6							19		2	21
West #7	1					1	17	1	2	22
West #8	1						2		2	5
West #9							2			2
West #10	1						7		1	9
1st Cliff N of Pueblo						2			1	3
IF #1							10			10
IF #2							5			5
IF #3							1			1
IF #4							2			2
IF #6									1	1
IF #7							1			1
IF #8							1			1
IF #9							1		1	2
IF #10						1				1
IF #11							1			1
IF #13							1			1
IF #14							2		1	3
IF #15							1			1
IF #16							1	1		2
IF #17										0
IF #18	1						1	1		3
IF #20							7	1	3	11
IF #21							1			1
IF #22							3			3
IF #23	1	1								2
IF #24							2			2
IF #26	3									3
IF #27	3									3
IF #28	1						3			4

Unit	Lower Verde J	Mercer (Lower Verde F)	MOCA	PM West	PM East	Phyllite	Polles	TUZI	Unknown	Total
IF #29	1						4			5
IF #30	1									1
Total	27	3	2	1	1	9	427	11	52	533

Table B.9. Inventory of Richinbar Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	PM East	PM West	Phyllite	Unknown	Total
West # 1.1		3		10	14	1	1	29
West # 1.2	1	3		6	15		6	31
West # 1.3		1		11	22		5	39
West # 2.1		5		5	16		3	29
West # 2.2		6		5	10		2	23
West # 3				4	7	2	1	14
West # 4				2	1			3
West # 5				1	1			2
West # 6					1			1
West # 8	1			1	1			3
West # 9		1		1				2
East # 1		9		10	15	2	2	38
East # 2	2	7		11	22		1	43
East # 3		7		10	12		3	32
East # 4		1		3	3			7
East # 5				6	6			12
East # 6			1	1	2			4
South # 1		6		3	11		1	21
South # 2		1		16	14		1	32
South # 3		4		2	9			15
South # 4	1	3		4	8			16
South # 5				3				3

Unit	Dugan	Granite II	Lower Verde J	PM East	PM West	Phyllite	Unknown	Total
South # 6		1		4	1			6
South # 7				1	1			2
South # 8				1	3			4
South # 10					1			1
South # 11				1	2			3
South # 12					1			1
South # 13		1			1			2
North # 1		2		4	5	1		12
North # 2	1	1		3	2	1		8
North # 3		1		2	5		1	9
North # 4		2		7	2	3	1	15
North # 5				6	5	2		13
North # 6		1		3	2	1		7
North # 7		3		7	5	2		17
North # 9	1			1	2			4
IF #1				1				1
IF #2							1	1
IF #3					1			1
IF #4				1	1		1	3
IF #5				1	1			2
IF #7		1		1	1			3
IF #8		1		2	1			4
IF #9				1				1
IF #10		1		2	7			10
IF #11					1			1
IF #12					3			3
IF #13					2		1	3
IF #14		3		2	4		1	10
IF #15					2			2
IF #16				1				1
Room 20					1			1
Room 22							1	1
Room 25					2			2
Room 26					1			1

Unit	Dugan	Granite II	Lower Verde J	PM East	PM West	Phyllite	Unknown	Total
Room 35					1			1
Room 36					1			1
Room 39							1	1
Room 41		1					1	2
Room 42					1			1
Room 44				1	1			2
Room 52				4				4
Room 53				1	1			2
Room 55		2			1			3
Unknown		2						2
Total	7	78	1	173	262	15	35	571

Table B.10. Inventory of Rosalie Plain Ware by Temper Type.

Unit	Dugan	Granite II	Lower Verde J	Mercer (Lower Verde F)	PM West	PM East	Phyllite	Polles	Unknown	Total
NE # 1	4	31	1		2	18	1	2	5	64
NE # 2		8				10		1		19
NE # 3		29			1	29	1		5	65
NE # 4	1	15			1	15	3		1	36
NE # 5		9			1	22	2		1	35
NE # 6		2				11	1			14
NE # 7		4				11			1	16
NE # 8		7				18	3		1	29
NW # 1	2	6			1	13	3			25
NW # 2		13	1			29	12		8	63
NW # 3		19		1	1	31	4		4	60
NW # 4	1	8	1		2	14	1		1	28
NW # 5		14			2	28	2		1	47

Unit	Dugan	Granite II	Lower Verde J	Mercer (Lower Verde F)	PM West	PM East	Phyllite	Polles	Unknown	Total
NW # 6		7		1	1	17	2		1	29
NW # 7		11				27	1		3	42
NW # 8		6				17			2	25
NW # 9	1	4				22	1		2	30
NW # 10					1	3				4
NW # 11		2	1		2	11	5			21
NW # 12		3				5				8
SW # 1		9				15	5		2	31
SW # 2		4			1	5			1	11
SW # 3						12	2		1	15
SW # 4		10	1			24	2		2	39
SW # 5	1	22			1	39	1	1	3	68
SW # 6	1	10	1			21	6		5	44
SW # 7		9			1	23	3			36
SW # 8		1				15	1	1	1	19
IF # 1		2				4				6
IF # 2		3				2				5
IF # 3						5				5
IF # 4						1				1
IF # 5		2				3				5
IF # 6						4				4
IF # 7						2				2
IF # 8		1					1			2
IF # 9		2								2
Total	11	273	6	2	18	526	63	5	51	955

Table B.11. Inventory of Tuzigoot Plain Ware by Temper Type.

Unit	Other Provenance Information	Gila Plain	Mercer (Lower Verde F)	MOCA	PM East	Phyllite	Polles	Prescott Gray	Prescott B/G	TUZI	Unknown	Total
TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")			2						27	3	32
TUZI 2554	Room III - 16 S Trench 4-6"	1		1						3	1	6
TUZI 198f	Grp I Block I upper stratum, box 2304	2		8				4		64	5	83
TUZI 2509	Grp I Block I second level		1	13		1		9	1	60	7	92
TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2			4	1			1		22	2	30
TUZI 198f	Grp I Block I upper stratum of strat block, bag 2 of 3			5			1	2		14	3	25
TUZI 2514	Grp III Rm 1 Strat Block 5, bag 1 of 2	3						3		7		13
TUZI 2506	Grp I Block I Str 4 Rm 10 Floor Fill			4			1	8		16	4	33
TUZI 2459	Grp III Rm 9			3			4	4		2	2	15
TUZI 2515	Grp 3 Rm 1, bottom of strat block 4, bag 2 of 4			2			2	2		2		8
TUZI 363f	Grp I Rm I Strat Block #5			4	1					5		10
TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2					1				14		15
TUZI 2504	Grp I Block I Second level		1	5			4			23	1	34
TUZI 2505	Grp I Block I Level 3							2	1	3		6
TUZI 2543	Room I-10 W Trench 0-6"below PGS							1		4	3	8
TUZI 2515	Grp 3 Rm 1, bottom of strat block 4						4	1		2	2	9
TUZI 2515	Grp 3 Rm 1, bottom of strat block 4			1				2		2		5
TUZI 2553	Room III - 16 0-4" S Wall			2						5	1	8
TUZI 2534				8	2		5			50	5	70
Unknown	Unknown						1			4		5
Total		6	2	62	4	2	22	39	2	329	39	507

APPENDIX C

DETAILED ANALYSIS CODING PACKET

Site Number

ASM numbers assigned to sites included in the project area.

Unit

Provenance code, typically assigned in the field.

Other Provenance

Additional provenance information for some samples.

Sherd Number

Each sherd chosen for detailed analysis is assigned a number.

Other Analysis

Used when selected for electron microprobe or petrographic thin-section analysis.

Other Sample Number

Record sample number used for additional specialized analyses.

Sherd Size

Table C.1 Sherd Size Classes.

Code	Description
1	Medium: 9-16 cm2
2	Large: Over 16 cm2
4	Same Vessel
99	Too small

Ware

Table C.2. Ceramic Wares.

Code	Description
1	Plain
2	Red
3	White-on-red
4	Other

Temper Type

Table C.3. Temper Types.

Code	Description
1	Perry Mesa East
2	Perry Mesa West
3	Dugan
4	Lower Verde Petrofacies J
5	Mercer/ Ister (Lower Verde Petrofacies F)
6	Polles
7	Tuzigoot
8	Montezuma Castle
9	Granite II
10	Phyllite
11	Other

Sherd Temper

Table C.4 Sherd Temper.

Code	Description
0	Not Visible
1	Visible
2	Indeterminate

Exterior Polish

Table C.5. Exterior Polish.

Code	Description
0	No visible surface treatment
1	Lustrous, no striations
2	Lustrous with striations
3	Striations, but not lustrous
4	Vitrified

Smudge

To be coded for the interior surface only. A smudged surface is black and both completely covers the interior surface of the sherd and exhibits evidence of polishing.

Table C.6. Smudge.

Code	Description
0	Absent
1	Present
2	Indeterminate

Creamy Interior

Table C.7. Creamy Interior.

Code	Description
0	Absent
1	Present
2	Indeterminate

Anvil Marks

Table C.8. Anvil Marks.

Code	Description
0	Absent
1	Present
2	Indeterminate

Overlapping Slabs

Table C.9. Overlapping Slabs.

Code	Description
0	Absent
1	Present
2	Indeterminate

Impressions

Table C.10. Impressions.

Code	Description
0	Absent
1	Textile
2	Basket
3	Other

Vessel Part

Table C.11. Vessel Part.

Code	Description
1	Body
2	Rim
3	Shoulder
4	Rim and shoulder
5	Handle
6	Rim and handle
7	Shoulder and handle
8	Rim, shoulder and handle
9	jar neck without rim
10	Basal cornerpoint

Vessel Form

The circumference of scoops is roughly elliptical, which makes their rim sherds readily distinguishable in most cases from the circular aperture of bowls and jars. The distinction between bowls and jars depends on the restriction of the orifice of jars, a restriction that is not present in bowls. Bowls are vessels where the maximum diameter occurs at the rim of the pot. To determine if a restriction exists, orient the rim sherd against a stiff piece of cardboard held at eye level and observe if the upper vessel wall curves inward.

Table C.12. Vessel Form.

Code	Description
1	Bowl
2	Jar
3	Scoop
4	Other
5	Wide-mouthed jar
6	Sherd plate
7	Cauldron
9	Indeterminate
-9	Not a rim sherd

Rim Angle

Rim angle refers to the relationship between the rim and neck/vessel wall. A "flared" rim is one which extends outward and increases the rim diameter over the orifice by 4 cm or more. "Outcurved" rims are outward also, but less so than flared rims. See Figure C.1.

Table C.13. Rim angle.

Code	Description
-9	Not a rim sherd
1	Straight (see figure)
2	Outcurved (see figure)
3	Flared (see figure)
4	Recurved (see figure)
5	Incurved (see figure)
6	Neckless Jar Rim (see figure)
9	Indeterminate

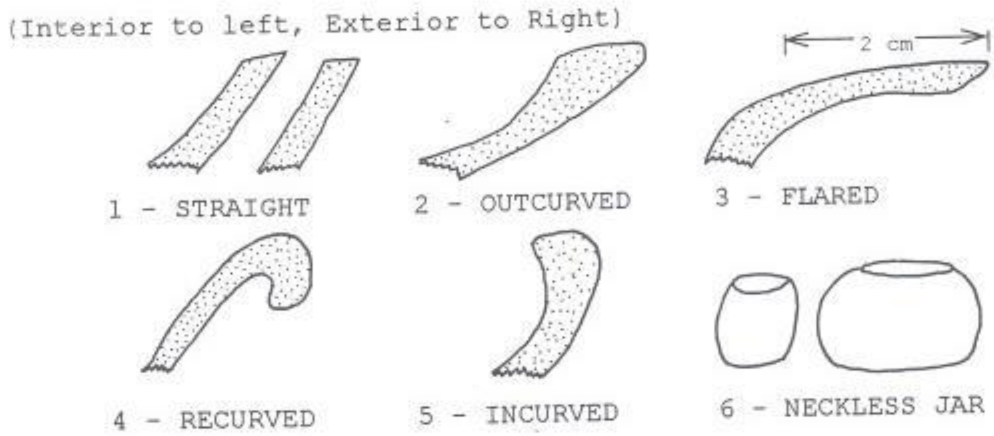

Figure C.1.Rim Angle.

Aperture Diameter

Should be measured where the diameter is at a minimum for jars, and where the orifice diameter is at a maximum for bowls (excludes outcurved and flared rim portion). Use the rim-sherd templates to measure to the closest two centimeters – even integers only. Only bowl and jar rim sherds with the top edge of the rim present and which can be properly oriented should be coded.

Jar Upper Wall Angle

Non-jar sherds coded as -9.

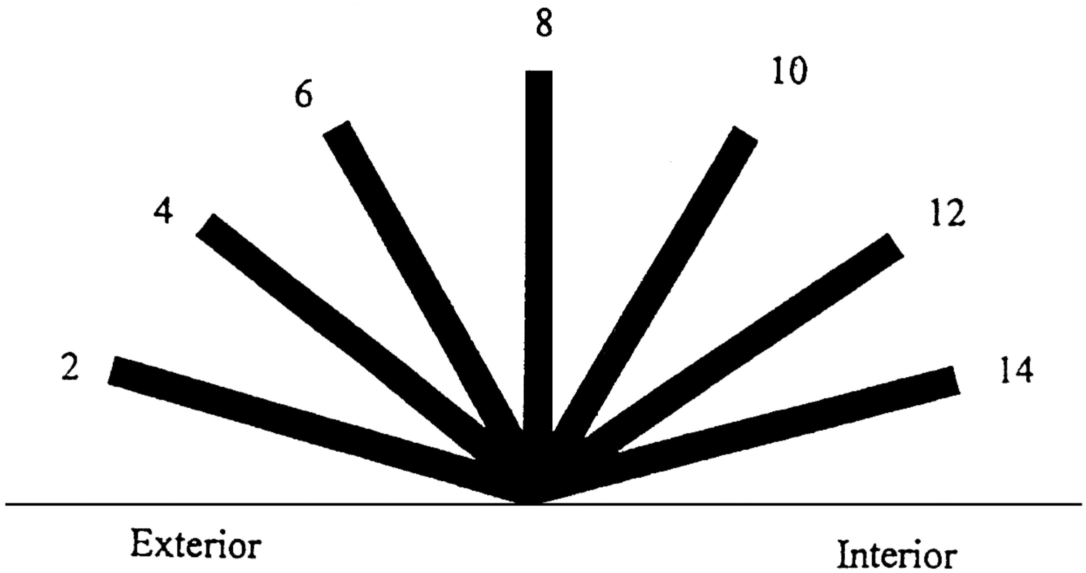

Figure C.2. Jar Upper Wall Angle.

Jar Shoulder Angle

A shoulder exists on all jars at the vessel's maximum diameter.

Table C.14. Jar Shoulder Angle.

Code	Description
-9	Not a shoulder sherd
1	Less Than 110°
2	110-115°
3	115-120°
4	Greater than 120°

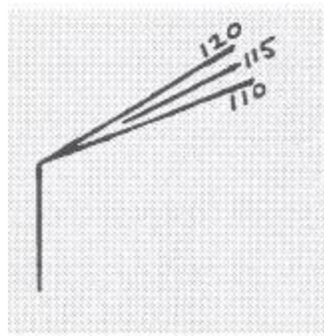

Figure C.3. Jar Shoulder Angle.

Jar Shoulder Sharpness

A shoulder exists on all jars at the vessel's maximum diameter. Compare the appropriate section of the sherd to the chart below. A "mold inset" is the joint formed from joining the upper vessel wall with a molded lower portion (Haury 1945:81-82).

Table C.15. Jar Shoulder Sharpness.

Code	Description
-9	Not a shoulder sherd
1	Very sharp (see figure)
2	Intermediate - sharp (see figure)
3	Intermediate - round (see figure)
4	Rounded (see figure)
5	Mold Inset

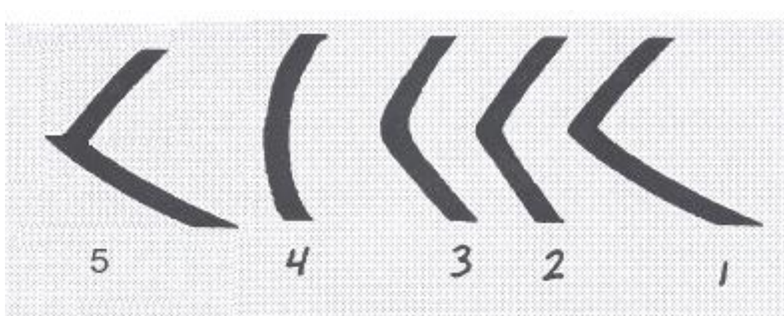

Figure C.4. Jar Shoulder Sharpness.

Jar Neck Completeness

Pertains to whether or not the vertical distance measured for the neck height includes the full distance from the top edge of the rim to the inflection point.

Table C.16. Jar Neck Completeness.

Code	Description
-9	Not a rim sherd
1	Complete
2	Incomplete
3	Neckless jar
9	Indeterminate

Jar Neck Height

The vertical distance from the top edge of the rim to the inflection point of the jar's profile. For incurved necks, measure from the lowest point of inflection. If the neck is incomplete, the vertical distance represented by the existing section should be measured. However, sherds missing the top edge of the rim [necks without rims] cannot be oriented properly, so such sherds should not be coded. Measure to the closest millimeter; neckless jars should be coded as zero.

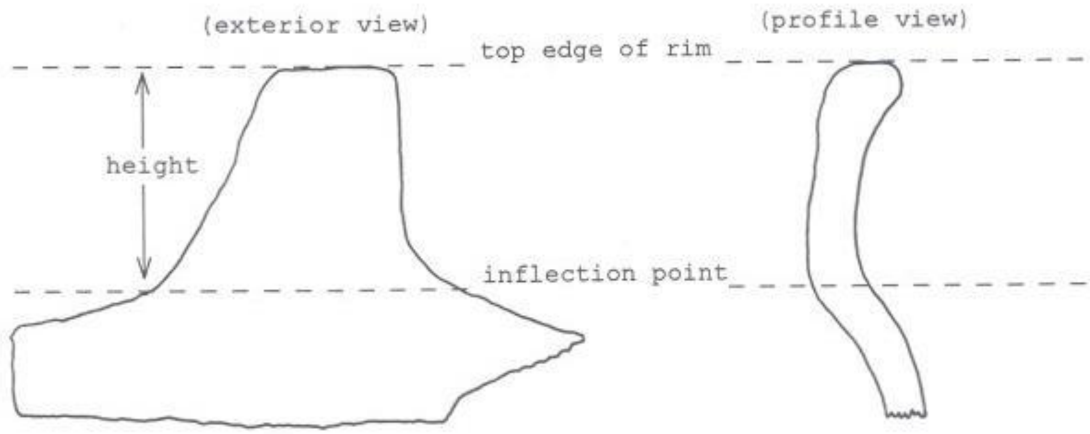

Figure C.5. Jar Neck Height.

Bowl Wall Angle

Measured for bowl rims only. The edge of the rim should be oriented so that it is parallel to the horizontal plane and the angle of the vessel wall should be determined with the chart below. Note: This measurement is for the vessel wall and not for the rim.

Table C.17. Bowl Wall Angle.

Code	Description
0	Not a bowl rim sherd
1	Deep (see figure)
2	Shallow (see figure)
3	Very Shallow (see figure
9	Indeterminate

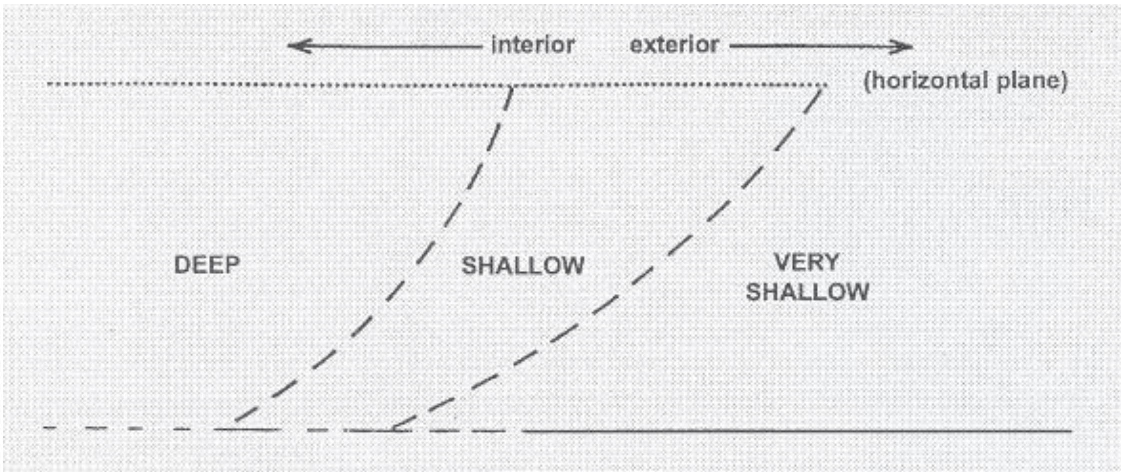

Figure C.6. Bowl Wall Angle.

APPENDIX D

DETAILED ANALYSIS

Table D.1. Detailed Analysis Data.

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Dugan	A2 Box 67		1	2	1	3	0	0	0	0	0	1	0	2	2	2	28	10	-9	-9	1	6	0
Dugan	A2 Box 68		1	2	1	4	0	0	0	0	0	0	0	2	2	2	44	10	-9	-9	1	11	0
Dugan	A4 Box 63		1	2	1	3	0	3	0	0	1	0	0	2	1	1	16	-9	-9	-9	-9	-9	1
Dugan	A4 Box 63		2	1	1	4	0	0	0	0	0	0	0	2	2	2	28	10	-9	-9	1	13	0
Dugan	A5 Box 39		1	2	1	9	0	2	0	0	0	0	0	2	2	2	30	12	-9	-9	1	10	0
Dugan	A5 Box 79		1	2	1	3	0	2	0	0	0	0	0	2	2	2	50	10	-9	-9	1	13	0
Dugan	A5 Box 79		2	2	1	3	0	1	0	1	1	0	0	2	2	2	40	10	-9	-9	1	22	0
Dugan	A6 Box 28		1	2	1	3	0	2	0	0	0	0	0	2	2	2	34	10	-9	-9	1	23	0
Dugan	A6 Box 29		1	2	1	4	0	0	1	0	0	0	0	2	2	2	22	10	-9	-9	1	13	0
Dugan	A6 Box 29		2	2	1	4	0	3	0	0	0	0	0	2	2	2	32	12	-9	-9	1	14	0
Dugan	A6 Box 29		3	2	1	3	0	2	0	0	0	0	0	2	2	2	36	10	-9	-9	1	13	0
Dugan	A6 Box 29		4	2	1	3	0	1	0	0	1	0	0	2	2	1	26	14	-9	-9	1	0	0
Dugan	A6 Box 31		1	2	1	9	0	2	0	0	0	0	0	2	2	1	26	10	-9	-9	1	22	0
Dugan	A7 Box 136		1	2	1	4	0	0	0	0	0	0	0	2	2	1	18	12	-9	-9	1	42	0
Dugan	A7 Box 33		1	2	1	4	0	0	0	0	0	0	0	2	2	1	12	14	-9	-9	1	15	0
Dugan	BA1 Box 103		1	2	1	3	0	1	0	0	1	0	0	2	2	1	32	14	-9	-9	1	0	0
Dugan	BA1 Box 25		1	2	1	3	0	2	0	0	1	1	0	2	2	1	30	8	-9	-9	2	52	0
Dugan	BA1 Box 25		2	2	1	3	0	0	0	0	0	0	0	2	2	1	20	14	-9	-9	1	18	0
Dugan	BA1 Box 25		3	2	1	3	0	1	1	0	1	1	0	2	2	1	36	10	-9	-9	1	11	0
Dugan	BA1 Box 25		4	2	1	4	0	0	0	0	0	0	0	2	2	1	22	10	-9	-9	1	10	0
Dugan	BA1 Box 25		5	2	1	4	0	3	1	0	0	0	0	2	2	2	28	12	-9	-9	1	24	0
Dugan	BA3 Box 27		1	1	1	7	1	2	0	0	0	0	0	2	1	1	16	-9	9	-9	-9	-9	2

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Dugan	BA3 Box 30		1	2	1	4	0	1	0	0	1	0	0	2	2	1	28	10	-9	-9	1	16	0
Dugan	BA3 Box 30		2	2	1	4	0	2	1	0	0	0	0	4	5	2	18	10	4	3	1	5	0
Dugan	BA3 Box 30		3	2	1	4	0	2	1	0	0	0	0	2	1	1	26	-9	-9	-9	-9	-9	1
Dugan	BA4 Box 16		1	2	1	4	0	1	0	0	0	0	0	2	1	1	24	-9	-9	-9	-9	-9	1
Dugan	BA4 Box 56		1	2	1	3	0	1	0	1	0	0	0	2	2	2	30	10	-9	-9	1	11	0
Dugan	BA4 Box 56		2	2	1	3	0	0	0	0	0	0	0	2	2	1	28	10	-9	-9	1	19	0
Dugan	BA4 Box 56		3	2	1	3	0	3	0	0	0	0	0	2	2	1	32	10	-9	-9	1	32	0
Dugan	BA4 Box 56		4	2	1	3	0	2	0	1	0	0	0	2	2	1	22	10	-9	-9	1	10	0
Dugan	BA4 Box 56		5	2	1	3	0	1	0	0	0	0	0	2	2	1	32	10	-9	-9	1	26	0
Dugan	BB1 Box 79		1	2	1	3	0	0	0	0	0	0	0	2	2	1	28	10	-9	-9	1	13	0
Dugan	BB1 Box 79		2	2	1	4	0	1	0	0	0	0	0	2	1	1	24	-9	-9	-9	-9	-9	1
Dugan	BB1 Box 79		3	2	1	4	0	3	0	0	1	1	2	2	2	2	18	10	-9	-9	1	13	0
Dugan	BB1 Box 79		4	1	1	4	0	2	1	0	0	0	0	2	5	1	18	10	-9	-9	1	6	0
Dugan	BB1 Box 79		5	2	1	4	0	2	1	0	0	0	0	2	5	2	30	10	-9	-9	1	8	0
Dugan	BB1 Box 79		6	2	1	4	0	3	0	0	0	0	0	2	2	1	26	10	-9	-9	1	9	0
Dugan	BB1 Box 79		7	2	1	4	0	3	1	0	1	0	0	2	2	1	20	10	-9	-9	1	31	0
Dugan	BB2 Box 41		1	2	1	4	0	1	0	0	0	1	0	2	2	1	18	10	-9	-9	1	45	0
Dugan	BB2 Box 42		1	2	1	3	0	1	1	0	0	0	0	4	5	1	16	12	1	2	1	0	0
Dugan	BB2 Box 42		2	2	1	4	0	1	0	0	0	0	0	2	2	1	26	12	-9	-9	1	12	0
Dugan	BB2 Box 42		3	2	1	4	0	1	0	0	0	0	0	2	2	1	24	10	-9	-9	1	24	0
Dugan	BB2 Box 79		1	1	1	1	0	0	0	0	0	0	0	2	2	1	24	10	-9	-9	1	0	0
Dugan	BB2 Box 79		1	1	1	5	0	0	0	0	0	0	0	2	2	2	28	10	-9	-9	1	7	0
Dugan	BB2 Box 79		1	2	1	3	0	1	0	0	0	0	0	2	2	1	16	10	-9	-9	1	17	0
Dugan	BB2 Box 79		2	2	1	3	0	1	0	0	0	0	0	2	2	2	26	10	-9	-9	1	9	0
Dugan	BB2 Box 79		3	2	1	3	0	2	0	1	1	0	0	2	2	2	14	12	-9	-9	1	8	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Dugan	BB2 Box 79		4	2	1	3	0	1	0	0	0	1	0	2	2	1	28	12	-9	-9	1	14	0
Dugan	BB2 Box 79		5	2	1	3	0	2	0	0	0	0	0	2	2	1	18	-9	-9	-9	1	0	0
Dugan	BB2 Box 79		6	2	1	3	0	1	1	0	0	0	0	2	5	1	34	10	-9	-9	1	7	0
Dugan	BB2 Box 79		7	2	1	3	0	1	0	0	0	0	0	2	2	1	24	12	-9	-9	1	0	0
Dugan	BB2 Box 79		8	2	1	3	0	1	0	0	1	0	0	2	2	1	20	12	-9	-9	1	6	0
Dugan	BB2 Box 79		9	1	1	4	0	1	1	0	0	0	0	2	2	2	28	12	-9	-9	1	11	0
Dugan	BB2 Box 79		10	2	1	4	0	2	0	0	0	0	0	2	2	1	26	10	-9	-9	1	21	0
Dugan	BB2 Box 79		11	1	1	4	0	3	0	0	0	0	0	2	2	1	18	10	-9	-9	1	16	0
Dugan	BB2 Box 79		12	2	1	4	0	1	0	0	0	0	0	2	2	1	26	10	-9	-9	1	19	0
Dugan	BB2 Box 79		13	2	1	4	0	2	0	0	0	0	0	4	5	2	18	10	4	3	1	6	0
Dugan	BB2 Box 79		14	2	1	4	0	3	0	0	0	0	0	2	2	2	30	12	-9	-9	1	17	0
Dugan	BB2 Box 79		15	1	1	5	0	2	1	0	0	0	0	2	2	1	18	12	-9	-9	1	22	0
Dugan	BB2 Box 79		16	1	1	5	0	2	1	0	0	0	0	2	5	1	20	10	-9	-9	1	5	0
Dugan	BB4 Box 79		1	2	1	3	0	1	0	1	0	0	0	2	2	1	46	10	-9	-9	1	16	0
Dugan	BB4 Box 79		2	2	1	4	0	2	1	0	0	0	0	2	5	2	24	10	-9	-9	1	17	0
Dugan	CA1 Box 79		1	2	1	10	0	0	0	0	0	0	0	2	2	1	14	8	-9	-9	2	51	0
Dugan	CA1 Box 79		2	2	1	3	0	2	1	0	0	0	0	2	5	1	16	10	-9	-9	1	4	0
Dugan	CA1 Box 79		3	2	1	3	0	0	0	0	0	1	0	2	2	1	16	14	-9	-9	1	13	0
Dugan	CA1 Box 79		4	2	1	4	0	0	2	0	0	0	0	2	2	2	22	14	-9	-9	1	44	0
Dugan	CA1 Box 79		5	2	1	4	0	1	0	0	0	0	0	2	2	1	20	10	-9	-9	1	18	0
Dugan	CA1 Box 79		6	2	1	4	0	3	0	0	0	0	0	2	2	2	28	12	-9	-9	1	15	0
Dugan	CA1 Box 79		7	2	1	4	0	3	1	0	0	0	0	2	2	2	24	12	-9	-9	1	19	0
Dugan	CA1 Box 79		8	1	1	4	0	0	1	0	0	0	0	2	2	1	18	12	-9	-9	1	16	0
Ister	North Mound 2		1	1	1	1	0	2	0	0	0	0	0	2	5	1	24	8	-9	-9	1	9	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Ister	North Mound 2		3	1	1	5	0	2	0	0	0	0	0	2	1	1	28	-9	-9	-9	-9	-9	1
Ister	South Mound 1		2	1	1	5	0	0	0	0	0	0	0	3	2	-9	-9	-9	4	3	-9	-9	0
Ister	South Mound 1		3	1	1	4	0	2	0	0	0	0	0	2	1	1	22	-9	-9	-9	-9	-9	3
Ister	South Mound 1		2	1	1	5	0	0	0	0	0	0	0	2	2	1	18	8	-9	-9	1	27	0
Ister	South Mound 1		3	1	1	5	0	0	0	0	1	0	0	2	2	1	-9	10	-9	-9	3	0	0
La Plata	East #4		1	1	1	1	0	2	0	0	0	1	0	2	2	2	26	10	-9	-9	1	25	0
La Plata	IF #3		1	1	1	3	0	1	2	0	0	0	0	2	5	2	40	10	-9	-9	1	15	0
La Plata	North #2		1	1	1	1	0	1	0	0	0	0	0	2	2	1	20	10	-9	-9	1	12	0
La Plata	North #9		1	1	1	2	0	2	0	0	1	0	0	2	1	1	26	-9	-9	-9	-9	-9	1
La Plata	South #6		1	1	1	2	0	3	0	0	0	0	0	2	2	2	24	6	-9	-9	1	15	0
La Plata	West #2		1	1	1	9	0	1	0	0	0	0	0	2	2	1	18	10	-9	-9	1	18	0
Mercer	Trash Mound		1	1	1	4	0	0	0	0	0	0	0	2	5	3	32	2	-9	-9	1	7	0
Mercer	Trash Mound		2	2	1	1	0	3	0	0	0	0	0	2	1	1	48	-9	-9	-9	-9	-9	1
Mercer	Trash Mound		1	1	1	5	0	0	0	0	0	0	0	5	2	-9	-9	-9	-9	-9	-9	-9	0
Mercer	Trash Mound		2	1	1	10	0	0	0	0	1	0	0	2	5	2	16	10	-9	-9	1	10	0
Mercer	Trash Mound		1	1	1	6	0	2	0	0	0	0	0	2	2	2	28	10	-9	-9	1	30	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Mercer	Trash Mound		2	2	1	5	0	0	0	0	1	1	0	3	2	-9	-9	-9	4	5	-9	-9	0
Mercer	Trash Mound		3	1	1	5	0	3	0	0	0	0	0	2	2	2	30	8	-9	-9	1	17	0
Mercer	Trash Mound		4	1	1	5	0	0	0	0	0	0	0	2	2	2	34	8	-9	-9	1	14	0
Mercer	Trash Mound		1	2	1	10	0	0	0	0	0	0	0	2	2	1	32	6	-9	-9	9	-9	0
Mercer	Trash Mound		2	1	1	10	0	0	0	0	0	0	0	2	2	2	34	6	-9	-9	1	7	0
Mercer	Trash Mound		3	1	1	4	0	3	0	0	0	0	0	2	1	1	26	-9	-9	-9	-9	-9	1
Mercer	Trash Mound		4	2	1	4	0	2	1	0	0	0	0	2	1	2	22	-9	-9	-9	-9	-9	1
MOCA	MOCA 1926	Castle A, test trench 8' down, bag 2 of 2	85	2	1	8	0	0	0	0	0	0	0	2	1	1	22	-9	-9	-9	-9	-9	1
MOCA	MOCA 1931	Castle A B" Trench 10 base of cliff 8'7"	87	2	1	8	0	3	0	0	0	0	0	2	2	1	28	12	-9	-9	1	23	0
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 1 of 2	78	2	1	7	1	1	0	0	0	0	0	3	-9	-9	-9	-9	4	4	-9	-9	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 1 of 2	79	2	1	7	1	0	0	0	1	0	0	2	2	2	20	10	-9	-9	1	22	0
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 1 of 2	80	1	1	8	0	0	0	0	0	0	0	2	1	1	16	-9	-9	-9	-9	0	2
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 1 of 2	81	1	1	8	0	1	0	0	0	0	0	2	2	1	18	10	-9	-9	1	15	0
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 2 of 2	82	1	1	8	0	1	0	0	0	0	0	2	1	1	36	-9	-9	-9	-9	-9	2
MOCA	MOCA 1932	Castle A, C trench 6, 8' 8", 2 of 2	84	1	1	7	1	2	1	0	0	0	0	2	1	5	28	8	-9	-9	-9	-9	1
MOCA	MOCA 1992	Montezuma Castle, talus trash, bag 1 of 2	86	2	1	1	0	1	0	0	1	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
MOCA	MOCA 547	Castle A, test trench 8' down, bag 2 of 2	83	2	1	7	1	2	2	0	1	1	0	3	-9	-9	-9	-9	4	4	-9	-9	0
MOCA	MOCA 547	Castle A, test trench C, 8' down, bag 1 of 2	95	2	1	7	1	3	0	0	0	0	0	2	3	1	-9	-9	-9	-9	-9	-9	2

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 553	Castle A, box 2 of 2	88	2	1	8	0	0	0	0	0	0	0	2	2	2	34	10	-9	-9	1	59	0
MOCA	MOCA 553	Castle A, box 1 of 2	89	2	1	10	0	0	0	0	0	0	0	2	1	1	22	-9	-9	-9	-9	-9	1
MOCA	MOCA 553	Castle A, box 1 of 2	90	2	1	8	0	0	0	0	0	1	0	2	2	2	32	10	-9	-9	1	63	0
MOCA	MOCA 553	Castle A, box 2 of 2	91	2	1	7	1	3	0	0	0	0	0	2	5	1	36	8	-9	-9	1	12	0
MOCA	MOCA 553	Castle A, box 2 of 2	92	2	1	8	0	0	0	0	0	0	0	2	2	2	-9	10	-9	-9	1	38	0
MOCA	MOCA 553	Castle A, box 1 of 2	93	2	1	8	0	0	0	0	1	0	0	2	2	2	34	10	-9	-9	1	16	0
MOCA	MOCA 553	Castle A, box 1 of 2	94	2	1	8	0	3	0	0	0	1	0	2	2	1	28	10	-9	-9	1	26	0
MOCA	MOCA 554	Castle A, Box 2 of 4	1	2	1	8	0	0	0	0	1	1	0	2	2	1	26	14	-9	-9	1	56	0
MOCA	MOCA 554	Castle A, Box 2 of 4	2	1	1	8	0	3	0	0	0	0	0	2	2	1	26	10	-9	-9	1	24	0
MOCA	MOCA 554	Castle A, Box 2 of 4	3	2	1	7	1	0	2	0	1	0	0	2	2	2	30	10	-9	-9	1	14	0
MOCA	MOCA 554	Castle A, Box 2 of 4	4	2	1	1	0	2	1	0	0	0	0	2	5	1	18	8	-9	-9	1	7	0
MOCA	MOCA 554	Castle A, Box 2 of 4	5	1	1	7	1	0	0	0	1	0	0	2	2	1	14	10	-9	-9	1	16	0
MOCA	MOCA 554	Castle A, Box 2 of 4	6	1	1	7	1	0	0	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	0	2

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 2 of 4	7	1	1	8	0	0	2	0	0	0	0	2	2	1	14	10	-9	-9	1	19	0
MOCA	MOCA 554	Castle A, Box 2 of 4	8	2	1	8	0	2	2	0	1	0	0	2	2	2	24	10	-9	-9	1	31	0
MOCA	MOCA 554	Castle A, Box 2 of 4	9	1	1	11	0	0	0	0	0	0	0	2	2	2	-9	10	-9	-9	1	18	0
MOCA	MOCA 554	Castle A, Box 1 of 4	10	2	1	8	0	0	0	0	0	0	0	2	2	1	26	10	-9	-9	1	31	0
MOCA	MOCA 554	Castle A, Box 4 of 4	11	1	1	8	0	0	0	0	0	0	0	2	2	2	22	10	-9	-9	1	22	0
MOCA	MOCA 554	Castle A, Box 4 of 4	12	2	1	8	0	0	0	0	1	0	0	2	2	2	24	10	-9	-9	1	36	0
MOCA	MOCA 554	Castle A, Box 4 of 4	13	2	1	8	0	0	0	0	1	0	0	2	2	1	28	12	-9	-9	1	48	0
MOCA	MOCA 554	Castle A, Box 4 of 4	14	2	1	8	0	2	0	0	0	0	0	2	2	1	16	10	-9	-9	2	-9	0
MOCA	MOCA 554	Castle A, Box 4 of 4	15	2	1	8	0	0	1	0	0	0	0	2	2	2	30	10	-9	-9	1	9	0
MOCA	MOCA 554	Castle A, Box 3 of 4	16	2	1	7	1	0	0	0	0	0	0	4	2	2	22	10	4	4	1	18	0
MOCA	MOCA 554	Castle A, Box 3 of 4	17	1	1	7	1	3	1	0	0	0	0	2	1	1	28	8	-9	-9	9	0	1
MOCA	MOCA 554	Castle A, Box 3 of 4	18	2	1	7	1	3	0	0	0	0	0	2	2	2	16	10	-9	-9	1	27	0
MOCA	MOCA 554	Castle A, Box 3 of 4	19	2	1	7	1	3	0	0	1	0	0	2	2	2	28	10	-9	-9	1	38	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 4 of 4	20	1	1	11	0	0	2	0	0	0	0	2	2	1	24	10	-9	-9	1	24	0
MOCA	MOCA 554	Castle A, Box 4 of 4	21	1	1	11	0	0	0	0	0	0	1	2	2	2	22	10	-9	-9	1	16	0
MOCA	MOCA 554	Castle A, Box 4 of 4	22	1	1	7	1	1	0	0	0	0	0	2	2	2	26	8	-9	-9	2	-9	0
MOCA	MOCA 554	Castle A, Box 4 of 4	23	1	1	7	1	0	0	0	1	0	0	2	2	3	-9	8	-9	-9	2	-9	0
MOCA	MOCA 554	Castle A, Box 4 of 4	24	2	1	7	1	1	0	0	0	0	0	2	2	3	28	10	-9	-9	1	67	0
MOCA	MOCA 554	Castle A, Box 4 of 4	25	1	1	1	0	0	0	0	1	0	0	2	2	2	32	10	-9	-9	1	34	0
MOCA	MOCA 554	Castle A, Box 4 of 4	26	2	1	8	0	0	0	0	0	1	0	2	2	2	20	10	-9	-9	1	23	0
MOCA	MOCA 554	Castle A, Box 4 of 4	27	2	1	8	0	0	0	0	0	0	0	2	2	1	14	10	-9	-9	1	14	0
MOCA	MOCA 554	Castle A, Box 4 of 4	28	2	1	8	0	0	0	0	0	0	0	2	2	2	26	10	-9	-9	1	17	0
MOCA	MOCA 554	Castle A, Box 4 of 4	29	2	1	8	0	0	0	0	0	0	0	2	2	2	24	12	-9	-9	1	14	0
MOCA	MOCA 554	Castle A, Box 3 of 4	30	1	1	10	0	1	0	0	0	0	0	2	5	2	38	8	-9	-9	-9	4	0
MOCA	MOCA 554	Castle A, Box 3 of 4	31	1	1	7	1	0	0	0	0	0	0	2	2	3	32	10	-9	-9	1	22	0
MOCA	MOCA 554	Castle A, Box 3 of 4	32	1	1	7	1	3	2	0	0	0	0	2	2	2	18	10	-9	-9	1	14	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 3 of 4	33	1	1	7	1	3	0	0	0	1	0	2	2	2	-9	10	-9	-9	1	26	0
MOCA	MOCA 554	Castle A, Box 3 of 4	34	4	1	8	0	3	0	0	0	1	0	2	2	2	36	12	-9	-9	1	15	0
MOCA	MOCA 554	Castle A, Box 3 of 4	35	2	1	8	0	0	0	0	1	0	0	2	2	1	30	10	-9	-9	1	18	0
MOCA	MOCA 554	Castle A, Box 3 of 4	36	2	1	8	0	0	0	0	0	0	0	2	2	1	20	12	-9	-9	1	11	0
MOCA	MOCA 554	Castle A, Box 3 of 4	37	1	1	8	0	1	0	0	0	0	0	2	2	1	22	10	-9	-9	1	18	0
MOCA	MOCA 554	Castle A, Box 3 of 4	38	2	1	8	0	1	0	0	0	1	0	2	2	2	16	12	-9	-9	1	25	0
MOCA	MOCA 554	Castle A, Box 3 of 4	39	1	1	8	1	1	0	0	0	0	0	2	2	1	-9	12	-9	-9	1	28	0
MOCA	MOCA 554	Castle A, Box 3 of 4	40	1	1	8	0	3	0	0	0	0	0	2	2	2	18	12	-9	-9	1	26	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	41	2	1	7	1	1	1	0	0	0	0	3	9	-9	-9	-9	2	2	-9	-9	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	42	1	1	7	1	0	0	0	0	0	0	2	2	1	14	10	-9	-9	1	16	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	43	2	1	7	1	2	1	0	0	0	0	2	5	2	18	8	-9	-9	1	8	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	44	2	1	8	1	0	0	0	1	1	0	2	2	1	20	12	-9	-9	1	34	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	45	2	1	8	0	0	0	0	0	0	0	2	2	1	40	10	-9	-9	1	23	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	46	1	1	8	0	1	0	0	0	0	0	2	1	1	26	-9	-9	-9	-9	-9	1
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	47	2	1	8	0	1	0	0	0	0	0	3	9	-9	-9	-9	4	3	-9	-9	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	48	2	1	8	0	1	0	0	1	0	0	2	2	2	40	10	-9	-9	1	32	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	49	1	1	8	0	3	0	0	0	0	0	2	2	2	26	12	-9	-9	1	14	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	50	1	1	8	0	0	0	0	0	0	0	2	2	1	-9	10	-9	-9	2	-9	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	51	1	1	8	0	0	1	0	0	0	0	2	2	1	18	10	-9	-9	1	26	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	52	1	1	10	0	3	0	0	0	0	0	2	5	1	-9	8	-9	-9	1	12	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	53	2	1	2	0	2	0	0	0	0	0	2	2	1	26	12	-9	-9	1	23	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	54	2	1	11	0	0	0	0	1	0	0	2	2	1	26	12	-9	-9	1	47	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	55	2	1	8	0	0	0	0	0	0	0	2	2	3	34	-9	-9	-9	-9	-9	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	56	2	1	8	0	0	0	0	0	0	1	2	2	2	32	10	-9	-9	1	15	0
MOCA	MOCA 554	Castle A, Box 1,2, and 3 of 4	57	2	1	11	0	1	0	0	0	0	0	2	5	2	28	8	-9	-9	1	14	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	58	2	1	7	1	2	0	0	1	0	0	2	5	2	18	8	-9	-9	1	19	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	59	2	1	8	0	1	0	0	0	0	0	2	2	1	20	12	-9	-9	1	33	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	60	2	1	8	0	0	0	0	1	0	0	2	2	2	30	10	-9	-9	1	24	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	61	2	1	8	0	0	0	0	0	0	0	2	2	2	16	12	-9	-9	1	65	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	62	2	1	8	0	0	0	0	0	0	0	2	5	1	42	10	-9	-9	1	21	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	63	2	1	8	0	0	0	0	0	0	0	2	2	1	26	10	-9	-9	1	32	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	64	2	1	8	0	0	0	0	0	0	0	2	5	1	44	10	-9	-9	1	18	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	65	1	1	8	0	0	0	0	1	0	0	2	5	1	24	8	-9	-9	1	11	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	66	1	1	8	0	0	0	0	0	0	0	2	2	2	16	10	-9	-9	1	13	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	67	1	1	8	0	3	0	0	0	0	0	2	2	1	20	12	-9	-9	1	17	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	68	2	1	8	0	0	0	0	1	0	0	2	2	1	22	14	-9	-9	1	18	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	69	2	1	8	0	0	2	0	0	0	0	2	2	3	26	10	-9	-9	1	44	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	70	2	1	8	0	1	0	0	0	0	0	2	2	2	34	10	-9	-9	1	33	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	71	2	1	8	0	0	0	0	0	0	0	2	2	2	-9	12	-9	-9	1	31	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	72	2	1	8	0	0	0	0	0	1	0	2	2	1	26	12	-9	-9	1	30	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	73	2	1	2	0	0	0	0	0	0	0	2	2	1	28	12	-9	-9	1	52	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	74	2	2	8	0	1	0	0	1	0	0	2	2	2	18	10	-9	-9	1	29	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	75	1	1	8	0	0	0	0	0	0	0	2	2	1	20	12	-9	-9	1	9	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	76	1	1	8	0	0	0	0	0	0	0	2	2	1	36	10	-9	-9	1	13	0
MOCA	MOCA 554	Castle A, Box 1 and 2 of 4	77	2	1	2	0	2	0	0	1	0	0	2	2	1	40	10	-9	-9	1	21	0
Mujeres	Corner #5		1	1	1	1	0	0	0	0	0	0	0	2	2	1	18	10	-9	-9	1	12	0
Mujeres	North #1		1	1	1	10	0	0	0	0	0	0	0	2	1	1	26	-9	-9	-9	-9	-9	1
Pato	IF 18		1	2	1	1	0	2	0	0	0	0	0	2	2	1	26	10	-9	-9	1	15	0
Pato	IF 19		1	2	1	11	1	1	0	0	0	0	0	2	2	1	24	12	-9	-9	1	20	0
Pato	IF 21		1	2	1	1	0	0	0	0	0	0	0	2	2	1	30	10	-9	-9	1	12	0
Pato	Midden East of pueblo		1	2	1	2	0	1	0	0	1	1	0	2	2	1	16	12	-9	-9	1	-9	0
Pato	Midden East of pueblo		2	1	1	9	0	2	0	0	0	0	0	2	1	1	22	-9	-9	-9	-9	-9	1

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
Polles	IF 1		1	2	1	6	0	3	0	0	0	0	0	2	2	3	16	14	-9	-9	1	39	0
Polles	IF 1		2	2	1	6	0	3	0	0	1	0	0	2	1	1	28	-9	-9	-9	-9	-9	2
Polles	IF 1		3	2	1	6	0	2	1	0	0	0	0	2	5	2	32	8	-9	-9	1	14	0
Polles	IF 1		4	2	1	6	0	2	1	0	0	0	0	2	5	2	24	10	-9	-9	1	6	0
Polles	IF 1		5	2	1	6	0	2	1	0	0	0	0	2	5	2	28	10	-9	-9	1	12	0
Polles	IF 14		1	2	1	6	0	2	0	0	1	0	0	2	2	1	28	8	-9	-9	1	23	0
Polles	IF 14		2	2	1	6	0	1	0	0	0	0	0	2	2	2	30	6	-9	-9	1	6	0
Polles	IF 2		1	2	1	6	0	1	0	0	0	0	0	2	1	1	40	-9	-9	-9	-9	-9	1
Polles	IF 2		2	2	1	6	0	2	1	0	0	0	0	2	5	2	24	2	-9	-9	1	13	0
Polles	IF 20		1	2	1	6	0	-9	0	0	0	0	0	2	2	1	22	10	-9	-9	1	16	0
Polles	IF 20		2	2	1	6	0	1	0	0	0	0	0	2	2	1	22	12	-9	-9	1	14	0
Polles	IF 20		3	2	1	6	0	3	0	0	0	0	0	2	2	2	22	12	-9	-9	1	13	0
Polles	IF 28		1	2	1	4	0	3	0	0	0	1	0	2	2	1	26	10	-9	-9	1	83	0
Polles	IF 29		1	2	1	6	0	2	0	0	0	0	0	2	1	1	40	-9	-9	-9	-9	-9	2
Polles	IF 9		1	2	1	11	0	3	0	0	0	0	0	2	2	2	28	4	-9	-9	1	31	0
Richinbar	East 2		1	1	1	1	0	1	0	0	1	0	0	2	2	1	24	10	-9	-9	1	6	0
Richinbar	IF #10		1	2	1	1	0	2	0	0	1	0	0	2	2	2	16	10	-9	-9	1	23	0
Richinbar	IF #7		1	2	1	2	0	1	0	0	0	0	1	2	1	2	16	-9	-9	-9	-9	-9	1
Rosalie	IF #8		1	1	1	10	0	2	0	0	0	0	0	2	2	1	38	10	-9	-9	1	15	0
Rosalie	NE #1		1	1	1	2	0	1	0	0	0	0	0	2	2	1	26	10	-9	-9	1	11	0
Rosalie	NE #1		2	1	1	3	0	1	0	0	0	0	0	2	2	1	18	10	-9	-9	1	8	0
Rosalie	NE #4		1	1	1	1	0	2	0	0	0	0	0	2	1	1	32	-9	-9	-9	-9	-9	2
Rosalie	NW #2		1	2	1	9	0	1	0	0	0	0	0	2	1	5	28	-9	-9	-9	-9	-9	1
Rosalie	NW #7		1	2	1	1	0	2	0	0	0	0	0	2	2	1	26	10	-9	-9	1	10	0
Rosalie	SW #5		1	1	1	10	0	1	0	0	0	0	0	2	2	2	38	10	-9	-9	1	4	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 198f	Grp I Block I upper stratum of strat block, bag 2 of 3	38	1	1	7	1	1	1	0	0	0	0	3	-9	-9	-9	-9	4	3	-9	-9	0
TUZI	TUZI 2459	Grp III Rm 9	67	2	1	6	0	1	0	0	1	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2459	Grp III Rm 9	68	2	1	6	1	2	0	0	1	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2459	Grp III Rm 9	69	1	1	6	0	1	0	0	0	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2504	Grp I Block I Second level	56	1	1	7	1	0	0	0	0	0	0	2	1	2	-9	-9	-9	-9	-9	-9	1
TUZI	TUZI 2504	Grp I Block I Second level	57	1	1	7	1	0	0	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	-9	9
TUZI	TUZI 2505	Grp I Block I Level 3	58	1	4	11	0	3	0	0	0	0	0	2	1	1	28	-9	-9	-9	-9	-9	9
TUZI	TUZI 2505	Grp I Block I Level 3	59	1	1	7	1	2	1	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	-9	9
TUZI	TUZI 2506	Grp I Block I Str 4 Rm 10 Floor Fill	39	2	1	7	1	3	0	0	0	1	0	2	2	1	22	14	-9	-9	1	21	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2506	Grp I Block I Str 4 Rm 10 Floor Fill	40	2	1	7	1	1	0	0	0	0	0	2	2	1	30	10	-9	-9	1	37	0
TUZI	TUZI 2506	Grp I Block I Str 4 Rm 10 Floor Fill	41	1	1	7	1	1	0	0	0	0	0	2	1	1	24	-9	-9	-9	-9	-9	1
TUZI	TUZI 2506	Grp I Block I Str 4 Rm 10 Floor Fill	42	1	1	7	1	2	0	0	0	1	0	2	2	1	24	10	-9	-9	1	16	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	14	1	1	7	1	3	2	0	0	0	0	2	2	1	16	10	-9	-9	1	20	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	15	2	1	7	1	3	0	0	1	0	0	2	2	1	28	10	-9	-9	1	21	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	16	1	1	7	1	1	1	0	0	0	0	2	2	1	-9	12	-9	-9	1	15	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	17	2	1	7	1	1	0	0	0	0	0	2	5	1	50	8	-9	-9	1	14	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	18	2	1	7	1	3	0	0	0	1	0	2	2	1	36	10	-9	-9	2	-9	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	19	1	1	7	1	2	0	0	1	0	0	2	4	6	12	14	-9	-9	1	0	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	20	2	1	7	1	2	1	0	0	0	0	2	5	1	32	8	-9	-9	1	13	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	21	1	1	7	1	3	0	0	0	0	0	2	2	1	42	10	-9	-9	1	22	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	22	1	1	7	1	3	1	0	0	0	0	2	5	1	26	8	-9	-9	1	9	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	23	2	1	7	1	3	0	0	0	1	0	2	5	1	18	8	-9	-9	1	21	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	24	2	1	7	1	1	0	0	0	0	0	2	2	1	34	10	-9	-9	1	24	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	25	1	1	7	1	3	0	0	0	0	0	2	2	1	26	10	-9	-9	1	12	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	26	1	1	7	1	0	0	0	0	0	0	2	2	1	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	27	1	4	11	1	3	2	0	0	1	0	2	5	1	36	8	-9	-9	1	11	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	28	4	1	7	1	3	0	0	1	1	0	2	2	1	14	12	-9	-9	1	13	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	29	1	1	8	0	1	0	0	0	0	0	2	1	1	32	-9	-9	-9	-9	-9	1
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	30	2	1	8	1	3	0	0	1	0	0	2	1	1	22	-9	-9	-9	-9	-9	9
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	31	2	1	7	1	3	0	0	0	1	0	2	2	2	18	10	-9	-9	1	29	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	32	1	1	8	0	1	2	0	0	0	0	2	2	1	22	12	-9	-9	1	22	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	33	2	1	8	0	2	0	0	0	0	0	2	2	1	28	12	-9	-9	1	17	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	34	2	1	7	1	3	0	0	0	0	0	2	2	1	38	12	-9	-9	1	21	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	35	1	1	7	1	0	0	0	0	0	0	2	5	1	24	8	-9	-9	1	7	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	36	1	1	1	0	3	0	0	0	0	0	2	2	1	14	10	-9	-9	1	18	0
TUZI	TUZI 2508	Grp I Rm 2 2nd level below floor (below 2'8"), bag 1 of 2	37	2	1	11	0	2	0	0	0	1	0	2	2	1	22	10	-9	-9	1	29	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	43	1	1	10	0	0	0	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	-9	2
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	44	1	1	7	1	3	0	0	0	0	0	2	2	2	32	8	-9	-9	1	13	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	45	1	1	7	1	1	1	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	-9	1
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	46	1	1	7	1	1	0	0	0	0	0	2	2	1	26	10	-9	-9	1	22	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	47	1	1	7	1	3	0	0	1	0	0	2	2	1	26	10	-9	-9	1	12	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	48	1	1	7	1	2	0	0	0	0	0	2	1	1	20	-9	-9	-9	-9	-9	1
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	49	1	4	7	1	2	0	0	0	0	0	2	1	1	-9	-9	-9	-9	-9	-9	1
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	50	2	1	7	1	2	1	0	1	0	0	2	2	1	-9	12	-9	-9	1	41	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	51	1	1	7	1	2	0	0	0	0	0	2	2	1	26	-9	-9	-9	-9	-9	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	52	1	1	7	1	1	1	0	0	1	0	2	1	1	-9	-9	-9	-9	-9	-9	1
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	53	1	1	7	1	3	2	0	0	0	0	2	2	1	-9	10	-9	-9	1	11	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	54	1	1	7	1	1	1	0	0	0	0	2	2	1	-9	12	-9	-9	1	11	0
TUZI	TUZI 2508	Grp I Rm 2 to 2'8" below floor bag 2 of 2	55	1	1	7	1	3	2	0	0	0	0	2	2	2	20	10	-9	-9	1	15	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	1	2	1	7	1	3	1	0	0	0	0	2	2	1	26	10	-9	-9	1	34	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	2	1	1	11	1	2	1	0	0	0	0	2	5	1	34	8	-9	-9	1	11	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	3	1	1	7	1	1	1	0	0	0	0	2	5	1	-9	8	-9	-9	1	19	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	4	1	1	7	1	3	0	0	0	1	0	2	2	1	26	10	-9	-9	1	24	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	5	2	1	7	1	3	2	0	0	0	0	2	2	1	-9	-9	-9	-9	1	29	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	6	1	1	7	1	3	0	0	0	0	0	2	2	1	30	10	-9	-9	1	21	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	7	1	1	7	1	1	1	0	0	0	0	2	1	1	30	-9	-9	-9	-9	-9	1
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	8	1	1	7	1	0	0	0	0	0	0	3	-9	-9	-9	-9	3	3	-9	-9	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	9	2	1	7	1	2	0	0	0	0	0	2	3	-9	-9	-9	-9	-9	-9	-9	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	10	1	1	7	1	2	0	0	0	0	0	2	5	2	30	8	-9	-9	1	11	0
TUZI	TUZI 2509	Grp I Rm 2 2nd level below floor (below 2'8")	11	1	1	11	1	1	1	0	0	0	0	2	1	1	20	-9	-9	-9	-9	-9	0
TUZI	TUZI 2509	Grp I Block I second level, bag 1 of 2	12	1	1	7	1	0	1	0	0	0	0	2	1	1	30	-9	-9	-9	-9	-9	1
TUZI	TUZI 2509	Grp I Block I second level, bag 1 of 2	13	2	4	11	0	2	0	0	0	0	0	2	2	1	18	10	-9	-9	1	19	0
TUZI	TUZI 2534		61	1	1	7	1	3	2	0	0	0	0	2	2	2	-9	10	-9	-9	1	8	0
TUZI	TUZI 2534		62	1	1	1	0	1	0	0	0	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2534		63	1	1	8	0	1	0	1	0	0	0	7	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2534		64	1	1	6	1	1	0	0	0	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2534		65	1	1	6	1	0	0	0	0	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0
TUZI	TUZI 2553	Room III - 16 0-4" S Wall	60	1	1	7	1	3	0	0	0	0	0	2	2	1	24	10	-9	-9	1	19	0

Site	Primary Provenance	Other Provenance	Sherd #	Sherd Size	Ware Type	Temper Type	Sherd Temper	Exterior Polish	Smudge	Creamy Interior	Anvil Marks	Overlapping Slabs	Impressions	Vessel Part	Vessel Form	Rim Angle	Aperture Diameter	Jar Upper Wall Angle	Jar Shoulder Angle	Jar Shoulder Sharpness	Jar Neck Completeness	Jar Neck Height	Bowl Wall Angle
TUZI	TUZI 363f	Grp I Rm I Strat Block #5	66	2	1	1	0	0	0	0	1	0	0	1	-9	-9	-9	-9	-9	-9	-9	-9	0

APPENDIX E

DISTRIBUTION OF SALADO POLYCHROME IN CENTRAL ARIZONA

Table E.1. Middle Verde Salado Polychrome.

Site	Observation Type	Salado Polychrome	Reference
Bridgeport	?	1	Pilles 2015
Montezuma Castle*	Excavation	3	Jackson and Van Valkenburgh 1954:43
Spring Creek Ruin	Survey	3	Schroeder 1960:Figure 1
Tuzigoot	Excavation	6	Caywood and Spicer 1935:48
Total		13	

* 14 sherds from 3 vessels (Pilles 2015)

Table E.2. Perry Mesa Salado Polychrome.

Site	Observation type	Salado Polychrome	Reference
Baby Canyon Ruin	Survey	5	Wilcox and Holmlund 2007:Appendix E
MNA Collections near Baby Canyon (3 sites)	Surface Collection	3	Wilcox and Holmlund 2007:Appendix E
Badger Springs	Excavation	220	North 2002:34; Wilcox and Holmlund 2007:Appendix B, Appendix E
Big Brooklyn	Survey	1	Wilcox and Holmlund 2007:Appendix E
Pilles Brooklyn Basin (8 sites)	Survey	6	Wilcox and Holmlund 2007:Appendix B

Site	Observation type	Salado Polychrome	Reference
Big Rosalie	Surface Collection, Survey	13	Shockey and Watkins 2009b:12; Wilcox and Holmlund 2007:Appendix B, Appendix E
MNA Collections on Black Mesa (5 sites)	Surface Collection	66	Wilcox and Holmlund 2007:Appendix E
Lousy Canyon	Excavation	1	Wilcox and Holmlund 2007:Appendix E
MNA Collections near Perry Tank Canyon (6 sites)	Surface Collection	80	Wilcox and Holmlund 2007:Appendix E
MNA/ASM Collections in Brooklyn Basin and Rosalie (18 sites)	Surface Collection	18	Wilcox and Holmlund 2007:Appendix E
Navajo Project (9 small Sites)	Excavation	54	Fiero et a. 1980:93
Pueblo La Plata and adjacent fieldhouses	Surface Collection, Survey	129	Kruse-Peeples et al. 2009; Shockey and Watkins 2009a:9; Wilcox and Holmlund 2007:Appendix E
Pueblo Pato	Surface Collection, Survey	20	Shockey and Watkins 2009a:9; Kruse-Peeples et al. 2009:132; Wilcox and Holmlund 2007:Appendix E
Richinbar Ruin and adjacent small sites	Surface Collection	79	Shockey and Watkins 2009a:9; Wilcox and Holmlund 2007:Appendix B
Las Mujeres (Squaw Creek Ruin)	Surface Collection	3	Wilcox and Holmlund 2007:Appendix E
Total		698	

Table E.3. Bloody Basin Salado Polychrome.

Site	Observation type	Salado Polychrome	Reference
AR-03-12-01-603	Survey	Present	J. Scott Wood unpublished site notes
AR-03-12-01-62; AZ O:13:10 (ASM)	Survey	Present	J. Scott Wood unpublished site notes
AZ O:13:14(ASM)	Surface Collection	7	Wilcox and Holmlund 2007:Appendix E
AZ O:13:15(ASM)	Surface Collection	1	Wilcox and Holmlund 2007:Appendix E
AZ O:13:7(ASM)	Surface Collection	2	Wilcox and Holmlund 2007:Appendix E
Bloody Racetrack (AR-03-12-01-650)	Survey	Present	J. Scott Wood unpublished site notes
Cavness Ranch (AR-03-12-01-629)	Survey	Present	J. Scott Wood unpublished site notes
Cottonwood Spring (AR-03-12-01-1116)	Survey	Present	J. Scott Wood unpublished site notes
CP Butte (AR-03-12-01-630)	Survey	Present	Courtright and Neily 2012
Dane's Dam (AR-03-12-01-345)	Survey	Present	J. Scott Wood unpublished site notes
Doorway (AR-03-12-01-1523)	Survey	Present	J. Scott Wood unpublished site notes
Dugan Ranch Ruin	Excavation	200	Unpublished analysis in posession of the author
Ft. Metate (AR-03-12-01-1514)	Survey	Present	J. Scott Wood unpublished site notes
Holmes (AR-03-12-01-1772)	Survey	Present	J. Scott Wood unpublished site notes
Lookout (AR-03-12-01-1; AZ O:13:13 [ASM])	Surface Collection	3	Wilcox and Holmlund 2007:Appendix E
MT Ranch (AR-03-12-01-200)	Survey	Present	J. Scott Wood unpublished site notes
Mud Springs Ruin	Surface Collection	6	Wilcox and Holmlund 2007:Appendix E
Peet's Spring (NA28349)	Survey	Present	J. Scott Wood unpublished site notes
Pigeon Spring (AR-03-12-01-1877)	Survey	Present	J. Scott Wood unpublished site notes
Racetrack (AR-03-12-01-1486)	Survey	Present	J. Scott Wood unpublished site notes
Sheep Bridge Road (AR-03-12-01-583)	Survey	Present	J. Scott Wood unpublished site notes

Site	Observation type	Salado Polychrome	Reference
Stone Camp (AR-03-12-01-560)	Survey	Present	Courtright and Neily 2012
Stone Camp East (AR-03-12-01-2121)	Survey	Present	Courtright and Neily 2012
Total		219	

Table E.4. Polles Salado Polychrome.

Site	Observation type	Salado Polychrome	Reference
Black Ridge Ruin (AR-03-12-01-52)**	Survey	35	North et al. 2003
Boulder Canyon Ruin	?	1	Pilles 2015
East Verde Ruin (AR-03-12-04-45)**	Survey	35	North et al. 2003
Fossil Creek Ruin (AR-03-04-01-521)**	Survey	35	North et al. 2003; Pilles 2015; Wilcox et al. 2001b:176
Judge's Stand	Survey	Present	Wilcox et al. 2001b:182
Polles Pueblo	Surface Collection	95	Shockey and Watkins 2009b:12; Wilcox and Holmlund 2007:Appendix E
Salome Ruin	?	1	Pilles 2015
Squaw Butte Ruin (AR-03-12-01-296)	Survey	1	North et al. 2003
Strawberry Ranch	Surface Collection	9	Wilcox and Holmlund 2007:Appendix E
Verde Hot Springs Ruin	Survey	3	Wilcox and Holmlund 2007:Appendix E
Warm Springs Ruin (AR-03-12-01-590)**	Survey	35	North et al. 2003
Total		250	

** Quantities not given in the text, but Chris North (personal communication, 2016) estimates between 20-50 sherds per site

Table E.5. Lower Verde Salado Polychrome.

Site	Observation type	Salado Polychrome	Reference
AR-03-12-01-646	Survey	5	North et al. 2003
AZ O:14:100 (ASU)	Surface Collection	6	Lerner 1984:306
AZ O:14:153 (ASU)	Surface Collection	4	Lerner 1984:306
AZ O:14:31 (ASM)	Surface Collection	3	Lerner 1984:306
AZ O:14:73 (ASM)	Surface Collection	1	Neily and Donata 1993
AZ O:14:88 (ASM)	Surface Collection	1	Neily and Donata 1993
AZ O:14:90 (ASM)	Surface Collection	9	Neily and Donata 1993
AZ O:14:98 (ASU)	Surface Collection	7	Lerner 1984:306
Davenport Ruin (AZ U:2:171 [ASU])	Excavation	31	Lerner 1984:306
Dry Creek Ruin	?	1	Wilcox and Holmlund 2007:Appendix E
Howard Ruin (AZ U:2:1 [ASM])	Surface Collection	19	Lerner 1984:306
Ister Flat (AZ O:14:64 [ASU])	?	5	Lerner 1984:306; Wilcox and Holmlund 2007:Appendix E
KA Ranch Ruin (AZ U:2:5 [ASM], AZ U:2:307 [ASU])	Surface Collection	8	Lerner 1984:306
Little House Ruin	Excavation	1	Whittlesey and Montgomery 1997
Mercer (AZ O:14:1 [ASM])	Surface Collection	56	Lerner 1984:306; Wilcox and Holmlund 2007:Appendix E
Mule Shoe Bend (AR-03-12-01-595)	Survey	250	North et al. 2003
Mullen Wash Ruin	Surface Collection	Present	Arizona Site Steward File
Red Creek Ruin (AR-03-12-01-58)**	Survey	35	North et al. 2003
Roadhouse Ruin	Excavation	3	Whittlesey and Montgomery 1997
The Citadel (AZ U:2:126 [ASU])	Surface Collection	2	Lerner 1984:306

Site	Observation type	Salado Polychrome	Reference
Verde 14:17	?	1	Wilcox and Holmlund 2007:Appendix E
Total		448	