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From the Southwest and Northern Mexico to the Southeast, and the Southern Plains: American Indian Ceramics in Texas

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Several articles in this volume of the *Bulletin of the Texas Archeological Society* concern the origins, development, and fluorescence of American Indian pottery and pottery traditions by cultural areas and temporal periods across the state of Texas, from prehistoric times to after European contact in the 17th century (Figure 1). They are a summary of what is currently know about aboriginal ceramics in most of what is now the state of Texas, and an illustration of its cultural diversity both spatially and temporally.

The manufacture and use of ceramic vessels by American Indian groups that lived in what is Texas is a common and widespread feature of distinctive archeological assemblages on sites across much of Texas (see Figure 1). The variety and diversity of ceramic forms, decorations, manufacturing techniques, and functions is outstanding among the native groups, ranging from coastal Goose Creek and Rockport pottery; the Toyah and Henrietta ceramics of the buffalo hunters and farmers of the prairie-plains and Hill Country; the Puebloan and Antelope Creek ceramics of the Panhandle farmers and buffalo hunters; the impressive Jornada Mogollon ceramics of the El Paso area Puebloan groups; and the well-made and finely decorated ceramics of the Caddo groups that lived in East Texas. Despite what is known about the distribution of ceramics in Texas archeological sites, the relationship between Prehistoric and Historic cultural and technological ceramic traditions has yet to be fully established across much of the state, except perhaps for the clear continuity between prehistoric and historic Caddo ceramic traditions in East Texas.

The use of ceramics by American Indians in Texas began as early as ca. 500 B.C. in parts of East Texas and Southeast Texas, and then continued to be used until as late as the nineteenth century among a number of different groups across the state (Table 1). In much of the state, the manufacture of pottery did not begin until as late as the 8th century A.D. and even later in the la Junta area and the Lower Pecos. By ca. A.D. 1200-1300, ceramics were a very significant part of the material culture of aboriginal peoples—including mobile hunter-gatherers as well as sedentary farmers—in Southeast and coastal Texas, among Caddo and Jornada Mogollon groups, and among the Plains Village communities in the Texas Panhandle and the North Central Texas prairies.

While we have a good working knowledge of the ages and durations of the various ceramic traditions in Texas, for more detailed considerations of the age of specific sites with ceramics, as well as the rapidity and tempo of ceramic assemblage changes, more refined approaches are needed to establish with precision the absolute age of Native ceramics. First, this can be done by the application of modern statistical analyses to radiocarbon dating of AMS samples from occupations with features associated with ceramics, as well as the direct dating of the ceramics themselves or the dating of organic residues adhering to vessels and sherds. Sites with 10-20 radiocarbon assays are suited for an analysis of 14C dates using a Bayesian modeling approach. This methodology is now quite widely used and well accepted and permits one to speak with statistical confidence about chronological relationships. Future analyses of large suites of radiocarbon dates from aboriginal sites in Texas with ceramics may want to consider Bayesian methods in calibrating radiocarbon dates from various archeological contexts, for establishing refined chronological estimates of the construction of specific features, as well as the probable duration of different occupations (Bronk Ramsey 2009; Levy et al. 2008; Kidder et al. 2010:131-132, 142). Secondly, the luminescence dating of ceramics has been applied with some considerable success in a variety of settings—and on different

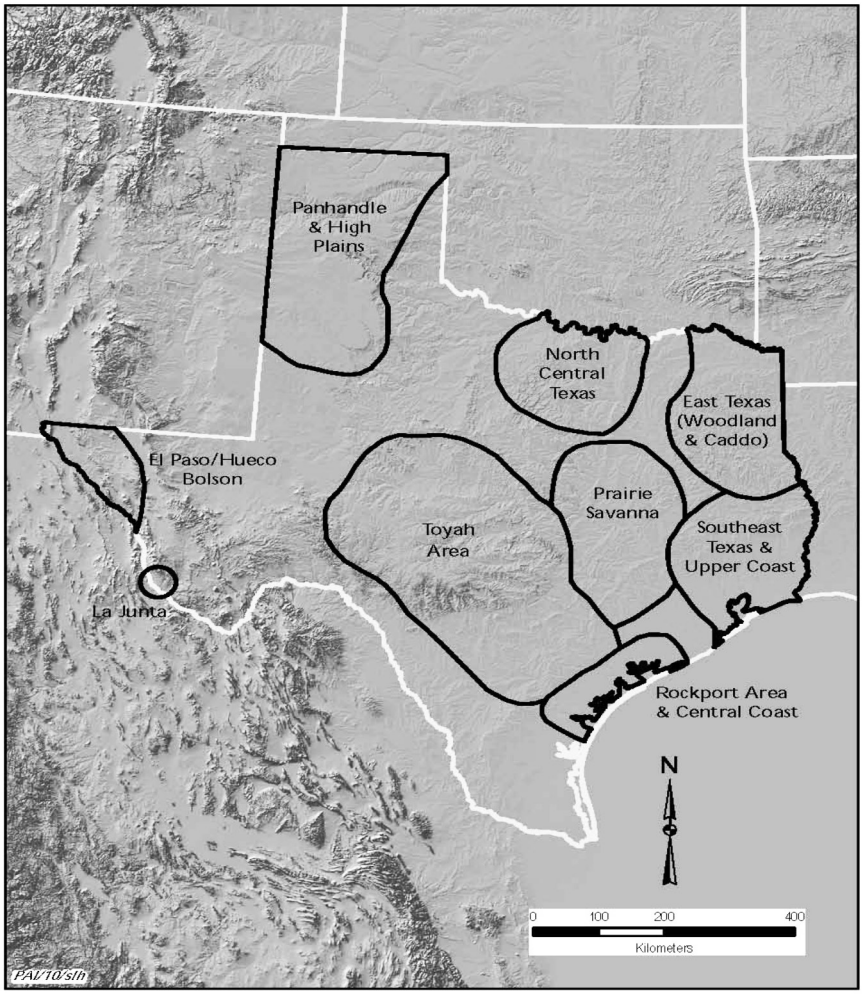

Figure 1. Areas across the state of Texas with evidence of American Indian ceramic manufacture and use.

Table 1. Chronological information on the adoption and use of ceramics by native groups in Texas.*

Area	First Appearance	Period of Use
East Texas	ca. 500 B.C.	ca. 500 B.C-AD 1830s
Southeast Texas	ca. 500 B.C.	ca. 500 B.C.-A.D. 1700
Prairie Savanna	ca. 50 B.C.	ca. 50 B.C.-late 17th century
Trans-Pecos	ca. A.D. 200	ca. A.D. 200-1880
Panhandle and High Plains	ca. A.D. 200	ca. A.D. 200-17th century
La Junta area	ca. A.D. 1250	ca. A.D. 1250-1760
Rockport area and Central Coast	ca. A.D. 700	ca. A.D. 700-1700
North Central Texas	ca. A.D. 750	ca. A.D. 750-1800
Central Texas/Toyah Area	ca. A.D. 900	ca. A.D. 900-1700
Lower Pecos	ca. A.D. 1500	ca. A.D. 1500-1700

*See articles in this volume; chapters in Perttula 2004; Perttula et al. 1995; Shafer n.d.; Suhm and Jelks 1962.

ceramic wares—in North America, but its use for more refined dating is only in its infancy in Texas. Given the abundance of ceramics of several different kinds and styles at many prehistoric and early historic sites in Texas, the luminescence dating of both plain and decorated sherds recovered in situ from these many sites should be routinely explored on both testing and data recovery projects in the region since it is a method "that dates the manufacture and use of…ceramic objects [that] provide a closer relationship between the target event [when a site is occupied] and the dated event [the age determined by the luminescence on a sherd]. Luminescence is particularly well suited for the dating of ceramics since the method measures the time elapsed since vessels were last heated, usually corresponding to manufacture or use" (Lipo et al. 2005:535).

Overall, the ceramic articles included in this volume consider how the study of different American Indian ceramic traditions help illuminate and better understand the lives of the Indian peoples that made these wares. The articles also consider and examine changes and continuity in stylistic practices, technology, function, and ideology as expressed in the sherds and vessels in well-dated assemblages from known cultural groups, including the Caddo and Karankawa. There also are discussions of instrumental neutron activation analysis and other analytical means used to track pottery vessel movement and trade across and within different regions. Some of the articles discuss the extensive record of use of ceramics by mobile groups, a distinctive aspect of the archeological record in the state, focusing on relevant technological, functional, or stylistic data in light of this theme, and also examine the meaning and significance of stylistic motifs and iconography on vessels from East Texas Caddo sites.

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Pottery at La Junta: One View of Regional Interaction along the Rio Grande

Nancy A. Kenmotsu

ABSTRACT

This study presents an initial characterization of regional production centers for ceramics from La Junta sites. The data from the study are used to suggest patterns of exchange and interaction between the people living in that region with those in surrounding areas.

INTRODUCTION

Ceramics have long provided archeologists an avenue to study issues of exchange and interaction among the people who used them. The use of instrumental neutron activation analyses (NAA) and petrography have been particularly important in advancing these understandings. Mimbres Black and White vessels, for example, the well-known and distinctive pottery made in southwestern New Mexico from A.D. 800 to A.D. 1140, is now known through such analyses to have been manufactured almost exclusively in the larger villages in the heartland of the Mimbres culture area (Powell-Marti and James 2006; Shafer 2003:187). Yet, as noted by Gilman et al. (1994:697), this ware has been recovered in Mimbres and non-Mimbres sites outside of these heartland villages, indicating that residents of the villages where it was manufactured had "some control over its production and distribution."

In this article, I present an initial characterization of the regional production centers for the ceramics from La Junta de los Rios (La Junta) for the period from A.D. 1250 to A.D. 1750 (Figure 1). The characterization draws from both NAA and petrographic studies of 133 sherds and four clay samples from 20 sites in La Junta and two sites in the El Paso area (41HZ12 and 41HZ16) (Figure 1). The data from the studies resulted in the assignment of several compositional groups and two of them can be sourced to distinct, geographically-separate areas of production. One is the area of the Hueco and Tularosa basins that make up modern El Paso, Texas, and south-central New Mexico, an area considered the core of the Jornada Mogollon. This group is made up exclusively of El Paso Polychrome sherds. The other distinct geographical group is from the Presidio and Redford bolsons at modern Redford and Presidio, Texas, and Ojinaga, Mexico. The area is known as La Junta de los Rios (La Junta) because it is where the Conchos River of Mexico confluences with the Rio Grande, and it is located some 250 miles downriver from El Paso. The compositional groups also separate by time period. Known dates of production of the El Paso compositional group are from ca. A.D. 1000/1200 to A.D. 1450 (Miller 1995, 2005), while the La Junta group appears to have begun production some time after A.D. 1450 and the production of these ceramics continued into the historic period. The presence of vessels in sites in La Junta that were manufactured in the El Paso area is evidence of long term as well as long distance interaction between the people living in the two regions although the extent of that interaction appears to have changed over time. The exchange implications of this interaction for the people living in La Junta are explored against recent advancements in our understanding of the interaction of Puebloan people with the groups around them. Questions of in situ pottery production that began after A.D. 1450 are also addressed.

PREVIOUS RESEARCH

Most previous work on Late Prehistoric sites in La Junta has focused on: (a) refining the cultural-historical sequence; (b) establishing the degree of mobility of the residents; and (c) addressing

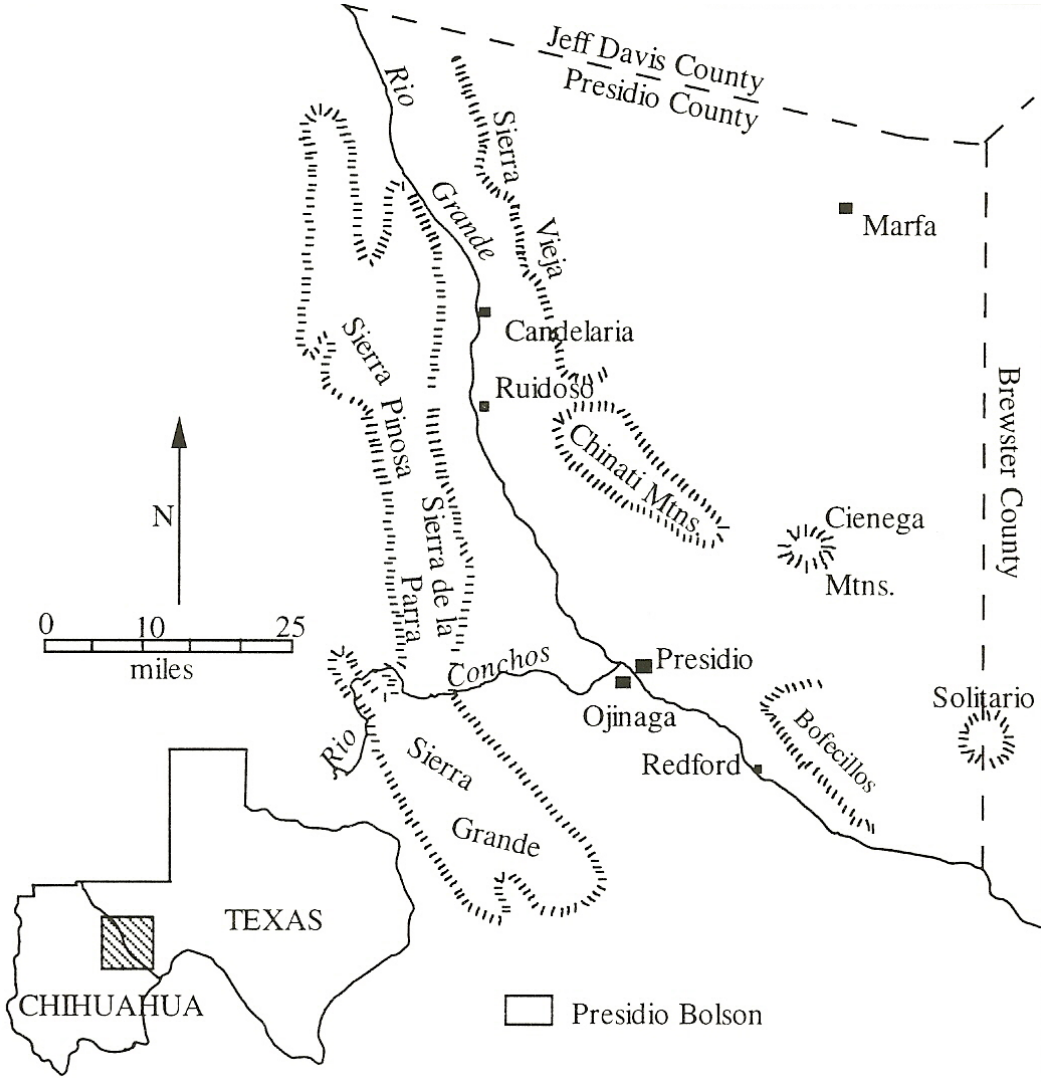

Figure 1. Location of La Junta de los Rios in relation to Texas and Mexico.

the question of whether the ceramics were locally made or were brought to the valley by residents or migrants (Cloud 2004; Cloud et al. 1994; Cloud and Piehl 2008; Kelley 1986; Kelley et al. 1940; Kelley and Kelley 1990; Kenmotsu 1994; Mallouf 1990, 1999, Shackelford 1951, 1955). Prior to several recent petrographic and NAA studies, including the one reported here, none of these issues had been definitively resolved to the satisfaction of any of the researchers involved in this interesting region. While each of the issues is important, the first two will be only briefly summarized here. The final topic—whether the ceramics were locally made—is the subject of this article.

THE CULTURAL-HISTORICAL SEQUENCE AT LA JUNTA

The culture-historical sequence for the Late Prehistoric period (A.D. 800-1450) in La Junta remains in flux. Table 1 depicts the current sequence, with phases, type sites, types of architectural features, and artifact types. As the table demonstrates, beginning around A.D. 1200 the pit houses, pueblos, and pottery document that La Junta is an extension of the American Southwest. The presence of these structures here is intriguing as they are missing across the broad Texas Trans-Pecos but present in the Jornada Mogollon. Donald Lehmer

(1948), who was responsible for the definition of the Jornada Branch of the Mogollon for a broad region around El Paso, spent six months in La Junta in 1939 excavating the Millington site (41PS14), the type site for the La Junta phase. He wrote: "El Paso Polychrome occurred in many of the La Junta Focus [now phase] houses, and a small El Paso Phase pueblo was also found at the [Millington] site, indicating the existence of an actual colony of El Paso Phase people [living in La Junta]" (Lehmer 1948:84). Nonetheless, he excluded La Junta from his definition of the Jornada Branch of the Mogollon.

The initial part of the Late Prehistoric period is known as the Livermore phase and is characterized by the presence of arrow points (Livermore, Toyah, and Fresno) with a hunter-gatherer lithic tool kit (Cloud and Piehl 2008:17-18; Kelley et al. 1940). An important period of time that merits additional research, it is not further considered here as it predates the use of pottery and the known dates of construction of pit houses and pueblos in the region.

The period between A.D. 1250-1400/1450 is known as the La Junta phase. During this phase, the architecture in La Junta is dominated by small (ca. 3.4 x 4.2 m), rectangular pithouses, sometimes arranged in groups (Kelley 1949, 1986; Kelley and Kelley 1990; Shackelford 1951). As noted above, a small unit pueblo, excavated by Lehmer at the Millington site, has been considered evidence that at least some people from the Jornada Mogollon migrated to La Junta (Kelley 1985, 1986:132, 1990:38; Lehmer 1948:84). Some, however, question whether the construction of the pueblo represents an accurate clone of El Paso phase pueblos in the Hueco Bolson (Cloud and Piehl 2008:19; Mallouf 1990:19, 1999:83). The material culture at La Junta phase components include shell ornaments, ground stone, and arrow points including Fresno, Perdiz, and Toyah (Cloud 2008; Cloud et al. 1994; Kelley 1952a, 1986; Kenmotsu 1994; Mallouf 1999). The dominant pottery found in these pueblos is El Paso Polychrome. Other ceramic types (Villa Ahumada Polychrome, Ramos Polychrome, Playas Red, Playas Incised, Chupadero Black-on-White, and Three Rivers Black-on-White) have been recovered as well, but in small quantities.

The dates A.D. 1450-1684 bracket a period defined as the Concepcion phase, although these dates warrant further consideration (Kelley 1986:ii; Kelley and Kelley 1990:10; Mallouf 1999:84). Many Concepcion phase sites overlie La Junta phase components and mixing of the two has been cited as an ongoing problem. Since there are few radiocarbon dates for this phase, dating it largely relies on architectural changes, the absence of El Paso Polychrome in Concepcion phase components, and the presence of new pottery styles. Architecture largely consists of the continued construction of rectangular and circular pit structures, but the structures were larger than in the La Junta phase. Pottery wares in this period represent "an… assemblage of plainwares…in association with rare red-on-gray or red-on-brown wares" (Kelley 1986:82) (Figure 2a-2c). Names assigned to locally produced Concepcion phase ceramics are Chinati Plain, Chinati Scored, Chinati Neck-Banded, Capote Plain, Capote Red-on-brown, Paloma Plain, and Paloma Red-on-gray (Kelley et al. 1940:35-36).

The period from A.D. 1250-1684 is made more intriguing by the presence of an aceramic manifestation termed the "Cielo Complex" by Robert Mallouf (1990, 1993, 1995, 1999). Cielo Complex sites are found on elevated landforms in La Junta and extend across much of the Texas Big Bend area and south for an unknown distance into northern Mexico. In La Junta, the sites overlook the terraces of the Rio Grande where the small villages are located. The sites are characterized by above-ground stacked stone rings, believed to be wickiup foundations, with narrow entryways (Mallouf 1999:65). Perdiz and Garza/Soto arrowpoints, flake drills, scrapers, some beveled knives, and small triangular shell pendants make up most of the artifact assemblages. Mallouf (1999) considers the sites to be the remnants of hunter-gatherers who interacted with the people in the La Junta villages but retained their more nomadic life styles.

Kelley et al. (1940) chose 1684 as the beginning of the period they called the Conchos phase because in that year a Spanish expedition came to La Junta, traveling from El Paso to visit the Jumano, hunter-gatherers who lived in the area of San Angelo, Texas (Kenmotsu 2001; Kenmotsu and Arnn 2012). Archeologically, the Conchos phase (A.D. 1684-1760) in La Junta is distinguished by two new pottery types—Conchos Plain and Conchos Red-on-brown (see Figure 2d)—and the occasional presence of sherds of Spanish majolica; the pottery from the Concepcion phase is gone. Lithic artifacts and the pit houses of the earlier Concepcion phase continued; Spanish documents also describe the presence of small pueblos in La

Table 1. Current cultural historical sequence for the period A.D. 1200-1760 in La Junta.*

Phase, Age Interval	Type Site	Architecture	Material Culture	Reference
Livermore, A.D. 800-1200	Alpine 2:7 and Livermore Cache (41JD66)	-	Livermore, Toyah, and Fresno arrow points, double beveled knives, snub-nosed scrapers, gravers,	Kelley et al. 1940:30-31
La Junta, A.D. 1200-1450	Millington (41PS14)	Circular pit houses; rectangular pit houses; a single example of a five-room pueblo in a shallow pit; adobe floors, most are jacal in construction, one is of adobe bricks.	El Paso Polychrome with small quantities of Villa Ahumada Polychrome, Ramos Polychrome, Playas Red, Playas Incised, Chupadero Black-on-white, and Three Rivers Black-on-white; Toyah, Perdiz, Fresno arrow points; ground stone; shell	Kelley 1986:72-75; Kelley et al. 1940:33
Concepcion, A.D. 1450-1684	Millington (41PS14), Loma Alta (41PS15)	Continuation of circular and rectangular pit houses; some rectangular structures built side by side; floors of tramped gravel or refuse.	Chinati Plain, Chinati Scored, Chinati Neck-Banded, Capote Plain, Capote Red-on-brown, Paloma Plain, and Paloma Red-on-gray; Toyah, Perdiz, Fresno arrow points; ground stone; shell.	Cloud and Piehl 2008:20-22; Kelley 1947, 1986:77-84; Kelley et al. 1940: 35
Cielo Complex, A.D. 1250 – 1684	Cielo Bravo (41PS52), Arroyo de las Burras (41PS	Stacked-stone circular wickiup foundations	Perdiz, Fresno, Garza/Soto arrow points; ground stone; sinker stones; flake drills, beveled knives; a few Olivella shell beads	Cloud and Piehl 2008:25; Mallouf 1990, 1999.
Conchos, A.D. 1684 – 1760	Millington (41PS14)	Rectangular structure, including structures built side by side	Conchos Plain, Conchos Red-on-brown with some Spanish majolica; Toyah, Perdiz, Fresno arrow points; ground stone; shell, Spanish coins.	Cloud and Piehl 2008:23-24; Kelley 1986:84-88; Kelley et al. 1940:163

* The chronological placement of local phases was initially made by Kelley (1939, 1949, 1986), Kelley et al. (1940), and Lehmer (1948) through cross-dating of intrusive, tree-ring dated ceramics and other cultural traits from other regions, including the Jornada Mogollon. In more recent years, the chronological sequence these researchers established has been largely confirmed through radiometric dating of charred beams, roof fall, post molds, pits, and burials from La Junta phase pueblos (Cloud 2008; Cloud et al. 1994:13, 35; Cloud and Piehl 2008; Mallouf 1990) and pits from a stratified campsite on the terrace of the Rio Grande within the Presidio Bolson (Cloud 2004:51, Table 1).

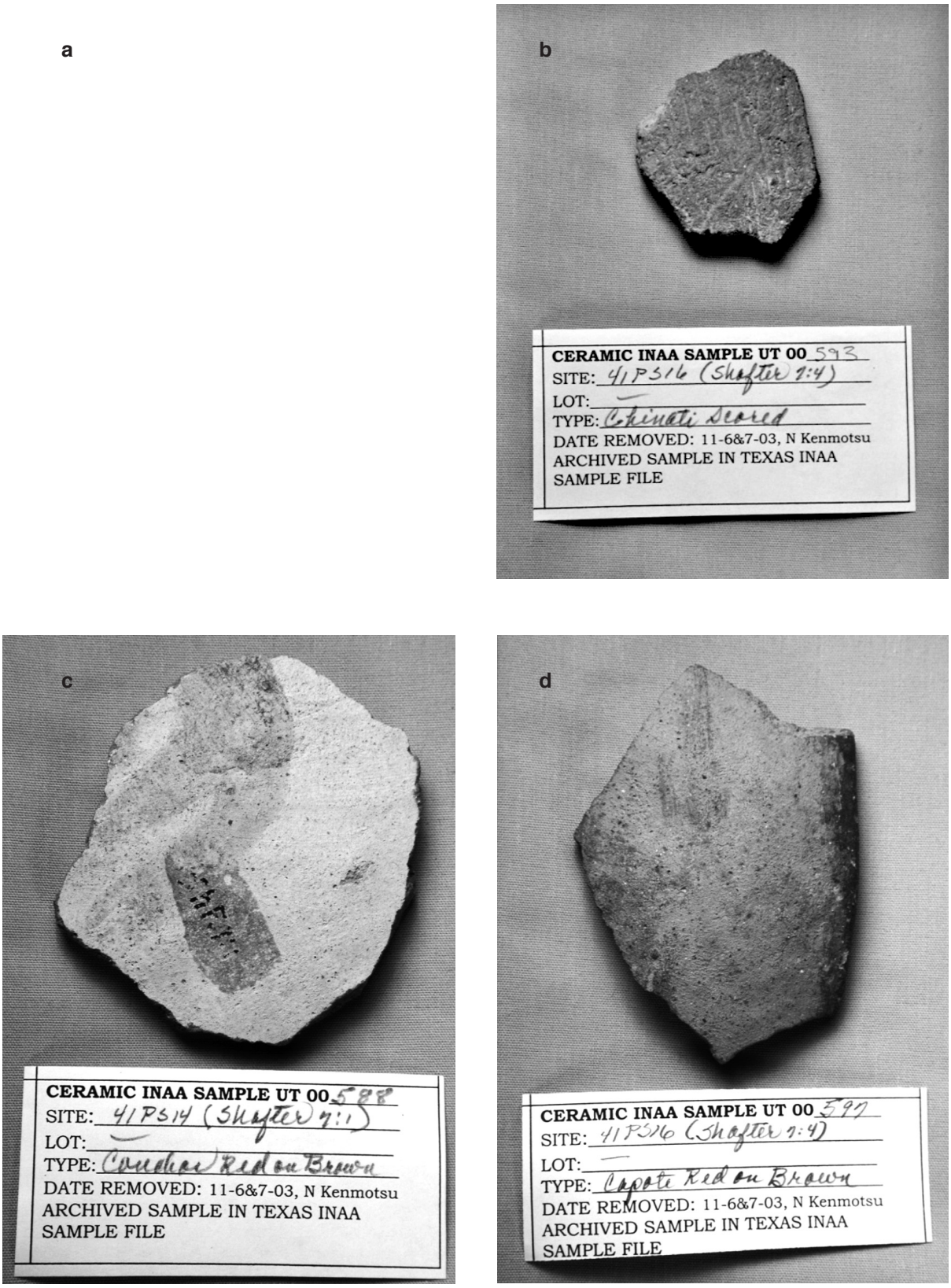

Figure 2. Ceramic types for La Junta after A.D. 1450: a, Chinate Scored (sample #UT000593); b, Paloma Red-on-gray (sample #UT000602); c, Capote Red-on-Brown (sample #UT000597); and d, Conchos Red-on-brown. Photographs by Matt Peeples and courtesy of TARL.

Table 2. Formal characteristics of El Paso Polychrome and the Concepcion and Conchos wares from La Junta.

Type (after Kelley 1986)	Vessel Form	Temper	Rim Form	Exterior Treatment	Interior Treatment	Wall thickness (in cm)*
El Paso Polychrome	Jars; bowls	Coarse grains of igneous rock	Jars have everted rims; bowls are direct	Black and red painted designs on upper half of vessels	Smoothed; bowls may have interior black and red painted designs	0.2-0.8
Chinati Plain and Scored	Jars; bowls	Sand	Straight to slightly everted	Smoothed, burnished; some scored with grass	Smoothed	0.48-1.19
Paloma Red-on- Gray	Bowls, saucers	Sand	Flat to beveled	Burnished; some with red parallel lines	Smoothed with red band near rim and floral-like designs in broad lines; burnished; gray wash	0.53-0.66
Capote Plain and Red-on-Brown	Large bowls; globular ollas; seed jars	Sand	Rounded	Burnished; some with red lines	Smoothed & burnished with red-brown wash	0.41-0.74
Conchos Red-on-Brown	Bowls, ollas	Sand (but less and finer grain than in earlier ceramic styles)	Rounded	Smoothed, burnished, some rilling, unslipped, but some lines	Burnished, some with thin gray wash	0.6-1.87

*The characteristics of the El Paso Polychrome are largely taken from Miller 1995. Descriptions of the Concepcion and Conchos wares taken from Kelley in Cloud (2004); the thickness of these wares is taken from a sample of 150 sherds of these ceramics in the collections of TARL.

Junta at this time. The period is largely dated based on the Spanish majolica and occasional coins with dates in the early to mid-1700s (Kelley 1986:84), but recently, two sherds of probable Conchos ware were recovered from an excavated feature that was radiocarbon dated to A.D. 1660-1810 (Cloud and Piehl 2008:62).

PREVIOUS RESEARCH ON THE EL PASO AND LA JUNTA CERAMIC GROUPS

Previous research on the brownwares of the El Paso tradition has been extensive. Initial typological definitions date to the early to mid 20th century (Mera 1938; Runyan and Hedrick 1973; Stallings 1938). A database of several thousand radiocarbon dates from feature contexts recovered from controlled subsurface excavations of sites in the Tularosa and Hueco basins and elsewhere in the El Paso area, largely due to the work at Fort Bliss, provides a firm foundation for the dates assigned to the three formally-defined ceramic types that make up this tradition. Miller (2005) completed the most recent refinement of the dates assigned to the three types using that database. The types are: (1) El Paso Brown, an unpainted, undecorated plain ware dating from A.D. 200/400-1000; (2) El Paso Bichrome, with red or black paint applied to the upper portions of otherwise undecorated vessels dating from A.D. 800/1000-1000/1200; and (3) El Paso Polychrome with application of both red and black paint decorating the upper portions of the vessels, dating from A.D. 1000/1200-1450.

El Paso Polychrome is the only one of the three types in this tradition that will be considered further

in this article. This type fully replaced the plain and bichrome styles by A.D. 1250 (Miller 1995:212). No plain or corrugated wares were produced in the region after that date, leaving El Paso Polychrome vessels to serve "as both utilitarian and non-utilitarian decorated ware" (Miller 1995:214). After A.D. 1450, "profound social and demographic changes took place" in the El Paso area as documented by the abandonment of the nucleated settlements of El Paso phase pueblos (Miller 2001:106). With these changes, manufacture of El Paso Polychrome ceased. Table 2 provides general characteristics of El Paso Polychrome and La Junta ceramics.

The initial date for the manufacture of El Paso Polychrome predates the current established beginning of the La Junta phase. However, the early forms of this polychrome style are neckless jars and wide-mouth bowls (Miller 1995:214). Around A.D. 1250, which approximates the initial date of the La Junta phase, the neckless jars were completely replaced by broad-shouldered jars or ollas with everted rims and restricted mouths. Shallow, wide-mouth bowls continued in production. In February 2012, I examined all El Paso Polychrome sherds and vessels that have been recovered from sites in La Junta at the Texas Archeological Research Laboratory, the University of Texas at Austin; those in the collections of the Museum of the Big Bend; and others in the laboratory at the Center for Big Bend Studies, Sul Ross State University. All El Paso Polychrome jars, partial jars, or rim sherds that were sufficiently large to detect the form of the rim had everted rims indicating they post-date A.D. 1250.

El Paso Polychrome has been recovered from sites outside the Jornada Mogollon region. At the Henderson site, a large pueblo in southeastern New Mexico, this ceramic type represents 53 percent of the total ceramic inventory of over 35,000 sherds (Wiseman 2004:68). Approximately 16 percent of the ceramics from the Villa Ahumada site in Chihuahua are El Paso Polychrome (Cruz Antillón et al. 2004). El Paso Polychrome is commonly found at Late Prehistoric sites in the Casas Grandes region (Whalen and Minnis 2001); at Casas Grandes proper, it represents 38 percent of the non-local ceramics (Burgett 2007). It has also been documented in small quantities at sites throughout West Texas (see Beene 1994; Creel 1981; Miller 1995), southwestern New Mexico (Creel et al. 2002), and northwestern Chihuahua (Phelps 1998). El Paso Polychrome is also the dominant pottery type at La Junta phase components.

Over 4,000 ceramic sherds and clay samples recovered from sites in the El Paso and Mimbres areas have been analyzed at the Archaeometry Laboratory Research Reactor Center of the University of Missouri (MURR) or Texas A&M University (Glascock and Ferguson 2010). Many of these sherds are of the El Paso brownware tradition. These studies have established an El Paso Core compositional group made up of nearly 500 ceramics classified as El Paso Brown, El Paso Bichrome, El Paso Polychrome, and Jornada Brown; all the ceramics in the core group were recovered from sites in the greater El Paso area (Glascock and Ferguson 2010:F-9). Ninety percent of sherds analyzed by NAA and classified as El Paso style pottery is assigned to this group regardless of where they were recovered. The core group may one day be split into smaller groups. In a recent NAA study from the Hueco Bolson, Miller (in Miller and Burt 2007:5-11 to 5-16) notes that some groups in the broad Hueco and Tularosa bolsons can be distinguished based on pastes that indicate production in the basins where ancient weathered clays were used versus production along the alluvial fans adjacent to the mountain ranges where higher concentrations of igneous materials and metals are present.

Petrographic analyses of El Paso brownware sherds have been a common focus of studies in the region for several decades (see Hill 1988, 1989, 1993; Rugge 1986, 1988; Smiley 1977; Southward 1979). These studies also reveal that production of pottery classified as El Paso ware, regardless of where they are found, was accomplished in the greater El Paso area.

Two studies will be briefly summarized to demonstrate that the El Paso ware recovered in other regions was produced in the El Paso area. Creel et al. (2002) used NAA to analyze 120 El Paso sherds from sites in the El Paso area and the Mimbres Valley. In that study, Creel et al. (2002:43) state: "[V]irtually all of the El Paso Polychrome fell into one group [the El Paso Core group]….On this basis, it is possible to state with confidence that most of the El Paso Polychrome in our sample was indeed manufactured in the El Paso area." The other study employed El Paso Polychrome recovered from Casas Grandes. Because of the prominence of El Paso Polychrome in the assemblages at the site, Burgett (2007) sought to test the possibility that the El Paso Polychrome was produced locally at Casas Grandes. To do so, she completed a petrographic study of 163 El Paso Polychrome rim sherds recovered at Casas Grandes

and 41 rim sherds from 10 sites on the Fort Bliss Military Reservation. She found "in terms of paste recipe, the Chihuahuan samples are identical to the Fort Bliss sites….It appears that Paquimé [Casas Grandes] was definitely obtaining El Paso Polychrome from the Jornada Mogollon region" (Burgett 2007:56).

Recent petrographic and NAA studies have been undertaken on El Paso ware recovered from La Junta phase sites. The first was a petrographic study of thin sections from five sherds of El Paso Polychrome recovered from the Millington site (Robinson 2004). While the sample was quite small, it demonstrated that the five have "low diversity [that is] suggestive of uniform manufacture for trade; the thin sections also have mineral types indicative of origin outside the La Junta region…These distinctive qualities and constituents point toward non-local manufacture [outside of La Junta]" (Robinson 2004:231). Portions of the same five sherds from Millington were also submitted by Cloud (2004) to MURR for NAA analysis (Rodriquez-Alegria et al. 2004). Four of the sherds were assigned to the El Paso Core chemical group; one was unassigned. Rodriquez-Alegria et al. (2004:222) concluded that "the results of our chemical analysis of El Paso Polychrome samples from the Millington site indicate that they were manufactured in the El Paso area to the north and subsequently imported or brought into the La Junta region."

In contrast to the many analyses on El Paso ceramics, the ceramic styles manufactured in La Junta remain understudied (Cloud and Piehl 2008:128). Kelley (1986; see also Kelley et al. 1940) first described the styles according to Kidder's (1931:20) binomial system where type names combine geographical places (e.g., Chinati, Conchos) with descriptive information (e.g., Plain, Scored). His descriptions, however, are thin. Kelley's (personal communication, 1994, see also Kelley 1986:vii-viii) intent was to complete the full descriptions of the attributes that distinguished each type from the others, but his service in World War II, his need to complete his dissertation at Harvard University, and his subsequent move to initiate a distinguished career at Southern Illinois University combined to prevent their completion. Cloud (2004:211-214), published slightly more comprehensive descriptions of the seven wares that had been identified by Kelley several decades earlier. These descriptions are included among his papers that are on file at the CBBS and were published with the permission of his widow, the late Ellen A. Kelley. Nonetheless, Kelley himself considered even these descriptions incomplete and preliminary.

Distribution of these wares outside of the Presidio and Redford basins is poorly known. In 1948, Kelley (1952b:257) conducted a reconnaissance along the Rio Grande from the head of Canyon Colorado some 10 miles below Redford to Fabens near El Paso; in 1949, he conducted a similar inspection of sites on the banks of the Conchos River beginning in Presidio and extending to the confluence of the Conchos with the Rio Florido. During these efforts, he identified La Junta pottery extending some 30 miles south of Presidio along the Conchos, southeast along the Rio Grande to Canyon Colorado, and 35 miles northwest along the Rio Grande to the vicinity of Ruidosa. A variety of ceramic sherds have been recovered in very small numbers from a sub-set of sites across the Trans-Pecos region, but, dwarfed by the lithic assemblages at these sites, they have been given little attention. Thus, it is not known if La Junta wares are represented in those collections. Even less is known about sites in northeastern Chihuahua since subsequent to Kelley's work along the Conchos in the mid-20th century almost no additional work has been undertaken there.

The general characteristics of El Paso and La Junta ceramics given in Table 2 highlight some differences among the La Junta styles and between those styles and El Paso Polychrome. Unlike the relatively thin El Paso vessels, La Junta vessels tend to be thick-walled; some exceed one centimeter in thickness. Tempers differ between El Paso ceramics and La Junta wares, reflecting the distinct geology of the two regions. Other differences include the fact that the paste of the La Junta wares can be crumbly and porous and Chinati wares included vegetable matter in the paste. Carbon streaking is quite common in El Paso ceramics, but not in La Junta vessels. The range of vessel types among La Junta ceramics increased over the jars and bowls of El Paso Polychrome to include jars, bowls, saucers, seed jars, and soup plates; at least one "platter" of Conchos Plain is known (Kelley 2004:214). Wares in the Concepcion phase exhibit coil and scrape techniques, but many of the Conchos ceramics exhibit manufacture with a wheel, likely inspired by Spanish missions in the La Junta area after A.D. 1684 (Kelley 1986:84). Wheel-influenced characteristics include rilling—ridges and grooves created around the vessel walls formed during spinning of the wheel and seen on some Conchos Red-on-Brown sherds—and some

Table 3. Sherds from selected sites used in the NAA study.

Site, Name	El Paso Plain	El Paso Polychrome	Chinati Plain	Chinati Scored	Capote Plain	Capote Red/Brown	Paloma Red/Gray	Paloma Plain	Conchos Plain	Conchos Red/Brown	Undifferentiated	Villa Ahumada	Playas Red	Playas Incised	Total by Site
41PS3	2	3										1		2	8
41PS5	3	3	1	1								1	2		11
41PS7		2					2		1			1			6
41PS8	3														3
41PS9		1							2						3
41PS10			2						1						3
41PS11		1													1
41PS12	1	3			2										6
41PS13		1													1
41PS14, Millington	2	13	6	6	6	3			3	2		1			42
41PS15, Loma Alta			2			1			1				3		7
41PS16, Kopenberger				2	2	2									6
41PS21, Polvo			1	1		2		1				1			6

base sherds also exhibit ridges where the vessel was attached to the wheel.

Finally, some vessel treatments of La Junta ceramics exhibit similarities with El Paso jars and bowls. In both, exterior surfaces are smoothed (see Figure 2). Slips or washes among both groups were rarely applied. Exterior surfaces have broad lines close to the rim in both. In La Junta ceramics, however, red is the prominent design color. However, unlike the careful design elements on El Paso Polychrome (see Miller 1995:216 and Figures 31-32), these designs were applied with less care (Kelley 1949; Kelley et al. 1940:32-40; Sayles 1936:55).

Robinson's (2004) petrographic study and the NAA analysis by Rodriguez-Alegria et al. (2004), mentioned above, also included characterizations of 23 sherds of La Junta ware along with four soil samples and one possible tempering agent; the latter five samples were collected on the banks of the Rio Grande in the Redford Bolson. While concerned about the small samples of each type (Capote, Chinati, and Conchos), Robinson (2004:233) concluded that the rocks and minerals in the paste of these wares "are reflective of the geology of the La Junta region, and one could not argue logically for manufacture in another region on the basis of petrology." The NAA results were more difficult to interpret (Rodriguez-Alegria et al. 2004:223). The samples largely fell into two groups (Capote-1 or Mimbres-5) with the Capote-1 group chemically similar to the Main Playas Red group but having statistically different compositions. One interpretation given was that the ceramics were manufactured in the Mimbres Valley and imported to La Junta. Alternatively, they were manufactured in La Junta from local clays that resemble those in the Mimbres Valley. Neither explanation was particularly satisfactory to the analysts and further research was recommended. This is discussed again in later sections of this article.

SAMPLE COMPOSITION

One hundred thirty-three sherds and four clays samples are reported in this study (Table 3). I selected 101 of these from a series of Presidio County sites stretching from southeast to northwest through the Presidio Bolson, in addition to a sample taken from a whole vessel from a cave (41JD2) in southern Jeff Davis County, and samples from two sites along the Rio Grande in Hudspeth County. These sherds are among the collections curated at the Texas Archeological Research Laboratory (TARL) at The University of Texas at Austin. Most were obtained by J. Charles Kelley during his surveys and excavations in La Junta in the 1930s and 1940s; several derive from brief investigations in La Junta by others. The whole vessel from 41JD2 was collected in the early to mid-20th century. Originally thought to be a possible Apache vessel, Ferg (2004), an expert on Chiricahua and Mescalero Apache pottery, inspected the vessel and concluded that it was a possible Chinati Scored vessel.

The sherds were primarily selected to determine whether the El Paso Polychrome and the La Junta wares have distinct chemical signatures that reflect manufacture in their respective regions. However, because some Chihuahuan ceramics have been recovered from sites in La Junta, and because little chemical characterizations of ceramics have been undertaken from sites south of the Rio Grande, several of these ceramics were also included in the study.

To these 101 sherds, analysts (Speakman and Glascock 2005) at MURR added the NAA results of the 32 sherds and four clay samples from Presidio County submitted by Cloud (2004). The addition was to address the problematic results in the earlier study. Those sherds came from the Millington site (41PS14)) and the Arroyo de la Presa site (41PS800), located on the left bank of the Rio Grande at the northwest edge of the Redford Bolson. The site was excavated by the CBBS in anticipation of the widening of FM 170 (Cloud 2004). The four clay samples were collected from local soils near to the Arroyo de la Presa site. The remainder of the article employs the combined data sets (see Table 3 and Figure 3).

Most of the samples came from excavated context. Unfortunately, almost none of those excavations have ever been fully analyzed or reported. The largest number of sherds (n=42) came from the Millington site, situated in the heart of the Presidio Bolson, and the site that Lehmer (1948) Kelley and Kelley (1990) concluded began as a small pueblo of immigrants from the El Paso area. All but three sites are in the Presidio Bolson. Two exceptions (41HZ12 and 41HZ16) are actually in the southwestern reaches of the Hueco Bolson (see Figure 3). Site 41HZ16 was excavated by Kelley (1949); one house at the other Hudspeth County site (41HZ12) was at least partially excavated by Kelley, but never formally reported. The two were

Table 3., (*Continued*)

41PS56		1					2								3
41PS58, San Antonio de Padua									1						1
41PS87					1	1	1	1	1	3					8
41PS800, Arroyo de la Presa											3				3
41HZ12	2	2													4
41HZ16	3	5	1		1										10
41JD2				1											1
TOTALS	**16**	**35**	**13**	**11**	**12**	**9**	**5**	**2**	**10**	**5**	**3**	**5**	**5**	**2**	**133**

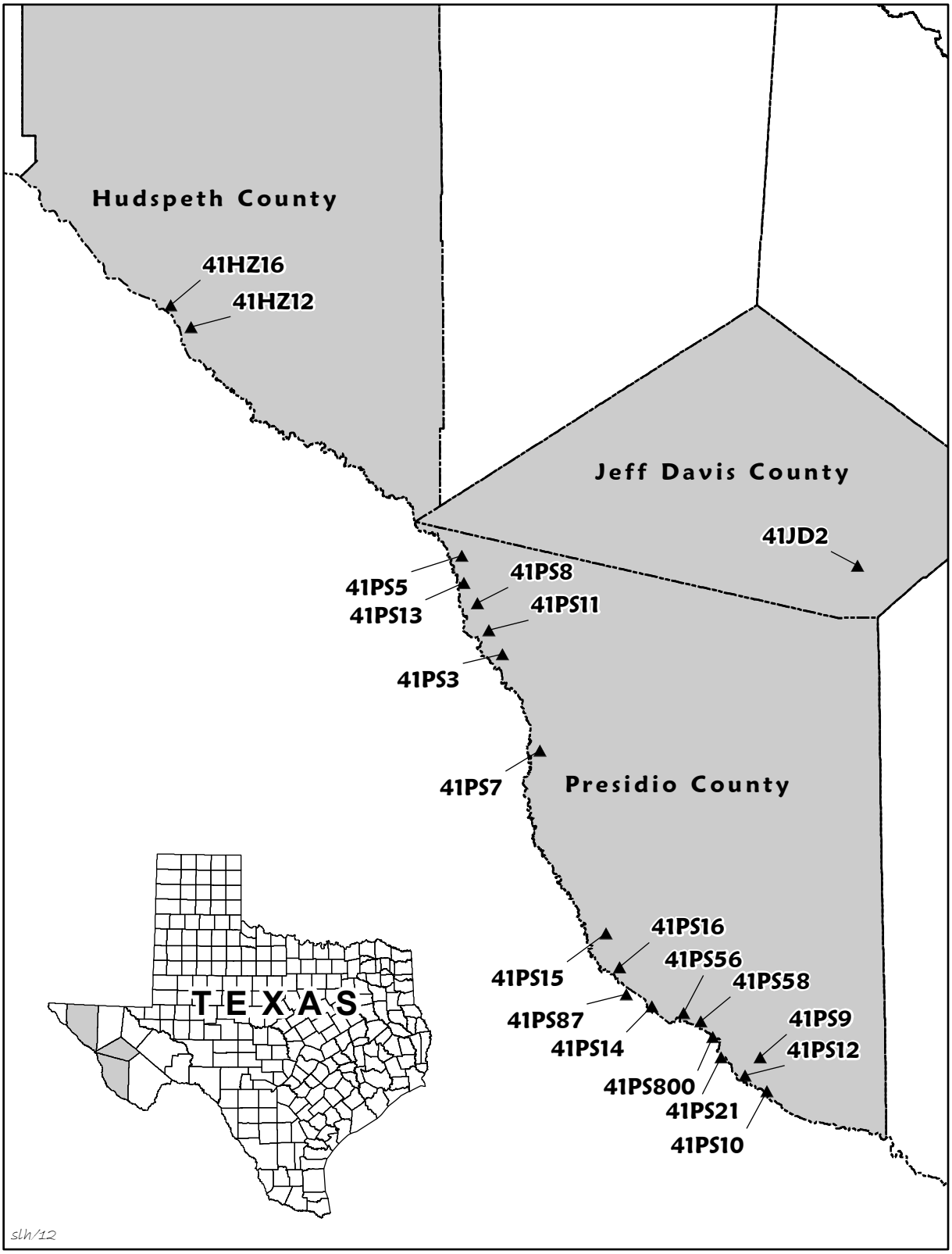

Figure 3. Locations of the sites that contributed sherds for NAA or petrographic analyses discussed in this article.

included in the study because they are outside of what is considered the heartland of the El Paso phase but had El Paso wares and architecture similar to both El Paso and the Presidio Bolson. Two sherds selected from 41HZ16 were chosen because they were thought to be similar to Capote and Chinati plain wares.

The ceramic styles within the group are dominated by ceramic styles from the Presidio Bolson (n=67). They include Chinati, Capote, Paloma, and Conchos examples; identification of these sherds was made by Kelley when he collected the sherds from the sites nearly seven decades ago. El Paso style ceramics (n=51) also constitute a significant part of the group. Sixteen of the El Paso ceramics are undifferentiated El Paso brownware, the name assigned to body sherds of these vessels that do not contain any decoration. While such sherds could represent portions of El Paso Brown or El Paso Bichrome from earlier periods, they are thought to be from the lower portions of El Paso Polychrome vessels because thus far all vessels from La Junta identifiable to a type are of that style. Moreover, all radiocarbon dates from La Junta components date after A.D. 1200 (Cloud and Piehl 2008). The remaining samples consist of Playas Red or Playas Incised (n=7), Villa Ahumada (n=3), undifferentiated Chihuahuan brownware (n=3), and four clay samples taken from both sides of the Rio Grande in the southern Presidio Bolson.

GEOLOGICAL SETTING

The Presidio and Redford bolsons are northwest to southeast-trending geologic basins stretching ca. 100 miles from Porvenir on the north to just south of Redford, Texas, within the Mexican Highlands section of the basin and range province. Redford Bolson, the smaller of the two, is some 12 miles long by six miles wide. The Presidio Bolson makes up the remainder of the length with a width ranging from two to 15 miles (Groat 1972). The basins are defined by mountain ranges that flank either side of the terraces of the Rio Grande and Rio Conchos of Mexico (see Figure 1) (Barnes 1979). Exposed rocks include granites, weathered rhyolitic tuff, basalt, and Cretaceous limestones (Robinson 2004:228). Within the basin, the Rio Grande and Conchos have contributed to the complex geologic make up of the alluvium where clay sources are present. Recently, Kuehn (2004:184) described the alluvial terraces in the southern portion of the basin where most of the pueblos are situated as "diverse, including deposits of fine-grained alluvium and a variety of volcanic and volcanic/clastic sediments." These clay sources are certainly adequate to build ceramic vessels as the clays along the banks of the Rio Grande are still used today to build large household pots (Mercedes Moreno personal communication, 1993).

Volcanic and limestone rocks are also present in the Hueco/Tularosa bolsons of the El Paso region, but distinctions exist between that region and La Junta. Physically separated by over 250 miles, these basins are much wider than the Presidio Bolson and have broad areas of Quaternary sands flanked by mountain ranges of Tertiary igneous rocks and Precambrian granite and rhyolite (Dietrich et al. 1983). Thus, while similar, it was anticipated that ceramics manufactured in the two regions would have distinct chemical signatures.

THE RESULTS

The analysis shows a general correspondence between currently defined types and their chemical composition. These groups include El Paso ware, Playas Red, Villa Ahumada, and a new Presidio County reference group (Chinati, Capote, Paloma, and Conchos wares). El Paso ware has the greatest compositional uniformity. Only five El Paso sherds fall outside of that group's 90 percent confidence ellipse (Figure 4). Similarly, the samples of ceramics that have long been believed to have been manufactured in the Presidio Bolson evidence a compositional uniformity distinct from the El Paso wares that date earlier in time. Comparison of their concentrations of Thorium and Cesium (see Figure 4) illustrate their distinct compositions. The Presidio County Reference Group is also distinct in composition from the various Mimbres reference groups (Figure 5).

Before reporting on these samples, a few comments should be mentioned about the analysis. In their interpretations of Cloud's samples, Rodriguez et al. (2004:223) stated that their assignment of his 18 samples of Capote, Chinati, and Conchos sherds to the Main Playas Red group and the Mimbres-5 subgroup was problematic. That assignment would have meant they had been imported into La Junta from the Mimbres valley of New Mexico. Given that the four clay samples taken from the banks of the Rio Grande within the Presidio Bolson, and

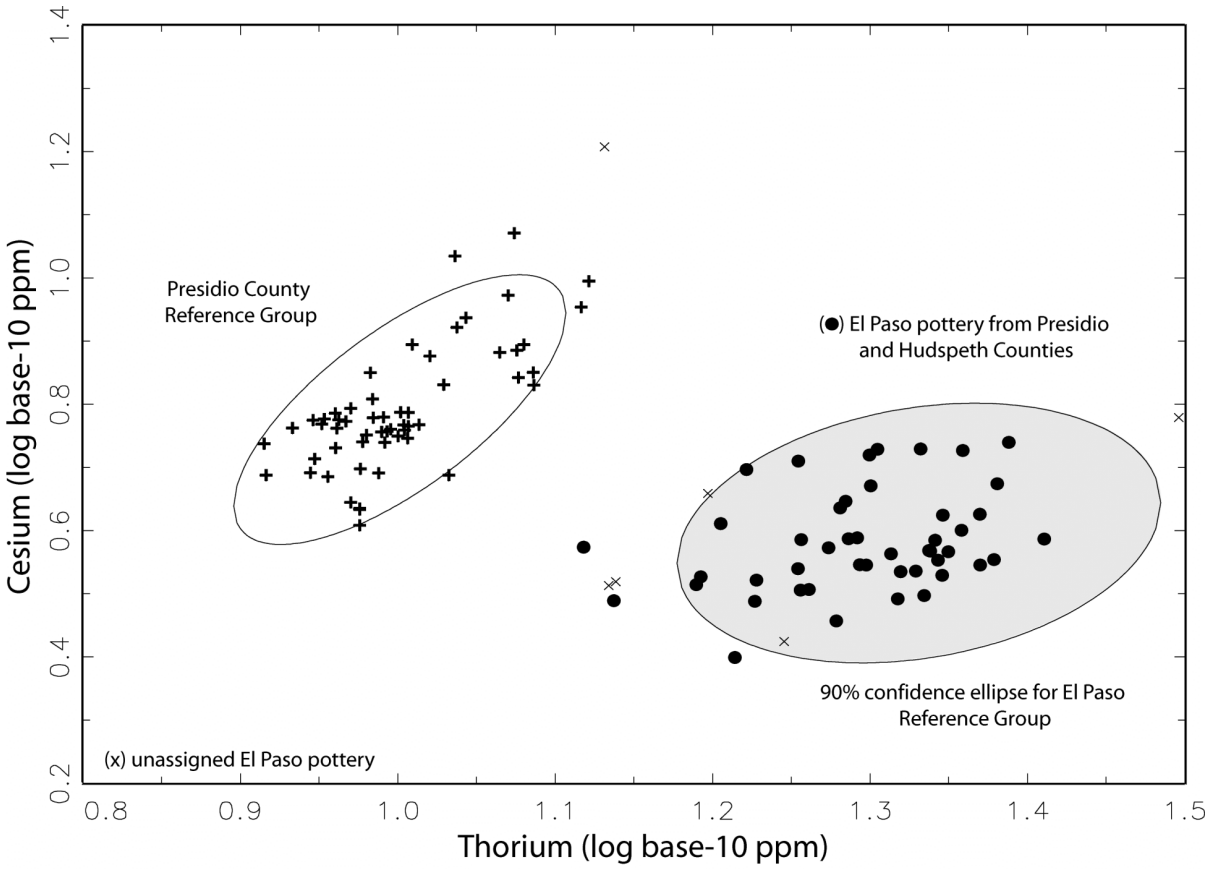

Figure 4. Bivariate plot of thorium and cesium base-10 logged concentrations showing El Paso sherds from Hudspeth and Presidio counties relative to the sherds from the pottery types (Chinati, Palomas, Capote, and Conchos) manufactured in La Junta (after Speakman and Glascock 2005:17).

submitted with the 18 sherds, were also assigned to the Main Playas Red group, Rodriguez et al. (2004:223) recommended additional NAA analysis of wares from La Junta to "form a statistically defensible subgroup within the Mimbres-5 subgroup."

Speakman and Glascock concurred and the 67 samples of La Junta wares provided an opportunity to do a re-examination. They felt that the Main Playas Red group had become so large and heterogeneous that non-related ceramics were erroneously assigned to that group and its subgroup, Mimbres-5 (Speakman and Glascock 2005:6). Thus, NAA from over 2000 Mimbres and Jornada pottery samples previously run at MURR and Texas A&M University, including those used for this study and those from the Rodriguez et al. (2004) study, were re-analyzed. Re-analysis of the data confirmed their belief and they stated:

Of particular relevance here is that Cloud's earlier sample of Capote, Chinati, and Conchos sherds together with similar pottery types analyzed for the current study [the 67 submitted by Kenmotsu] can now be shown to form a group that is both **distinct** from other Mimbres/Jornada compositional groups **and statistically viable**—as we would expect given the distance between El Paso and Presidio County (Speakman and Glascock 2005:7, emphasis in original).

EL PASO POLYCHROME

Fifty-one samples of El Paso Polychrome were analyzed in this study (see Table 3). Samples from the Millington site dominate the group, but samples were taken from nine other sites in La Junta, giving the sample geographic diversity within the area. Several samples from the two Hudspeth County sites were also among the group.

The El Paso Polychrome recovered from sites in La Junta form a chemically distinct group (Figure 4

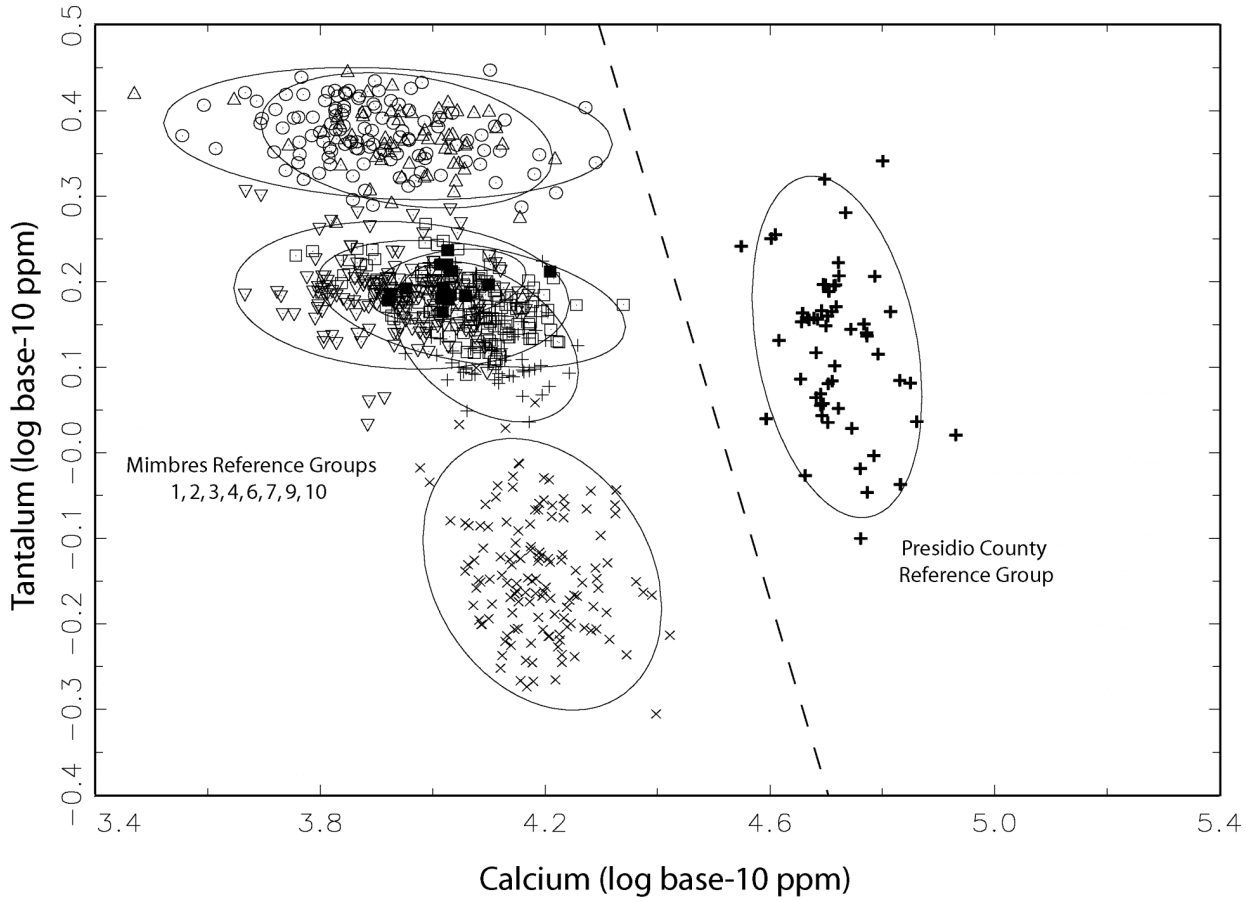

Figure 5. Bivariate plot of calcium and tantalum base-10 logged concentrations showing the separation of the Presidio county sherds of Chinati, Palomas, Capote, and Conchos wares from the various Mimbres reference groups (after Speakman and Glascock 2005:13).

and Table 4) that closely matches the chemical signature of the El Paso core group. Forty-six of the 51 El Paso style sherds fall within that core group. One Hudspeth County sample and four of the samples from the Presidio Bolson fall outside it. Since the El Paso core group has been well established (Speakman and Glascock 2005:8), these results indicate that the bulk of the El Paso ware in La Junta sites was made in El Paso. This finding matches recent NAA analysis on 120 El Paso sherds from sites in the El Paso area and the Mimbres Valley (Creel et al. 2002:43) as well as the petrographic analyses of El Paso Polychrome from Casas Grandes by Burgett (2007) and from the Presidio Bolson by Robinson (2004:231).

Of the five El Paso style sherds that did not fit into the 90 percent confidence ellipse for the El Paso reference group, four are quite close to the ellipse. Speakman and Glascock (2005:8) state: "It is our opinion that these [four] unassigned samples are local to the El Paso area."

The final El Paso style sherd not within the El Paso core group has a chemical composition that places it at considerable distance from that group. It came from 41PS56, a site located in the central portion of the Presidio Bolson. My re-examination of the sherd at TARL still places it stylistically as El Paso Polychrome. The NAA analysis by Creel et al. (2002), mentioned above, had four El Paso style sherds that did not match the El Paso core group. Because the four were within the Playas group that included the clay samples from the Mimbres Valley, Creel and colleagues concluded they were locally made in the Mimbres Valley. While a single sherd will only allow speculation about non-local manufacture of El Paso Polychrome within the Presidio Bolson, it suggests a need to pursue additional NAA study of El Paso ware from this and other areas outside of the El Paso core area.

Table 4. Composition assignments for El Paso style ceramics by site and ceramic type.

Site	El Paso Plain	El Paso Polychrome	El Paso Core Group	Unassigned
41PS3	2	3	**5**	
41PS5	3	3	**5**	**1**
41PS7		2	**1**	**1**
41PS8	3		**3**	
41PS9		1	**1**	
41PS11		1	**1**	
41PS12	1	3	**4**	
41PS13		1	**1**	
41PS14, Millington	2	13	**14**	**1**
41PS56		1		**1**
41HZ12	2	2	**4**	
41HZ16	3	5	**7**	**1**

PLAYAS RED

Seven Playas Red sherds from three sites were included in the analysis. Four were recovered at 41PS3 and 41PS5 located in the northern reaches of the Presidio Bolson. The other three were from Loma Alta (41PS15), a Concepcion phase village located in the heart of the Presidio Bolson. While this is a small sample, it provided interesting results showing several distinct signatures (Table 5). Four samples fall within the ellipse for Mimbres-4 subgroup, indicating that they were likely produced in or close to the Mimbres Valley (Figure 6). Other chemical sourcing studies have also demonstrated that Playas Red ceramics were produced in the Mimbres Valley (Creel et al. 2002); still others indicate production in the western portions of the Jornada Mogollon (Bradley and Hoffer 1985).

The samples from Loma Alta do not fit as neatly into the Mimbres-4 subgroup. Two do generally fall within the Mimbres-4 compositional group but have dramatically different levels of arsenic than other Mimbres-4 samples (Speakman and Glascock 2005:8). The chemical signature of the final specimen appears to be outside of any known subgroup. It is possible that together the three represent a compositional group that has not been submitted for NAA analysis in the past. All three are a heavily burnished, very hard, dark brown to reddish ware that Kelley's notes at TARL call Playas Red, but his dissertation called them Polished Red (Kelley 1986:83).

Given that the sample (n=7) is small, only trends are suggested here. First, since some or all La Junta phase pueblos have pottery produced in El Paso, it is not unexpected that Playas Red would have been found in La Junta phase sites. The El Paso Polychrome vessels found in the Mimbres Valley were almost exclusively vessels manufactured in the El Paso area (Creel et al. 2002), and ceramics from the Mimbres Valley are recovered in small numbers from sites in the El Paso area (Miller et al. 2009). Because Playas Red dates to the same approximate

Table 5. Composition group for Playas Red style ceramics by site and ceramic type.

Site	Name	Playas Red	Mimbres-4 Group	Unassigned
41PS3		2	**2**	
41PS5		2	**2**	
41PS15	Loma Alta	3		**3**

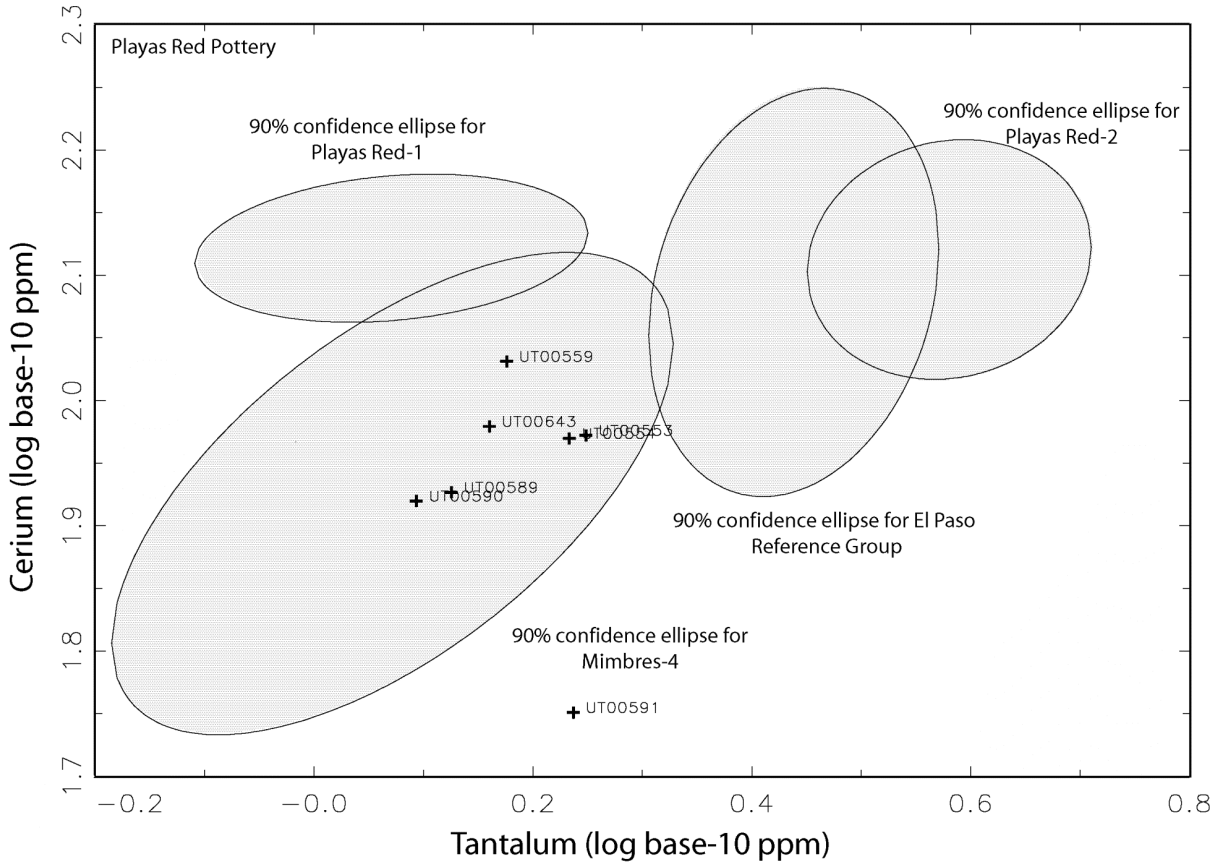

Figure 6. Plot showing the relationships of the Playas Red samples from La Junta sites to various known ceramic reference groups (after Speakman and Glascock 2005:19).

time as El Paso Polychrome, it is possible that the movement of vessels manufactured in the El Paso core area to La Junta was accompanied by movement of Playas Red vessels from El Paso to La Junta as part of the same process.

The three sherds from Loma Alta may represent one or more unique compositional types. Certainly, their unique signatures suggest that Kelley's (1986:83) moniker for them as an unnamed polished red rather than Playas Red may be correct. While similar to Playas, their chemical signatures suggest that they differ in some way from that type. The sample is small and firm conclusions await additional analyses.

VILLA AHUMADA AND UNDIFFERENTIATED CHIHUAHUAN

Three samples of Villa Ahumada Polychrome analyzed in the study were from sites in the Presidio Bolson that date to the La Junta phase. Villa Ahumada is present in small numbers at La Junta phase sites (Kelley et al. 1949:34; Shackleford 1951:71-72) and it has been dated to the same A.D. 1200-1450 time period (Minnis and Whelan 2004:118; Ravesloot et al. 1995; Whelan and Minnis 2001:38-45). Three other samples of an undifferentiated Chihuahuan ware recovered from the Arroyo de la Presa site were also re-analyzed. There is little that can be drawn from these six other than saying that all are well outside of the 90 percent confidence ellipse of the El Paso reference group. Speakman and Glascock (2005:8) note that these three "add to the handful of analyses of Casas Grandes polychromes that have been analyzed by NAA at MURR and Texas A&M….Given the small number of Chihuahuan pottery samples that have been analyzed, we can't say very much."

PRESIDIO COUNTY REFERENCE GROUP

Sixty-seven sherds of wares thought to have been manufactured in the Presidio Bolson were analyzed in the study. All but three are from 12 sites within the basin (see Figures 4 and 5). Most are from the Millington site, but several other sites contributed three or more samples (Table 6). The exceptions are three samples from adjacent counties. Two came from the two Hudspeth County sites and one came from the base of a whole vessel from site 41JD2.

Like El Paso Polychrome, the wares that Kelley first described so many years ago—Capote, Chinati, Paloma, and Conchos—clearly form a compositional group distinct from other samples. Fifty-six of the 67 samples of these wares are assigned to the Presidio County reference group (see Table 6). They are compositionally distinct when compared to the composition of both El Paso and Mimbres groups (see Figure 4). Speakman and Glascock (2005:7) note that with this study the Presidio County reference group is now "statistically viable." Moreover, the findings are consistent with Robinson's (2004:231) petrographic analysis of 22 Chinati, Capote, and Conchos sherds.

Results of the clay samples, however, are not as straight forward. One clay sample (SRS036) is within a one percent probability of membership in this same Presidio County compositional group (Speakman and Glascock 2005:7), suggesting some affiliation with that group. However, two other clay samples exceed the one percent probability, and the fourth, gathered from Monte Marqueno, is quite aberrant. This result is, nonetheless, actually common for clay samples in NAA studies across the southern Southwest, especially in the Jornada (Myles Miller personal communication, 2012): clays just do not match with sherds samples.

The 11 unassigned samples of La Junta wares are from eight of the 12 sites contributing Capote, Paloma, Chinati, and Conchos sherds. Two are from one Hudspeth County site, north of the Bolson, and one is the sample taken from the vessel at 41JD2. More than anything, these unassigned samples are an indication of the need for additional work. Speakman and Glascock (2005:7) note the "paucity of research…conducted south of the Rio Grande." Future submission of NAA samples from the Conchos drainage could aid in assigning these 11 to other compositional groups. When Kelley (1952b:287) conducted surveys south of the Rio Grande, he found a series of small village sites that contained the same wares that he had recovered from investigations in La Junta. His findings match the archival record. Although La Junta was only infrequently visited by the Spanish prior to 1750, a number of Spanish documents refer to the close relationships of the people in La Junta with the other small villages residing south along the Conchos River in Mexico (Kenmotsu 1994:492-501, 2001). During times of conflict, the people of La Junta were documented fleeing to their friends' villages to the south or conversely, their friends came to their pueblos. The 11 unassigned samples may, then, reflect this fluid movement with people and vessels moving north and south along the Conchos River after A.D. 1450.

IMPLICATIONS FOR EXCHANGE AND INTERACTION

The results of NAA analyses have implications about the social networks of exchange and

Table 6. Composition group for Presidio County style ceramics by site and ceramic type.

Site	Chinti Wares	Capote Wares	Paloma Wares	Conchos Wares	Presidio Group	Unassigned
41PS5	2					**2**
41PS7			2	1	**2**	**1**
41PS9				2	**2**	
41PS10	2			1	**3**	
41PS12		2			**1**	**1**
41PS14	10	8		5	**21**	**2**
41PS15	2	1		1	**3**	**1**
41PS16	2	4			**6**	
41PS21	2	2	1		**4**	**1**
41PS56			2		**2**	
41PS58				1	**1**	
41PS87		2	2	4	**8**	
41HZ16	1	1				**2**
41JD2	1					**1**

interaction operating along the Rio Grande from A.D. 1200-1750. Prior to that time, there is no evidence of sedentism in the Presidio Bolson (Cloud et al. 1994; Kelley et al. 1940; Mallouf 1990). The first conclusion that can be drawn is that La Junta is yet one more region where the El Paso Polychrome found at these sites was produced in the El Paso region some 250 miles distant. The El Paso Polychrome found at Casas Grandes was made in El Paso as was that found at Villa Ahumada (Burgett 2007; Cruz-Antillon et al. 2004). The majority of El Paso Polychrome sherds from sites in the Mimbres Valley were also manufactured in the El Paso area (Creel et al. 2002). In other words, the people in the heartland of the Jornada Mogollon region had a wide network of trading partners. The present study now shows that sometime around A.D. 1250 La Junta was linked in to this broad network of trade and interaction between the potters in the El Paso area and other regions of the Southwest and northern Mexico, a network that continued until the upheaval in the El Paso area and other areas of the Southwest that occurred around A.D. 1450 (Adams and Duff 2004a). Although Speth (personal communication, 2010) believes the El Paso Polychrome at the Henderson and Bloom sites in southeastern New Mexico were made in that area, another possibility is that these vessels too were made in the El Paso region.

The scope of this external network for the Jornada Mogollon is significant. We have long known that exotic materials are recovered from the pueblos and villages in northern Mexico and the American Southwest (e.g., Kelley 1986; Lehmer 1948; Miller and Graves 2009), but they do not occur in large quantities. Yet the quantity of El Paso Polychrome jars in the far flung regions is substantial. At the Henderson and Bloom sites, if they were not locally made, they make up the single largest type of pottery recovered at the site. At La

Junta, the volume of sherds of El Paso ware is not overwhelming, but they dominate the ceramic inventory. Sherds of Chihuahuan ceramics typically are very few in number at La Junta sites. Their presence in other lands in heavy quantities begs the question: why did people in these other regions want the El Paso Polychrome vessels? Except in La Junta, the other regions produced their own pottery. DiPeso (1974) called El Paso Polychrome vessels the 'tin cans' of Southwestern ceramics. Perhaps, but the volume of these ceramics in regions outside the Jornada Mogollon proper suggests something more. Why did other groups want these vessels when they could make their own? What function did they serve in these outlying regions? Were they, as Di Peso opined, just tin cans or the equivalent of work horses?

Another possibility needs to be considered: that they served some ritual function. At this point, I should acknowledge that I believe they likely arrived empty. Stoltman (1999:21) has argued that the large quantity of utilitarian gray wares imported to Chaco Canyon from the Chuska region were empty when transported:

Because of the substantial distances involved, the bulkiness and fragility of the pottery vessels, even when empty (e.g., Wilson and Blinman 1995:65), and the ready availability of textile containers which would have been far superior [to the use of pots] for the task of long-distance pedestrian transport of dry foodstuffs.

The same considerations should apply for the transport of El Paso Polychrome. It is also important to note that Speth and LeDuc (2007) illustrate the large size of many of the El Paso jars in a sample they examined from museum collections. Similarly, many of the El Paso vessels at Casas Grandes are sizeable (Burgett 2007). My inspection of the rim sherds from La Junta found that most are too small to estimate vessel size. However, partial pots and whole vessels from La Junta, which are admittedly only a handful, are sizeable vessels, suggesting that many of the others may have also been large. The 250 mile walk from El Paso was not difficult for people who lacked vehicles or beasts of burden and whose mode of transportation was walking. However, carrying several large or medium-sized El Paso jars with a tump line would have made the journey awkward at the least. If the vessels were also filled, the effort would have been much more difficult.

Their arrival empty should not, however, per se indicate that they were mere work horses or tin cans for utilitarian activities. I suggest that their arrival in quantities that dwarf all other ceramics indicates that the vessels themselves, and not their contents, had value to the people who readily accepted them, either as an affirmation of friendship or for some ritual message they embodied. I quickly add that this must be understood as a working hypothesis. As noted earlier, there is much we do not comprehend about the people living here from A.D. 1250-1450. Many of the early excavations have never been analyzed and mixing of deposits remains a problem.

Nonetheless, like Kelley (1986, 1995) and Lehmer (1948), I argue that the small unit pueblo at the Millington site represents at least a small migration of people from El Paso to the region. When the vessels came, however, the people in La Junta accepted El Paso ware as their primary ceramic type from A.D. 1250-1450. How large a group the migrants represented and whether they were from a single, extended family, or several families, is unknown. Nonetheless, migration studies (Dykeman and Roebuck 2008; Frose et al. 2008; Ives 1990; Matson and Magne 2007) indicate that movement of small groups is the norm when people migrate from one region to another. Matson and Magne (2007) published results of a long-term study of Athapaskan linguistic, ethnographic, and archeological evidence to provide a coherent model of Athapaskan migration over time.

As they and others have shown, migration is not a simple one-way movement of people but rather is of small groups moving into areas where they have established alliances and are familiar with the landscape and existing peoples (see Clark 2001; Lyons 2003). Rarely is migration a mass movement of people. Sometimes the people traveling remain far from their originals homelands, sometimes not. The Pueblo IV period (A.D. 1250-1600) throughout the Southwest was not an easy time as a number of the authors in Adams and Duff (2004b), among others, have noted. In La Junta, the El Paso style pueblo at Millington, the vessels found at many sites through the La Junta region, and the continued construction of pueblos after the dissolution of the pueblos in the Jornada Mogollon as documented by Spanish documents (Kelley 1986; Kenmotsu 1994), indicate to me that at least some people from the Jornada Mogollon region came to and stayed in La Junta. When they did, their ideas about ways to live, build homes, and organize food supplies

influenced local residents, and encouraged them to adopt some of those ideas.

An equally important outcome of the NAA study is that the various ceramic styles that Kelley named but did not formally describe have a distinct chemical composition and were manufactured in La Junta. These styles (Chinati, Capote, Paloma, and Conchos) begin to appear in the archeological record of La Junta after A.D. 1450, a time when the El Paso pueblos are being abandoned. Yet, another implication of the study that deserves a great deal more research is that the villages in La Junta persisted throughout the period of Spanish colonization of northern Mexico; a few remained viable after 1750 and new pottery styles were produced in them (Kenmotsu 1994:19). This suggests that whatever natural or cultural mechanisms causing abandonment of lifeways based on small-scale cultivation in the El Paso region were not operating at La Junta.

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A Compositional Analysis of Central Texas Hunter-Gatherer Ceramics and Its Implications for Mobility, Ethnic Group Territory, and Interaction

Darrell Creel, Jeffrey R. Ferguson, and Nancy A. Kenmotsu

ABSTRACT

Instrumental neutron activation analysis of 600 ceramic samples from Late Prehistoric/early historic Toyah phase hunter-gatherer assemblages in Central Texas has resulted in the definition of several chemically distinct groups. Many of these groups have primarily west central Texas distributions and may, to some extent, be reflecting territories of the Jumano and closely affiliated groups documented to have been in that area in the early historic period. Several other chemical groups are mostly restricted to the area along and below the Balcones Escarpment and may in part be related to other ethnohistorically documented native groups, possibly including Sanan-speaking peoples. This study has methodological implications for territory and mobility definition among hunter-gatherer groups using modest quantities of undecorated pottery.

INTRODUCTION

Chemical analysis of prehistoric ceramics has generally focused on pottery produced by cultures with agriculturally-based economies. This is as true of instrumental neutron activation analysis (NAA) as it is of petrography or any of the other less frequently employed techniques. In contrast, the research presented here explicitly addresses questions of ceramic production and transport as they relate to mobility in hunting and gathering cultural groups, the Late Prehistoric and probably early historic Toyah phase (sometimes referred as a horizon or interval) population in Central Texas (Figure 1). For the most part, archeologists perceive the Toyah population as having an emphasis on bison and deer hunting, and as a result, the people are commonly believed to have been highly mobile. Geographically, the Toyah population extends over a relatively large area with diverse physiography, biota, and other natural resources. The area from which the majority of samples in this study derive is some 300 miles east-west and north-south, and it is more or less equivalent to what Johnson (1994) referred to as the "Classic Toyah area" (Figure 1). The marked uniformity of most parts of the material culture throughout Central Texas has traditionally been interpreted as reflecting large group territories and/or substantial long-distance interaction. More recently, however, some researchers have suggested that individual groups may have had much smaller territories and that locally-made pottery vessels may not have been transported very far (Arnn 2012a, 2012b). The study reported here bears directly on this issue, indicating that chemical analysis of undecorated pottery can, and does, reveal much about the movement and territory of native people who, in this study area, bridged the prehistoric/historic time period in Central Texas.

The research described herein employed a chemical compositional analysis using NAA on 602 ceramics and 40 clay samples from the central portion of Texas. There are two specific objectives to this research, the first being an assessment of the scale at which ceramic production and movement within Central Texas are detectable. Assuming that the first objective is accomplished and, secondarily, that meaningful compositional groups are defined, the other primary objective is creation of an NAA database large enough that sets of 5-10 samples from future cultural resource management (CRM) projects are worthwhile expenditures even at commercial rates. That is, small numbers of samples will more likely yield meaningful results if they can be compared to an existing and large database.

This research began in 2000 with the proposal, "Compositional Analysis of Prehistoric Ceramics

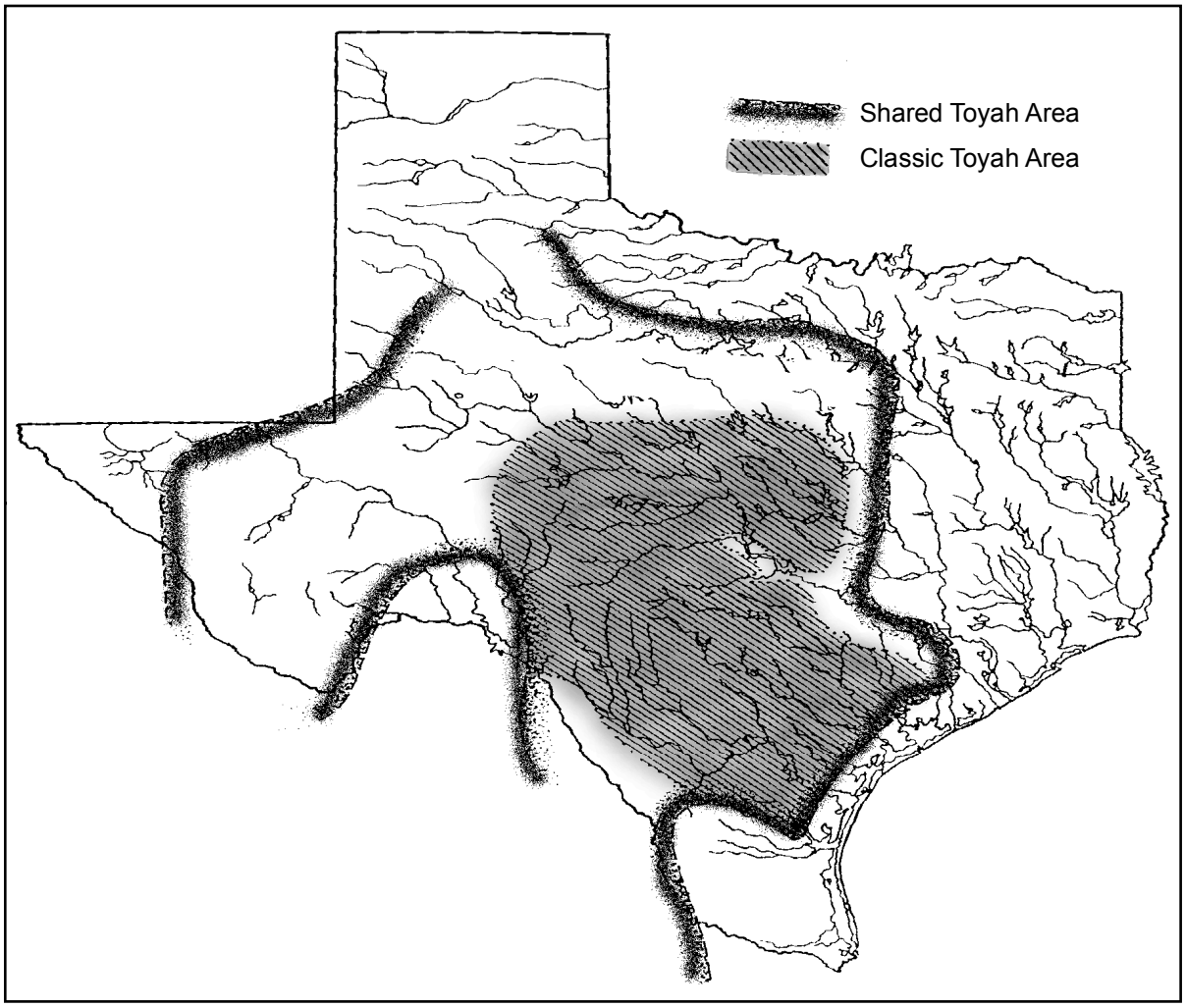

Figure 1. Location of the Toyah phase in Texas. Map after Johnson (1994:Figure 105).

from Central Texas," submitted by Darrell Creel to the Archaeometry Laboratory at the Missouri University Research Reactor (MURR). This proposal was approved and approximately 400 samples were subsequently submitted for NAA at the National Science Foundation-subsidized fee. Funding for this analysis was provided by the Texas Department of Transportation, the Texas Parks and Wildlife Department, the Lower Colorado River Authority, the Texas Archeological Society Donors Fund, the Council of Texas Archeologists, Friends of the Texas Archeological Research Laboratory, Kerza and Elton Prewitt, and Lawrence Aten. The resulting data were analyzed by Neff and Glascock (2005). A few additional samples were added to the dataset in the next few years, and the larger set of samples was the basis of a master's thesis by Jeffrey Taff (2006). Taff (2007) conducted further statistical analysis of that dataset in 2007. The current analysis builds on these earlier analyses but has the advantage of additional ceramic and raw clay samples.

PREVIOUS HUNTER-GATHERER CERAMICS RESEARCH

Mobility among hunting and gathering societies has received a great deal of research attention, and there is a robust literature on the topic. In recent decades, Binford's (1980) forager-collector continuum has influenced much of our thinking about mobility (see also Binford 2001); and Kelly's (1983, 1992, 1995) expansion of, and elaboration on, Binford's ideas has been similarly important. Many others researchers have addressed hunter-gatherer mobility

using a variety of innovative approaches, including compositional analysis of material culture, primarily lithic tools, which are often the principal or only artifact type preserved. This is particularly the case in Paleoindian research, there being a robust literature (not cited here) addressing lithic material distinctions and their implications for mobility and interaction.

No systematic effort has been made here to summarize that extensive literature, but three studies are noted here for their relevance to the current project. First is Hard and Katzenberg's (2011) stable isotope study of hunter-gatherer-fisher diet and mobility on the Gulf Coastal Plain in Texas. For the most part, this study focused on earlier time periods than the Toyah phase, but there is some geographic overlap with the data presented herein. Importantly, Hard and Katzenberg approached the question of mobility using stable isotopic data from human and faunal remains. Such an approach would be highly desirable but is precluded for the Toyah horizon/phase because of the paucity of Toyah human remains. It is for this reason that Taylor and Creel (2012) did not have any meaningful data for the Toyah horizon/phase in their initial study of heritable dental traits among Native American populations in Texas.

Another important study is Mehalchick and Kibler's (2008) analysis of mostly Late Archaic hunter-gatherer remains in the North Bosque River valley just west of Waco, Texas, an area from which some of the ceramic samples included in this study derive. Like many other researchers around the world, they used lithic artifacts and other data to address questions of mobility, seasonality, intensity of site use, group aggregation and fissioning, and territory.

The third study, Arnn's (2012a) interdisciplinary analysis of the Toyah horizon/phase is perhaps the most directly relevant to the current project. In that study, Arnn addresses what he sees as a large, political, economic, and social alliance of Late Prehistoric and early historic native groups that he refers to as the Tejas alliance. Many of his ideas are important in the interpretation of the ceramic compositional data presented here. Particularly notable are the community territories and marriage groups he discusses for Central Texas, precisely the area of interest in this study.

Worldwide, there have been numerous studies of hunter-gatherer use of ceramics, with effort devoted to research topics such as ceramic function (e.g., Sassaman 1993; Wills 1995), gender relations (e.g., Crown and Wills 1995; Sassaman 1992), and mobility (Sampson 1988). All of these topics, and others, are relevant in research on the Late Prehistoric hunter-gatherers of Central Texas; but the focus here is on two interrelated topics, mobility and territory size. Most studies of hunter-gatherer territory size and mobility have used variation in decorative style, manufacturing technology, vessel form, etc., as the basis for inference. Ridings and Sampson (1990), for example, analyzed the distribution of decorative motifs in their effort to identify group territory size among the historic Karoo Bushmen in South Africa (see also Bollong et. al. 1997; Sampson 1988).

In contrast, relatively few researchers have used chemical compositional analysis to examine hunter-gatherer mobility. Eerkens et. al. (2002) and Hildebrand et. al. (2002) have used NAA to examine Great Basin and southern California hunter-gatherer ceramics, with results indicating relatively substantial residential mobility. Boyd et. al. (2002) conducted both NAA and petrographic analysis of early historic sherds from the Southern Plains. Although they were unable to determine conclusively where the ceramics found in hunter-gatherer sites were made, the evidence as a whole strongly suggested that all of the pottery was acquired from various eastern Pueblos in New Mexico where such pottery is known to have been made. Creel and Clark have used NAA to determine the sources of Chupadero Black-on-white ceramics found in hunter-gatherer sites on the southern Plains and adjacent Trans-Pecos Texas (Clark 2006; Creel et. al. 2002). Chupadero Black-on-white is a Late Prehistoric pottery type made in large quantities at a number of pueblos in central New Mexico, and it occurs widely in sites on the Southern Plains. Clearly, this pottery type was acquired, rather than made, by Southern Plains hunter-gatherers. However, that analysis was not intended to address questions of mobility and did not yield data sufficient to do more than pose questions relevant to that issue.

CULTURAL SETTING

The Toyah horizon/phase is a readily recognized Late Prehistoric/ early historic cultural complex occurring in the central and southern portions of Texas; it is dated at ca. A.D. 1300-1600, possibly extending as late as 1700. Interestingly, the Toyah hunter-gatherers bordered and interacted

with agricultural groups to the east (the Caddo), the north (Plains village), west (Jornada Mogollon and eastern Ancestral Puebloan), and to the south more distant (Huastec). Interaction was evidently most intense with Caddo (Hasinai) and Jornada Mogollon peoples, particularly the former if the greater quantities and more widespread occurrence of Caddo ceramics is any indication (see additional discussion below). Thus, Toyah folks surely were familiar with pottery made by other peoples with whom they interacted and, in some cases, even appear to have used some of the same surface modification and decorative techniques (e. g., brushing, incising, engraving, and painting) as their eastern and western neighbors.

The Toyah horizon/phase is best known for the emphasis on bison and deer hunting, and the toolkit is very much like that of contemporaneous bison hunting groups through the Great Plains, of which Central Texas is the most southern portion. Ceramics consistently occur in Toyah sites, though never in large numbers, at least compared to the sedentary farming groups in surrounding regions. So far as we currently know, the largest site inventory would rarely exceed 20-30 vessels, even in the most extensively excavated sites, although it is likely that our sampling has yielded a rather modest representation of actual vessel numbers at some sites. Similarly, there is little evidence to date for more than a very few vessels of any kind in use at any given time in any given site, perhaps suggesting that pottery containers may not have been standard utilitarian items for every family.

Certainly, there is some variability in vessel form, with narrow mouth bottles, wide mouth jars, and bowls of various sizes (most thoroughly discussed by Johnson [1994]). The issues of vessel form and function are in need of further study but are not directly addressed in this study. Quigg and Peck (1995:146-148) argued that some of the vessels from the Rush site were used to boil fat from fractured bison bone, but that analysis is so far the only one of its kind and needs to be repeated with other assemblages. Whether some, perhaps even most, of these vessels were used primarily for ritual or other special purposes, as suggested by Arnn (2012a:78, 2012b:54), is unknown and unaddressed in any systematic technical analysis so far, including this compositional analysis.

Most of the pottery is plain bone-tempered earthenware assigned to the type Leon Plain; and most is very similar to, if not often indistinguishable from, native-made ceramics in the early Spanish missions in south central and southeastern Texas. Far less common are red-slipped bone-tempered vessels referred to by J. Charles Kelley as Doss Redware (Kelley 1947). Also rare are vessels with brushed exteriors of the Boothe Brushed type defined on the basis of the assemblage from the Collins site in Travis County (Suhm 1955). Boothe Brushed is believed to have been made in that general area and, though similar in many respects, is not a Caddo ware.

Leon Plain is a generally well-made, distinctive ware, with many vessels having extremely thin walls and polished exteriors. The typological issues with Leon Plain and Doss Red have been discussed by others, the early descriptions of the former being by Krieger (1946), Suhm et al. (1954), and Suhm and Jelks (1962). Shafer (personal communication, 2012) has suggested that the thin-walled narrow mouth jars/bottles are more often red-slipped and are perhaps best referred to as Doss Red, whereas the term Leon Plain is more appropriate for the bowls and wide mouth jars generally lacking a red slip or wash. Although a distinction based on vessel form may have some general validity, it is not consistent enough to warrant typological differentiation; and in any event, the fugitive nature of the slip or wash on some vessels renders the overall distinction somewhat suspect.

The notion of Leon Plain as a valid "type" is in need of reconsideration despite the fact that most archeologists readily recognize this distinctive pottery. Generally, the ceramics typically typed as Leon Plain are well-made, bone-tempered, and often thin-walled. Some vessels have additional materials in the fabric, most notably including naturally occurring sand as well as sand deliberately added as temper; but they nonetheless fit comfortably within the type definition. One of the concerns with this type definition is its extensive area of occurrence and our inability to link the "type" to a specific cultural group. Doug Boyd (personal communication, 2012) has the following useful perspective: "I have come to believe that Leon Plain isn't really a "type" in the sense that most of our other ceramic types are. It cannot be linked to a particular group or place...it is too widespread. The name now denotes a bone-tempered ceramic tradition that cross-cuts cultural and ethnic boundaries." The results of the NAA project reported here provide some data that may help us resolve the concerns with the validity and usefulness of the typological definition.

In addition to this presumably locally-made ware, occasional sherds/vessels of Caddo pottery types occur in Toyah horizon/phase sites and are generally easily linked to various parts of eastern Texas on the basis of vessel form, paste and temper attributes, and decoration. For the most part, these Caddo vessels are believed to have been acquired through trade by the Central Texas hunter-gatherer groups (see Perttula et al. 2003); but certain sites on the eastern edge of Central Texas may have been occupied for short periods by Caddo people from eastern Texas (see Shafer [2006] for a useful perspective on what he calls the Prairie Caddo).

Similarly, in the western and northwestern portions of Central Texas, assemblages occasionally contain pottery made in the Puebloan area of New Mexico and/or the Jornada Mogollon area of far western Texas; this is in addition to the Leon Plain and Caddo wares. These western types include various Rio Grande glazewares, corrugated wares (especially Ochoa Indented Corrugated), Chupadero Black-on-white, and El Paso Polychrome.

In perhaps the most comprehensive recent analysis of Leon Plain, Johnson (1994:287) interpreted variation in ceramic attributes, as well as other items in the assemblages, as indicating that the Toyah phase consisted of small bands of a few families with relatively small territories. The variability in clays in the ceramics from individual sites suggested to Johnson that the small group territories had diverse clay resources. The inference of small territory size is based largely on the occurrence of specific vessel forms in the different parts of Central Texas. This is consistent with earliest Spanish explorers' observations that the Native Americans in Central Texas lived in small bands, although camps with one thousand or more inhabitants were also documented (see Wade 2003:38). Such large camps were apparently temporary and fluid. This is also consistent with Arnn's (2012a, 2012b) view of small social groups linked into large social fields.

Although evidence such as that marshaled by Johnson is suggestive of small territory size, the apparent widespread uniformity of other parts of Toyah phase material culture may reflect larger territory size and greater mobility. Indeed, long ago, J. Charles Kelley (1955) argued that the Jumano were the early historic Toyah phase descendants and that the extensive travels of at least some of them were responsible for the consistent occurrence of many items of Toyah material culture over very large areas. If this were true, one would predict that any compositional groups identified through NAA would be widespread and not mostly restricted to small areas.

Within Central Texas, the only meaningful tests of this notion via ceramic research have been the petrographic analysis of a small number of Leon Plain specimens by Reese-Taylor (1995). Based on small samples from two localities in west central Texas and one in the southeastern part, Reese-Taylor asserted that there is considerable homogeneity in the bone-tempered pottery in Central Texas. There is, obviously, diversity in interpretations of Toyah horizon/phase territory size and mobility and, thus, the need for a concerted effort to address the issue. The relatively large-scale research effort reported herein will hopefully be a step toward resolving this issue.

GEOLOGIC SETTING

The feasibility of testing Johnson's model of small territory size using NAA requires chemical diversity in usable clay sources over relatively small distances, and the geologic variability in most of Central Texas area appears to be sufficiently diverse. Much of the landscape is a Cretaceous limestone plateau (the Edwards Plateau), but many of the streams draining the area have cut completely through the limestone into much different underlying formations. This includes, most notably, the Llano Uplift, an area containing outcrops of granites, schist, and sandstones. The Colorado River, for example, heads in the Southern Plains and flows through the Llano Uplift as well as the Edwards Plateau and then down through the Gulf coastal plain. The distance from the Southern Plains to the eastern edge of Central Texas is some 300 miles. In these miles, the pattern of exposed geologic formations, many of them containing significant clay deposits, is such that many drainages, or segments of drainages, have very different potential clay sources (see Garner et al. 1979). It is also true that some areas, particularly those where the streams have not cut through the Cretaceous limestone, have little diversity in geologic exposures and therefore comparatively little diversity in clay resources. Nonetheless, the overall geologic setting is such that the prospects are good for identifying chemical compositional groups of ceramics made in Central Texas.

CERAMIC COMPOSITIONAL ANALYSIS BACKGROUND

A number of relevant compositional analyses have been conducted on ceramics from central Texas or adjacent areas. Among these are the extensive and on-going analyses of Caddo pottery primarily by Timothy K. Perttula (see Ferguson 2007; Perttula and Ferguson 2010) but also including a modest effort targeting the George C. Davis site (Descantes et. al. 2004), Leonard's analysis of Rio Grande glazewares from Southern Plains sites (Leonard 2006), an NAA and petrographic analysis of Chupadero Black-on-white from western Texas and New Mexico (Creel et al. 2002; Clark 2006), Alvarado's NAA project on Ochoa Indented Corrugated from West Texas and southeast New Mexico (Alvarado 2008), Carlson's NAA research on Spanish colonial and native ceramics from missions in Central and East Texas (Carlson 1994; Carlson et. al. 2007), Perttula's (2002) NAA study of native-made Goliad Plain from Mission Refugio, Neff and Glascock's NAA analysis of ceramics from Refugio and Carvajal Crossing (Neff and Glascock 2001), Perttula's study of Caddo and Central Texas pottery in the Fort Hood area (Perttula et al. 2003), Boyd's NAA analysis of ceramics from the Lake Alan Henry area just north of Central Texas (Boyd et al. 2002), and Neff's modest NAA of ceramics from the McGuire's Garden site (41FT425) in Freestone County just east of the current project (Neff 2002b).

There have also been several petrographic analyses of ceramics from Central Texas sites, and most of these samples have also been subjected to NAA for this project. As noted previously, these include Kittleman's (1994) analysis of Buckhollow site pottery and Reese-Taylor's analyses of ceramics from sites at O. H. Ivie Reservoir, from the middle Onion Creek valley, and from the Rush site (Reese-Taylor 1993, 1995; Reese-Taylor et al. 1994). The ceramics from the middle Onion Creek valley were also subjected to proton induced X-ray emission analysis and the results compared with the petrographic analysis (Reese-Taylor et al. 1994). Similarly, Hill (2001) conducted a petrographic analysis of the Carvajal Crossing project ceramics that paralleled the NAA study by Neff and Glascock (2001), and the results from both were evaluated in a comprehensive manner.

More recently, several sites have been partially excavated in Central Texas for Texas Department of Transportation highway projects, and all of the samples from those sites are included in the analysis reported here. More or less coincident with these were several additional ceramic samples and a number of raw clay samples submitted for analysis as part of the Central Texas ceramic project. These add a modest number to the 400+ samples in the original batch of Central Texas samples that form the core of the current dataset. In addition, this analysis has included the samples from Carvajal Crossing and Mission Refugio even though most of the samples are Goliad Plain.

THE NAA SAMPLE

The NAA samples considered in this study total 640, of which 40 are raw clay (36 localities, some of which are also archeological sites with NAA samples), one is a ceramic pipe, and the remaining 600 are pottery vessel samples (note that this counts only three samples from 41KM69 since there were three pairs of samples, each pair from the same vessel; one from two duplicate samples from 41CV41, and one from three duplicate samples from 41CV174). Table 1 presents the basic data on the sites and number of ceramic samples per site, and Table 2 presents the data on the clay samples. Figure 2 shows the locations of the sites with ceramic samples, and Figure 3 shows clay sample locales. The data on each sample will be available digitally at a website URL yet to be determined.

Of the total, 477 samples were selected and analyzed in 2001-2002 for the Central Texas Ceramic Project (hereinafter referred to as CTCP), the remaining 165 are from seven separate CRM projects conducted since the original CTCP analysis. All but one of these CRM projects were done for the Texas Department of Transportation (TXDOT), and a few of the samples in the original CTCP analysis were from a TXDOT project in Fayette County.

Geographically, the majority of the samples are from the Edwards Plateau and immediately adjacent areas, with a large number from the Blackland Prairie below the Balcones Escarpment, extending to the Brazos River valley area around Waco. By far the most disjunct sample locality is Mission Rosario on the coastal plain in Refugio County; this large sample (n=106) was analyzed as part of a highway mitigation effort by the Center for Archaeological Research at the University of Texas at San Antonio, and has been included in this analysis because it focused on Goliad Plain, the

Table 1. Archeological sites and ceramics used in the analysis.

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41BC00114	Wheatley	3						1		4
41BL	Hartrick Bluff; Shafer Coll							1		1
41BL00018		1								1
41BL00022	H. Shafer Collection	1						1		2
41BL00023	Penny Winkle							2		2
41BL00104	Evoe	1						2		3
41BL00323	Gault				1					1
41BP	Wilson site (old 1C-138)			1						1
41BP00001	Goodwin site	2								2
41BQ00285								5		5
41BR00073	E.B. Sayles Collection							1		1
41BR00306	Coleman 2:3	2		1						3
41BR00307	E.B. Sayles Collection							1		1
41BT00001	Grelle	1		2	2					5
41BT00010	W. A. Chisum	2								2
41BX00228	Panther Springs Creek	4		1						5
41BX00300	Salado Creek Watershed	1								1
41BX00323	Kohnitz Coll.	3								3
41BX00528	Pampoa-Talon Crossing	4			4					8
41BX00980	S.W. Ind. School Dist.	4			5					9
41CC00031		1								1
41CC00131	Currie	6								6
41CC00170	Dripping Hole Branch	2								2
41CC00222		1								1
41CC00295	Paint Rock	2			2					4
41CK00066								1		1
41CK00079	Sand Creek	1								1
41CK00100		1								1
41CK00120	Pavo Site							1		1
41CM	Engle Farm	2								2

Table 1. *(Continued)*

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41CM00001	Oblate Rockshelter	2								2
41CM00125	M. Kohnitz Collection	2								2
41CM00247	M. Kohnitz Collection	1								1
41CN00095	Elm Creek	6								6
41CN	E.B. Sayles; Coleman 1:1	2			1					3
41CN	Millard Collection	1						4		5
41CV00041	Fort Hood 41CV41-A							1		1
41CV00048								1		1
41CV00101	H. Shafer Collection							1		1
41CV00174	Fort Hood 41CV174-A	1								1
41CV00344								3		3
41CV01512								1		1
41CY	Kline Cave (old 1C-26)	1								1
41ED00015	Grooms Ranch	1								1
41ED	E.B. Sayles, Rock Spr. 4:1				2					2
41FS00018	E.B. Sayles Collection				1					1
41FS00054	Steadman #11	1								1
41FS00062	Steadman Collection	1								1
41FY00135	Sandbur				7				1	8
41GL00001	Lehman Rockshelter		1							1
41HI00001	Kyle Site							2		2
41HI00008	Blum Rockshelter							6		6
41HI00050								1		1
41HI00105	McDonald Site							7		7
41HI00111								1		1
41HI00134								1		1
41HI00154								1		1
41HI00237								1		1
41HI00239								2		2
41HI00241								1		1

Table 1. *(Continued)*

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41HY00014	J. Greer Collection							1		1
41HY00163	Zatopec	6	2		1					9
41HY00202	Barton Site							1		1
41HY209-M	Mustang Branch	2								2
41HY209-T	Mustang Branch	1			1	1		2	1	6
41IR	Rusty Holt Collection			1						1
41IR00028		1						1		2
41IR00031		1			2					3
41IR00038		6						1	1	8
41IR00050								1		1
41IR00054	E.B. Sayles Collection	1								1
41JS00072	E.B. Sayles Collection	1			1					2
41KA00001	Scarbrough Farm site	2								2
41KA26-B	Carvajal Crossing				1		20			21
41KM00004	J.C. Kelley Collection	2								2
41KM00016	Buckhollow	8								8
41KM00069	Flatrock Road Site	3								3
41KM00226	Little Paint Site	6								6
41KM	E.B. Sayles, Junction 1:4	3								3
41KN	E.B. Sayles, Texas Y:8:2	1								1
41KR00521	Bryant Saner Collection	1								1
41KR00526	Cullum	2								2
41LL00004	Fall Creek	9		1	3			3		16
41LL00076	Spencer Collection	3		1				3		7
41LL00078	Slab Site				2					2
41LL00380	Long's Camp	1								1
41LL00413	Charlotte Graham Coll.	2						1		3
41ME00019	Natalia	1		1	1					3
41ME00102	David Calame Collection	3								3
41ME00103	David Calame Collection	1								1

Table 1. *(Continued)*

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41ME00115	David Calame Collection	1								1
41MH00004	E.B. Sayles Collection	1								1
41MK00011	H. Shafer Collection	1			1					2
41ML00028	Gas Plant Site							1		1
41ML00035	Baylor Site							3		3
41ML00040	TP&L Site				2					2
41ML00044	Chupek							4		4
41ML00046	Asa Warner							4		4
41MN1	Presidio San Saba						5			5
41MN00023	Mission San Saba						7		2	9
41MN00033	Janee site	1								1
41MN00055				5						5
41MV	E.B. Sayles, Texas Y:14:4	1								1
41NL00010	E.B. Sayles Collection								1	1
41NL00013	E.B. Sayles Collection	4			2				1	7
41NL00019	E.B. Sayles Collection							1		1
41RE00001	Mission San Lorenzo	1								1
41RF00001	Mission Refugio				19		87			106
41RN00003		2								2
41RN00113					1					1
41RN00163		1								1
41RN00169	Rocky Branch	3								3
41SC00004	E.B. Sayles Collection								1	1
41SS00002	Fall Creek No. 2	1			1					2
41SS00020	Finis Frost	4			1					5
41SS00028	Whitley Collection	3							1	4
41SS00051	Texas Tech Field School	2								2
41SS00110	Texas Tech Field School	2								2
41TA00040	E.B. Sayles Collection	1								1
41TA00117	E.B. Sayles Collection	3			1					4

Table 1. *(Continued)*

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41TA00123	E.B. Sayles Collection	2						2	1	5
41TA00124	E.B. Sayles Collection	2						2		4
41TA00125	E.B. Sayles Collection							2		2
41TA00186	Steadman #31							1		1
41TA00202	Steadman #65							1		1
41TG00038		3								3
41TG00045		13						2		15
41TG00048		3						2		5
41TG00078	Ben Cox Collection	1								1
41TG00091		12								12
41TG00346	Rush site	4			1			1		6
41TG00424								1		1
41TG00541	Ben Cox Collection	6						2		8
41TV00005	Nancy Edwards Collection	2						2		4
41TV00029		1						1		2
41TV00039	Rogers Spring site	1								1
41TV00040	Collins Site	6			1	2			1	10
41TV00042	Smith Rockshelter				1					1
41TV00104	Sneed Site	1						1		2
41TV00134	Polecat Hollow	1								1
41TV00142	Hillcrest Bluff	2						1		3
41TV00441	S.E. Metro Park	1			2			1		4
41UV00001	E. E. Nelson Ranch				1					1
41UV00002	Kincaid Rockshelter	3						1		4
41UV00007	Stockley Ranch	1								1
41UV00021	La Jita	5								5
41UV00137	G. Evans Collection	3								3
41UV	E.B. Sayles, Texas Y:4:1	1								1
41VV00011	Javelina Bluff	1								1
41VV00188	Devils Mouth	3								3

Table 1. *(Continued)*

Site Number*	Site Name	Leon Plain	Doss Red	Untyped Bone-tempered	Untyped Plain	Boothe Brushed	Goliad Plain	Caddo	Other**	Total
41VV00365	Seminole Canyon	1								1
41VV00424	Baker #1-2	1								1
41VV00444					6					6
41VV01723		2								2
41VV01724		2								2
41WM	J. Fagg Farm (old #1C-259)	1								1
41WM00006	Beyer Site	1								1
41WM00008	Cedar Park Mound	3						1		4
41WM00071	Barker	2						3		5
41WM00108		1								1
41WM00118								1		1
41WM00124								1		1
41WM00133	Loeve							5		5
41WM00437	Rowe Valley	2			1	1	1	2		7
Total		257	3	11	80	4	120	113	12	600

*Column has an indication of county even if the site does not have a formally assigned archeological site number.

**Other includes pipe, untyped painted, Goose Creek Plain, Ochoa Indented Corrugated, Chupadero Black-on-White, untyped upper Rio Grande glazeware, and untyped burnished red ware.

Table 2. Clay, burned daub, and fired clay waster samples used in the analysis.

Site Number*	Site Name	Natural Clay	Burned Clay or Daub	Fired Clay Waster	Total
41BC00114	Wheatley	1			1
41BP	clay source	1			1
41BT	Double Horn Creek Clay	1			1
41BT	Camp Creek	1			1
41BT	Lake Buchanan Clay Sample	1			1
41BX	San Antonio River alluvium	1			1
41BX	inactive clay quarry	1			1
41BX00300	Salado Creek Watershed	2			2
41CN	clay source	1			1
41CN	clay source	1			1
41FR00034	Suzanna Calame	1			1
41FT	Clay #3	1			1
41GL	Pedernales River Clay	1			1
41GL	Pedernales River Clay	1			1
41GU	Acme Brick clay	1			1
41GU4	Wilson, Durham, Chandler	1			1
41GU00005	H. Wilson and Company	1			1
41KR00600		1			1
41LL	Kingsland Clay Sample	1			1
41LL00417	Sandy Creek Clay	1			1
41LT	Clay #1 Kosse Silici	1			1
41LT	Clay #2	1			1
41ME	D'Hanis clay	1			1
41MK	clay source	1			1
41MK	inactive clay quarry	1			1
41MK	clay source	1			1
41MN00023	Mission San Saba		2		2
41MN00055		1			1
41MS	Clay #4	1			1
41RF00001	Mission Refugio	1			1
41SS	Colorado River Clay	1			1
41TV	Lake Travis Clay Sample	1			1
41TV00039	Rogers Spring site	1			1
41UV00132	Smith Site	2			2
41WM00118			1		1
41WM00230	Loeve Fox		1		1
41WN	Mission clay quarry			1	1
Total		35	4	1	40

*Column has an indication of county even if clay source does not have a site number

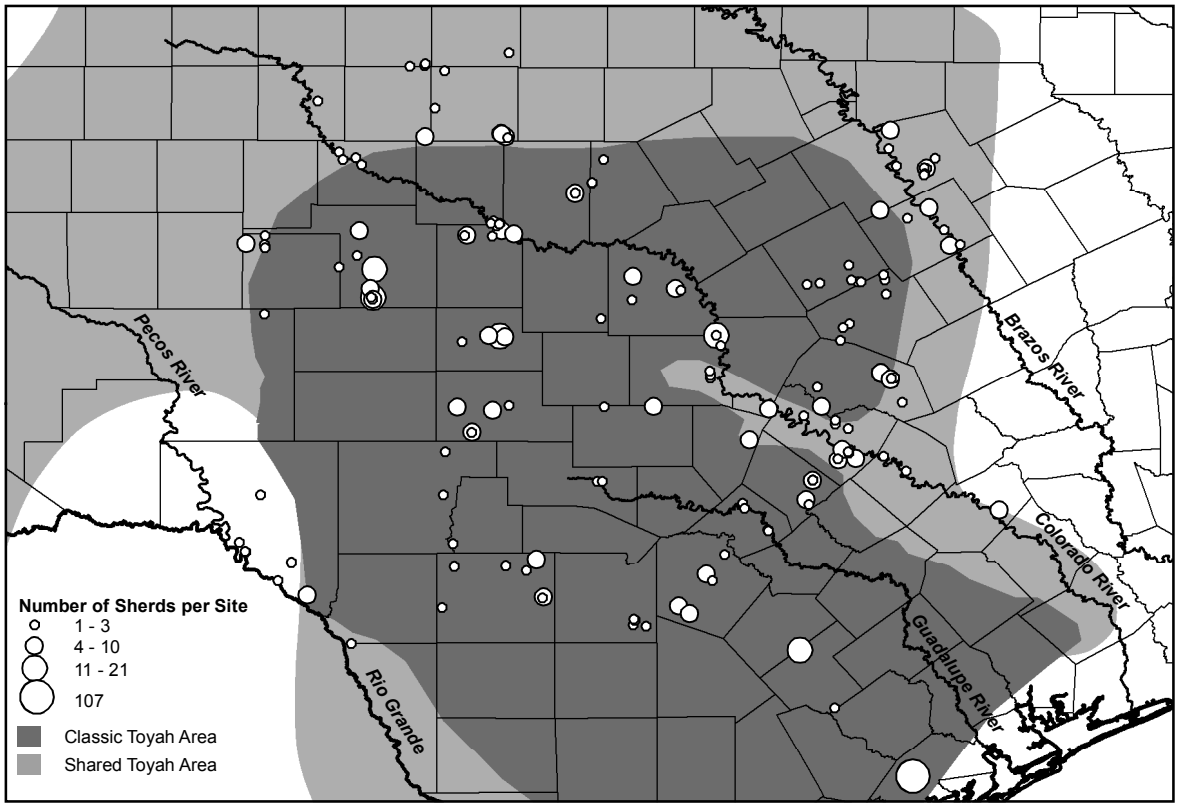

Figure 2. Locations of 160 sites represented in the NAA ceramic sample.

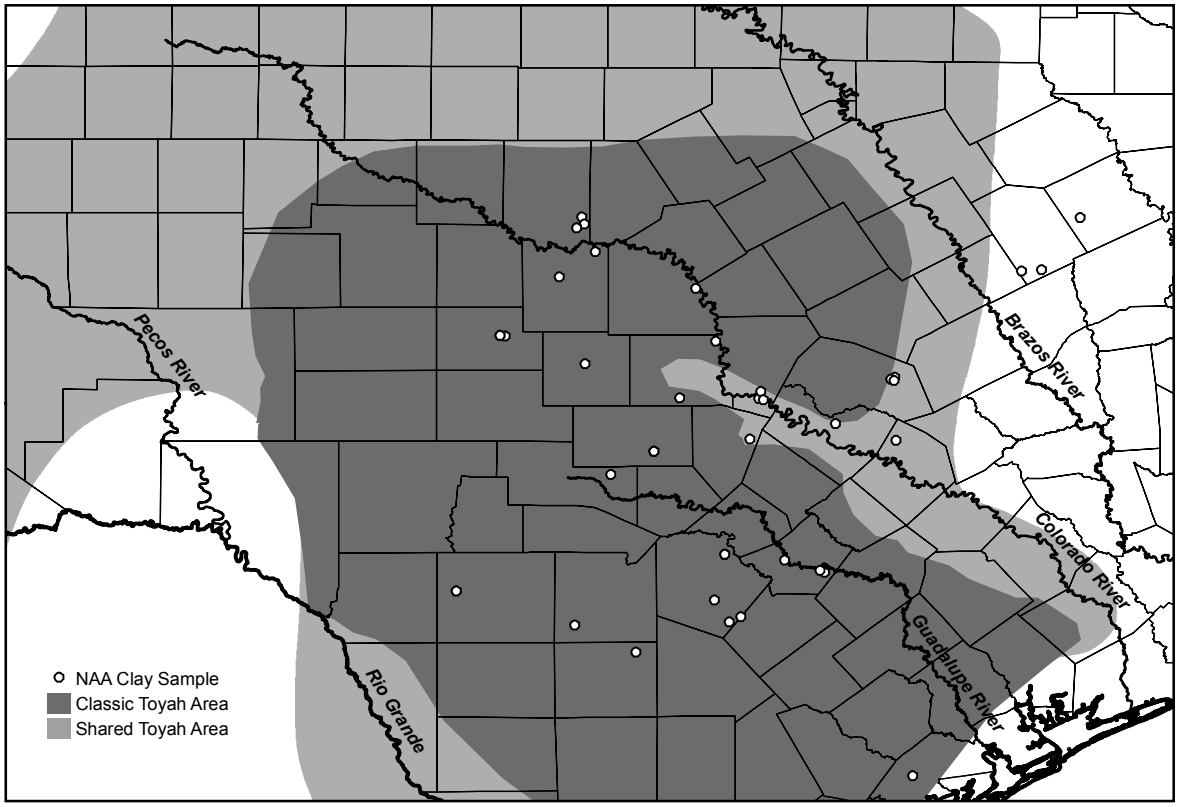

Figure 3. Locations of 36 sites and collection localities represented in the NAA natural clay samples.

historic, Native-made bone-tempered pottery type typically found in quantity in Central and central coastal Spanish missions and presumed to have derived from Leon Plain.

Figure 2 shows that the distribution of archeological sites from which at least one sample was selected is more or less even within the main project area. There are, however, significant gaps that are presumed, at this point at least, to reflect nothing more than lack of samples to which we had access. There is no reason to think that these gaps in our sample distribution are real gaps in the occurrence of ceramics archeologically. Indeed, there are collections from several sites that were not included because the sherds were either too small or there was only one sherd. In such cases, we did not destroy the only known ceramics from those sites, but we assume that the broad patterns in the data have not been materially affected by this exclusion.

Although most sites are represented by only one or two samples, many have four or five samples, and several sites have 10 or more. Other than the 20 from Carvajal Crossing in Karnes County and the 106 from Mission Refugio in Refugio County, the largest site samples are 18 from the Fall Creek site complex (41LL4 and 41SS2), 15 from 41TG45, 12 from 41TG91, 11 from Mission San Sabá (41MN23), and 10 from the Collins site (41TV40). There are more than 30 samples from a cluster of sites in southern Tom Green County, and there is a comparably large cluster of samples (n=27) from the general area of the Concho-Colorado river confluence, from Paint Rock to the modern O. H. Ivie Reservoir.

Figure 3 shows the location of raw clay samples used in this study. Most samples were acquired specifically for this effort from clay outcrops, but a few were from archeological sites. One of the principal goals of the raw material sampling was to visit the locations identified as commercial clay sources on the map, *Mineral Resources of Texas* (Garner et al. 1979). For the most part, these are in the Wilcox Formation along the Balcones Escarpment and in the Permian/Pennsylvanian formations in west central Texas, particularly as exposed on the surface in the Colorado River valley in Brown, Coleman, and McCulloch counties. Chuck Hixson generously provided ceramic-quality clays from several locations in the Llano Uplift area. The clay sampling effort was not comprehensive and is weakest in the western and northern portions of the study area. In particular, we have not yet sampled the important clay sources in the Clear Fork of the Brazos drainage in the northern part of the study area or clays in the Concho River drainage in the northwestern part of the study area.

One important part of this project was the focus on the Edwards Plateau and the ignoring of the rather substantial occurrence of Leon Plain in the area south and southeast of San Antonio. In part, this was a funding issue, but it was also a project phasing issue, the research plan focusing first on the Edwards Plateau, and then later, as funds became available, to expand the effort to include the important area south of San Antonio.

For the samples analyzed specifically for this project, the specimens were assigned to known ceramic types if at all possible; this is reflected in the counts presented in Tables 1 and 3. However, a number of samples included in this analysis were originally submitted by other researchers, so their ceramic type identifications (or descriptive category) are used herein to avoid potential confusion. The majority of the untyped specimens with bone temper could be comfortably typed as Leon Plain. Thus, the total sample of Leon Plain is somewhat greater than 300. Relatively little attention is herein given to Goliad Plain since it was a historic period mission ceramic product and the subject of a separate project. The Ochoa Indented Corrugated, the Chupadero Black-on-white, and the untyped Rio Grande glazeware samples are not included in the discussion since all were imported from areas west or northwest of Central Texas.

LABORATORY METHODS AND STATISTICAL ANALYSIS

Pottery samples were prepared for NAA using procedures standard at MURR. Fragments of about 1cm^2 were removed from each sample and abraded using a silicon carbide burr in order to remove glaze, slip, paint, and adhering soil, thereby reducing the risk of measuring contamination. The samples were washed in deionized water and allowed to dry in the laboratory. Once dry, the individual sherds were ground to powder in an agate mortar to homogenize the samples. Archival samples were retained from each sherd (when possible) for future research.

Two analytical samples were prepared from each source specimen. Portions of approximately 150 mg of powder were weighed into clean high-density polyethylene vials used for short irradiations

Table 3. Summary of samples by ceramic types.

Ceramic Type	No. of Samples	No. of Sites
Leon Plain	257*	107
Doss Red	3	2
Untyped bone-tempered (probably Leon Plain)	11	6
Untyped Plain	80	34
Boothe Brushed	4	3
Goliad Plain	120	5
Caddo (various types)	113	62
Untyped painted*	2	2
Goose Creek Plain	1	1
Ochoa Indented Corrugated	4	4
Chupadero Black-on-white	1	1
Untyped Rio Grande glazeware	1	1
Untyped burnished red ware	2	1
Pipe	1	1
Total	600	230

Note: The ceramic samples are from 160 sites.

* One is a painted Leon Plain sherd.

at MURR. At the same time, 200 mg of each sample was weighed into high-purity quartz vials used for long irradiations. Individual sample weights were recorded to the nearest 0.01 mg using an analytical balance. Both vials were sealed prior to irradiation. Along with the unknown samples, Standards made from National Institute of Standards and Technology (NIST) certified standard reference materials of SRM-1633b (coal fly ash) and SRM-688 (basalt rock) were similarly prepared, as were quality control samples (e.g., standards treated as unknowns) of SRM-278 (obsidian rock) and Ohio Red Clay (a standard developed for in-house applications).

Irradiation and Gamma-Ray Spectroscopy

Neutron activation analysis of ceramics at MURR, which consists of two irradiations and a total of three gamma counts, constitutes a superset of the procedures used at most other NAA laboratories (Glascock 1992; Neff 1992, 2000). As discussed in detail by Glascock (1992), a short irradiation is carried out through the pneumatic tube irradiation system. Samples in the polyvials are sequentially irradiated, two at a time, for five seconds by a neutron flux of 8 x 10^{13} n cm^{-2} s^{-1} The 720-second count yields gamma spectra containing peaks for nine short-lived elements aluminum (Al), barium (Ba), calcium (Ca), dysprosium (Dy), potassium (K), manganese (Mn), sodium (Na), titanium (Ti), and vanadium (V). The samples are encapsulated in quartz vials and are subjected to a 24–hour irradiation at a neutron flux of 5 x 10^{13} n cm^{-2} s^{-1}. This long irradiation is analogous to the single irradiation utilized at most other laboratories. After the long irradiation, samples decay for seven days, and then are counted for 1,800 seconds (the "middle count") on a high-resolution germanium detector coupled to an automatic sample changer. The middle count yields determinations of seven medium half-life elements, namely arsenic (As), lanthanum (La), lutetium (Lu), neodymium (Nd), samarium (Sm), uranium (U), and ytterbium (Yb). After an additional three- or four-week decay, a final count of 8,500 seconds is carried out on each sample. The latter measurement yields the following 17 long half-life elements: cerium (Ce), cobalt

(Co), chromium (Cr), cesium (Cs), europium (Eu), iron (Fe), hafnium (Hf), nickel (Ni), rubidium (Rb), antimony (Sb), scandium (Sc), strontium (Sr), tantalum (Ta), terbium (Tb), thorium (Th), zinc (Zn), and zirconium (Zr). The element concentration data from the three measurements are tabulated in parts per million.

Interpreting Chemical Data

The analyses at MURR, described above, produced elemental concentration values for 33 elements in most of the analyzed samples. Data for nickel (Ni) in many samples was below detection limits (as is the norm for most New World ceramics) and was removed from consideration during the statistical analysis. Calcium levels were found to be high enough (up to 7.4 percent) in many specimens to require a calcium correction of the dataset. Because calcium has the potential to affect (dilute) the concentrations of other elements in the analysis, all samples were mathematically corrected to compensate for any possible calcium-included effects (the data were examined before and after calcium correction and the results were similar). The following mathematical correction was used as it has been proven to be effective in other calcium-rich datasets (Cogswell et al. 1998:64; Steponaitis et al. 1996):

$$e' = \frac{10^6 e}{10^6 - 2.5c}$$

where e' is the corrected concentration of a given element in parts per million (ppm), e is the measured concentration of that element in ppm, and c is the concentration of elemental calcium in ppm. After the calcium correction, calcium was generally removed from the statistical analyses. Statistical analysis was subsequently carried out on base-10 logarithms of concentrations on the remaining 31 elements.

Use of log concentrations rather than raw data compensates for differences in magnitude between the major elements, such as calcium, on one hand and trace elements, such as the rare earth or lanthanide elements (REEs). Transformation to base-10 logarithms also yields a more normal distribution for many trace elements.

The interpretation of compositional data obtained from the analysis of archeological materials is discussed in detail elsewhere (e.g., Baxter and Buck 2000; Bieber et al. 1976; Bishop and Neff 1989; Glascock 1992; Harbottle 1976; Neff 2000) and will only be summarized here. The main goal of data analysis is to identify distinct homogeneous groups within the analytical database. Based on the provenance postulate of Weigand et al. (1977), different chemical groups may be assumed to represent geographically restricted sources. For lithic materials such as obsidian, basalt, and cryptocrystalline silicates (e.g., chert, flint, or jasper), raw material samples are frequently collected from known outcrops or secondary deposits and the compositional data obtained on the samples is used to define the source localities or boundaries. The locations of sources can also be inferred by comparing unknown specimens (i.e., ceramic artifacts) to knowns (i.e., clay samples) or by indirect methods such as the "criterion of abundance" (Bishop et al. 1992) or by arguments based on geological and sedimentological characteristics (e.g., Steponaitis et al. 1996). The ubiquity of ceramic raw materials usually makes it impossible to sample all potential "sources" intensively enough to create groups of knowns to which unknowns can be compared. Lithic sources tend to be more localized and compositionally homogeneous in the case of obsidian or compositionally heterogeneous as is the case for most cherts.

Compositional groups can be viewed as "centers of mass" in the compositional hyperspace described by the measured elemental data. Groups are characterized by the locations of their centroids and the unique relationships (i.e., correlations) between the elements. Decisions about whether to assign a specimen to a particular compositional group are based on the overall probability that the measured concentrations for the specimen could have been obtained from that group.

Initial hypotheses about source-related subgroups in the compositional data can be derived from non-compositional information (e.g., archeological context, decorative attributes, etc.) or from application of various pattern-recognition techniques to the multivariate chemical data. Some of the pattern recognition techniques that have been used to investigate archeological data sets are cluster analysis (CA), principal components analysis (PCA), and discriminant analysis (DA). Each of the techniques has its own advantages and disadvantages which may depend upon the types and quantity of data available for interpretation.

The variables (measured elements) in archeological and geological data sets are often correlated

and frequently large in number. This makes handling and interpreting patterns within the data difficult. Therefore, it is often useful to transform the original variables into a smaller set of uncorrelated variables in order to make data interpretation easier. Of the above-mentioned pattern recognition techniques, PCA is a technique that transforms the data from the original correlated variables into uncorrelated variables most easily.

PCA creates a new set of reference axes arranged in decreasing order of variance subsumed. The individual PCs are linear combinations of the original variables. The data can be displayed on combinations of the new axes, just as they can be displayed on the original elemental concentration axes. PCA can be used in a pure pattern-recognition mode (i.e., to search for subgroups in an undifferentiated data set), or in a more evaluative mode (i.e., to assess the coherence of hypothetical groups suggested by other criteria). Generally, compositional differences between specimens can be expected to be larger for specimens in different groups than for specimens in the same group, and this implies that groups should be detectable as distinct areas of high point density on plots of the first few components. It is well known that PCA of chemical data is scale dependent (Mardia et al. 1979), and analyses tend to be dominated by those elements or isotopes for which the concentrations are relatively large. This is yet another reason for the log transformation of the data.

One frequently exploited strength of PCA, discussed by Baxter (1992), Baxter and Buck (2000), and Neff (1994, 2002a), is that it can be applied as a simultaneous R- and Q-mode technique, with both variables (elements) and objects (individual analyzed samples) displayed on the same set of principal component reference axes. A plot using the first two principal components as axes is usually the best possible two-dimensional representation of the correlation or variance-covariance structure within the data set. Small angles between the vectors from the origin to variable coordinates indicate strong positive correlation; angles at 90 degrees indicate no correlation; and angles close to 180 degrees indicate strong negative correlation. Likewise, a plot of sample coordinates on these same axes will be the best two-dimensional representation of Euclidean relations among the samples in log-concentration space (if the PCA was based on the variance-covariance matrix) or standardized log-concentration space (if the PCA was based on the correlation matrix). Displaying both objects and variables on the same plot makes it possible to observe the contributions of specific elements to group separation and to the distinctive shapes of the various groups. Such a plot is commonly referred to as a "biplot" in reference to the simultaneous plotting of objects and variables. The variable inter-relationships inferred from a biplot can be verified directly by inspecting bivariate elemental concentration plots (note that a bivariate plot of elemental concentrations is not a Biplot).

Whether a group can be discriminated easily from other groups can be evaluated visually in two dimensions or statistically in multiple dimensions. A metric known as the Mahalanobis distance (or generalized distance) makes it possible to describe the separation between groups or between individual samples and groups on multiple dimensions. The Mahalanobis distance of a specimen from a group centroid (Bieber et al. 1976; Bishop and Neff 1989) is defined by:

$$D^2_{y,X} = [y - \overline{X}]^t I_x [y - \overline{X}]$$

where y is the 1 x m array of logged elemental concentrations for the specimen of interest, X is the n x m data matrix of logged concentrations for the group to which the point is being compared with being its 1 x m centroid, and is the inverse of the m x m variance-covariance matrix of group X. Because Mahalanobis distance takes into account variances and covariances in the multivariate group it is analogous to expressing distance from a univariate mean in standard deviation units. Like standard deviation units, Mahalanobis distances can be converted into probabilities of group membership for individual specimens. For relatively small sample sizes, it is appropriate to base probabilities on Hotelling's , which is the multivariate extension of the univariate Student's.

When group sizes are small, Mahalanobis distance-based probabilities can fluctuate dramatically depending upon whether or not each specimen is assumed to be a member of the group to which it is being compared. Harbottle (1976) calls this phenomenon "stretchability" in reference to the tendency of an included specimen to stretch the group in the direction of its own location in elemental concentration space. This problem can be circumvented by cross-validation; that is, by removing each specimen from its presumed group before calculating its own probability of membership (Baxter 1994; Leese and Main 1994). This is a conservative approach to group evaluation that may sometimes exclude true group members.

Small sample and group sizes place further constraints on the use of Mahalanobis distance: with more elements than samples, the group variance-covariance matrix is singular, thus rendering calculation of (and itself) impossible. Therefore, the dimensionality of the groups must somehow be reduced. One approach would be to eliminate elements considered irrelevant or redundant. The problem with this approach is that the investigator's preconceptions about which elements should be discriminated may not be valid. It also squanders the main advantage of multi-element analysis, namely the capability to measure a large number of elements. An alternative approach is to calculate Mahalanobis distances with the scores on principal components extracted from the variance-covariance or correlation matrix for the complete data set. This approach entails only the assumption, entirely reasonable in light of the above discussion of PCA, that most group-separating differences should be visible on the first several PCs. Unless a data set is extremely complex, containing numerous distinct groups, using enough components to subsume at least 90 percent of the total variance in the data can be generally assumed to yield Mahalanobis distances that approximate Mahalanobis distances in full elemental concentration space.

Lastly, Mahalanobis distance calculations are also quite useful for handling missing data (Sayre 1975). When many specimens are analyzed for a large number of elements, it is almost certain that a few element concentrations will be missed for some of the specimens. This occurs most frequently when the concentration for an element is near the detection limit. Rather than eliminate the specimen or the element from consideration, it is possible to substitute a missing value by replacing it with a value that minimizes the Mahalanobis distance for the specimen from the group centroid. Thus, those few specimens which are missing a single concentration value can still be used in group calculations.

STATISTICAL INTERPRETATION

The compositional groups are formed without regard to any descriptive information. This section describes the chemical and statistical justification for the compositional groups prior to examining their spatial and cultural distributions.

The majority of the compositional groups are composed of small clusters of between two and 11 samples that separate from the other samples in the study in bivariate plots and generally exhibit a similar chemistry across most or all of the elements included in this study. Figure 4 is a plot of all of these small groups. Group 1 (n=6) exhibits elevated cesium levels. Group 2 (n=2) has relatively high chromium and tantalum, while Group 3 (n=3) has low chromium. Group 4 (n=7) separates in plots of zirconium with both samarium and europium. Group 5 (n=6) is separated in a plot of cerium and cobalt and Group 6 (n=6) in a plot of samarium and rubidium. Group 7 (n=4) exhibits increased tantalum, and Group 8 (n=4) has comparatively low samarium. Group 9 (n=6) is separated in a plot of rubidium and chromium, Group 13 (n=4) in a plot of chromium and hafnium, Group 14 (n=11) in a plot of chromium and lutetium, and Group 15 (n=11) in a plot of lutetium and cerium. All 12 of the small groups account for a total of only 68 samples, or approximately 11 percent of the total data set. Due to their small size, it is difficult to further statistically evaluate the validity of these small groups.

The majority of the remaining samples form a large mass of fairly uniform chemistry that has created some difficulty in previous attempts to interpret these data. Three groups (Groups 10, 11, and 12) were initially formed using hierarchical cluster analysis and refined using a combination of bivariate plots and group membership probabilities based on Mahalanobis distance calculations. Figure 5 is a plot showing the decent separation of the three large groups. Appendix Table A-4 in Creel et al. (2012) lists group membership probabilities for the members of the three large groups as well as the projected membership probabilities for all other samples in this study.

Two of the three large groups exhibit some internal patterning that has led to the development of a number of subgroups. Most of these subgroup designations have reduced the sample size below the threshold for robust statistical analysis, thus the subgroups are generally based mostly on visual inspection of bivariate plots. Group 10 is divided into three subgroups based almost entirely on the terbium concentrations. Figure 6 is a plot of the Group 10 subgroups. No subgroup structure has been identified for Group 11, but Group 12 is divided into 3 subgroups with a couple of samples not included in a subgroup (Figure 7).

In addition to the roughly 58 percent of the sample assigned to Groups 1 through 15, there are 15 additional samples removed from the dataset early on

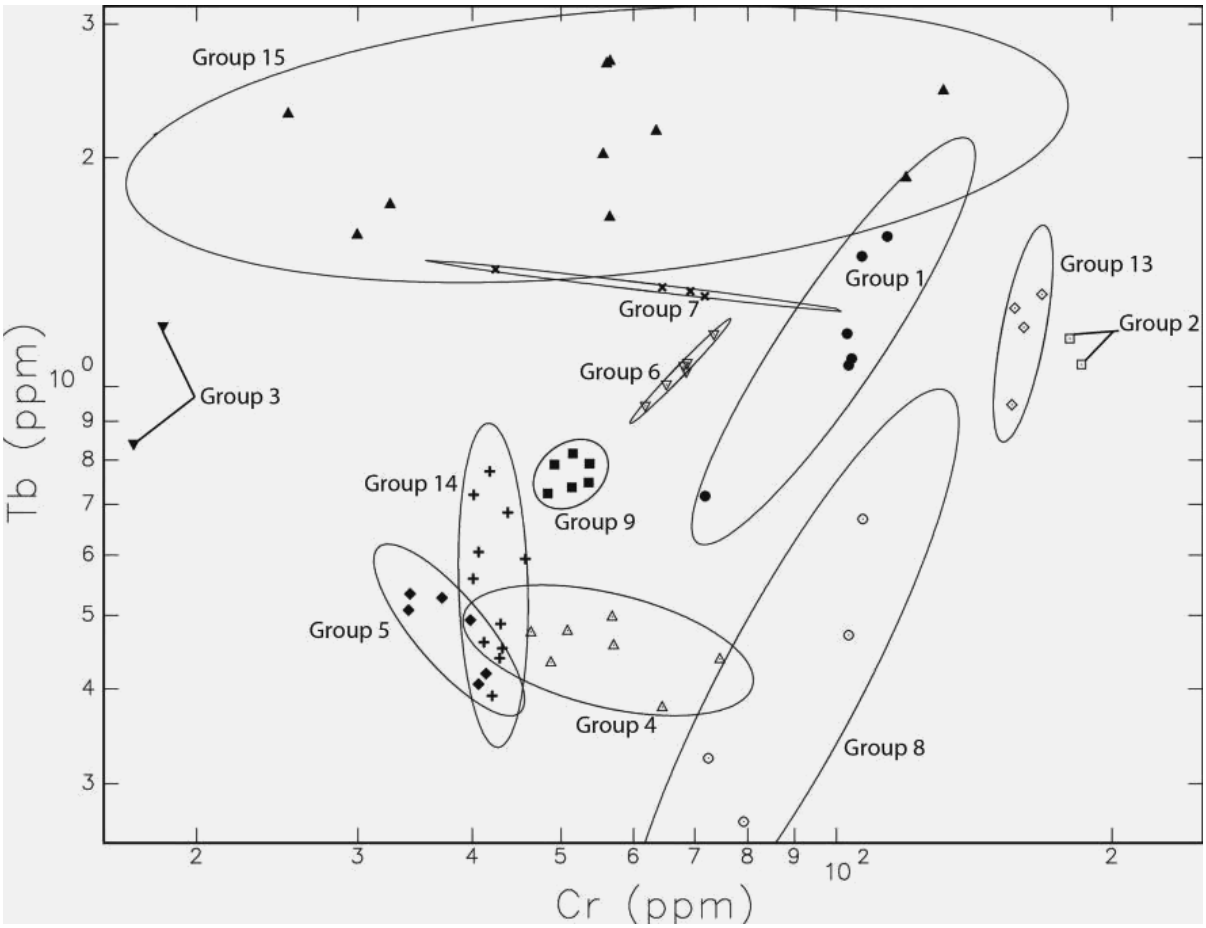

Figure 4. Bivariate plot of chromium and terbium showing the small compositional groups. Ellipses represent 90 percent confidence intervals for membership in the group.

due to very unique chemistries. These samples have been classified as outliers. Some of these samples may only be unique in the concentration of one or two elements, but it is enough to skew some of the multivariate statistics if they were not removed. While the specific sources for the outliers' unique chemistries are not known, it is not safe to assume that they represent imported ceramics.

An additional 186 samples remain unassigned. The vast majority of the unassigned samples are part of the large mass of samples that was divided to form Groups 10, 11, and 12. The groups represent very conservative clusters, and thus the groups exclude many more potential members than other approaches. Many of the unassigned samples are either not quite similar enough to any of the large groups or potentially belong to more than one group. Figure 8 is a plot of the unassigned samples relative to the three large groups.

INTERPRETATION OF CHEMICAL COMPOSITIONAL GROUPS

Statistical analysis of the dataset resulted in the identification of 15 compositional groups, five of which contain only historic mission period ceramics and are not discussed further here. Of the 10 groups containing native-made, non-mission pottery, three (Groups 1, 10, and 12) have been split into three subgroups each. In effect, this yields 16 separate groups that include native-made, non-mission ceramics (Table 4). It is important to note, however, that 317 (53 percent) of the ceramic samples are either outliers or, much more frequently, are currently unassigned to a compositional group. Slightly less than one-third of these are Caddo pottery samples that have no probability of membership in any of the Central Texas compositional groups.

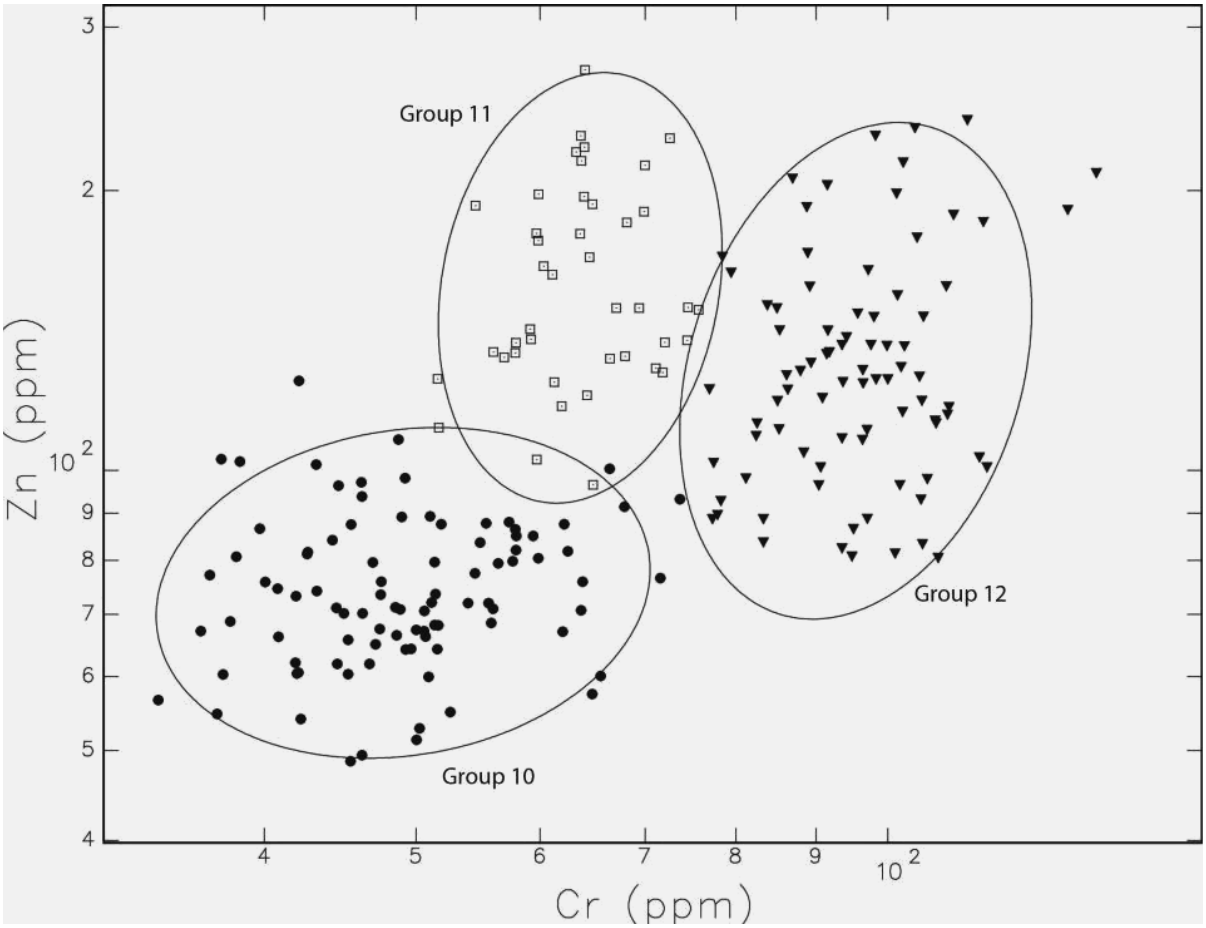

Figure 5. Bivariate plot of chromium and zinc showing the separation of groups 10, 11, and 12. Ellipses represent 90 percent confidence intervals for membership in the group.

Chemically, the compositional groups defined above and discussed more fully below separate into two somewhat loosely defined clusters of similar groups, hereafter referred to as Clusters A and B, with Group 11 somewhat intermediate. The two clusters were identified by observing bivariate plots of the first few canonical discriminant functions and, in general, are distinguished by somewhat lower values for transition metals and rare earths La, Nd, Sm, Ta, Th, Ce, Eu, and Tb. To some extent, this is paralleled by lower values for many of the clay samples from the Wilcox Formation along and below the Balcones Escarpment (not all of which have been assigned to a compositional group in Cluster B) as well as a few of the clay samples from the Llano Uplift area. Not surprisingly, these clusters have geographically different concentrations. Cluster A is largely a west central Texas set of groups whereas Cluster B is focused on the Balcones Escarpment zone and adjacent Gulf coastal plain area. The clusters and their groups are discussed in some detail below, with the focus being on Leon Plain.

Of the 257 Leon Plain samples, typologically the largest portion of the dataset and the focus of this study, 130 (51 percent) are unassigned to a group. The percentage of unassigned Leon Plain is about 43 percent in west central Texas samples but is notably higher at about 57 percent in the areas along and closer to the Balcones Escarpment. The reason for this difference is unknown. In any event, it seems likely that additional samples of Leon Plain will result in the definition of new groups.

Cluster A

Cluster A has several compositional groups, all with member provenience primarily or exclusively in

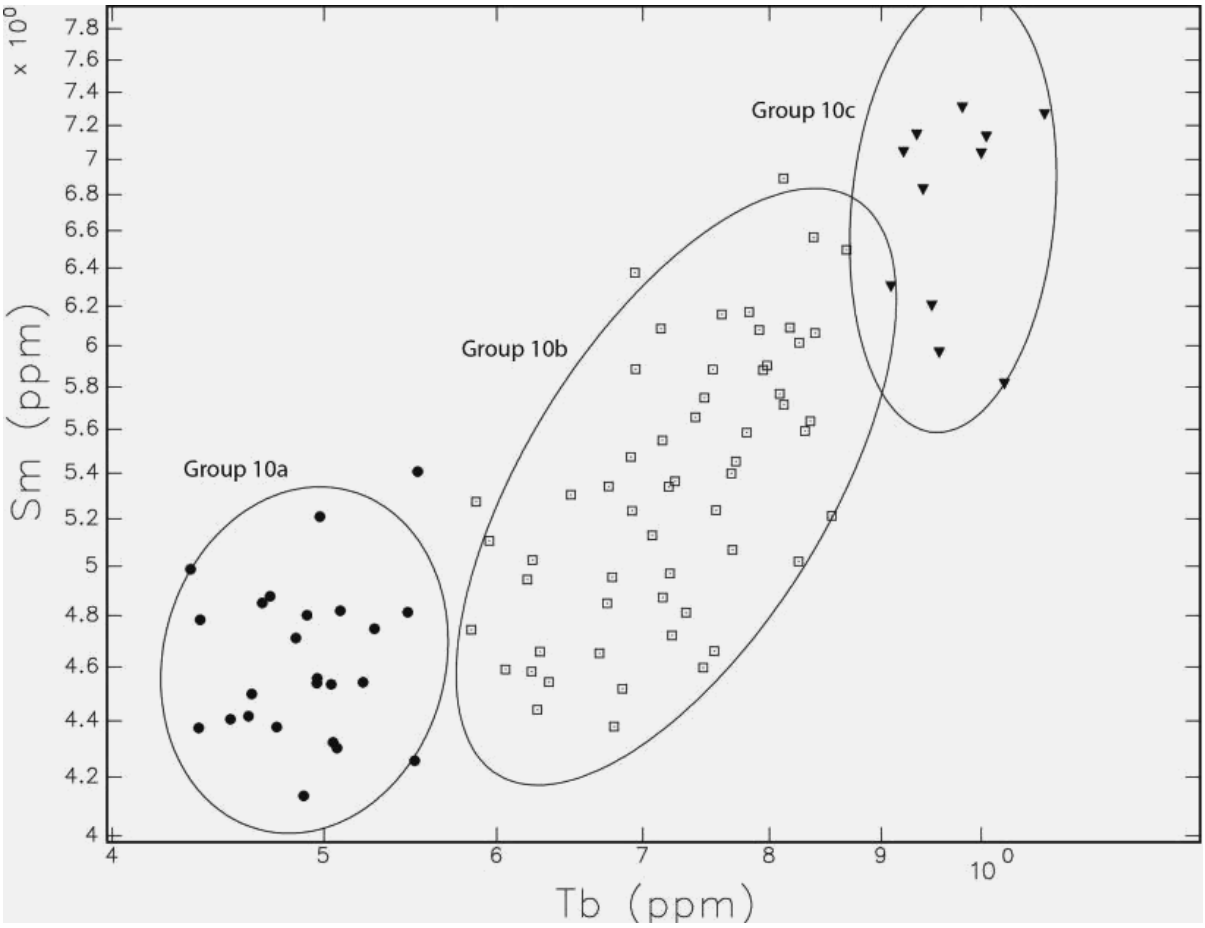

Figure 6. Bivariate plot of terbium and samarium showing the separation of the three Group 10 subgroups. Ellipses represent 90 percent confidence intervals for membership in the group.

west central Texas, the Llano Uplift area, and, in some cases, the Lower Pecos. Most samples are from sites in the heartland of the Jumano, that is the Concho, upper Colorado, and San Saba river drainages, and the vast majority of the samples are Leon Plain. There are a few Goliad Plain and one Doss Red as well. Some of the groups are small and occur (in the present sample) at only one or two sites, whereas others are larger and occur in more sites over somewhat larger areas. Then there are the large groups that contain the bulk of the samples and have larger distributions, mostly in west central Texas and, in some cases, the Lower Pecos, and including a very modest number of samples from Travis, Williamson, and Bell counties, plus one from Uvalde County.

Group 1

This group has six samples, all bone-tempered with sand. Three of the six are untyped bone-tempered plain from 41MN55, one is Goliad Plain from 41MN23, and two are Leon Plain from 41VV1724 (Figure 9). These have been assigned to three subgroups, 1A, 1B, and 1C.

Group 1A

Subgroup 1A contains three untyped bone-tempered plain samples from 41MN55.These are presumed to have been made somewhere other than the site area since a clay sample from 41MN55 is a member of Group 10 (probability of membership 27.35 percent).

Group 1B

Subgroup 1B contains two Leon Plain samples from 41VV1724; the production area is unknown. Interestingly, all of the other Val Verde County samples assigned to compositional group are in

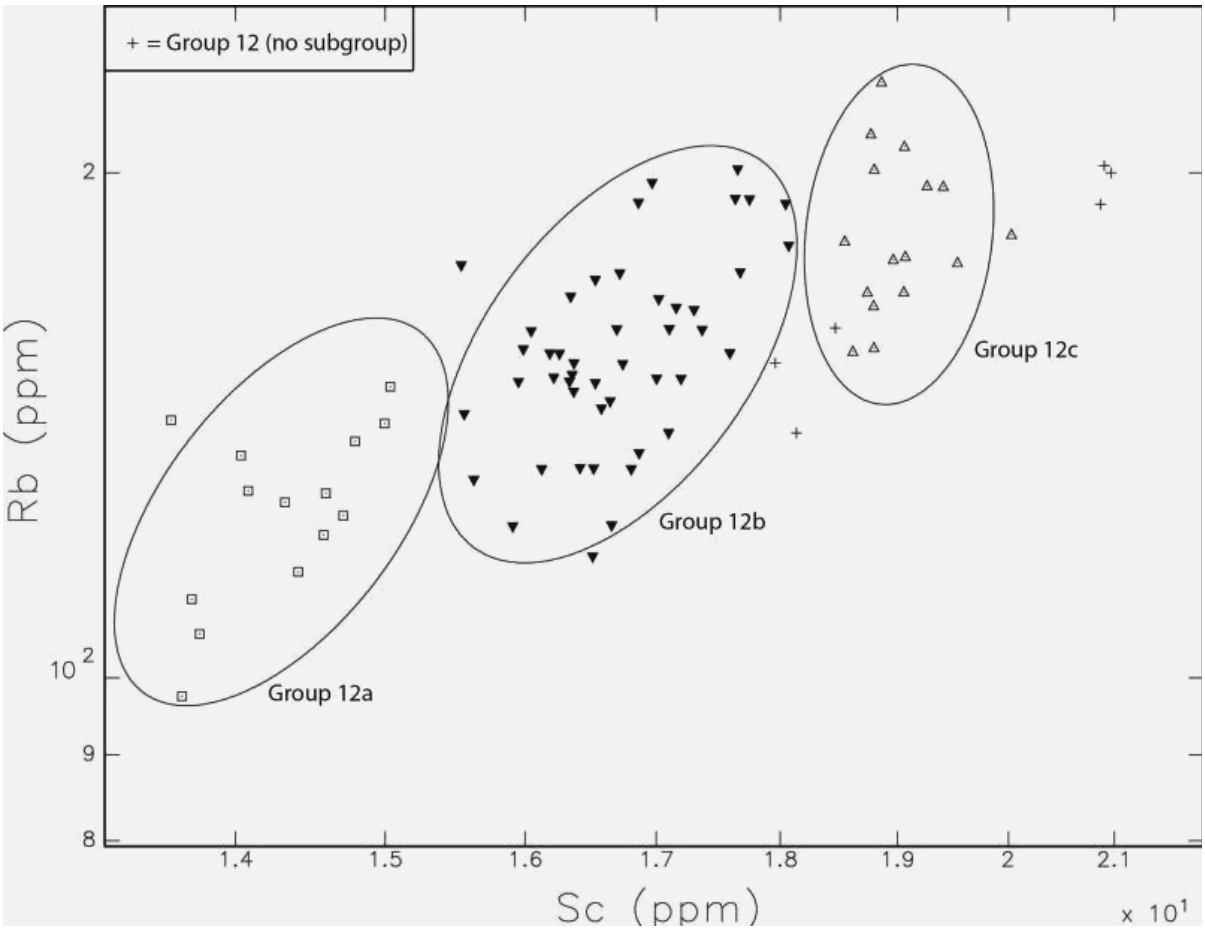

Figure 7. Bivariate plot of scandium and rubidium showing the separation of the three Group 10 subgroups. Ellipses represent 90 percent confidence intervals for membership in the group.

Group 12, most of them Group 12B (eight of nine in subgroup 12B, and one assigned only to Group 12).

Group 1C

This subgroup has only one member, the distinctive Goliad Plain sample from Mission San Sabá (41MN23). The production area is currently undetermined.

Group 7

There are four samples in this group: two Leon Plain, one Doss Red, and one untyped plain sherd with sand, mica, and possibly bone temper inclusions. Two samples are from 41SS28, and one each from 41CC295 and 41GL1. Distribution in the upper Colorado/Pedernales drainages (Figure 10) is presumed to reflect production somewhere in that region, with movement of vessels over a limited area.

Group 9

There are three paired sets of samples (equal to three vessels sampled) in this group, all Leon Plain from 41KM69 (Figure 11). The production locale presumed to be the Kimble County area.

Group 12

Group 12 is one of the two largest groups in the entire Central Texas dataset and is overwhelmingly a west central Texas and Lower Pecos group (Figure 12). For the most part, it has been divided into three subgroups, A, B, and C; but a few samples cannot be so assigned. Four clay samples are members of this group but none can be confidently assigned to any of the subgroups.

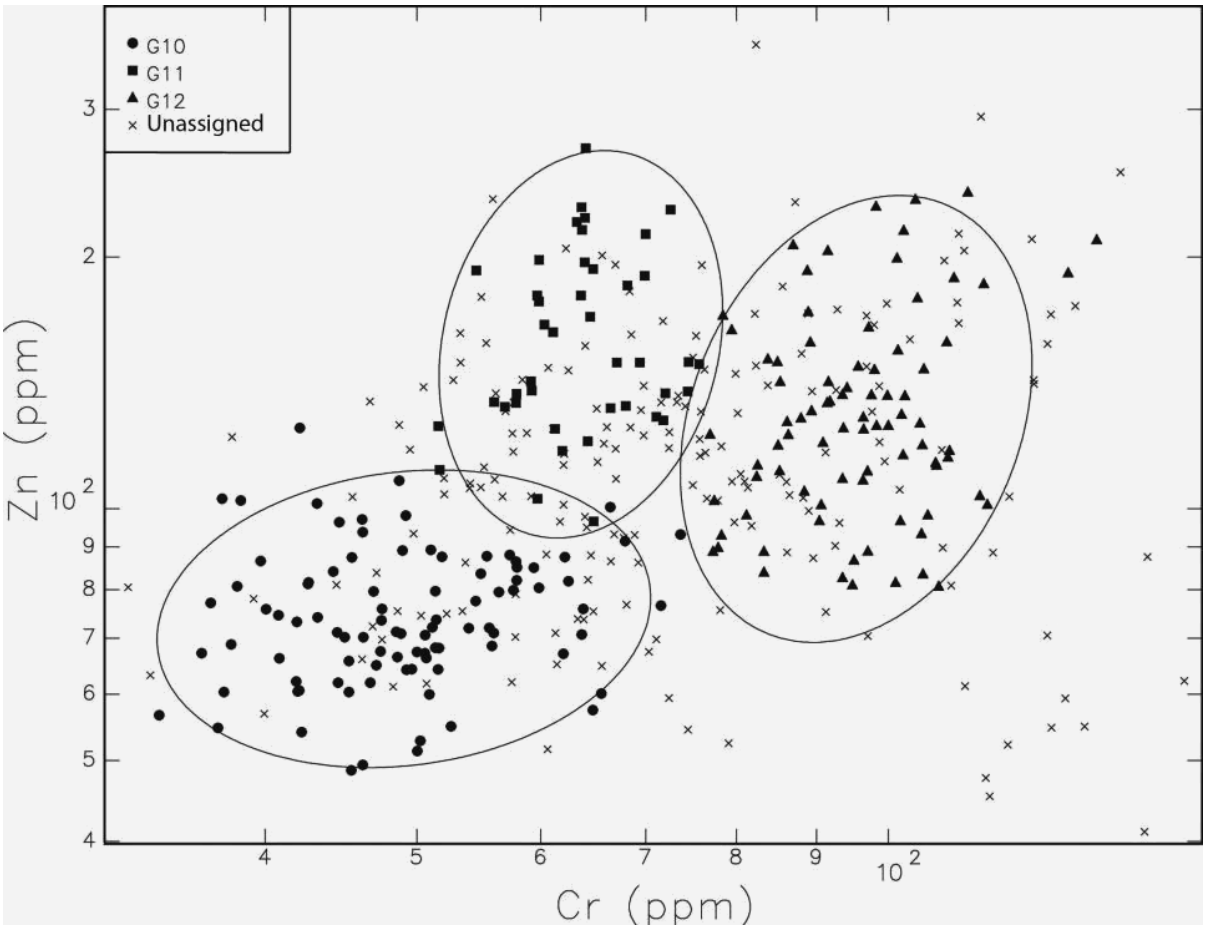

Figure 8. Bivariate plot of chromium and zinc showing the separation of the three large Groups and the unassigned samples. Ellipses represent 90 percent confidence intervals for membership in the group.

The clays are from Coleman, McCulloch, Kerr, and Uvalde counties.

Group 12A

Fourteen samples, two from 41TG45, two from 41TG91, two from 41CN95, one each from 41SS51 and 41SS110, two from 41TV40, and one each from 41BL104, 41UV21, 41WM437, and 41VV188 are in Group 12A (Figure 13). All are Leon Plain except for one Boothe Brushed sherd from the Collins site (41TV40) and one possible Goliad Plain from 41WM437 (Rowe Valley). Based on sample provenience, production is inferred to be the upper Concho/Colorado drainage area. Movement of vessels was widespread, particularly along the Colorado River.

Group 12B

Forty-six samples are in Group 12B, all Leon Plain (or plain bone-tempered from Lower Pecos sites and not given a type name) except for a single painted, bone-tempered sample from 41TV40. One sample is engraved Leon Plain[1] from 41TG45. Most are from sites in the upper Colorado/Concho drainage, especially well represented in Tom Green County and the Ivie Reservoir area (Figure 14). Several samples are from sites in the Lower Pecos (Val Verde County), and additional samples occur singly throughout most of Central Texas to the Balcones Escarpment, mostly in the Colorado River drainage. A few samples are from the Abilene area. Based on sample provenience, production is inferred to be the upper Concho/Colorado drainage area. Movement of vessels was widespread, particularly along the Colorado River.

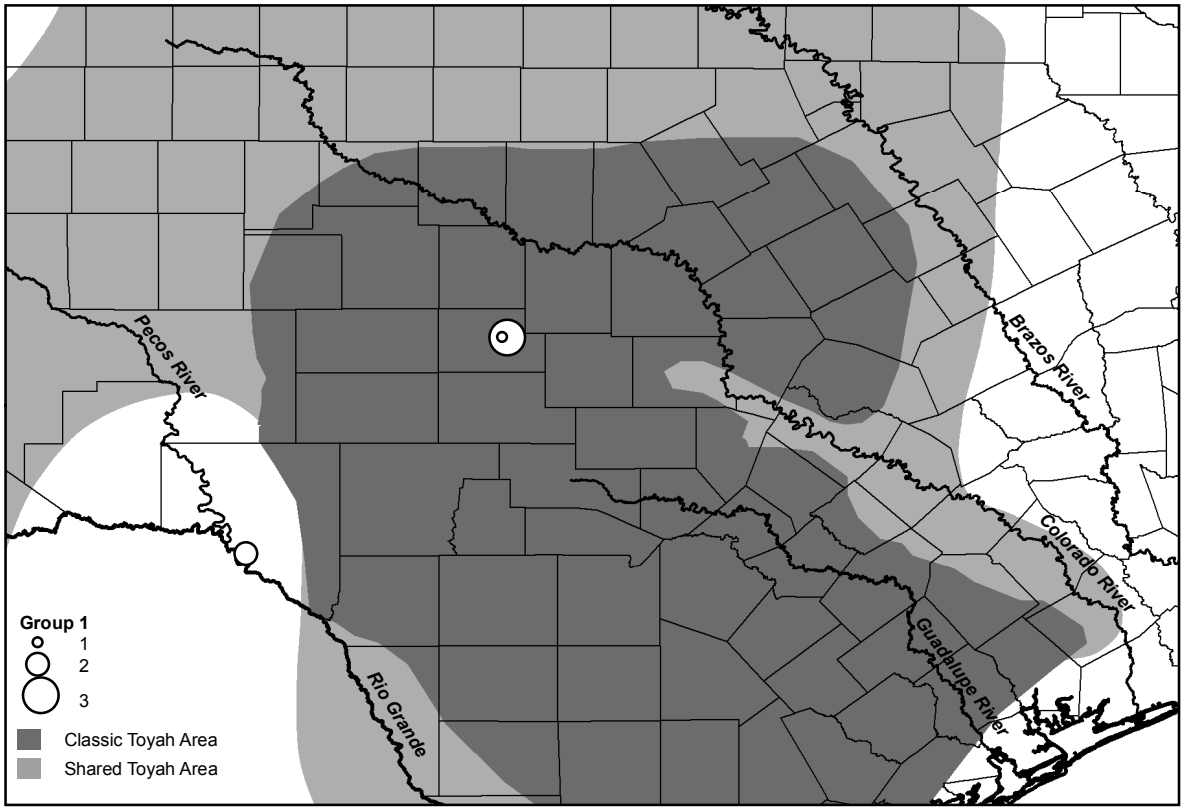

Figure 9. Distribution of Group 1A, 1B, and 1C members.

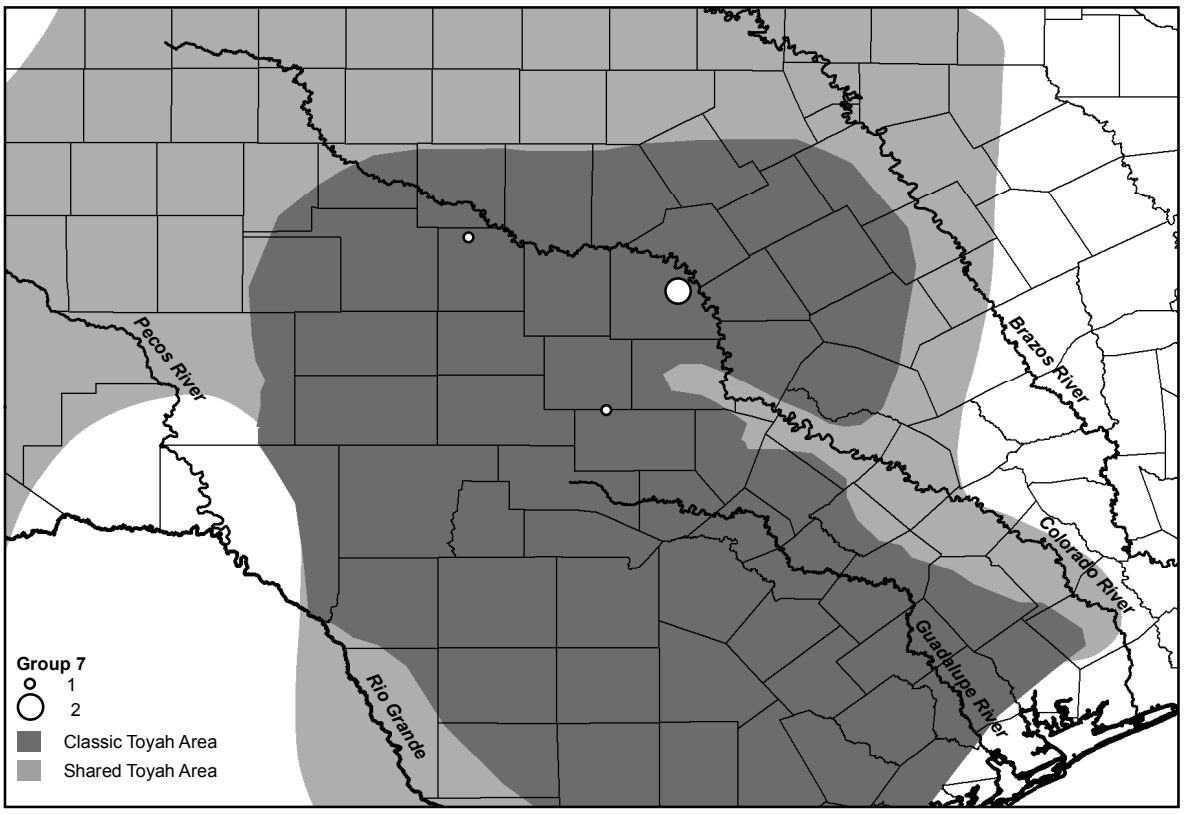

Figure 10. Distribution of Group 7 members.

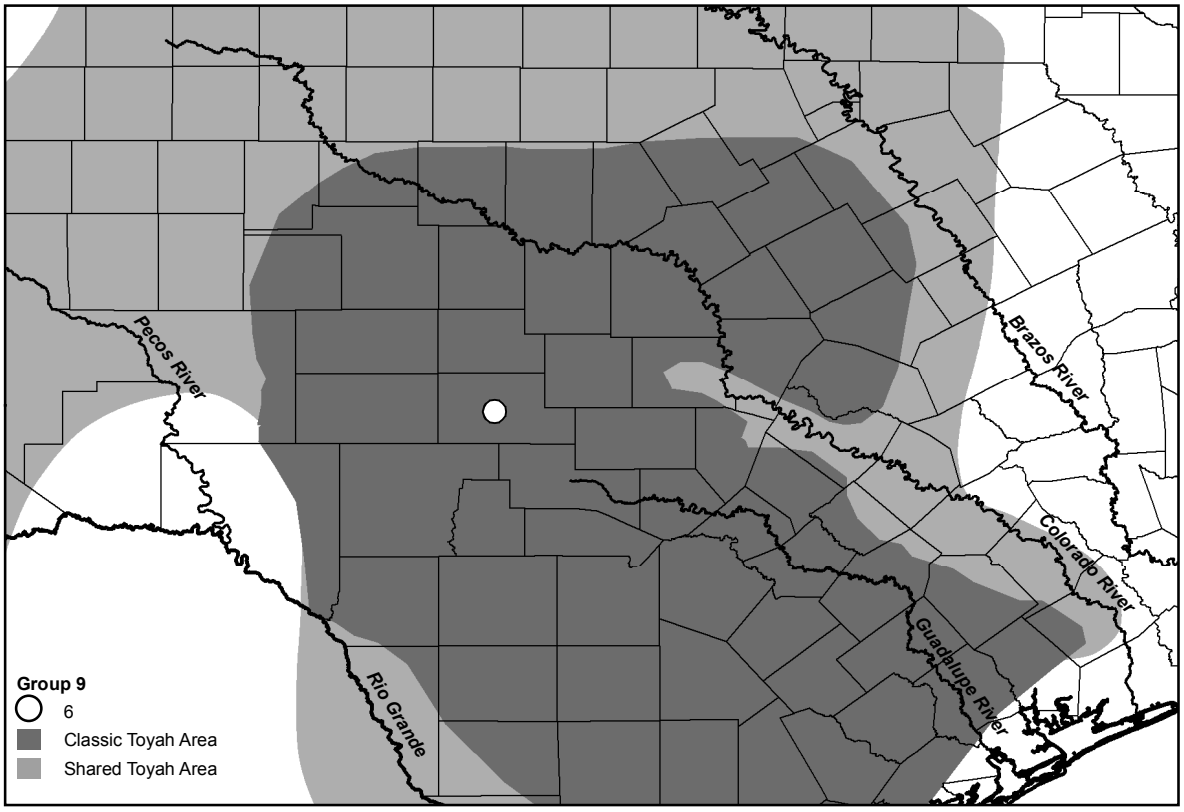

Figure 11. Distribution of Group 9 members.

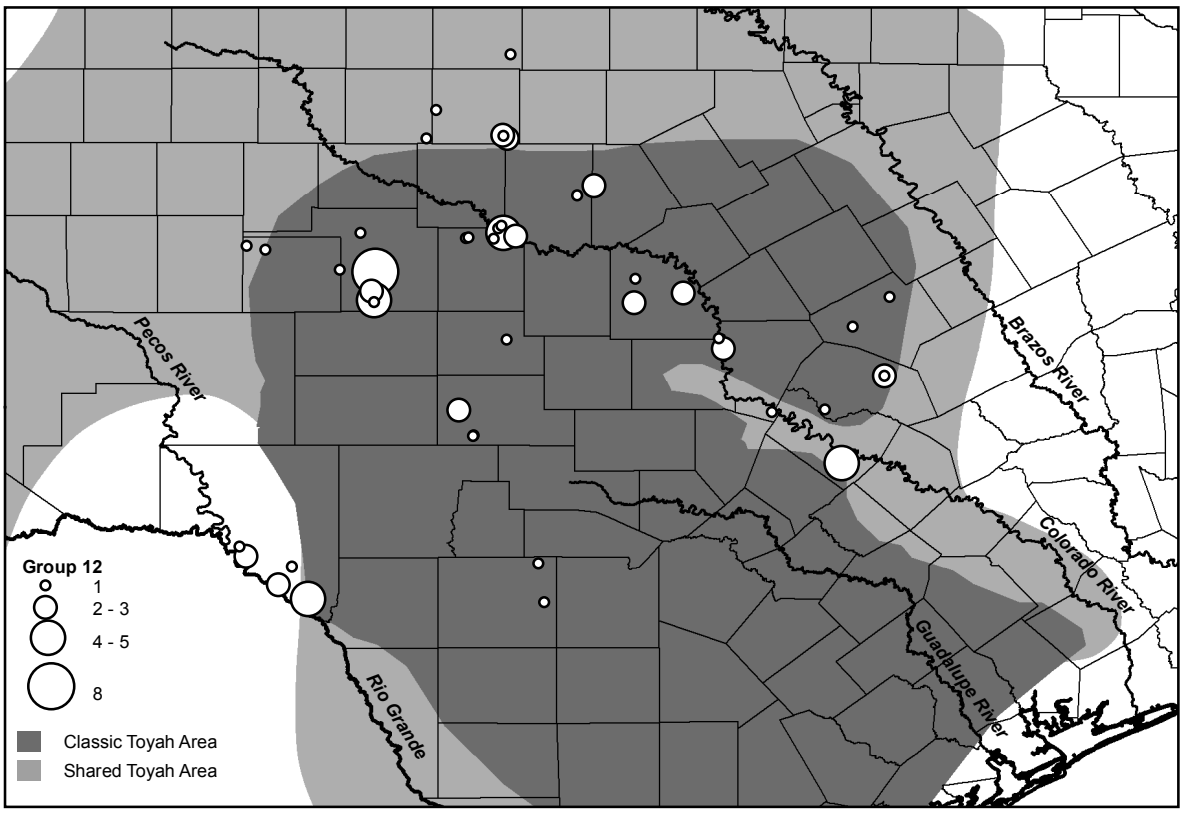

Figure 12. Distribution of all Group 12 members (includes Subgroups 12A, 12B, and 12C)

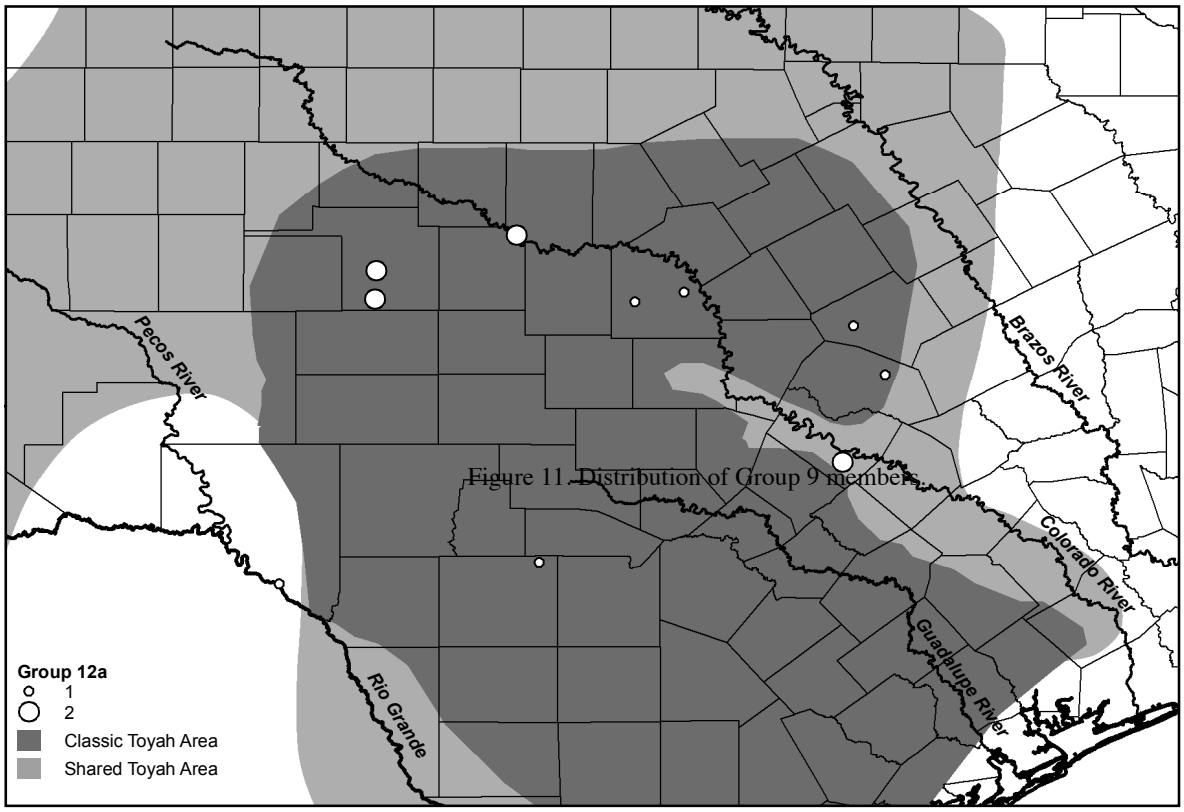

Figure 11. Distribution of Group 9 members.

Figure 13. Distribution of Group 12A members.

Group 12C

Sixteen samples are in Group 12C, all Leon Plain, including one red-slipped specimen from 41KM226. Most samples are from the Concho River drainage, with a couple from the Abilene area and down the Colorado River to the Balcones Escarpment and in Kimble County (Figure 15). Based on sample provenience, production is inferred to be the Concho/Colorado drainage area. Movement of vessels was widespread but apparently did not extend to the Lower Pecos area.

Group 13

Group 13 contains four samples, three Leon Plain and one untyped sherd containing sand and mica (no bone noted). Two samples are from 41CN-Coleman 1:1[2], one Leon Plain and the untyped sherd. Others are from adjacent Runnels and San Saba county sites 41RN163 and 41SS20 (Figure 16). The restricted distribution in the upper Colorado drainage is presumed to reflect production somewhere in that area, with movement of vessels in a limited area.

Group 15

There are 10 samples in Group 15, mostly Leon Plain or untyped plain sherds with sand and mica. As shown in Figure 17, all are from sites along the Colorado River from the Concho confluence to the Balcones Escarpment, except for two samples from Buckhollow (41KM16). Production locale is presumably within the area of occurrence but cannot be more specifically defined at present. Movement of vessels seems to be primarily along the Colorado River.

Cluster B

Cluster B is basically the opposite of Cluster A, with members from sites primarily along the Balcones Escarpment and onto the coastal plain. Most of these ceramics were almost certainly made from Wilcox Formation clays that are available in a narrow zone just below the escarpment. Typologically, the members are Leon Plain, Goliad Plain, untyped sandy paste, and Boothe Brushed, the great majority being the first two types. Most samples are in one of

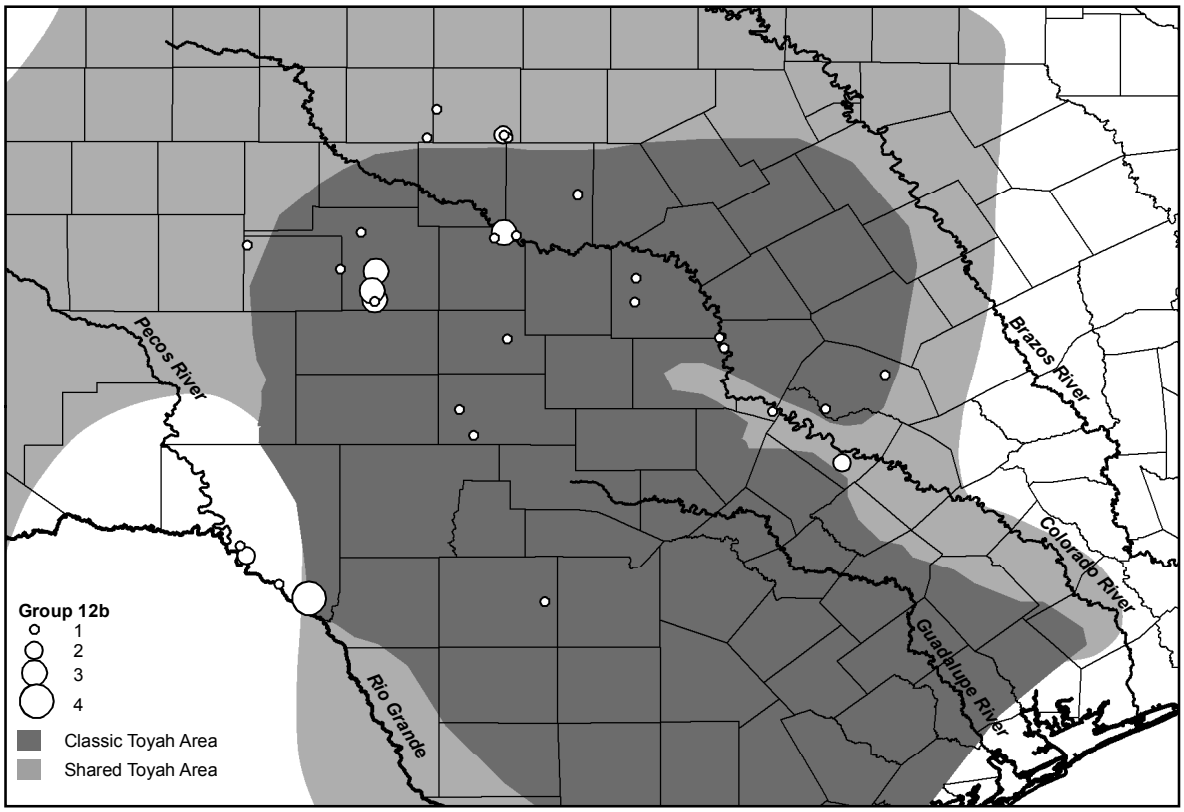

Figure 14. Distribution of Group 12B members.

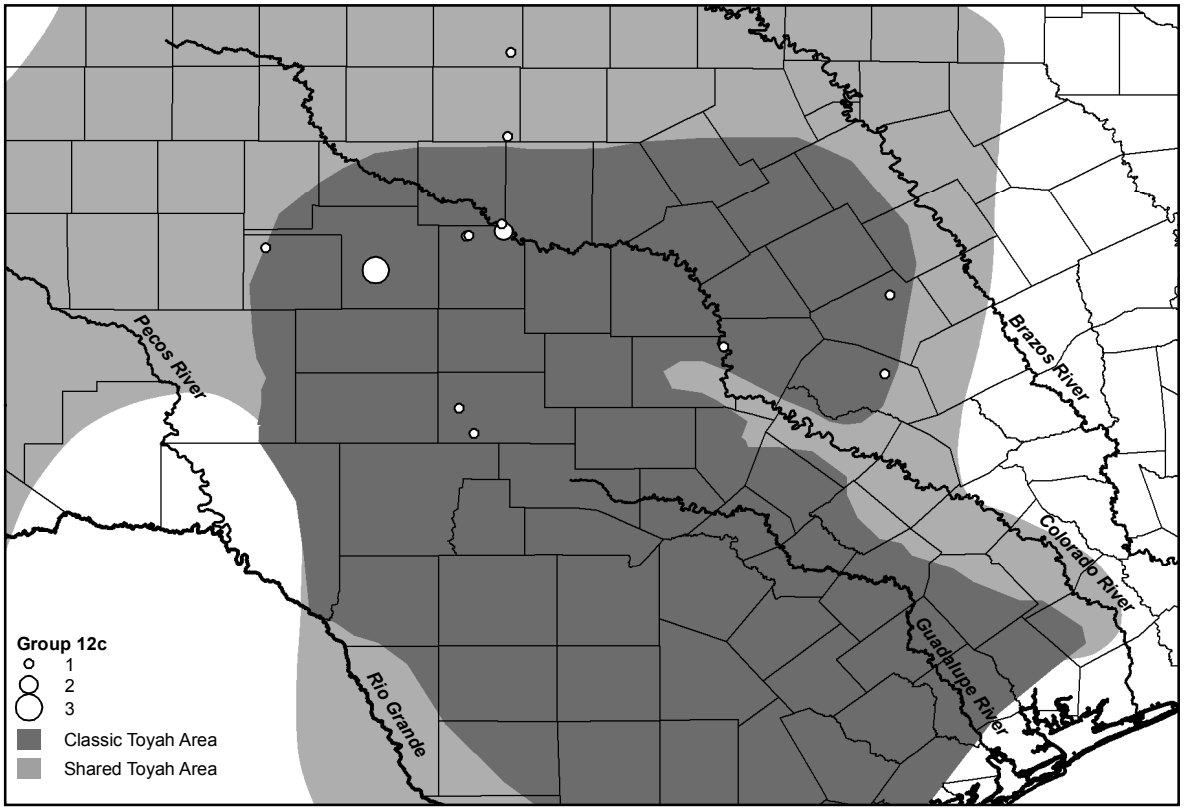

Figure 15. Distribution of Group 12C members.

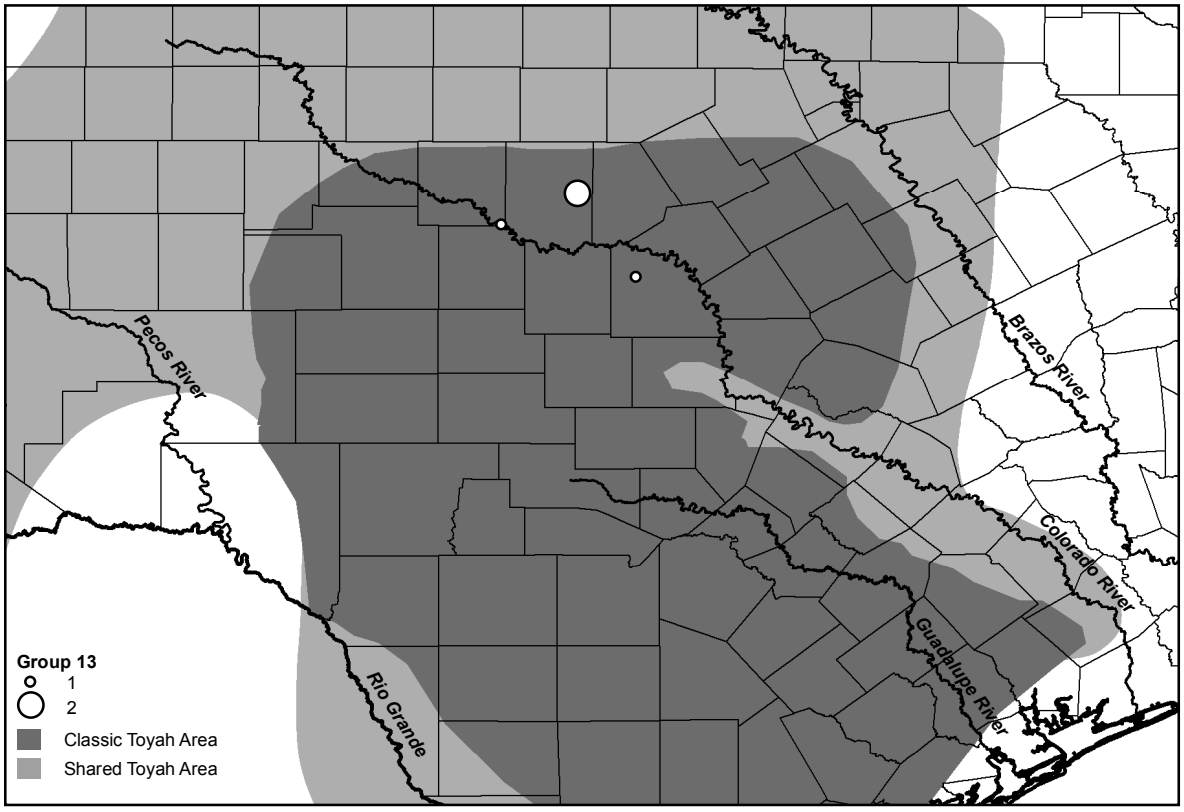

Figure 16. Distribution of Group 13 members.

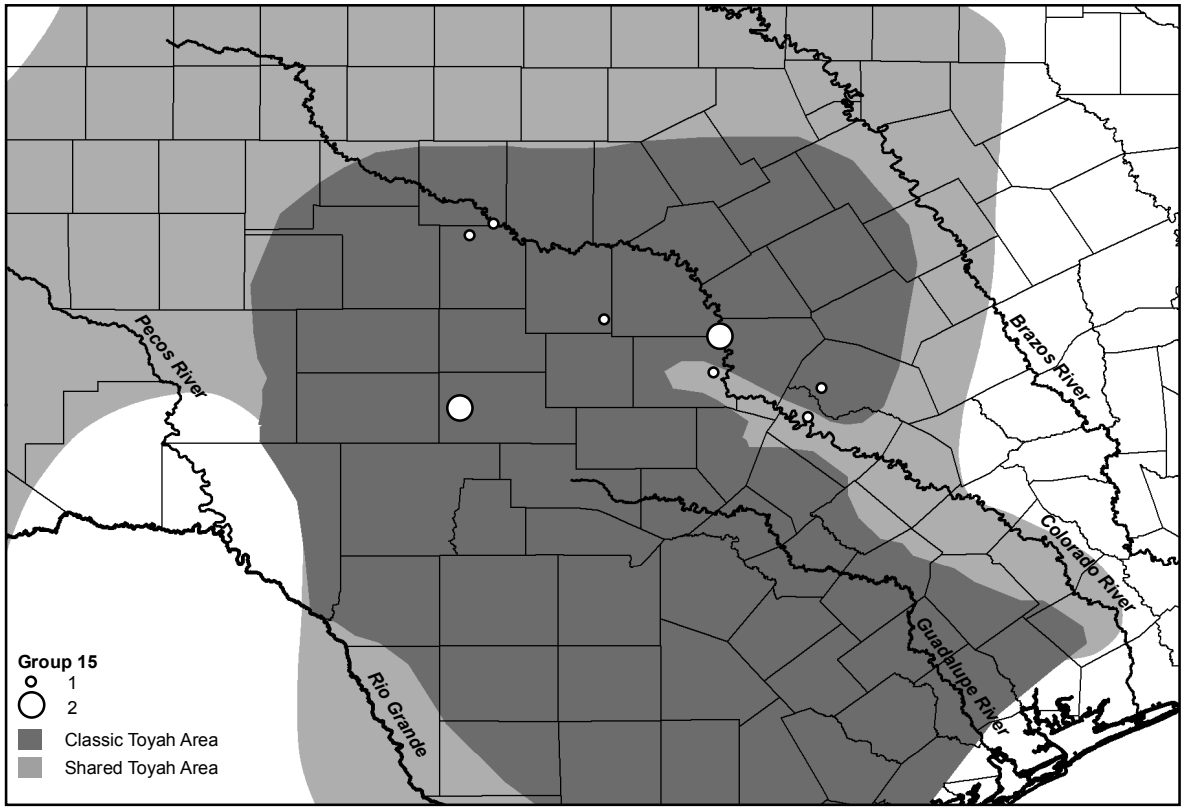

Figure 17. Distribution of Group 15 members.

the three subgroups of Group 10, and are from sites along the escarpment or on the coastal plain (many are also historic). However, there are scattered samples all the way out into west central Texas, most of which are Leon Plain. At this point, we infer that the west central Texas samples reflect movement of pots from the escarpment production zone out west; there are various potential explanations for this as discussed below.

Group 4

There are seven samples in this group, three Leon Plain and three untyped plain (one with bone temper and two with sand, one possibly being Goose Creek Plain). The samples are from widely dispersed sites, although two are from 41BX980 and one is from nearby 41ME102 (Figure 18). This slight concentration in the San Antonio area is suggestive of production there.

Group 8

This group has four samples, all Leon Plain. Three are from 41TG45, the other from 41UV137 (Figure 19). Based on the dominance of samples from southern Tom Green County, specifically the 41TG45 area, production could be reasonably inferred to have been that locale. However, the members of this group are more similar chemically to those in other Cluster B groups, and the interpretation currently favored here is that the production locale is more likely the Balcones Escarpment zone, possibly in the Uvalde County area.

Group 10

Group 10 is one of the two largest groups in the entire Central Texas dataset (n=92 exclusive of 14 clay samples and 22 Caddo pottery samples with relatively high probabilities of membership as discussed below). In contrast to the other large group (Group 12), Group 10 is decidedly concentrated in sites along the Balcones Escarpment from the San Antonio area northeast to the greater Austin area but with members scattered all through Central Texas and on the Gulf Coastal Plain (Figure 20). It has been divided into three subgroups, A, B, and C, with all archeological ceramic samples assigned to a subgroup. Fourteen clay samples are members of this group but none can be confidently assigned to any of the subgroups. Many of the clays are from Wilcox Formation sources just below the Balcones Escarpment, but others are from various parts of Central Texas, including some from west central Texas (Coleman and Menard counties). Approximately 40 percent of the members are from Mission Refugio in Refugio County.

A number of Caddo pottery samples have high probabilities of membership in Group 10 (n=22 with probabilities greater than 3 percent), and several more have lower probabilities. These are not included in the Group 10 count above because of the considerable overlap between Group 10 and most of the previously analyzed Caddo pottery samples from Caddo sites in East Texas (over a thousand of which have been run to date). This overlap is probably a result of the fact that the Wilcox formation outcrop extends from the narrow band along the Balcones Escarpment to a much wider and even dominant exposure in northeast Texas. While probability of membership in Group 10 may be quite high, this does not necessarily imply production of Caddo vessels in Central Texas, although this cannot be ruled out on compositional or other grounds. Typologically and technologically, most, if not all, of these samples seem likely to have been Caddo area products. However, during this study, a few samples that have a general appearance of Caddo pottery were identified as possibly having been made in Central Texas due to various attributes. Some of these may well have been made in Central Texas, and this is one of the more interesting research topics to be addressed later in this article.

Group 10A

This subgroup has 24 members, four of them Leon Plain from four sites along the Balcones Escarpment, 16 being Goliad Plain from Mission Refugio, and the other four being untyped sandy paste plain sherds from Mission Refugio (Figure 21). Production is presumed to have been somewhere along the Balcones Escarpment for the Leon Plain and perhaps with the Goliad Plain and untyped sandy paste pottery, although it is also possible that the clay for the Mission Refugio samples was transported from the source to the mission.

Group 10B

This subgroup has 57 members, 21 of which are Goliad Plain or untyped sandy paste plain from Mission Refugio, the remainder mostly from a number of sites along the Balcones Escarpment from the San Antonio area to around Austin (Figure 22). Others

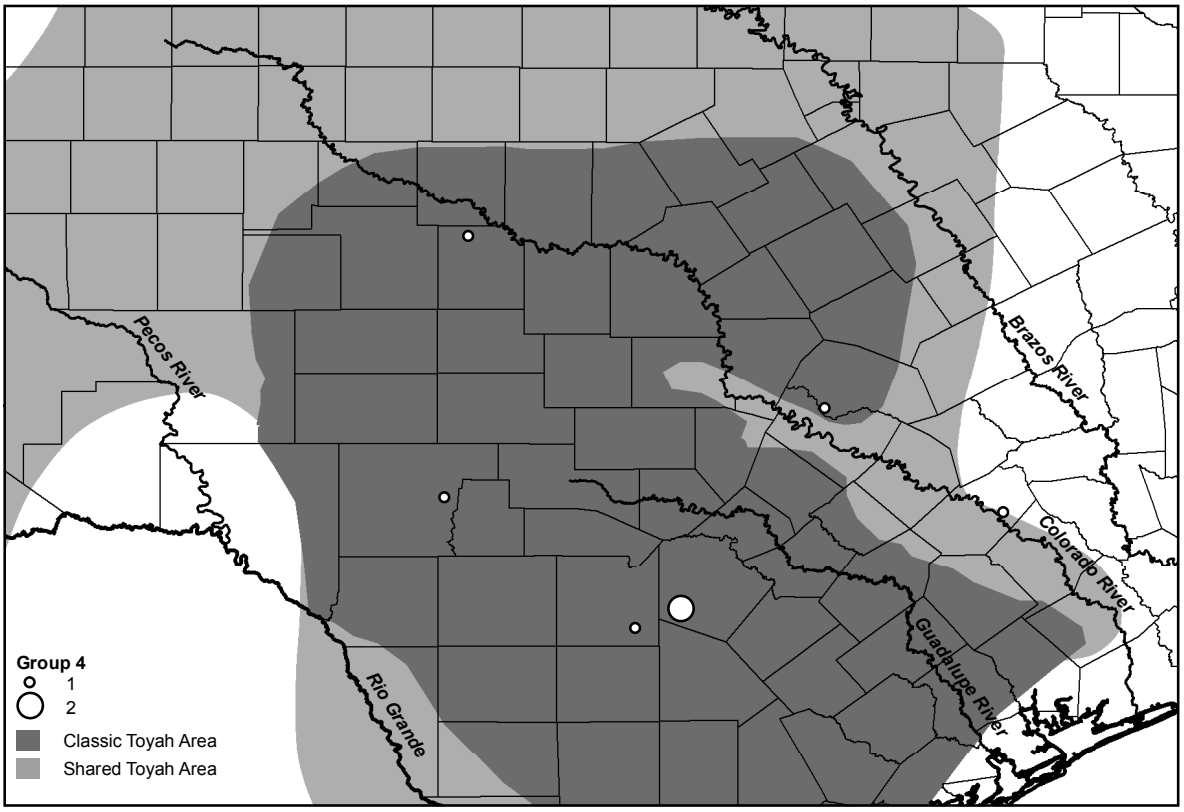

Figure 18. Distribution of Group 4 members.

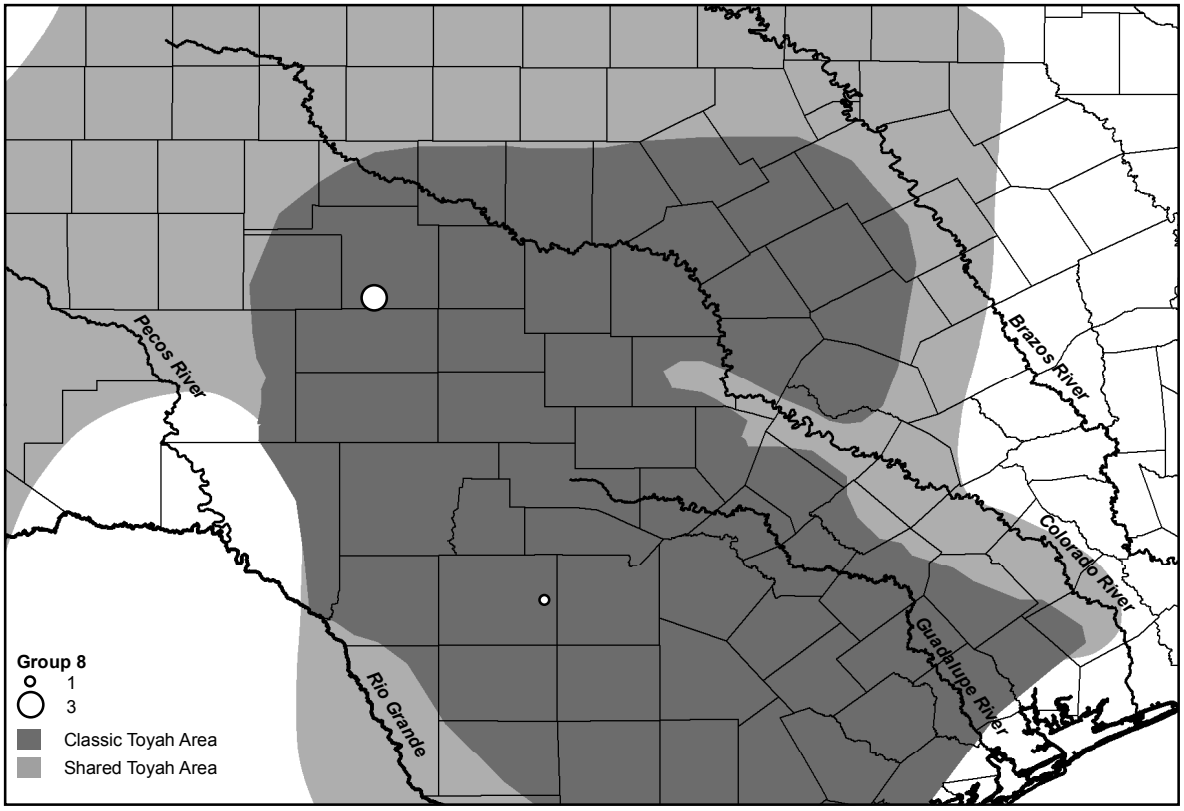

Figure 19. Distribution of Group 8 members.

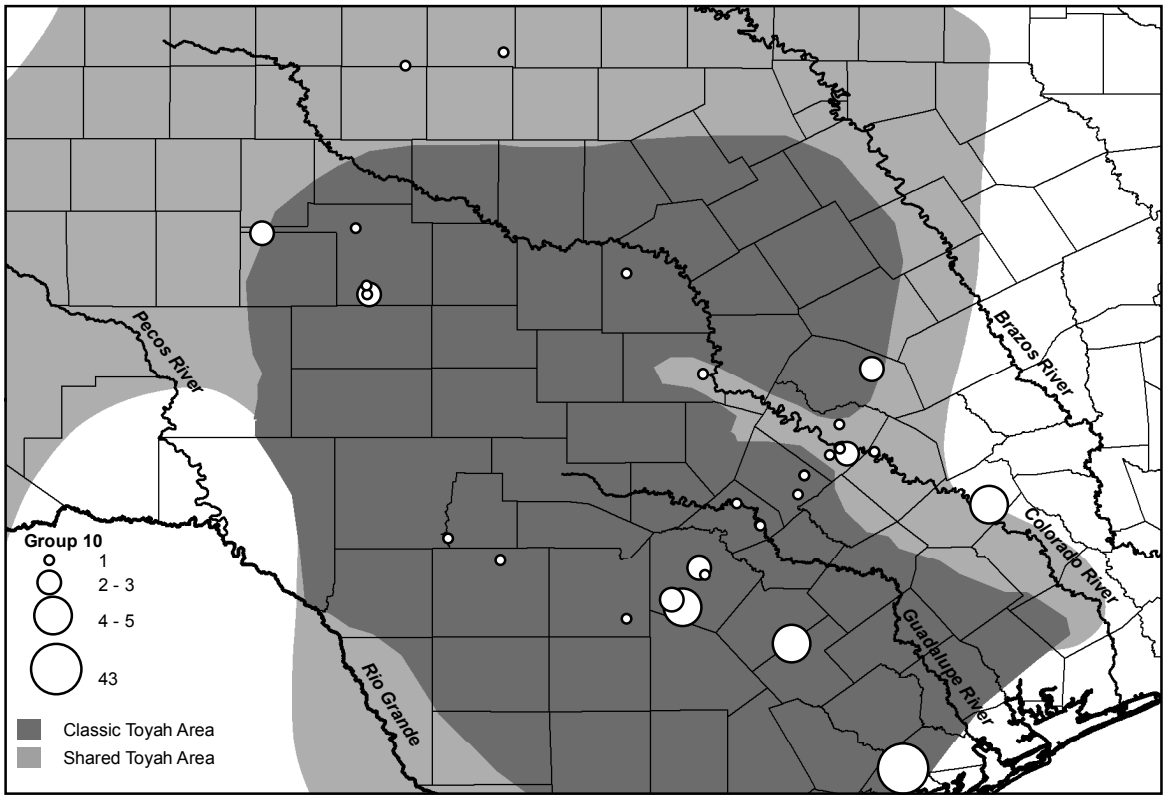

Figure 20. Distribution of all Group 10 members (includes Subgroups 10A, 10B, and 10C).

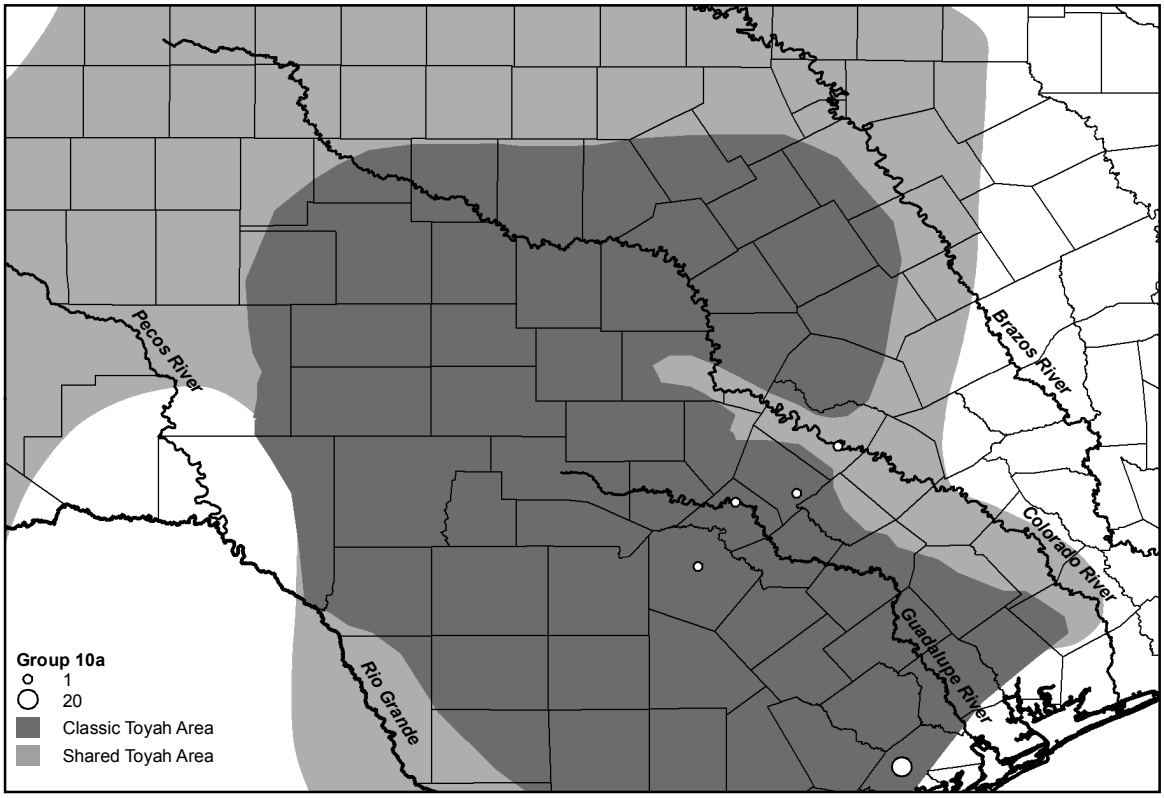

Figure 21. Distribution of Group 10A members.

occur in sites between the Gulf coast and the escarpment as well as in sites scattered across Central and west central Texas. Typologically, the members are Leon Plain (n=15), Goliad Plain (n=26), untyped bone-tempered plain (n=8), and untyped sandy paste plain (n=8). All of the Goliad Plain is from the historic components of Carvajal Crossing (41KA26B) and Mission Refugio. Samples with predominantly sandy paste are from Sandbur (41FY135) and Mission Refugio, with a very few others from widely distributed sites. At present, it is impossible to define the production area, but it is likely somewhere in the Wilcox Formation outcropping just below the Balcones Escarpment. The greatest concentration of members in the San Antonio area suggests production there, but the number in the Austin area is comparable. Indeed, production for this group may have been in the zone from San Antonio to Austin and not a more specific locale.

Group 10C

This subgroup has 11 members, six being Leon Plain, one probable Leon Plain, two Goliad Plain, one Boothe Brushed, and one untyped sandy plain. In general, the geographic distribution of the samples is much like that of Group 10B, and the production area is presumed to be the same (Figure 23). However, the distribution has an interesting difference, that being the occurrence of four members, all Leon Plain, in three sites in southern Tom Green County in west central Texas, well northwest of the main area of occurrence. There is also an untyped plain sample from Irion County just west of the others. It is not clear how this geographically disjunct group of samples is to be interpreted.

Group 11

With 42 members, Group 11 is one of the three largest compositional groups in the dataset; overall, it is much like Group 10 in distribution. As shown in Figure 24, most of the members are Goliad Plain from two sites, Carvajal Crossing in Karnes County (n=7) and Mission Refugio (n=28). The remaining samples are Leon Plain (n=2), untyped plain (n=3), and untyped sandy paste plain (n=2). While most members are historic period ceramics from Mission Refugio

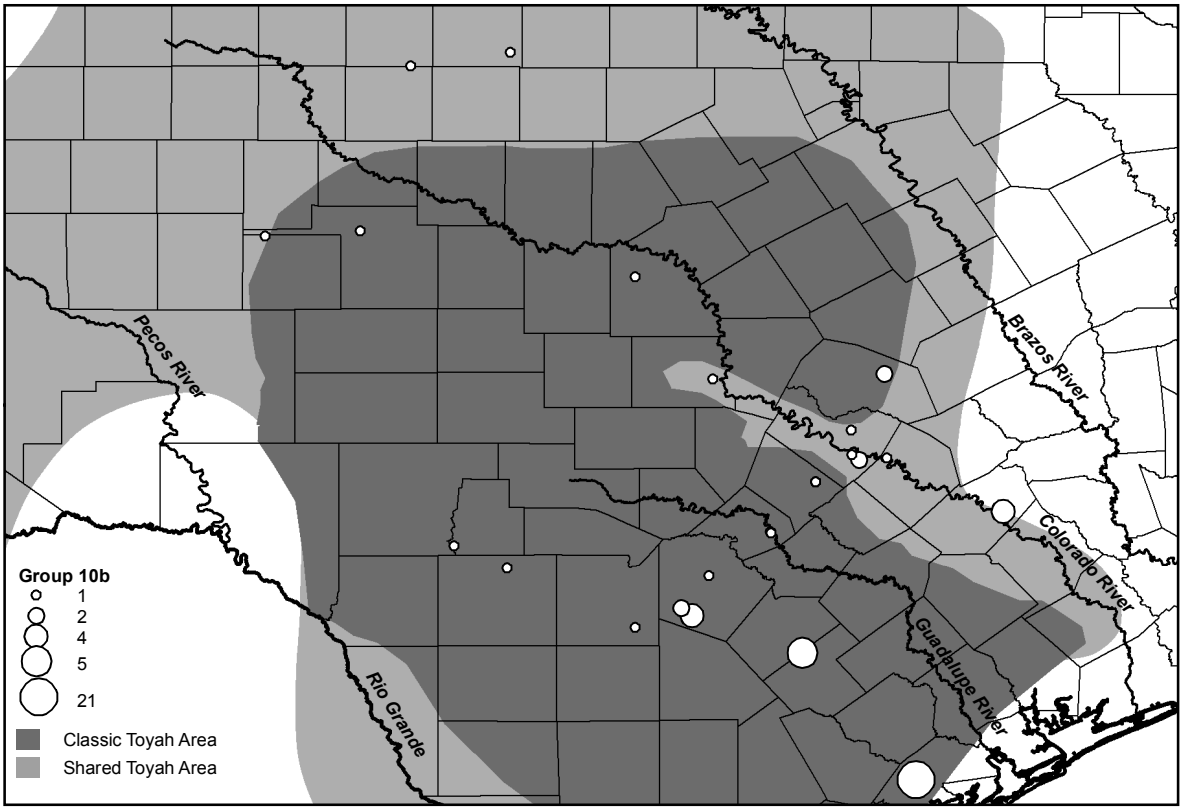

Figure 22. Distribution of Group 10B members.

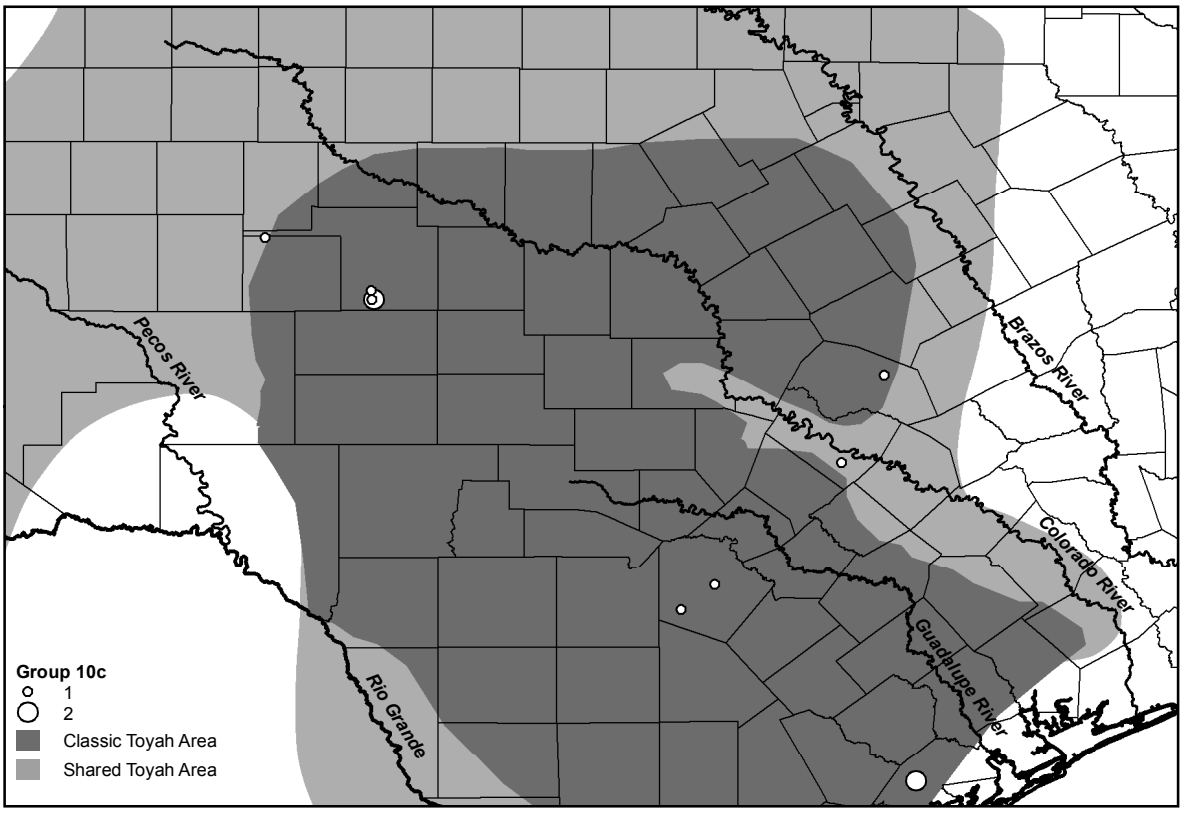

Figure 23. Distribution of Group 10C members.

and Carvajal Crossing, the prehistoric samples are from sites along the Balcones Escarpment, like Group 10, in addition to two untyped plain members from the TP&L site in McLennan County near Waco. One clay sample from Burnet County has a very slight probability of membership, but this is likely coincidental and without significance. At present, the production area for this group is unknown, although it is possible it was in the Wilcox Formation outcrop in the San Antonio-Austin area.

Group 14

This group has 11 members, eight of which are from Mission Refugio (six Goliad Plain and two untyped sandy paste plain). The remaining members are one Goose Creek Plain sherd from the Sandbur site in Fayette County, one Leon Plain from the Beyer site in Williamson County, and one untyped plain sherd (with bone and sand temper) from 41TV441 in Travis County (Figure 25). Were it not for the members from Mission Refugio, the occurrence of the other samples in the area of Travis, Williamson, and Fayette counties could suggest production somewhere in that vicinity.

Historic Period Compositional Groups

Not included in the preceding discussion of clusters and compositional groups are four site-specific groups of historic ceramics. Two of the groups have members (in this sample only) from Mission San Sabá in Menard County (Groups 2 and 6), one group is from Carvajal Crossing in Karnes County (Group 3), and the other is from Mission Refugio (Group 5).

There are two groups specific to Mission San Sabá in Menard County, one with two burnished red ware sherds (Group 2), the other with six Goliad Plain members (Group 6). Both groups represent ceramics believed to have been brought to the mission at its founding (see discussion of Goliad Plain below). Interestingly, there is one other Goliad Plain sample from Mission San Sabá, and it is assigned to Group 1, a group with mostly Leon Plain probably produced in the Mission San

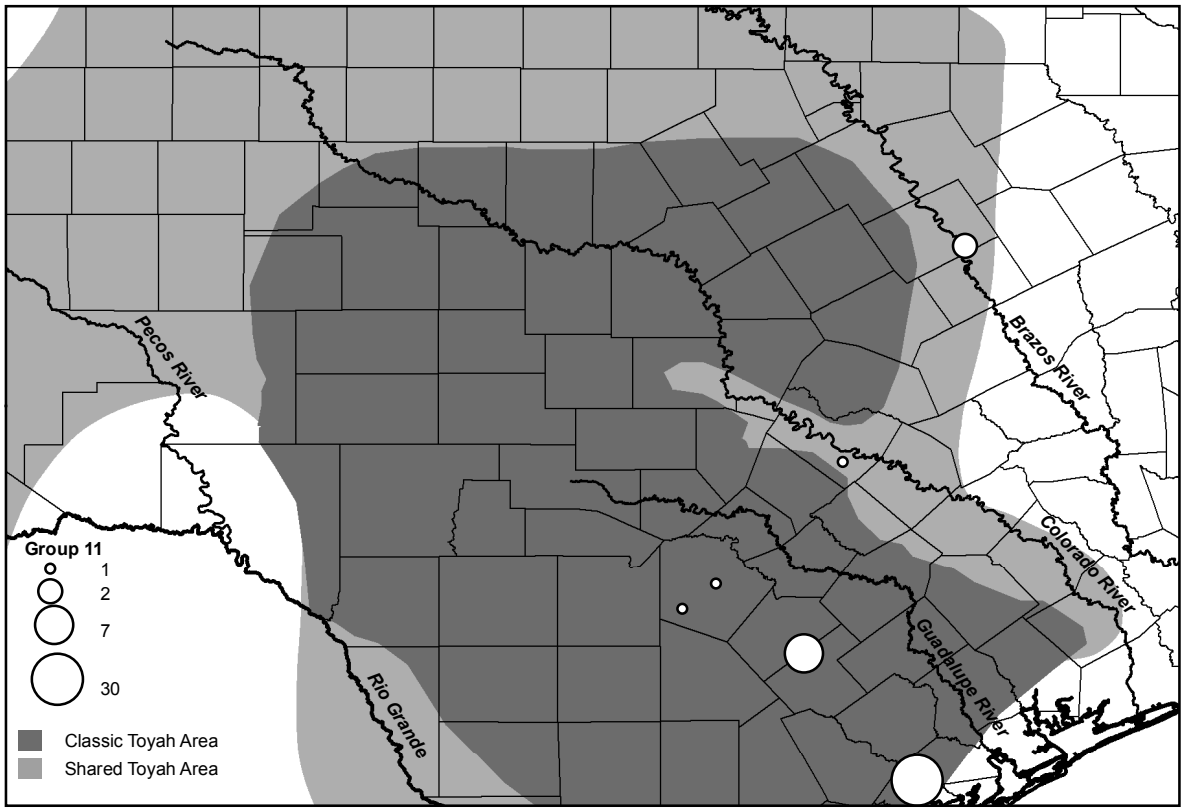

Figure 24. Distribution of Group 11 members.

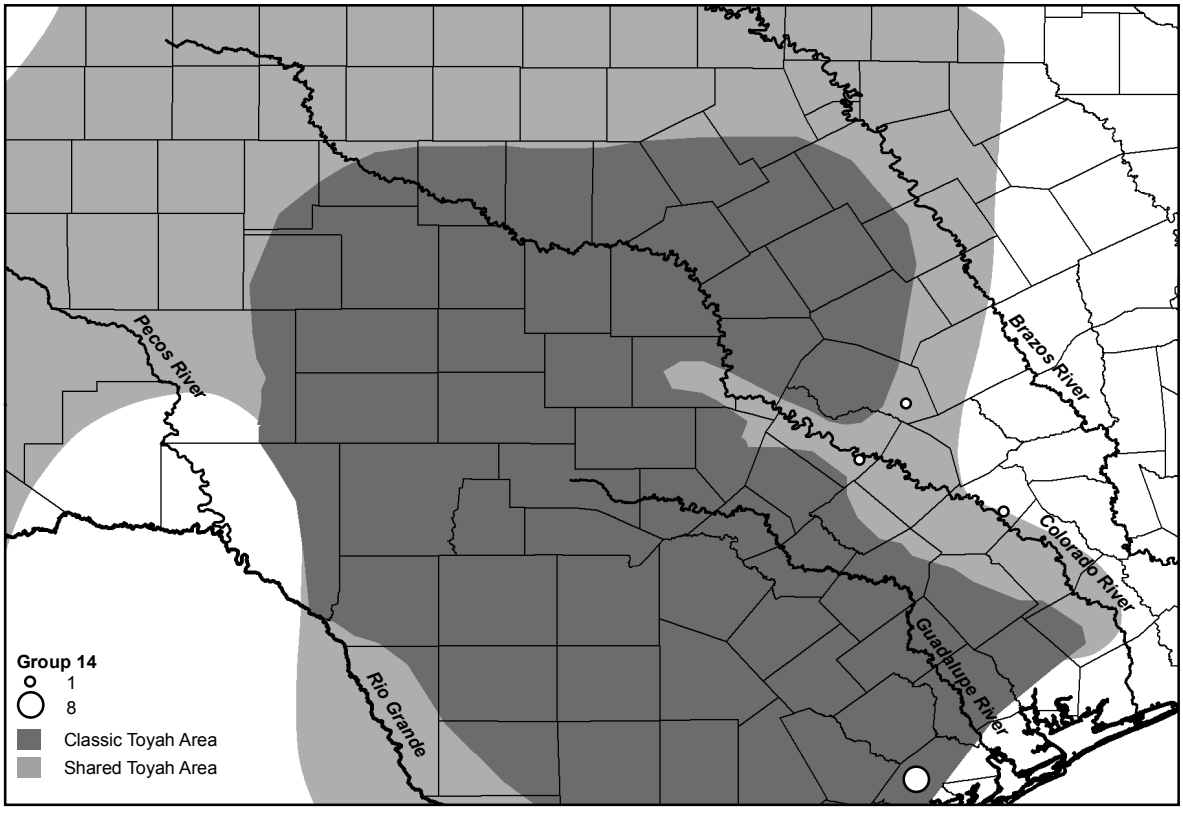

Figure 25. Distribution of Group 14 members.

Sabá area. Surprisingly and inexplicably, two burned daub samples from Mission San Sabá have high probabilities of membership in Group 10 as does a clay sample from nearby 41MN55, suggesting that the historic ceramics from the mission were made elsewhere and brought there.

The small groups of Goliad Plain from Carvajal Crossing and Mission Refugio are similarly interesting because they further indicate the diversity of clay sources used in the production of historic native-made pottery. At Carvajal Crossing, for example, the 20 Goliad Plain samples fall into three compositional groups (3, 10B, and 11); the Goliad Plain from Mission Refugio falls into six groups. These ceramics and groups are not discussed further here because they are reported in detail by Ferguson (2012) and McWilliams and Boyd (2012:Chapter 15).

CERAMIC PRODUCTION BY TYPE

Leon Plain

This pottery type represents the largest portion of the dataset with 257 samples, and it was the focus of the research effort. Slightly less than half of the Leon Plain samples were assigned to a compositional group, due in part to the conservative level of confidence used to define membership. Thus, many of the samples unassigned to a compositional group herein are probably members of the larger groups, 10, 11, and 12; but it is also possible that additional compositional groups may be defined as the overall sample increases in size.

One of the more interesting and surprising results of this project is the fact that most of the Leon Plain (and many of the plain bone-tempered samples not assigned to pottery type) is in Cluster A compositional groups whose members are overwhelmingly from the Edwards Plateau, west central Texas in particular. In part, this reflects the larger portion of the sample from sites in west central Texas, but it is difficult to know if this is reflecting ***only*** geographic bias in our sample. Approximately 40 percent of the Leon Plain from sites in the area from about San Saba County west and northwest could not be assigned to a compositional group. Membership of Cluster A compositional groups is wholly or predominantly Leon Plain, the others being untyped bone-tempered plain (and probably Leon Plain) except for one plain ware apparently without bone temper.

There is a hint that Leon Plain is more common in west central Texas (that is, from San Saba County west and northwest). But regardless of relative proportions, most of the Leon Plain in the Edwards Plateau/west central Texas area was presumably made there, an assessment based on clay members in Group 12. Not only was most Leon Plain found there made in this west central Texas production area, but Leon Plain was, so far as we know, the only pottery made there. Essentially all pottery made in this area was plain and bone-tempered, although a small amount lacked bone temper and the rare piece was engraved, incised, or painted.

A considerable amount of Leon Plain was also evidently made at locales along the Balcones Escarpment, probably from the clay sources in the Wilcox Formation; this is the Leon Plain in Cluster B compositional groups. In contrast to Cluster A, however, nearly two-thirds of the samples from sites in counties along the Balcones Escarpment could not be assigned to a compositional group.

Doss Red

Only three samples specifically typed as Doss Red by the original analyst were included in this study, although several others had evidence of thin, fugitive red slips or washes (as previously discussed). Only one of the three was assigned to a group (Group 7, Lehmann Rockshelter), the others being currently unassigned.

Boothe Brushed

Three samples of Boothe Brushed and one possible Boothe Brushed were analyzed in this study. Two are from the Collins site (41TV40), one in Group 10C, the other in Group 12A. The sample from Mustang Branch (41HY209-T) is unassigned as is the possible Boothe Brushed from Rowe Valley (41WM437). The latter is more similar chemically to Caddo pottery and it is likely that the sample was actually from a Caddo brushed vessel and not Boothe Brushed. The very limited information currently available indicates production in different areas and movement over considerable distance.

Goliad Plain

Goliad Plain, the bone-tempered ceramic considered by some to be the historic period native-made mission pottery descendent from Leon Plain,

constitutes the second largest typological category in the dataset with 120 samples (includes one possible Goliad Plain sherd from Rowe Valley, 41WM437). These derive from four sites, most from Mission Refugio. Goliad Plain falls into nine compositional groups, including all three subgroups of Group 10. All of the Goliad Plain from Mission San Sabá is in Group 6, in contrast to the multiple groups represented in the larger samples from Mission Refugio and Carvajal Crossing. This difference is likely due in part to the very short existence of Mission San Sabá, during which all of the pottery present was evidently brought on the original founding expedition compared to the substantially longer period of use of Mission Refugio, which allowed for resupplying multiple times. In addition, unlike the situation at Mission Refugio, there were never any native neophytes at Mission San Sabá to make Goliad Plain (McWilliams and Boyd 2012).

Caddo Ceramics

A total of 113 samples of pottery identified to specific type or, due to original sherd size, only as Caddo based on one or more technological or surface treatment attributes are in the dataset. Represented are most of the prehistoric and historic pottery types from the Hasinai Caddo area of central east Texas. Caddo pottery occurs widely and consistently in Central Texas, mostly from brushed vessels. Kelley reports two sherds of the historic Patton Engraved type from the Loma Alta site in the La Junta area in far West Texas (Kelley 1986:83).

A few of the Caddo sherds in the present study have good probabilities of membership in Central Texas compositional groups, primarily Group 10; but the rather considerable chemical similarity between the clays from the Wilcox formation in Central Texas though East Texas precludes a definitive discrimination. The difficulty in interpreting Caddo ceramic NAA data is discussed at length by Ferguson (2007; see also Perttula and Ferguson 2010). Essentially all Caddo pottery samples with substantial probabilities of membership in a Central Texas compositional group (as well as in Caddo chemical compositional groups) are from the Waco, Belton, to Austin area, mostly from the vicinity of Waco, Temple, and Belton. Practically none of the many Caddo pottery samples from the Edwards Plateau/west central Texas area has a meaningful probability of membership in any of the Central Texas compositional groups. At present it is impossible to know if this has any significance. In general, our data do not permit a confident determination of whether some Caddo pottery may have been made in Central Texas, but they do not preclude this possibility.

NAA AND PETROGRAPHIC ANALYSIS

As noted previously, several of the samples used in this analysis had been previously subjected to petrographic analysis (Kittleman 1994; Reese-Taylor 1995), and an effort was made to correlate the results of the two different analyses. Unfortunately, in some cases, it was not possible to link sample numbers, and there is some inconsistency in the petrographic groups from analysis to analysis. In addition, because a majority of the NAA samples could not be assigned to compositional groups, the results are difficult to interpret. In general, however, vessels that had bone as the principal tempering material and had little or no sand either as a natural inclusion or as an added tempering agent, were in NAA Group 12B. In contrast, vessels that had sand were more likely to be in NAA Group 10B or, in one case, Group 15. Samples with bone and carbonate temper, all from either the Rush site (41TG346) or the Rocky Branch site (41RN169), were unassigned.

Leon Plain and Compositional Group Distributions

In our effort to assess how the NAA data on Leon Plain and the other, less numerous, types may reflect on native group mobility and territories, we have made a number of assumptions. We acknowledge that these assumptions could, in part or all, be invalid and that there may well be other, potentially more plausible bases for interpretation of our NAA data. Nonetheless, we present these assumptions here as the basis for an initial assessment in large part because there is either some ethnohistoric, archeological, or comparative anthropological basis for them.

First, based on well-known cross cultural data, we have assumed that the native hunting and gathering groups of Central Texas in the Late Prehistoric and early historic periods were generally patrilineal or bilateral in descent system and probably practiced patrilocal post-marital residence.

Second, based on ethnohistoric data, we assume that prehistorically these native groups had more or less specific territories that may have overlapped that of other contemporaneous, distinct groups. Third, we have assumed that pottery was made by women, although to our knowledge there is only one case of ethnohistoric documentation of pottery making by women. In 1783, Cardenas (quoted in Ricklis 1999) praised the pottery-making skills of the native women at Mission Espíritu Santo (modern Goliad); it is here assumed that that skill was part of a long-standing tradition among native groups.

Fourth, vessels are assumed to have been made for use by the maker and her (and/or, perhaps, his) group, not for exchange (although this could well have occurred to some extent). One basis for this assumption is that, to our knowledge, no Leon Plain has yet been found in Caddo assemblages or in the La Junta area. And last, we assume that pottery vessels were primarily either water containers in the case of the narrow neck jars, or were for cooking in the case of wide mouth jars and bowls. Use of some vessels for boiling fat from bones at the Rush site was argued by Quigg and Peck (1995:146-148), and one of the typical occurrences in Toyah phase sites is quantities of much fractured bison/deer bone that was probably boiled to render fat. And in fact, there is ethnohistoric documentation of native groups in Central Texas rendering fat (type of container not noted, see Wade [2003:221]). Not all Leon Plain vessels, however, would have been suitable for either of these general uses; the very small shallow bowls, for example, may have been serving/eating vessels.

As noted previously, one of the key issues of interest is the geographic distribution of each compositional group as it may inform on native group mobility and territory size in Central Texas. The compositional group distribution maps are highly informative, although unfortunately, we are forced to evaluate our data as if all samples were contemporaneous despite the probability of a few centuries being represented by the members in most groups. As currently defined, the geographic area of individual compositional groups ranges from a single site to most of Central Texas. But even in those groups with large areas, the great majority of samples are within about 150 km (100 miles) of one another.

The site-specific groups, Group 1A from 41MN55 and Group 9 from 41KM69 being good examples, indicate that vessels were made from locally available clays but were not moved from that locality. Whether the current compositional group membership reflects very limited production and brief vessel life or perhaps reflects longer stays in those localities is unknown. Alternatively, the present sample may be insufficient to reveal the existence of additional members in other sites.

Groups 7, 13, and 15 are examples of groups whose distribution covers an area up to 150 km or so across. In the present sample, none of these groups has many members; but they may still be quite informative about group mobility. The areas are comparable to, or not much larger than, the hypothetical Jumano community territories defined by Arnn (2012a:Figure 8.10) at about 1600 km^2 and are perhaps comparable to the marriage groups also discussed by Arnn (2012a:213-233). The distribution of compositional group members suggests that areas over which pottery vessels were made, transported, and used were something like 100-150 km or so in size, more comparable to Arnn's marriage/linguistic group territory size. There is some overlap in the distribution of most groups.

At a larger scale are compositional groups whose distribution covers most of Central Texas. Groups 10B, 10C, 12A, 12B, and 12C have such large geographic distributions. As shown in Figures 13-15, Groups 12A, 12B, and 12C are heavily centered on the Concho-Colorado river area of west central Texas but with significant numbers of members throughout Central Texas as far as the Balcones Escarpment zone, including several members from the Lower Pecos area in Val Verde County (although not typed by the original analysts, these are Leon Plain by all criteria). Group 12A seems largely a Concho-Colorado river drainage group well represented as far as the Balcones Escarpment area. Group 12C is similar but is much more concentrated in the upper Colorado and Concho River areas. Group 12B is much like 12A and 12C but has substantial representation at several sites in the Lower Pecos area. As noted previously, we do not know if the distribution of Group 12B is more or less continuous from the upper Colorado and Concho River areas to the Lower Pecos because we have no samples from the area in between.

In general, the concentration of Group 12 members in the upper Colorado and Concho River areas suggests that pottery vessels were made from clays available there; and in fact, there are a few clay members in Group 12, two from the Colorado River valley in Coleman and McCulloch counties. Evidently, most of these vessels were used and

broken in the general area of production, but some appear to have been moved considerable distances to the east and south, as far as the Lower Pecos and Balcones Escarpment areas. The larger scale of mobility that these compositional groups suggest is reflective of the mobility patterns of the Jumano in the late seventeenth and early eighteenth centuries (Kenmotsu and Arnn 2012:27-36). Based on their own description, the Jumano, accompanied by the Cíbolo, made what appears to have been a nearly annual journey from their homelands on the Concho-Colorado river area to La Junta (modern Presidio, Texas), then moving back east through Central Texas to the Caddo, sometimes swinging south through the Lower Pecos before reaching the Caddo, and eventually returning home.

By contrast, the non-Goliad Plain members of Groups 4, 10A, 10B, 10C, and 11 are heavily concentrated along the Balcones Escarpment from the San Antonio area northeast to the Austin area. Given this distribution and the membership in Group 10 of Wilcox Formation clays, it is likely that these samples were produced in this region along the escarpment. Along the escarpment, samples are from sites in canyons of the Edwards Plateau as well as from the Blackland Prairie and Post Oak Belt. In a general sense, one can compare this occurrence with the territory of the historic period Eastern Sanan linguistic group (Arnn 2012a:Figure 8.5; Johnson and Campbell 1992:Figure 1), although the latter may have been somewhat less extensive than the distribution of Group 4, 10A, 10B, 10C, and 11 members along the Balcones Escarpment. Whether the Eastern Sanan-speaking groups were actually the makers of Leon Plain along the Balcones Escarpment is currently unknown, but the fact that they were historically documented in that area toward the end of the period when Leon Plain was made there suggests that they were in fact the makers. If so, one might infer that they had been in that area for several centuries.

The membership of Group 10C is particularly interesting in that the Leon Plain and other presumably prehistoric plain wares are about equally from sites in the escarpment zone and the Concho River drainage in west central Texas, especially on the South Concho, with no samples from the intervening area. If the statistical definition of this group reflects prehistoric reality, one could speculate that pottery made along the Balcones Escarpment was taken by one or more hunter-gatherer groups who went to the Concho River area, a distance of some 300 km. An alternate interpretation, favored here, is that groups from the Concho River area traveled to the Balcones Escarpment as recorded in the ethnohistoric documents (AGN 1691; Kenmotsu 2001; Terán 1968), taking pots with them and returning with vessels (and other items and perhaps wives) from that area. If the lack of Group 10C members from the intervening area is real, this suggests that the trips were reasonably fast, at least fast enough that no vessel was broken along the way. Of course, it is also possible that a less conservative assignment of samples to compositional group might result in some samples from the intervening area becoming members of Group 10C.

As a set, Groups 4, 10B, and 10C have members scattered across Central Texas, west through the Concho River drainage and north into the Clear Fork of the Brazos valley around Abilene. The distribution of Group 10C members is somewhat different, as noted previously, but together the distributions suggest pottery production along the Balcones Escarpment, with transportation of modest numbers of vessels north and west throughout the Edwards Plateau, somewhat concentrated in the Concho River drainage area.

Group 13 is interesting not only in its limited distribution along the Colorado River in Coleman, Runnels, and San Saba counties (see Figure 16), but also as it may relate to a potential boundary zone between two cultural group territories tentatively identified by Arnn (2012a:222). Among a number of Late Prehistoric sites investigated in west central Texas, the occurrence of unlined hearths (that is, hearths without a rock lining) is north of the Colorado River at its confluence with the Concho. To an extent, the distributions of the unlined hearths and Group 13 ceramics overlap, and it may well be that there was a territorial boundary of some sort along the Colorado River in Late Prehistoric and/or early historic times. Conversely, most of the Group 12 members, as well as Groups 7 and 15, are from sites in this same general area but south of the Colorado River where hearths are generally rock-lined. Typologically, however, there is no perceptible difference in the ceramics between Group 13 and the other groups (1, 8, 9, and 12) believed to have been made in west central Texas.

Is there a reasonable link between compositional group areas and native group territories and mobility? In a general sense, the answer seems to be yes. Most notably, as shown in Figure 26, the distributions of compositional groups in Cluster A

are quite similar to the core territory of the Jumano and closely affiliated native groups; that is, the area of the Concho River, San Saba, and perhaps Llano river drainages as it was documented ethnohistorically through the A.D. 1600s (AGI 1688; AGN 1682-1683; Ayer 1965; BN 1631; Posada 1962). All members of some small Cluster A groups fall in this general area as do most of the members of the larger compositional groups (12A, 12B, and 12C), implying that these pottery vessels were made and used in that region. Chronologically, a link with the Jumano is plausible because of the occurrence of historic Caddo pottery (Patton Engraved, Bullard Brushed, etc.) in sites that also have Leon Plain and comparable radiocarbon dates from the Toyah components at the Rush site (41TG346) in Tom Green County. The scattered occurrences of Leon Plain from west central Texas compositional groups beyond this core area are consistent with documented extensive travels of the Jumano and other closely affiliated native groups (Arnn 2012a; Wade 1998, 2003).

Interestingly, Cluster B compositional groups have the opposite distributions: members are heavily concentrated along the Balcones Escarpment from San Antonio to the Austin area, but some are scattered throughout the area of the present sample (Figure 27). As noted earlier, this suggests that pottery vessels in these compositional groups were made along the escarpment and were, in limited numbers, sometimes moved substantial distances to the west and northwest. The ethnic identity of the makers of pottery in Cluster B compositional groups is unknown, although as noted previously, there is a possible linkage with Eastern Sanan groups in the eastern escarpment zone.

If women made the pottery, learned how to do so from their mothers and other women in that group, and then, upon marriage, moved to the husband's group and territory, this would be a plausible explanation for typological homogeneity in Leon Plain over Central Texas. Occasional capturing of wives and of young girls who had learned pottery making is also consistent with the typological homogeneity (capturing was not infrequently reported to have occurred in the ethnohistoric documents). Similarly, the chemical variability in clays available in the different geologic formations exposed in Central Texas could well yield the compositional groups identified in this study. Indeed, in the absence of recognized patterned variability in other attributes of Leon Plain (such as vessel form or red slipping), chemical differences in clays used for pottery manufacture are perhaps the most readily accessible kind of evidence for identifying group territories. In fact, our compositional group data may well have revealed at least a muted indication of ethnic group territories, perhaps something along the lines of Arnn's proposed Jumano marriage/linguistic groups or even his more restricted community territories.

If the compositional groups identified in this study reflect real differences that relate to native group distinctions at some organizational level, we can escape the typological constraints that have long dominated research on Toyah phase sites and ask new questions. As was noted previously, some archeologists now believe it more appropriate to consider Leon Plain as a ceramic tradition rather than a ceramic type. In terms of the Leon Plain/Doss Red typological distinction, the data presented here can be interpreted in a number of different ways; but in our view, analysts are often unable to consistently detect fugitive red slipping, or more commonly, red washing, on these bone-tempered vessels. Thus, ***in this analysis***, the range of variation is too great for a type distinction with meaningful confidence, but we would support an analysis focusing on the specific issue of the typological validity of Doss Red.

More generally, our data suggest that there are at least two major sets of bone-tempered plain ware (Leon Plain/Doss Red broadly defined) in Central Texas, one occurring mostly in the Balcones Escarpment zone (our Cluster B), the other mostly to the northwest and west (our Cluster A). So far as we currently know, these differ only in chemical composition, although it is entirely possible that differences in vessel form and perhaps other attributes may be revealed by an analysis focusing on such variables. How the chemical variation relates to the question of Leon Plain being a "type" versus a ceramic tradition is unclear, but perhaps any assessment of typological validity should be tempered (so to speak) by expectations of what may be a widely variable geographic distribution of material culture among mobile hunter-gatherers as opposed to sedentary agriculturalists.

SITES WITH LARGER NUMBERS OF SAMPLES

If the generally small number of samples per site, but from a large number of sites in a large

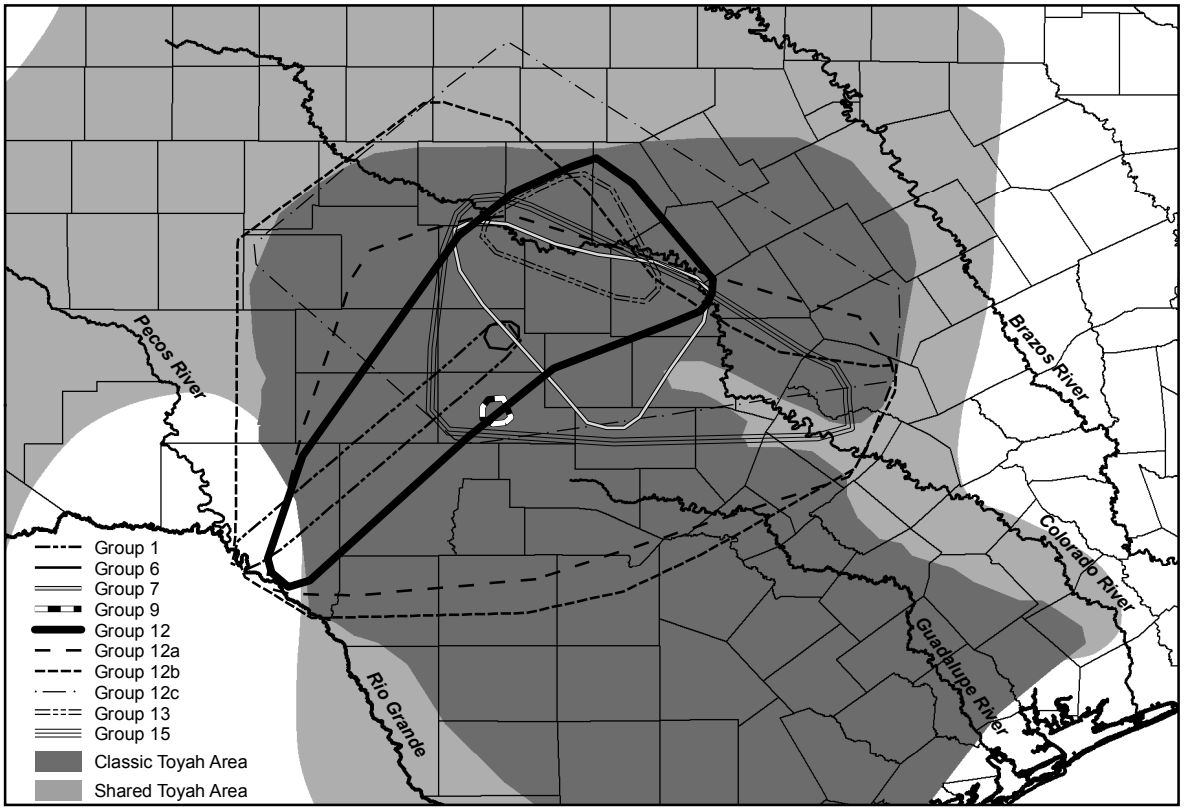

Figure 26. Geographic distributions of the Cluster A compositional groups.

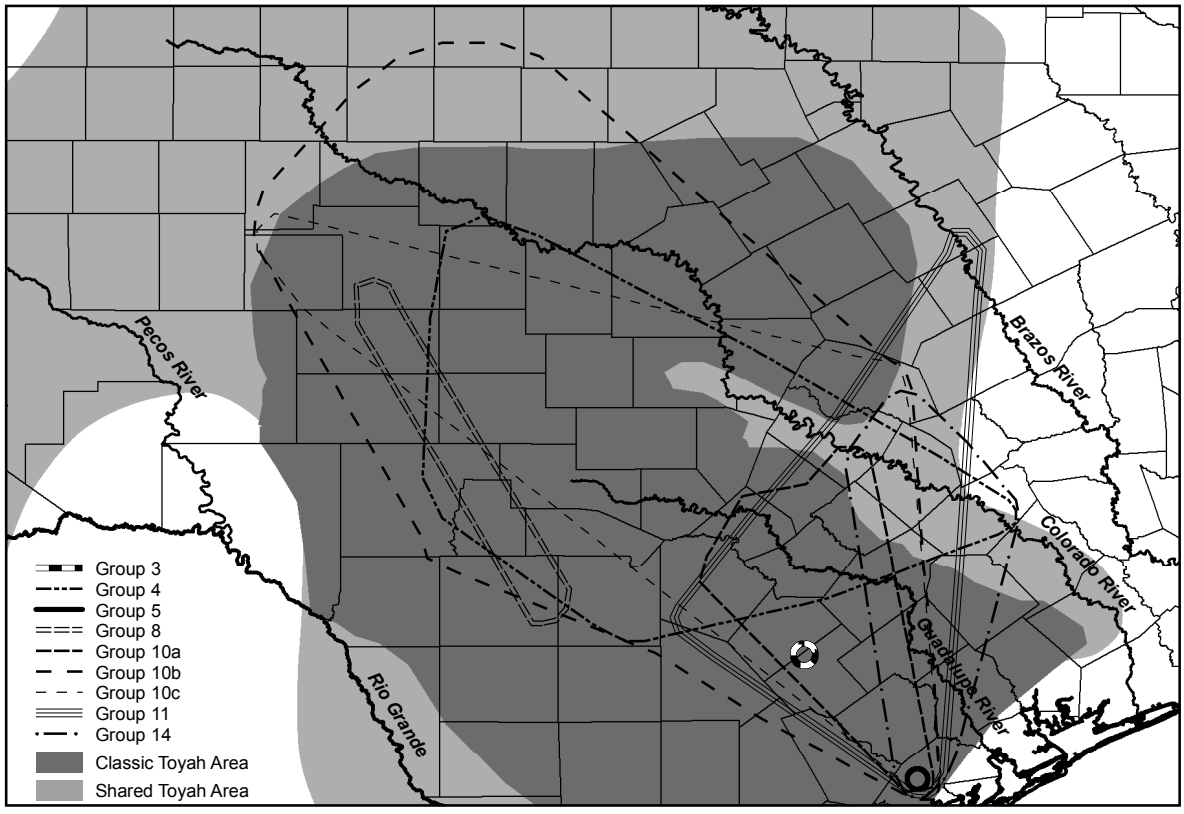

Figure 27. Geographic distributions of the Cluster B compositional groups.

geographic area, yields some confidence in the compositional group distributions, a rather different view of ceramic occurrence in Central Texas comes from sites from which we have larger numbers of NAA samples. It is important to note that the number of NAA samples per site is likely biased to a significant extent on the basis of available material (in known and accessible collections). This availability is, in turn, based on the number of ceramics at a particular site as well as a number of sampling biases such as surface collection versus excavation, often the very small size of sherds, the similarity of the pottery to the soil, ground surface visibility during surface collection, intensity of surface collections, extent of excavation, size of site, whether pot breaks were encountered during excavations, and the extent to which we could confidently distinguish vessel batches in collections. Thus, in the present dataset, it is probable that the number of samples from a given site is, in most cases, simply a matter of sampling and not necessarily a reflection of actual number of pottery vessels present.

On the other hand, it is entirely possible that some of the sites represented in this sample actually had substantially larger numbers of vessels. This could be due to a number of factors including intensity of occupation, length of site use, and even special characteristics of the sites relative to suitability/desirability of occasionally larger population aggregations. The ethnohistoric record reveals clearly that some sites were the location of large, interethnic, group aggregations often referred to as "fairs" (Kenmotsu and Arnn 2012:28-29). It is reasonable to infer that such sites may have contained larger numbers and greater diversity of pottery vessels (as well as other forms of material culture). Ceramically, we might expect there to be greater typological variability in such sites, and, in fact, there are a number of sites with mostly locally made bone-tempered plain wares as well as the occasional vessel from the Caddo area, the Gulf coast, and even the Southwest. It is difficult to know if any of the sites represented in this sample was a "fair" location or if the greater numbers of vessels and/or greater typological variability is simply a function of sample size.

In any event, in the present sample, the number of chemical compositional groups represented in a particular site is generally a function of the number of samples from that site. Table 5 presents the data on those sites with at least seven samples (included only if at least one sample is assigned to a compositional group). This table illustrates the fact that a site with more samples is likely to have more compositional groups represented, although this is clouded by the large number of currently unassigned samples. What this increased diversity in compositional groups might mean is uncertain, although there are various potential factors that may cause it. These include length of period of occupation (one occupation episode only versus regular and repeated use over four centuries), changes in ethnic groups occupying the site over time, and more or less contemporaneous use by different groups (including the "fair" type of occupation). These are not necessarily mutually exclusive.

It is also useful to consider the data beyond the site level of analysis, at clusters of nearby sites, for example, and perhaps more meaningfully with the present sample, at the county level. No detailed assessment at this level is presented here except for a set of contrasts to illustrate the considerable differences across Central Texas. Two particularly interesting pairs are Taylor/Bexar and Tom Green/Travis counties at opposite sides of the project area (Figure 28); the pertinent data are presented in Table 6.

There are 16 samples from six sites in Taylor County and 26 samples from five sites in Bexar County. Among the interesting differences are the complete separation of assigned samples by compositional group cluster A versus B. That is, all assigned samples from Taylor County are in Group 12, 12B, or 12C, primarily 12B. In marked contrast, all of the assigned samples from Bexar County are members of cluster B groups, particularly Groups 4, 10B, 10C, and 11. It is, of course, possible that some of the currently unassigned samples from both counties may eventually be assigned to groups in other clusters, but the differences between the two county areas are significant and illustrative of the general pattern discussed previously.

The data in Table 6 also illustrate the possible effect of sample bias in the Tom Green and Travis County pair. Travis has 28 samples, Tom Green, 51, and with these somewhat larger samples, we see representation of additional compositional groups. While this may well be an effect of larger sample numbers, it is also possible that the Colorado River may have been an important travel corridor between the Balcones Escarpment and the mixed grasslands of the upper Colorado and Concho river areas in west central Texas, an area for which there is much ethnohistoric evidence that it was

Table 5. Compositional group representation at sites with seven or more INAA samples.

		Cluster A Groups							Cluster B Groups								
Site	**Number of INAA Samples**	**9**	**12**	**12A**	**12B**	**12C**	**13**	**15**	**4**	**8**	**10A**	**10B**	**10C**	**11**	**14**	**Caddo or other non-central Texas sample**	**Outlier/ Unassigned**
41NL13	7				1												6
41IR38	7				1											2	4
41TG91	12			2	3	3											4
41LL4/41SS2	18				1			2								3	12
41TG541	8				3								1			2	2
41KM16	8		1		1	1		2					1				2
41TG45	15			2	3					3			2			2	3
41TV40	10			2	2								1	1			4
41WM437	7			1								2	1			2*	1
41HY209	8											2				2	4
41BX528	8											4					4
41BX980	9								2			4			1		2
41FY135	8								1			4			1		2
41HY163	9										1						8
	Total in Group	0	1	7	15	4	0	4	3	3	1	16	6	1	2		
	Total in Cluster	31							32								

* Caddo pottery samples with probability of membership in a central Texas compositional group and herein assigned

Table 6. Compositional group and cluster representation of ceramics from Bexar, Taylor, Tom Green, and Travis counties.*

County	Number of Sites	Number of INAA Ceramic Samples	Cluster A Groups					Cluster B Groups								Total of Sherds Assigned to Clusters A and B	Caddo and other non-central Texas sherds	Unassigned (includes outliers)
			12	12 A	12 B	12 C	15	4	8	10	10 A	10 B	10 C	11	14			
Bexar*	5	26	-	-	-	-	-	2	-	-	1	7	2	2	-	14	0	12
Taylor	6	16	-	-	5	1	-	-	-	-	-	-	-	-	-	6	7**	3
Tom Green	8	51	-	4	11	3	-	-	3	-	-	1	4	-	-	26	8	17
Travis	9	28	-	2	2	-	1	-	-	2	1	3	1	1	1	14	4	11

* One clay sample from Bexar County has a probability of membership in Group 10

** One Caddo pottery sherd from Taylor County has a good probability of membership in Group 12

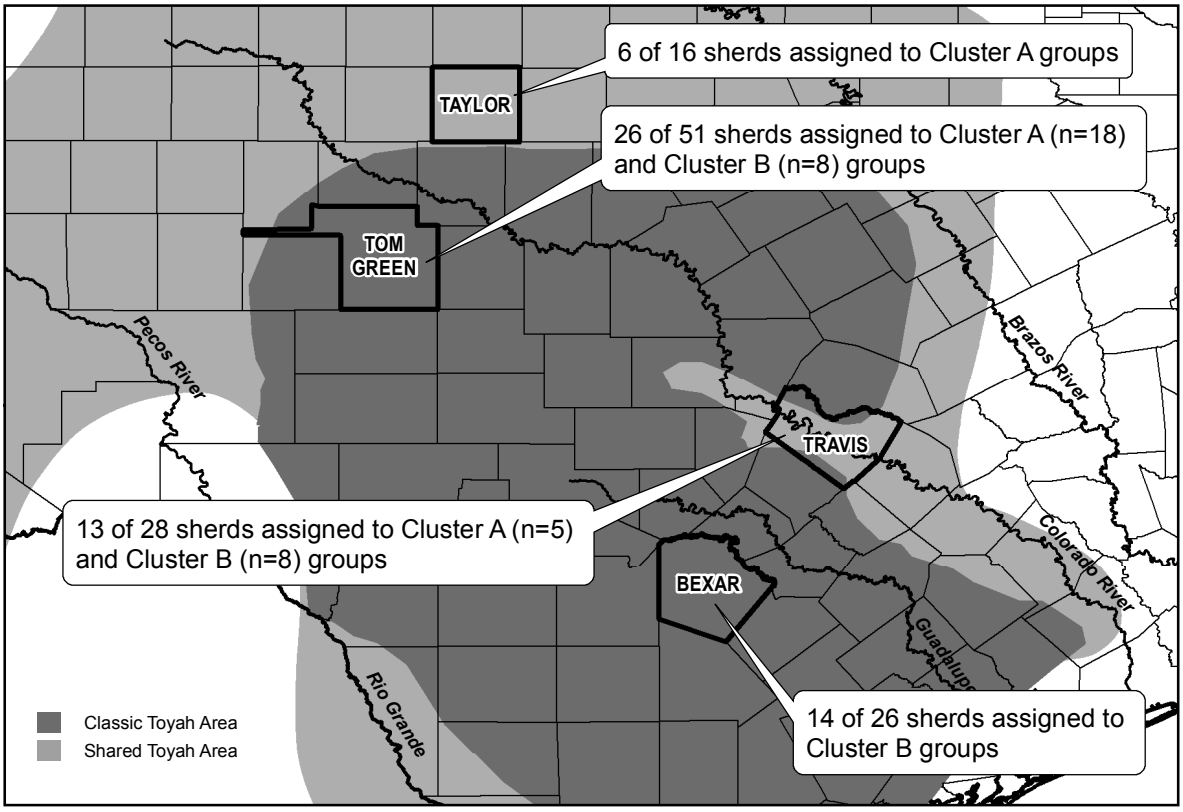

Figure 28. Locations of four counties—Bexar, Taylor, Tom Green, and Travis—with large ceramic samples and many specimens assigned to clusters A or B. The total sample is 121 sherds from 28 sites in these four counties. Of these, sherds from 20 sites are assigned to Cluster A (29 sherds) or Cluster B (30 sherds).

generally, but not always, a major bison hunting area. The potential importance of the Colorado River as a major prehistoric/early historic travel route warrants further research.

In addition, we should consider with some care the importance of the area where the Concho joins the Colorado River in west central Texas. Figures 26 and 27 provide a generalized rendition of compositional group distributions in geographic clusters A and B; note that in Figure 26, the distributions of Groups 12A, 12B, and 12C have been reduced somewhat by excluding the outlying samples most distant from the geographic concentration of most members. One of the most interesting observations of these cluster A group distributions is that most of them overlap at the Concho/Colorado confluence (this would be the case even if full distributions were represented). There are 27 ceramic samples from the confluence area (the Paint Rock site to Ivie Reservoir at the confluence), a relatively modest count given the number of compositional groups represented. Therefore, this concentration of compositional groups must be real and not likely reflective of any sampling bias. This is the area documented by the ethnohistoric records as the homeland of the Jumano in the A.D. 1600s (see Kenmotsu 2001; Wade 2003:218), and there are chronometric dates in the 1600s from some sites there (Treece and Lintz 1993:Table 6.1). At some point, we may want to build on the interpretations of Treece and Lintz (1993:442-444) and reevaluate the important data from the pre-inundation excavations at O. H. Ivie Reservoir. It may also be worthwhile to reconsider the rock art at the Paint Rock site in light of the findings of this NAA study.

CADDO POTTERY IN CENTRAL TEXAS

Since quite a few Caddo sherds from Central Texas sites were included in this study, a few comments are pertinent. Many years ago, Krieger mapped out the basic distribution of Caddo pottery

in Central Texas (Krieger 1946:Map). Since then, we have added substantially to this in terms of number of sherds and number of sites, but the overall distribution is little modified. Early Caddo pottery occurs in some quantities in the area from the Brazos River valley around Waco south to the Georgetown area, and Shafer (2006) has put forth a plausible explanation for this occurrence in his Prairie Caddo model. At that time, probably sometime in the period from A.D. 1000-1300 or 1400, Caddo people, perhaps from the George C. Davis site, established a substantial presence along the eastern edge of Central Texas, with the hunting of deer for meat and hides being a major activity. The sociopolitical environment then was a difficult one as is reflected in the widespread occurrence of violent deaths in this area (Baker 2001; Prewitt 1974). Violent deaths were also occurring in the Abilene area at the same time, and there is evidence there for the taking of trophy skulls and mandibles presumably by outsiders. Schambach et al. (2011) argues that this might have been done by early Caddo people from the Crenshaw site in the Great Bend of the Red River, in southwest Arkansas.

By contrast, the occurrence of Caddo pottery in Central Texas after about A.D. 1400 is much more widespread and, in our view, reflects the new Caddo interest in hunting bison whose population had just grown/expanded rather substantially on the Southern Plains and into greater Central Texas. Casañas (1968:44), a Spanish priest living among the Hasinai Caddo in 1690, wrote that many of the Hasinai men traveled six days west to hunt bison. The most frequent type of Caddo pottery in Central Texas is Bullard Brushed, the common utility ware in central east Texas; but there are a number of other Caddo pottery types (incised, engraved, etc.) represented at late sites throughout much of Central Texas. Although it is difficult to assess, there is some sense that Late Prehistoric and historic Caddo pottery, primarily from the Hasinai area in central east Texas, is considerably more common at sites along streams in the Blackland Prairie just below the Balcones Escarpment, from about the Colorado River (maybe as far as the San Marcos River) north to the Brazos River valley in the vicinity of Waco. Many of these sites have hundreds of sherds representing many Caddo vessels, some Leon Plain and Boothe Brushed sherds, and in some cases, even types from the Gulf coast.

In this regard, it is important to note that in 1542 the surviving members of De Soto's expedition tried to reach Mexico through Texas. Leaving the Hasinai Caddo area and moving southwest, Bruseth and Kenmotsu (1993:216) argue they reached the Guadalupe River, where they turned back because people on the other side of the river did not speak the language of the Indian (presumably Caddo) guides. A century and a half later, Father Masanet accompanied Terán on his 1691 journey to East Texas from what is now northeast Mexico. As they crossed the Guadalupe River, Mazanet (1968:169) noted that they had moved across a linguistic boundary and into a region where "they are all friends and have no wars," suggesting that the Caddo had better relations with people living north of San Marcos.

Perhaps the most interesting aspect of the occurrence of Caddo pottery north of the Guadalupe River (or San Marcos River) is that some sites may have been special in the sense of being the location of recurring occupation by larger numbers of people and different native groups, probably representing multiple language groups. If this is true, in a sense, these sites may have been locations for some of the "fairs" described in the ethnohistoric literature. As an example, one such site may be the Collins site (41TV40) in Travis County, but there are others. We suggest that a more comprehensive research effort be focused on the typological and compositional variability in one or more of these sites.

PROBLEM AREAS AND SUGGESTIONS FOR FUTURE SAMPLING

Despite the interesting and presumably valid inferences from this research effort, there are a number of problems that must be borne in mind when assessing the interpretations offered herein. Among these are geographic sampling biases of both ceramics and raw clays (the need for more of the latter being particularly great), the large number of unassigned samples, and the general lack of chronological separation among the samples. The large number of samples that cannot be assigned to a compositional group may be reduced somewhat as additional samples are analyzed, particularly in areas currently with few or no samples. The geographic biases are substantial, with particularly limited sampling from: (1) what Boyd (2012) refers to as the northern Toyah area, including the Clear Fork of the Brazos in Sweetwater/Abilene areas,

extending to the Eastland area, (2) the western portion of the area in Crockett, Kinney, Schleicher, and Sutton counties, and (3) the area of Mills, Lampasas, Coryell, and Hamilton counties. Both ceramic and raw clay samples are needed from all these areas. Of course, additional samples from those parts of Central Texas more substantially sampled already would be helpful as well.

The problem of temporal differentiation is an altogether different challenge, and it is likely that we cannot do much to demonstrate chronological separation among samples within or between sites with currently available information. Newly acquired samples may well be more precisely dated, particularly as we use our chronological capabilities more effectively. In our opinion, there is good reason to argue for occupation of some of the purportedly prehistoric ceramic sites during the historic period. A good example is site 41TG45, an extensive site from which a substantial ceramic sample has been recovered from fairly modest looting back dirt. The ceramics include much Leon Plain, Patton Engraved (a historic Caddo type from central east Texas), Caddo brushed pottery, and even chain mail (this collection is unpublished). A comparable and even larger ceramic assemblage comes from the Davis Hackberry Spring site (Riemenschneider 1996). At the earlier end of the Toyah phase (or Late Prehistoric 2 period), there are sites with Leon Plain and non-local pottery types such as Chupadero Black-on-white and Ochoa Indented Corrugated, both of which are prehistoric. One sample of Leon Plain has broad line red painted decoration reminiscent of El Paso Polychrome, also suggestive of an earlier time (similar pottery is reported at the Currie site in Concho County). And in any event, a substantial number of radiocarbon dates from Toyah phase sites suggest a time period of a few centuries, extending into the A.D. 1600s, when the Jumano and associated ethnic groups are documented to have been in precisely the areas represented in our sample.

CONCLUDING THOUGHTS

The results of this study are, if anything, thought-provoking. On many levels, the data relate to the basic issue of archeological definition of the Toyah horizon/phase and its relation to native groups documented ethnohistorically. It is not our intention to reassess the Toyah phase concept, particularly since the recently published volume, *The Toyah Phase of Central Texas* (Kenmotsu and Boyd 2012), has many current perspectives on the issue; but we do have comments that bear on the topic.

First, we have defined in a generalized way two major clusters of chemical groups of Leon Plain pottery, one in Central and west central Texas, the other along the Balcones Escarpment. However, as noted previously, we did not include much Leon Plain pottery from the southern part of the Toyah phase area, south and southeast of the escarpment in our sampling, so we do not know how the ceramics from the numerous Toyah sites there relate chemically to those we have analyzed. It is entirely possible that yet another cluster of chemically similar ceramics may be present in this southern area.

As was discussed previously, the two general clusters of chemical compositional groups that we recognize can be tentatively linked to native groups documented by various Spanish chroniclers during the sixteenth, seventeenth, and eighteenth centuries A.D. Cluster A, largely a west central Texas set of ceramics, seems reasonably linked to the Jumano and closely affiliated native groups, whereas Cluster B may possibly be linked to Sanan-speaking and perhaps other native groups along and below the Balcones Escarpment. If so, it is reasonable to infer that both sets of native groups (or "nations" as per early Spanish terminology) had some antiquity in their respective regions, presumably as early as the beginning of the Toyah phase sometime after about A.D. 1300. How much earlier, if any, is a topic for additional research.

More generally, the broad distinction between the two clusters of compositional groups may reflect to some extent the differences noted by Johnson (1994:258-263) between Toyah assemblages in the Balcones Escarpment area and those to the north and west into the upper drainages of the Colorado River and its tributaries (as well as the Clear Fork of the Brazos). It is unclear how much of this difference relates to landscape and resource variation, but we cannot ignore the growing body of archeological data indicative of social boundaries smaller in scale than the Toyah phase/horizon. This, after all, is the approach advocated so persuasively by Arnn and others in recent years.

Despite the distinction between the two loosely defined clusters of Leon Plain chemical groups and the possible linkage with different ethnic groups,

the typological similarity of Leon Plain suggests rather considerable interaction over greater Central Texas in the Late Prehistoric and early historic period. As discussed earlier, this interaction presumably involved intermarriage, occasional captive-taking (see Cameron 2008), trading, and other forms of interaction, most of them noted commonly in the ethnohistoric literature. How the people over greater Central Texas may have been linguistically related is currently unknown, but we wonder if the makers of Leon Plain spoke related languages/dialects.

Earlier, we noted that patrilocality might be a plausible factor in what has been perceived as the typological homogeneity of Leon Plain. That is, among what we presume were predominantly exogamous groups, women would usually have moved in with their spouse's group. Presuming further that women were the potters, this pervasive dispersal of the potters via marriage could account for the homogeneity and distribution of Leon Plain. The capturing of women for wives from time to time, documented ethnohistorically for the region, might also be a factor. Fortunately, this issue has been addressed for many areas of the world in recent years, including North America.

Among the more provocative discussions is in DeBoer's (2008) analysis of captives, particularly captive wives. One of his comments is pertinent to the whole Toyah concept (DeBoer 2008:250-251):

> The shunting of captives must have created a vast rhizomatic network of information exchange. How this exchange differed from the various agencies of conventional diffusion has yet to be understood. Furthermore, if the few estimates for the frequency of marriage through capture are generally applicable, then the dissemination of genetic information, or gene flow, must have been substantial. This raises numerous questions about the reliability of phylogenies based on DNA samples labeled "Apache" or "Conibo" when such groups were constituted through the incorporation of others.

We should be mindful of this caution in analyzing and interpreting any data on human remains, be it DNA, heritable dental trait data, or other osteological data.

As a second issue, we noted previously the early historic documentation of a cultural boundary in the Blackland Prairie possibly at the Guadalupe/San Marcos River. Here we wish only to point out that Johnson's oft-cited map of his "classic Toyah culture" has a distinct edge along the Colorado River in the Blackland Prairie, not far from the Guadalupe/San Marcos River. Are we looking at the same boundary, although perhaps one that changed slightly over time (see Prewitt [2012] for discussion of the Rowe Valley site)? The occurrence of Late Prehistoric/early historic Caddo pottery in this part of Central Texas is largely, but not exclusively, restricted to the area northeast of the area from the San Marcos River to the Colorado River. This suggests that the "fairs" attended by the Hasinai Caddo and other native groups such as the Jumano were at sites in this area. Perhaps a fresh review of Spanish documents with the objective of identifying the locations of such fairs might prove informative.

As a third issue, several researchers have noted that perishable forms of social distinction such as styles of tattooing, hair, clothing, and ornamentation may be far more indicative of social identity than arrow point or ceramic types (see Arnn 2012a, 2012b; Boyd 2012; Kenmotsu and Arnn 2012). In a recent volume, *Ethnicity in Ancient Amazonia* (Hornborg and Hill 2011), DeBoer presents an informative analysis that is relevant to our study and to Toyah archeology more generally. As he notes (DeBoer 2011:96):

> Quotidian and utilitarian artifacts readily diffuse to neighbors, resulting in a large cluster of contiguous groups sharing the trait. In contrast to this contagious pattern, ornaments tend to hopscotch across groups as if striving to maximize perimeters of difference. Such ornaments, including perishable hairdos and body painting, are rare in the archaeological record but are likely to be the most telling carriers for group identity.

It is beyond the scope of this study to explore this issue in greater detail, but we suggest that the ethnohistoric record be searched and, to the extent possible, the distribution of different tattoo styles and other ways of marking native social identity in and around the study area be mapped. The issue of tattoo similarity, for example, has been important in discussions of the Jumano of Central Texas and their purported interaction with the Humanas pueblos in central New Mexico.

This brings up a fourth issue, the occurrences of Leon Plain and other elements of the Toyah material culture assemblage in sites outside what Johnson defined as the "classic Toyah area," particularly in Boyd's (2102) northern Toyah area. Boyd has addressed this issue in some detail, pointing out that the occurrence of Leon Plain with Lott points in some contexts suggests a different ethnic group than those making and using Perdiz points. How this might relate to linguistic/ethnic similarity/distinction is an issue that merits further research, but we again note DeBoer's caution about markers of group identity. Indeed, this goes to the general and oft-discussed topic of whether Toyah should be considered a phase, an interval, a horizon, or a phenomenon. The authors of most chapters in *The Toyah Phase of Central Texas* (Kenmotsu and Boyd 2012) are keenly aware of this issue and they present a sophisticated understanding of Toyah that provides a basis for future research.

END NOTES

1. One of the unresolved issues relating to the type definition of Leon Plain is the fact that there are rare vessels that had incised, engraved, or even painted decoration. Because of their rarity, these have not been referred to as different types by any of the researchers who have found them.
2. Several of the samples used in this study are from the E. B. Sayles collection at the Texas Archeological Research Laboratory and have Gila Pueblo site numbers. Site designations like this one indicate that site location is known with sufficient accuracy to determine county even if the location of the site is not known precisely enough to assign it a trinomial. For example, the Gila Pueblo site number, Coleman 1:1, is known to be in Coleman County.

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The Rockport Ware Pottery of the Central Texas Coast: Form, Technology, Style, and Ethnic Affiliation

Robert A. Ricklis

ABSTRACT

Rockport ware pottery is found in abundance on Late Prehistoric archeological sites along the Central Texas Coast, from Matagorda Bay to the northern shoreline of Baffin Bay, and from the Gulf of Mexico shoreline to a distance of some 40 km inland. A thin, coil-built, low-fired, sandy paste pottery, Rockport ware can be divided into several recurrent and basic types. Technologically, this pottery is related to the sandy paste Goose Creek ceramics of the Upper Texas coast, a region that was almost certainly the direct source area for the spread of ceramic technology to the Central Coast area by ca. A.D. 1250, and possibly earlier. Stylistically, Rockport ware is unique to the Central Coast, particularly in the use of asphaltum as a viscous black paint for decoration as well as for coating interior and/or exterior vessel surfaces. Incised decoration is present on a minority of Rockport vessels, and the basic incised design motifs are similar to those found on Upper Coast ceramics, suggesting diffusion of certain stylistic ideas from that area and, ultimately, from the Coles Creek and Plaquemine ceramic traditions of Louisiana and the Lower Mississippi Valley areas. Rockport ware is readily distinguishable from the contemporaneous bone-tempered plain ware of the Toyah Horizon of the Texas interior, and the technological and stylistic distinctions permit the archeological identification of a definite coastal-inland territorial boundary during the Late Prehistoric period. The presence of Rockport pottery at certain Spanish Colonial mission and presidio sites, in conjunction with ethnohistorical information on the locations of various ethnic/tribal groups, allows for the confident linkage of the Rockport phase with the Karankawa Indians who inhabited this portion of the Texas coast in early historic times.

INTRODUCTION

Archeological sites along the Central Coast of Texas have yielded abundant evidence of a Late Prehistoric-to-Protohistoric (ca. A.D. 1200/1300-1700) indigenous ceramic tradition practiced by the non-agricultural, hunter-gatherer-fisher people of the region. Typically, the many thousands of sherds of Native pottery documented by archeological research in this region are assigned to the Rockport ware series, as formally defined by Suhm and Jelks (1962), and sorted by them into three distinct types. The goals of this paper are to: (a) describe and define Rockport Ware in terms of its key technological, formal, and stylistic attributes, (b) present an updated assessment of Rockport pottery typology, (c) discuss this ceramic tradition in terms of its temporal and geographical distributions, including its probable cultural-geographical origins, and (d) examine the evidence for Rockport pottery as a stylistically distinctive material culture marker of the historically well-documented, ethnically and linguistically discrete Karankawa groups who were the indigenous inhabitants of the central Texas coastal region during the historic Colonial period (Figure 1).

The aboriginal ceramics of the Central Texas coast were first documented in print by two avocational archeologists, George Martin (1931) and Wendell Potter (1930), who identified a sandy paste ware, often coated and/or decorated with natural black asphaltum, as a recurrent trait on archeological sites in the Corpus Christi area. In a slightly later survey of Texas archeology for Gila Pueblo, E. B. Sayles (1935) noted the presence of a distinct coastal pottery with a characteristic sandy paste, and suggested a linkage with the Karankawa Indians of the region. In his reports on certain coastal sites such as Kent-Crane, Live Oak Point, and Webb Island, T. N. Campbell (1952, 1957, 1958) described and illustrated sandy paste pottery sherds, sometimes bearing incised line decorations and often decorated/coated with asphaltum. Further, Campbell (1961) suggested that the origin of

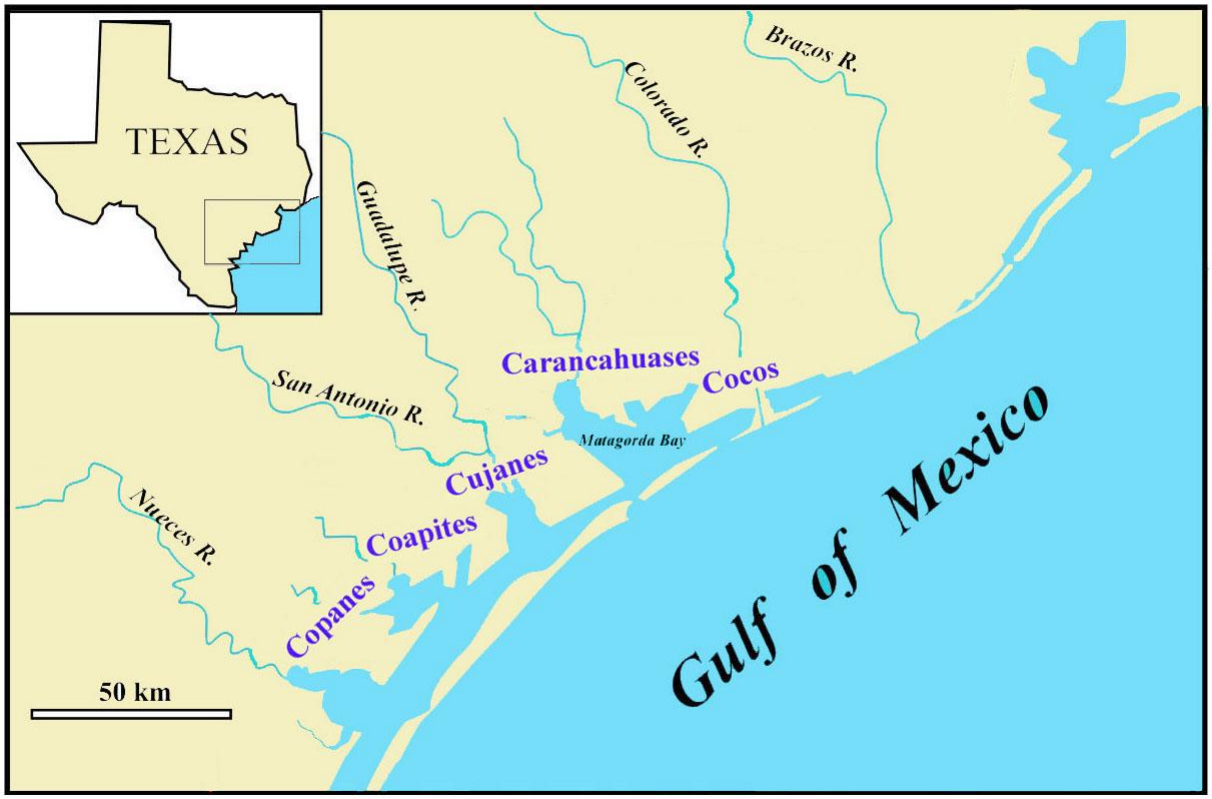

Figure 1. Map showing the approximate locations of the five subgroups of the larger Karankawa ethnic and linguistic group in the 17th and 18th centuries.

this sandy paste ceramic technology was the Upper Texas coast area, from which ceramic production diffused southward into the Central coast region. Suhm and Jelks (1962) defined Rockport ware as a component of the "Neo-American" (i.e., Late Prehistoric) Rockport Focus of this part of the coast. They identified it as a thin, low-fired sandy paste pottery made by coil construction in the forms of jars, bowls, and narrow-mouth bottle-like vessels, and subdivided Rockport Ware into three formally defined types, namely, Rockport Plain, Rockport Incised, and Rockport Black-on-Gray.

More recent archeological work in the region has documented markedly expanded samples of Rockport ware sherds in association with other aboriginal artifact traits diagnostic of the regional Late Prehistoric, Protohistoric, and Early Historic (Colonial) periods (e.g., Headrick 1991; Prewitt et al. 1987; Ricklis 1988, 1996, 1999, 2000, 2010; Weinstein 2002). Recurrently found in association with Rockport pottery is a suite of lithic artifacts that includes arrow points (primarily of the Perdiz type), small unifacial end scrapers, tiny cylindrical drills, expanded-base drills made on flakes or blades, bifacial knives (sometimes alternately beveled), small prismatic blades (Hester and Shafer 1975), and occasional fragments of sandstone milling stones. Associated marine/estuarine shell artifacts include perforated oyster and/or rangia clam shells, perforated whelk shells, bi-pointed whelk columellae, whelk-shell hammers, edge-flaked sunray venus clam shell cutting/scraping tools, and whelk body-whorl adzes, all of which have direct antecedents in the Late Archaic assemblages of the region (e.g., see Prewitt et al. 1987; Ricklis 1996, 2010; Story 1968; Weinstein 2002).

The co-occurrence of Rockport pottery and these various lithic and shell artifacts constitutes the material culture assemblage of the Rockport phase, the archeological counterpart of the historically documented Karankawa Indian tribes of the Central Texas coast area (Newcomb 1983; Ricklis 1996), a correlation discussed in some detail further on in this article. Identifiable most readily on the basis of the presence of Rockport ware pottery sherds, the Rockport phase has a geographic range

Figure 2. Map showing approximate extent of the Rockport phase along the Central Texas coast, and locations of key sites mentioned in the text.

along the Texas coast (Figure 2) from the northern shoreline of Baffin Bay (Highley 1980) northward to the Matagorda Bay area (Fritz 1975; Ricklis 2007), and extends from the mainland shoreline of the Gulf of Mexico inland approximately 40 km, at which point contemporaneous Late Prehistoric assemblages exhibit a more or less abrupt shift in ceramics to the bone-tempered plain ware (so-called Leon Plain; see Suhm and Jelks 1962) typical of the inland Toyah Horizon (Ricklis 1996; see also Black 1986; Highley 1986). This has been taken to represent a major Late Prehistoric cultural boundary zone (Ricklis 1995a) between coastal and interior populations at the same distance from the mainland shoreline (i.e., 10 leagues, or 40 km) identified by the early 19th Century Mexican government as the inland margin of Karankawa territory (Smithwick 1900:13, cited in Ricklis 1996:96).

DEFINING ROCKPORT WARE IN TERMS OF ATTRIBUTES AND TYPES

Rockport ware pottery can be most accurately defined by reference to its technological, formal, and stylistic attributes. As used here, technological attributes are those aspects of ceramics that most directly reflect the technology employed in producing the vessels; formal attributes are the discernible aspects that are most directly related to the shapes/forms of ceramic vessels; and stylistic attributes are the aspects (e.g., decoration) that directly reflect non-functional/non-technical dimensions of the ceramics and that represent the stylistic/aesthetic choices of the potter. These categorizations are not necessarily mutually exclusive and they do, in fact, show significant degrees of overlap as represented, for example, in the fact that vessel shape

is both a formal attribute and a stylistic one. For the purpose of descriptive clarity, however, this tripartite division is a convenient way of rationally ordering and defining the diverse set of specific characteristics by which Rockport ware is definable and recognizable.

Technological Attributes

These are the discernible aspects of sherds which specifically represent the technical aspects of clay preparation, vessel construction, and firing. In Rockport ware they include:

- Aplastic inclusions, or tempering materials (e.g., sand, crushed bone, particles of shell). Rockport ware contains an abundance of fine, well-sorted sand. Under low power (10-20X) microscopy, the sand inclusions within the clay body are very similar to those seen in the sandy clays of the region's Beaumont Formation, and it is likely that such sandy clays were chosen by aboriginal potters because the natural sand inclusions served as a tempering agent. Crushed bone is frequently also present as an added temper, although typically not in the profuse quantities seen in the ceramics of the inland Toyah horizon. Indeed, patterned differences in the proportions of sherds with sparse (<5% of clay body), moderate (5-25% of clay body) and profuse (>25% of clay body) quantities of bone temper have been effectively used to distinguish sites of the Rockport phase vs. the Toyah horizon at the spatial interface of the two traditions at slightly inland locations along the Texas central coastal plain (see Ricklis 1995a; 1996:Appendix A). Sparse inclusions of shell particles are occasionally present, although as suggested by Story (1968), these may have been natural inclusions in lagoonal clays and do not appear in the profuse quantities seen in true shell-tempered pottery. Other inclusions, such as caliche ($CaCO_3$) particles, are likewise sparsely represented and are probably natural occurrences within the clay, especially if it was gathered from Beaumont Formation deposits, in which caliche is often present. Grog temper (crushed pottery), although common in Upper Coast ceramics (e.g., Aten 1983), is altogether absent in Rockport ware.
- Coil breaks (broken edges of sherds on which there is the observable presence of a joint between two constructional coils of clay).
- Colors of sherds, indicative of oxidizing vs. reducing firing atmospheres. Free exposure of the vessel to oxygen (air) during firing indicates an open firing technique in which the vessel was oxidized by exposure to air, resulting in a relatively light sherd color (e.g., red, orange, white, buff-colored, depending on amounts of iron in the clay). Conversely, if the vessel was more or less cut off from air flow during firing (e.g., it was largely or completely covered by fuel), the result was a reduced, dark color (e.g., dark gray to nearly black). Incomplete oxidation, wherein the core of the sherd retains a dark color while one or both surfaces were oxidized to a lighter color such as a light buff, yellow, red, or orange, is common in Rockport ware and presumably indicates a rapid, or relatively short-lived firing process in which the core was not fired for sufficient time for the oxidation process to fully penetrate the vessel wall. Occasional mottling of surface colors (e.g., patchiness of both dark and light-colored surface areas) indicates that the vessel was fired under conditions in which different parts of the vessel were exposed to differing amounts of air flow.

Formal Attributes

This group of attributes can be subdivided into several subcategories, all or most of which are readily observable on individual rim sherds (generally speaking, rim sherds represent that portion of the pottery vessel on which the maximum number of attributes is observable). Formal attributes of Rockport pottery are:

- Rim shape may be straight, everted, or inverted (Figure 3).
- Lip form may be flat, rounded, or pointed (Figure 3)
- Sherd/vessel-wall thickness
- Vessel shape is generally determinable only with relatively large sherds or reconstructed portions of vessels. May be bowl, jar, olla, neckless olla, or bottle-like (Figure 4).

- Vessel size (most readily estimated based on vessel orifice diameter, as indicated by curvatures of rim sherds or, if available, reconstructed vessels and/or portions of vessels).

- Handles, in the form of loops of clay inserted into two holes in the vessel wall and then bonded to the wall by pressing the wet clay of the coil into the still-wet clay of the vessel wall. These are extremely rare in Rockport ware, and the only published examples are a single specimen from the Guadalupe Bay site (41CL2) (Weinstein and Hutchins 2002), and two specimens from the McGloin Bluff site (41SP11) (Ricklis 2010). The fact that all three of these examples are made of sandy paste clays without any added bone temper has led to their inclusion within the Rockport ware series. Loop handles are fairly common in samples of the bone-tempered ceramics commonly found at 18th Century Spanish Colonial mission sites such as the various locations of the Espiritu Santo Mission (Ricklis 1999, 2000; Walter 2007) and the Mission of Nuestra Señora del Rosario near Goliad (Gilmore 1974; Ricklis 1999, 2000), and are also documented at non-pre-mission Toyah horizon sites (e.g., Black 1986; Highley 1986), suggesting a possible aboriginal origin in the inland bone-tempered plain ware ceramic tradition and a subsequent incorporation into the descendant tradition of bone-tempered Goliad Ware found in abundance at Texas coastal plain mission sites (e.g., Hester 1980, 1989; Ricklis 2000; Walter 2007). Given that the available evidence suggests that both Guadalupe Bay and McGloin Bluff were recurrently occupied through the Late Prehistoric, Protohistoric, and into the Colonial periods (see Weinstein 2002; Ricklis 2010), it is possible that the technique of producing vessels with loop handles was acquired by coastal people through contact with these missions. Also, it is worth noting that the pottery sherd samples from both Guadalupe Bay and

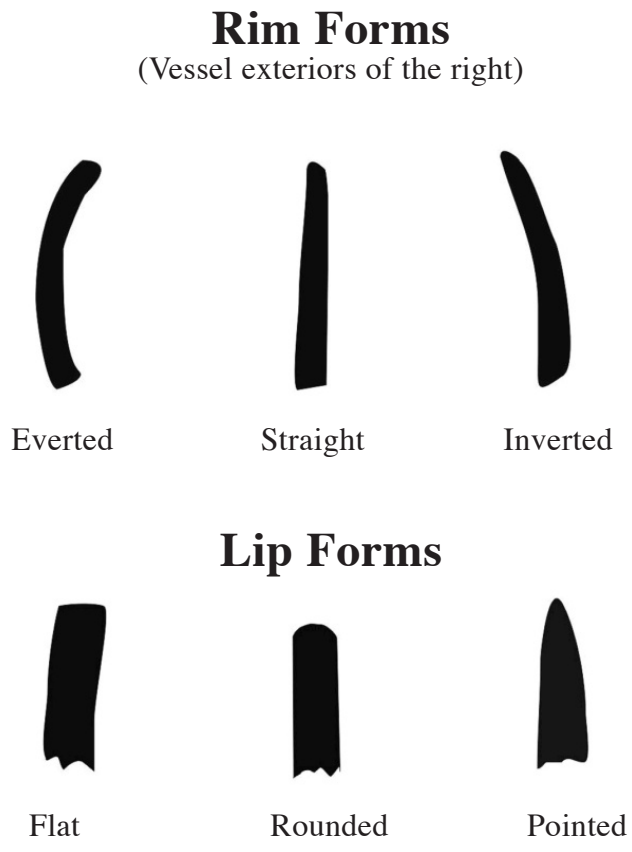

Figure 3. Rim and lip forms commonly expressed in Rockport Ware.

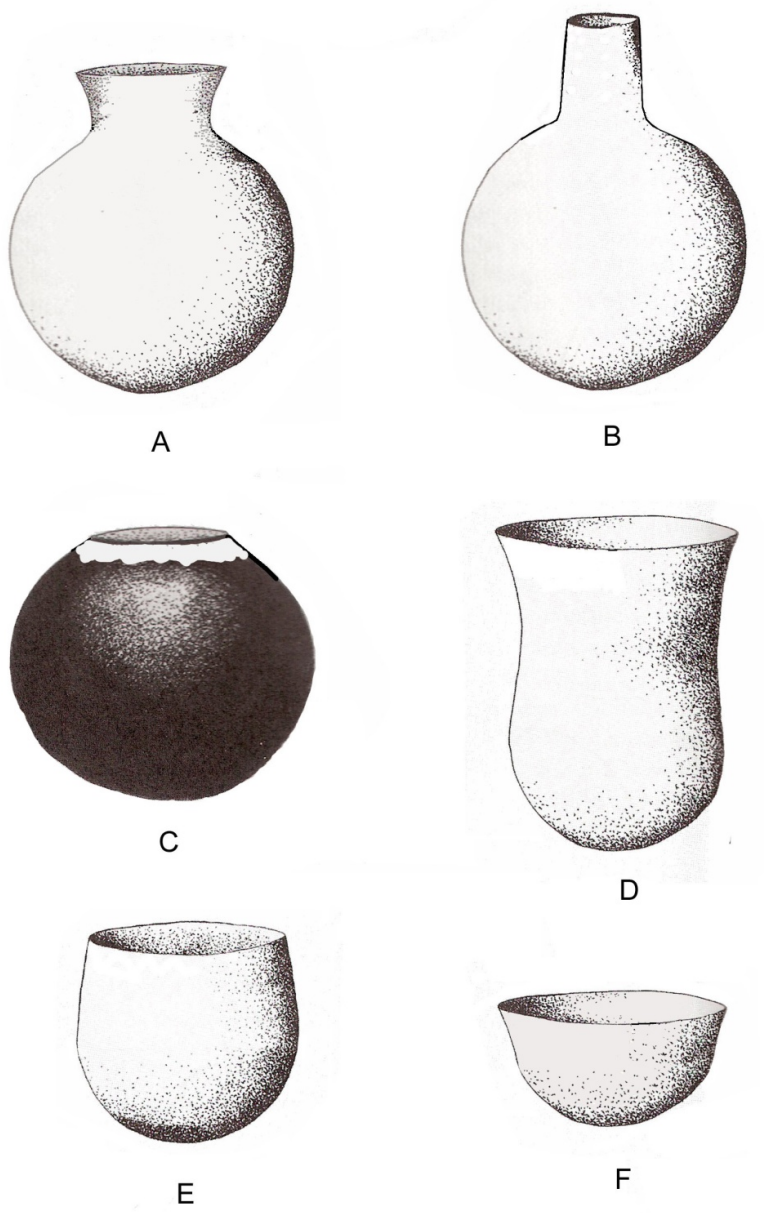

Figure 4. Rockport ware vessel shapes: A, olla; B, bottle; C, neckless olla, D, Jar; E, deep bowl; F, bowl.

McGloin Bluff are large enough (42,000+ and 28,000+ sherds, respectively) to contain a minimal representation of this very rare trait. Thus, while handles are not unknown in Rockport pottery, they were extremely rare, and are perhaps present only as a result of acculturative influence from the inland bone-tempered native ceramic tradition that was incorporated into the material culture repertoire of the coastal plain missions of the post-Contact Colonial period.

Stylistic Attributes

These include various kinds of surface finish as well as added decorative elements. In Rockport ware, the following stylistic attributes are recurrent:

- Surface finishes may be smooth, scored, brushed, or burnished. Scoring, generally done with the edge of a ribbed bivalve shell such as a scallop or cockle (see Calhoun 1963) may, strictly speaking, be a

technological attribute since the ribbed shell may have been used to bind and smooth over coil joints in the still-wet clay. Brushing is present but extremely rare in large samples of Rockport ware (e.g., Ricklis 2010), while burnishing is seen only on a small minority of sherds. By far the most common surface treatment is complete smoothing over of the vessel surface prior to drying and firing.

- Notching of vessel lips. Notched or nicked lips are found throughout the Rockport phase area. Close spacing (<5 mm apart) of the notches frequently gives the rim of the vessel a crenelated appearance. Similar lip treatment is seen on examples of the Goose Creek pottery of the Upper Texas coast area (e.g., Ricklis 1994).
- Incising. This decorative technique was used on only a minority of Rockport vessels. Its redundant occurrence on various sites throughout the area (e.g., Corbin 1974; Ricklis 1996, 2010; Story 1968; Suhm and Jelks 1962; Weinstein 1992, 2002) indicates, however, that this technique was an integral part of the Rockport ceramic tradition. Design motifs commonly consist of multiple parallel horizontal lines or cross-hatched lines immediately below the exterior rims of vessels, frequently highly reminiscent of the incised motifs on Goose Creek Incised and San Jacinto Incised types of the Upper Texas coast area (see Aten 1983). These, in turn, are reminiscent of design motifs that are common in the Coles Creek and Plaquemine ceramic traditions to the east in Louisiana and the Lower Mississippi Valley area (Ricklis 1994). Also known, although quite rarely, are incised line decorations on vessel lips, consisting of short diagonal parallel or cross-hatched incised lines traversing more or less flat lips. Also rare are squiggly or zig-zag incised lines on exterior surfaces, used in combination with the squiggly lines applied as asphaltum paint.
- Asphaltum surface treatments (coating and/or painted decoration). Asphaltum, a naturally occurring viscous black tar found on Gulf of Mexico beaches, originates in petroleum seepages in the floor of the Gulf. Being lighter than water, globules of this material float on the surface and are washed onto the windward shores of barrier islands by wave action. Asphaltum was commonly used to coat vessel surfaces, probably as a sealant, and as a paint to create a number of distinctive decorative motifs on vessel surfaces. Such coatings and decorations were applied after the vessel had been fired. The painted motifs commonly include straight bands (usually along the lip and uppermost rim of the vessel) and sets of vertical squiggly lines that extend from just below the rim down vessel exteriors. Less common are clusters or rows of painted dots, often used in combination with the squiggly line motifs.
- Punctations. Rows of small punctations are occasionally found on the exteriors of Rockport sherds. Usually, they are aligned parallel to, and in between, the vertical squiggly lines just mentioned. Typically, punctuations were not used in combination with incised line decorations.
- Slips were employed as a decorative technique on a small percentage of Rockport vessels. In some cases, the entire exterior surface was covered with an off-white or light-gray slip that served as a background for typical asphaltum decorations, resulting in a fairly sophisticated and attractive black-on-white decorated variant. Rarely found, but documented at multiple sites (e.g., Kirchmeyer [41NU11, Headrick 1991]; McGloin Bluff [Ricklis 2010]; Guadalupe Bay [Weinstein and Hutchins 2002]), is the use of red slip in combination with black asphaltum to create a polychrome decoration.

An Example of the Breakdown of Attributes in a Rockport Ware Assemblage

To give an idea of the representation of these various attributes within a large sample of Rockport pottery, Table 1 shows their raw numbers and percentage representations in the sample of 366 analyzed rim sherds from the McGloin Bluff site on Corpus Christi Bay. Table 2 presents the quantifications of vessel orifice diameters according to incrementally graded sizes, based on matching of rim sherd curvatures against a template of concentric circles whose diameters vary in 2 cm increments. It can be seen that the most common orifice diameter was 20 cm, and that most of the vessels had orifice

Table 1. Attribute Representations, Sample of 366 Analyzed Rim sherds from the McGloin Bluff Site (41SP11).

Attribute	Number	Percent
Profuse sand (>25% clay body)	366	100.0
Crushed bone temper	18	4.9
Sparse (<5% of clay body)	14	3.8
Moderate (5-25% of clay body)	4	1.1
Color		
Light Buff (Oxidized)	328	89.6
Dark gray (Reduced)	38	10.4
Rim Form		
Everted	156	42.5
Straight	158	43.2
Inverted	52	14.2
Lip Form		
Flat	109	29.8
Rounded	173	48.6
Pointed	79	21.6
Estimated Vessel Form		
Jar	12	2.2
Bowl or Jar	295	80.8
Bottle	5	1.4
Bowl	15	4.1
Olla	20	5.5
Neckless Olla	18	4.9
Surface Treatment		
Scored Interior	15	4.1
Scored Exterior	14	3.8
Scored Interior and Exterior	21	5.7
Burnished	1	0.3
Smooth (exterior and interior)	306	83.6
Gray-White Slip	6	2.2
Polychrome Painted	3	0.8
Asphaltum Applications		
Lip Band	209	
Exterior Coating	100	
Interior Coating	70	
Exterior Vertical Squiggly Lines	28	
Exterior Dots	6	
Diagonal Lines below rim, exterior	2	
Notching on Lip	10	
Lip Incising	2	
Exterior Sub-Rim Incising	2	
Exterior Punctations	2	

diameters falling between 16 and 28 cm. These data indicate that Rockport pots were generally of small to medium size, with the apparent maximum orifice diameter being around 32 cm.

Table 2. Numbers of Rim sherds from the McGloin Bluff Site (41SP11) in Size Groupings of Vessel Orifice Diameters, grouped in 2 cm increments.

Estimated Diameter (cm)	No. Specimens
2	2
4	8
6	5
8	8
10	6
12	18
14	13
16	22
18	19
20	48
22	37
24	36
26	24
28	18
30	12
32	8

ROCKPORT WARE TYPOLOGY

The assignment of pottery sherds representing a distinct ceramic tradition into formal types allows for ready sorting of sherds and for easy communication concerning patterned variability between archeological researchers. As noted above, the earliest effort to type Rockport pottery was the tripartite typology presented a half century ago by Suhm and Jelks (1962). As was perhaps inevitable, in the course of subsequent archeological research in the central coast region, this original typology has been modified and augmented (Ricklis 1995a, 2010; Weinstein and Hutchins 2002), though the basic conceptualization has proven highly useful and fairly resilient.

At present, Rockport ware typology is a work in progress, and a final consensus as to the "best" (i.e., most useful) approach has yet to be reached. A basic exposition of the history of typological definitions, as presented below, is perhaps the best way to convey to the reader the current status of Rockport ceramic typology.

Types Defined by Suhm and Jelks (1962)

The recognition of a regionally distinctive ceramic tradition of sandy paste, asphaltum coated/decorated pottery began with the already mentioned publications of Martin (1931) and Potter (1932) in the early 1930s. These early descriptions were later significantly augmented by Campbell's publications (1952, 1956, 1958, 1961) on materials from central coast sites, in which site-specific findings were described.

Based on their observations of collections then available for study, Suhm and Jelks (1962) defined three formal types of Rockport ware, as follows:

- *Rockport Plain*. Sherds of this type were defined as having a sandy paste (clay body containing more or less profuse amounts of fine-grained sand particles) with evidence of coil construction in the form of coil breaks along sherd edges. Surfaces were either smoothed or scored, and lacked any form of decoration other than lip notching in a minority of cases. Based on sherd curvatures, vessel forms were variable and included the full range of forms seen in Rockport ware (i.e., jars, bowls, ollas, and bottles). Vessel walls were relatively thin, and bases were typically rounded. Rim profiles were varied, and could be straight, everted, or inverted.
- *Rockport Incised*. Sherds are composed of the same sandy paste clay as is the case with Rockport Plain, and generally represent vessels having the forms of deep bowls or jars. Ollas and bottle forms are not typically represented by sherds of this type. Decoration is in the form of geometric patterns of thin incised lines on vessel exteriors immediately under the lip. Design motifs are variable, but commonly take the forms of multiple parallel horizontal incised lines, often with incised "pendant" triangles immediately under the lowermost line, or a band of cross-hatched lines. Aside from the incised lines, vessel surfaces are plain and smoothed or sometimes lightly burnished.

- *Rockport Black-on-Gray*. Again a sandy paste ware, vessels of this type were either coated with asphaltum or decorated with painted asphaltum bands, squiggles, and/or dots. Vessel interiors and/or exteriors are often partially or completely coated with asphaltum. Vessel forms are variable and can be of any of the shapes known for Rockport ware. Surfaces upon which the asphaltum was applied, always subsequent to firing, are usually smooth or, much less commonly, scored.

A Modified Typology (Ricklis 1995a)

In an overview of Central Coast aboriginal ceramics published in 1995, I suggested a modification of the Suhm and Jelks (1962) typology, based on observations of sizeable sherd samples from a number of sites in the areas of Corpus Christi, Copano, and San Antonio Bays. These modifications reflected certain patterned variations in Rockport ware decorative motifs which, because they occur repeatedly in sherd samples from throughout the Rockport phase area, were believed to be legitimate and useful augmentations of the original typology. The net result of these changes is that there came to be five types in the series, rather than the original three, as follows:

- *Rockport Plain*. This type remained as originally defined, with the sole exception that unpainted, un-incised rims with notched lips were not included, given that lip notching is clearly a *decorative* technique. Given this simple fact, it was reasonable to make the stylistic distinction of notched lip sherds/vessels as a decorated type, separate from Rockport Plain. Low power (10-20X) microscopic examination of sherd edges revealed that sparse or moderate amounts of crushed-bone temper was sometimes present, along with profuse amounts of fine sand in clay bodies.
- *Rockport Crenelated*. Since lip notching commonly gives vessel rims a crenelated appearance, the typological designation Rockport Crenelated was suggested. Sparse-to-moderate quantities of crushed bone temper is sometimes present along with the usual profuse amount of fine sand.
- *Rockport Incised*. This type was left unmodified from the original definition formulated by Suhm and Jelks (1962). Again, it was observed that sparse-to-moderate amounts of crushed bone had often been added as a tempering agent to the usual sandy paste clay body.
- *Rockport Black-on-Gray I*. Examination of Rockport sherd samples revealed that asphaltum-painted decorative variants were not employed randomly, but rather were used in standard ways, with the result that two distinct style-based types could be readily identified. By far the most basic of these is the application of a narrow painted band of asphaltum along the vessel lip; often the painted band extends from the lip proper downward onto the interior and/or exterior uppermost portion of the rim. In cases where this band was the sole decorative element on the vessel, the Rockport Black-on-Gray I type is represented. Judging from sherd curvatures, vessels of this type were typically jars and/or bowls. Microscopic examination of sherd edges revealed that sparse-to-moderate amounts of crushed bone temper were present in some sherds of this type.
- *Rockport Black-on-Gray II*. This type exhibits asphaltum lip banding with the addition of vertically oriented squiggly lines of asphaltum on the vessel exteriors. These lines begin at the base of the lip bands and extend variable distances down the exterior surface of the vessels. This decorative combination is commonly found on narrow-mouth vessels (ollas, bottles) that most often have interiors completely coated with asphaltum. Assuming that such coatings were applied in order to seal vessel interiors, and considering that these combined surface treatments are commonly found on narrow-mouth pots with more or less constricted necks, it was inferred that this type is often represented by vessels that functioned as water containers (Ricklis 1995a). It was noted that crushed bone temper was only rarely added to the sandy clays from which vessels of this type were made, and it was suggested that non-cooking vessels, such as pots of this type were inferred to represent, might not have required the additional tempering agent which would have mitigated the effects of continual expansion and contraction of the vessel walls to which cooking vessels would have been subjected.

A Type-Variety Approach to Classifying Rockport Ware (Weinstein and Hutchins 2002)

In their detailed analysis of the large sample (n=42,000+) of Rockport sherds from the Guadalupe Bay site (41CL2) near the mouth of the Guadalupe River, Richard Weinstein and Michelle Hutchins (2002) devised a complicated type-variety classification designed to systematically account for the observed variability in the ceramics from that site. Essentially, this approach attempted to transfer to the Central Texas Coast the way pottery variability is managed by archeologists working in Mississippian and pre-Mississippian contexts in Louisiana and the Lower Mississippi Valley (LMV) region (Phillips 1970) and also employed to a more limited extent by Aten (1983) in sorting the aboriginal pottery from the Upper Texas coast area. The type-variety approach was developed as a way to formally identify patterned variability within ceramic types, under the working assumption that recurrent varieties can be defined as meaningful signifiers of cultural variation through time and across space.

Six types were defined by Weinstein and Hutchins, and these were further divided into 25 varieties based on different aplastic inclusions in the clay body such as crushed bone, crushed shell, caliche particles, and/or organic inclusions. Their typology used the three types defined by Suhm and Jelks (1962) as a starting point, and included Rockport Plain, Rockport Incised, Rockport Black-on-Gray (asphaltum painted designs on a grayish-white slipped surface) and Rockport Black (essentially the same as the Rockport Black-on-Gray of Suhm and Jelks [1962]), Rockport Red (a rare type with a surficial red film), and Rockport Polychrome (another rare type with combined black asphaltum and red-slip decoration).

As discussed further on, certain aspects of this typology are useful and have been incorporated into more recent analyses of Rockport ware (Ricklis 2010). However, while the type-variety system developed by Weinstein and Hutchins represents a considerable effort, the results are in some fundamental ways questionable. Many of their varieties are based on differences in aplastic inclusions that do not necessarily reflect intentional, culturally informed decision making on the part of Rockport phase potters. While the inclusion of crushed bone can be assumed to be the intentional addition of an aplastic tempering agent, the presence of more or less sparse shell-particle inclusions may reflect a natural occurrence in the clay, as suggested by Story (1968), and the presence of caliche particles is likely the result of the natural presence of caliche which is commonly found within the region's ubiquitous Beaumont Formation clays. Likewise, various organic inclusions are likely to have been simply the result of the natural presence of such materials in the clays when they were collected by potters, and thus they do not necessarily represent culturally informed choices on the part of the aboriginal potters. For these reasons, defining formal varieties on the presence/absence of these various materials results, in my view, in an unconvincing and potentially misleading taxonomy.

For the decorated types—Rockport Incised, Rockport Black, and Rockport Black-on-Gray—Weinstein and Hutchins defined numerous named design motifs. Often these motifs were identified on very small sherds on which only a part of the supposed complete motif is discernible, and as a result the reconstructed motifs are sometimes unconvincing (see, for example, Weinstein and Hutchins [2002:340], which shows an artist's reconstruction of a vessel of Rockport Black-on-Gray, "Matagorda Island Motif," along with accompanying photographs of actual sherds upon which this motif definition was based). These problems are likely to exist with *any* sample of Rockport pottery comprised mainly of small sherds, as will generally be the rule, given the thin and friable nature of this low-fired ware and a dearth of contexts (e.g., burials) that yield whole or reconstructed vessels. Thus, the use of a relatively simple, basic typology would seem to remain the most useful approach to sorting and providing basic descriptions of samples of Rockport ware pottery sherds. Should a more detailed description be desirable, it can easily be achieved by analyzing sherds in terms of their technological, formal, and stylistic attributes, and reporting the results accordingly.

A More Recent Revision of the Rockport Ware Typology (Ricklis 2010)

Recent data recovery excavations at the McGloin Bluff site (41SP11), a major Rockport phase site on the northern shore of Corpus Christi Bay (Ricklis 2010), resulted in the recovery of a very large sample of Rockport ware pottery sherds (n=28,275). Along with the even larger sample

(42,000+ sherds) from the Guadalupe Bay site reported by Weinstein and Hutchins (2002), the sheer numbers of sherds highlights the intensity in the production and use of pottery by Rockport phase people to a degree seemingly comparable to the use of ceramics by relatively sedentary horticulturalists such as, for example, the Caddo of East Texas, and to a far greater extent than is generally the case with aboriginal societies that practiced a mobile hunting-and-gathering mode of adaptation (e.g., even the most extensive investigations of contemporaneous sites of the inland Toyah horizon have generally yielded less than 1000 potsherds; e.g., Black 1986; Highley 1986; Johnson 1994; Quigg et al. 2008). This may reflect the relatively limited residential mobility of Rockport phase/Karankawa coastal groups who, as mentioned previously, operated within around 40 km of the mainland shoreline (see Ricklis 1996), and also their use of dugout canoes for transportation (Newcomb 1961, 1983), a practice that would have facilitated the transport of ceramic vessels and other domestic items.

In any event, the large sample from McGloin Bluff provided a fresh opportunity to test the usefulness of the existing typologies for defining and describing Rockport pottery sherds. Both attribute and typological analyses were conducted on rim sherds, since the rim portion of the vessels exhibits the greatest number of formal and stylistic attributes. The McGloin Bluff sherd sample contained a total of 1,021 rim sherds. For analytical purposes, those rim sherds with maximum dimensions of 3 cm or greater were selected, as many aspects of decoration and/or form were difficult or impossible to define with confidence on smaller sherds. This selection process resulted in a still-sizeable sample of 366 rim sherds for complete attribute and typological analysis.

Based on recurrent, patterned combinations of attributes, nine types were defined for the Rockport rim sherd sample from McGloin Bluff; these are listed in Table 3. For ease of visual comprehension, most of the decorated types are drawn schematically in Figure 5. Individual sherds of the various types are shown below in Figures 6 through 14. The types can be briefly described, as follows:

Rockport Plain (Figure 6A-D)

The definition of this type remains unchanged from that presented previously (Suhm and Jelks 1962; Ricklis 1995a; Weinstein and Hutchins 2002). This is an undecorated, uncoated sandy paste pottery in the form of bowls, jars, ollas, and bottles. Sparse to moderate amounts of crushed bone temper may be present in the paste.

Rockport Crenelated (Figure 7E-F, H-K)

This type is also unchanged from Ricklis (1995a). The diagnostic attribute is closely spaced notches along vessel lips which give the rim a crenelated appearance. Typically, vessels were in the form of bowls or jars. Some examples bear a band of asphaltum painted onto vessel lips. Since the lip notching had to have been accomplished prior to firing and the asphaltum band had to have been applied after firing, the decision to notch the lip took priority and such sherds are therefore placed in the Rockport Crenelated type as opposed to one of the asphaltum surface-treated types described below. Again, sparse to moderate amounts of bone temper may be present.

Rockport Incised (Figure 6H-I and Figures 8-9)

The same type as originally defined by Suhm and Jelks (1962) and later reiterated by Ricklis (1995a) and Weinstein and Hutchins (2002). The diagnostic attribute is a zone of geometric incised designs immediately under the exterior of vessel lips.

Vessels of this type were usually in the form of bowls or jars. Common design motifs are horizontal incised lines (often underlain by a band of "pendant triangles"), or sets of opposing (cross-hatched) incised lines. The thickness of the incisions varies, but they are usually thin, having been accomplished with the use of some kind of sharply pointed tool. Most commonly, vessels of this type were not otherwise decorated, although occasionally asphaltum lip banding and/or exterior coating is present. Sparse to moderate amounts of crushed bone temper may be present in addition to the usual profusion of fine sand particles.

Rockport Black-on-Buff I (Figure 10)

This is a re-naming of the previously defined Rockport Black-on-Gray I (Ricklis 1995a). The new terminology is necessitated by two factors. First, as noted above, Weinstein and Hutchins (2002) chose to employ the term "Rockport Black-on-Gray" exclusively for vessels on which asphaltum decorations were painted over a light

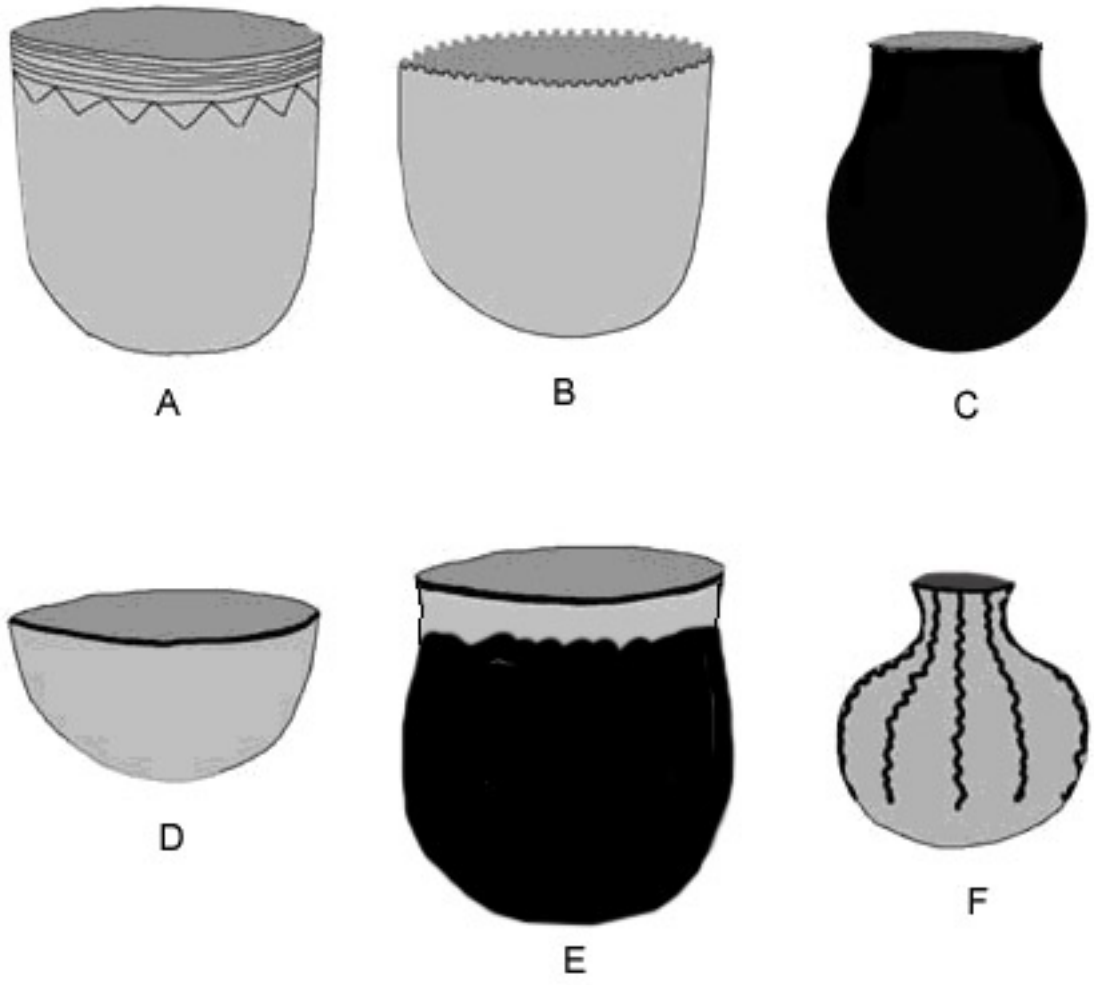

Figure 5. Drawings of decorated Rockport Ware types based on analysis of rim sherds from the McGloin Bluff site: A, Rockport Incised; B, Rockport Crenelated; C, Rockport Black; D, Rockport Black-on-Buff I-A; E, Rockport Black-on-Buff I-B; F, Rockport Black-on-Buff II. The undecorated type, Rockport Plain, and slipped types, Rockport Black-on-Gray and Rockport Polychrome, are not shown here. Vessel forms are those commonly associated with each type, although a given type is not necessarily restricted to one form.

gray surficial slip. Because I have also noted the presence of a light gray to off-white slip on a small minority of Rockport sherds, and since surfaces thus treated were further embellished with typical Rockport asphaltum-painted motifs, I believe this is a reliable and useful type definition and, like Weinstein and Hutchins, I believe the old term is best restricted to sherds/vessels of this description. Second, an overwhelming majority of asphaltum-decorated vessels have surfaces fired in an oxidizing atmosphere to a color ranging from buff (light yellowish-brown) to orange, and thus the term "black-on-buff" is a more accurate descriptor than "black-on-gray." It is not entirely clear why Suhm and Jelks (1962) employed the latter term, although it seems reasonable to suppose that it was because the buff color sometimes grades to gray on sherds/vessels in which an oxidizing atmosphere was not consistently maintained during firing. In any event, it is worth noting that the prevalence of light buff-to-orange surfaces strongly suggests that these colors were preferred as a contrasting backdrop for the asphaltum designs painted onto vessel surfaces and that oxidizing firing atmospheres were intentionally created for vessels that were to be subsequently decorated with asphaltum paint.

In the sizeable sample of rim sherds from McGloin Bluff, it was possible to identify two

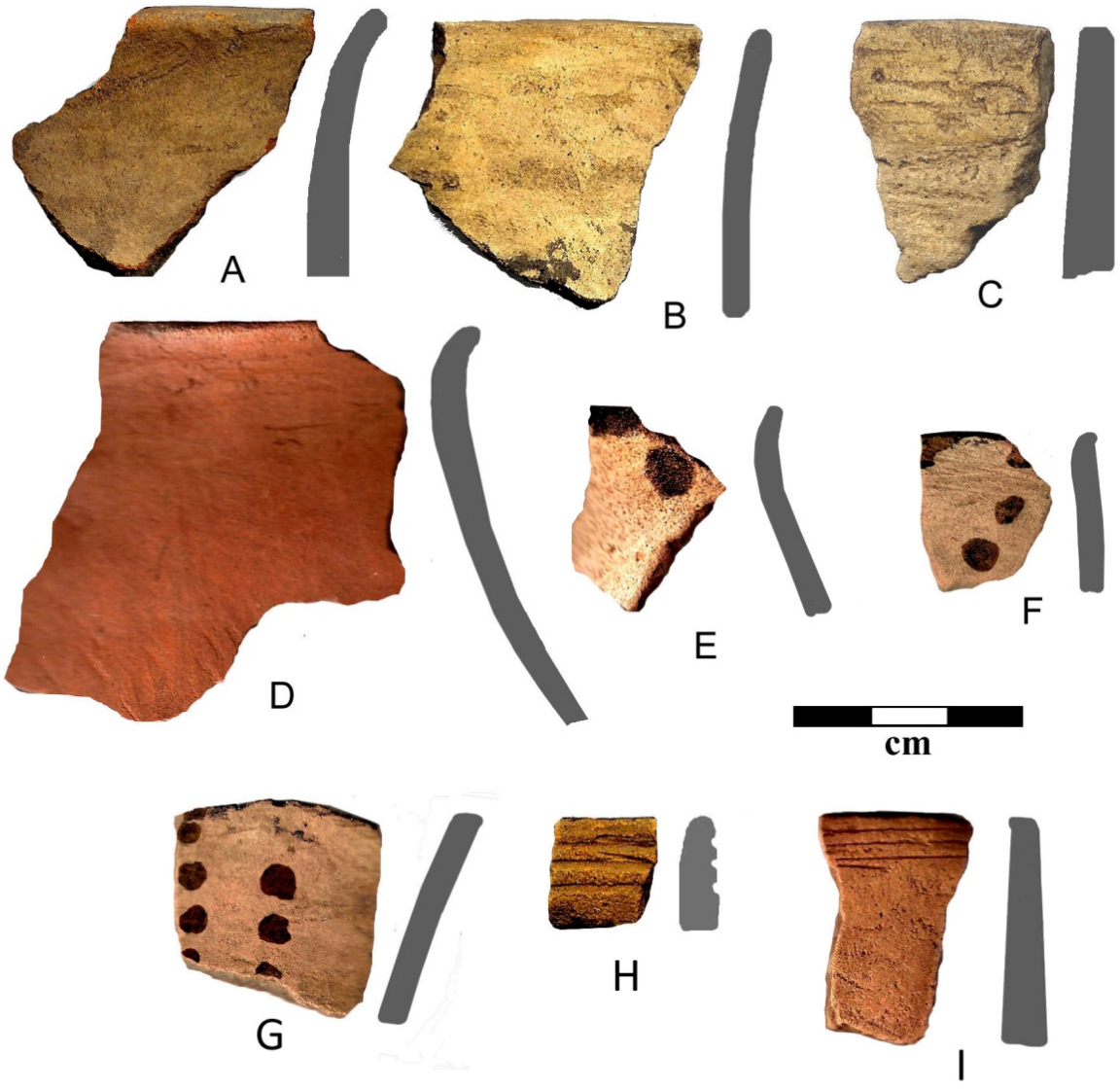

Figure 6. Rockport Ware rim sherds from the McGloin Bluff site on the northern shoreline of Corpus Christi Bay: A-D, Rockport Plain (note smoothed-over scoring on C); E-G, rims with asphaltum lip bands and dots; H-I, Rockport Incised rim sherds. Silhouetted profiles show rim exteriors to the right.

recurring decorative themes, on the basis of which Rockport Black-on-Buff I was divided into two subtypes, as follows:

Rockport Black-on-Buff I-A

On rim sherds assigned to this type, the sole decoration is a thin band of asphaltum painted onto an otherwise unmodified vessel lip. The band may extend downward onto the interior or exterior rim portions of the vessel a short distance (i.e., generally no more than a few mm). Vessel forms are variable, and this decoration can be seen on any of the several shapes represented by Rockport vessels. Sparse to moderate amounts of bone temper may be present in the sandy paste clay body.

Rockport Black-on-Buff I-B

The same as Rockport Black-on-Buff I-A, with the addition of exterior asphaltum coating on the vessel body extending upward to the lower neck portion of the vessel, creating a horizontal zone lacking asphaltum between the lip band and the coated portion (see Figure 10G, I-L). Sparse to moderate amounts of bone temper may be present.

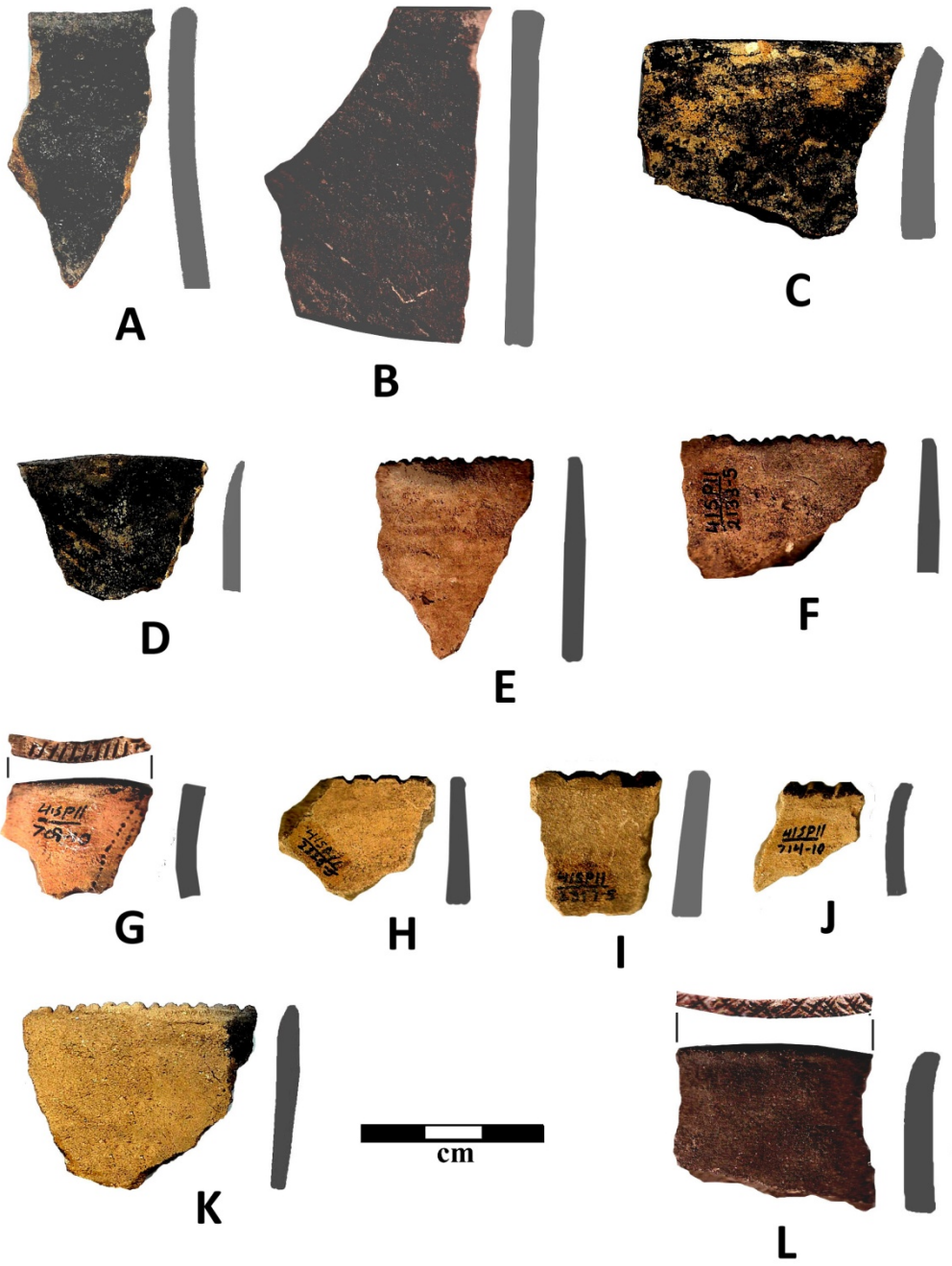

Figure 7. Additional rim sherds from the McGloin Bluff site: A-D, Rockport Black (complete exterior asphaltum coating); E-F, H-K, Rockport Crenelated; G, L, rims with parallel incising on flat lips. Silhouetted profiles show rim exteriors to the right.

Rockport Black-on-Buff II (Figure 11)

This is the same as the previously defined (Ricklis 1995a) type, Rockport Black-on-Gray II. Asphaltum decoration consists of a narrow band along the lip, underlain by a series of parallel vertical squiggly lines that begin immediately below the lip band and extend downward along the vessel exterior. Vessel forms may be bowls, ollas, or bottles. Commonly, interiors of vessels bear a more-or-less thick coating of asphaltum, which probably functioned as a sealant. This, plus the common narrow-mouth forms (bottles and ollas) of the vessels suggests a correlation between this

Figure 8. Reconstructed jar of the Rockport Incised type from the Linn Lake site (41VT82), lower Guadalupe River floodplain. Photo courtesy of TexasBeyondHistory,net, used here with permission.

type and containers for the transport and/or storage of water. Sherds of this type generally are devoid of any amount of bone temper; as noted earlier, this may reflect that fact that these vessels did not require the additional tempering agent as they were not subjected to repeated heating-cooling, as would be case if they were used for cooking.

Rockport Black (see Figure 7A-D)

This type is comprised of bowls and jars with exteriors that were completely coasted with asphaltum. The term was used quite differently by Weinstein and Hutchins (2002) to designate asphaltum-decorated vessels which are here designated as Rockport Black-on-Buff. Since Weinstein and Hutchins did not report ceramics having complete exterior coatings of asphaltum, it is possible that this type (as here defined) was geographically restricted to the Corpus Christi Bay area. Future research will be required to evaluate whether or not this (and perhaps other) intra-regional geographic variability in Rockport ware can be confirmed.

Rockport Black-on-Gray (Figure 12)

This is the same type as was described by Weinstein and Hutchins (2002), namely, vessels with asphaltum decoration applied over a light gray to off-white slip on vessel exteriors. The

Figure 9. Rockport Incised vessel sections: left, horizontal incised lines with a single incised pendant triangle, a bowl from the Linn Lake site; right, horizontal incised lines with a continuous band of incised pendant triangles, a jar from the Guadalupe Bay site. Photos courtesy of TexasBeyondHistory.net and Coastal Environments, Inc., used here with permission.

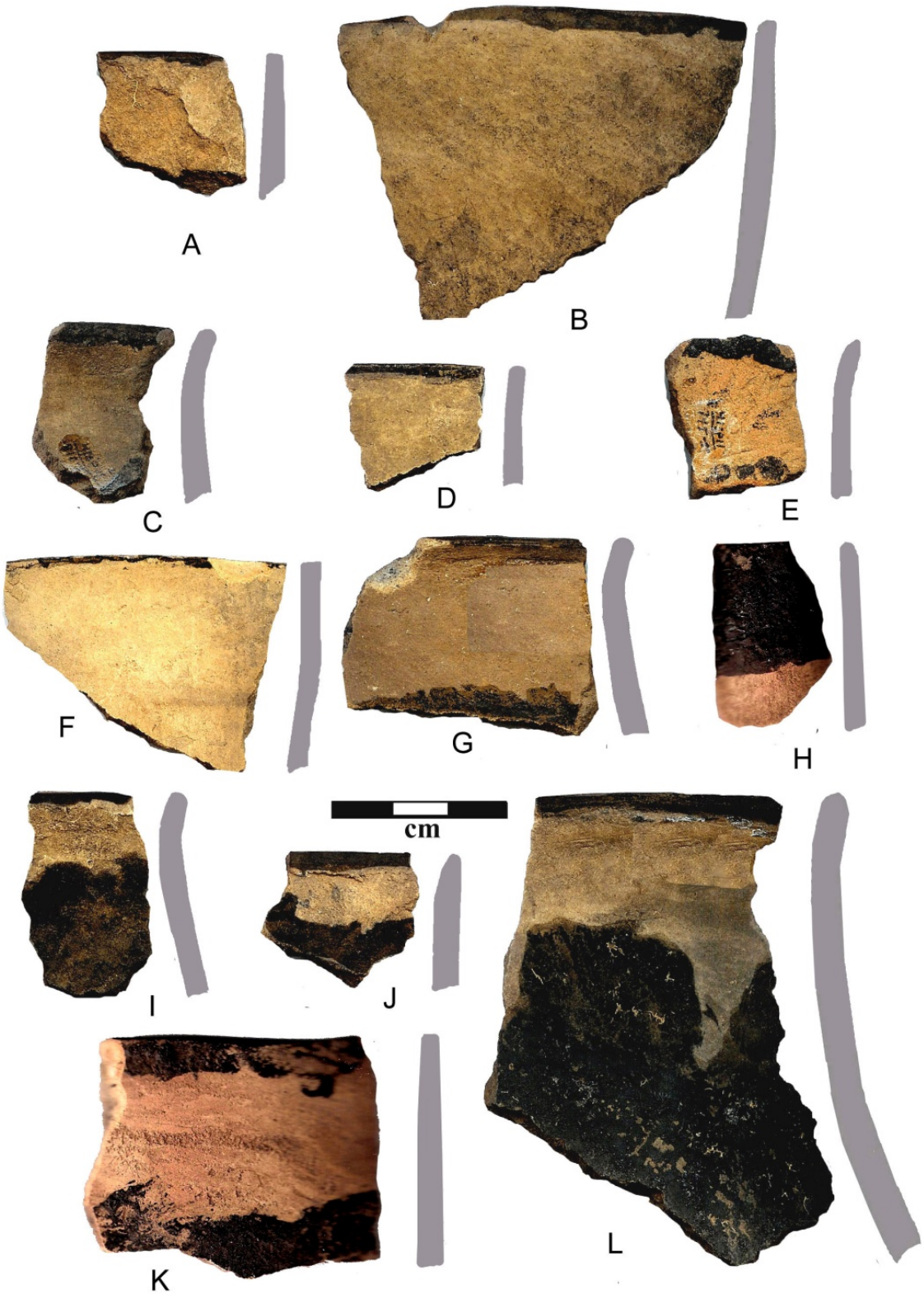

Figure 10. Rockport Black-on-Buff I rimsherds from the McGloin Bluff site: A-F, H, Rockport Black-on-Buff I-A; G, I-L, Rockport Black-on-Buff 1-B. Silhouetted profiles show rim exteriors to the right.

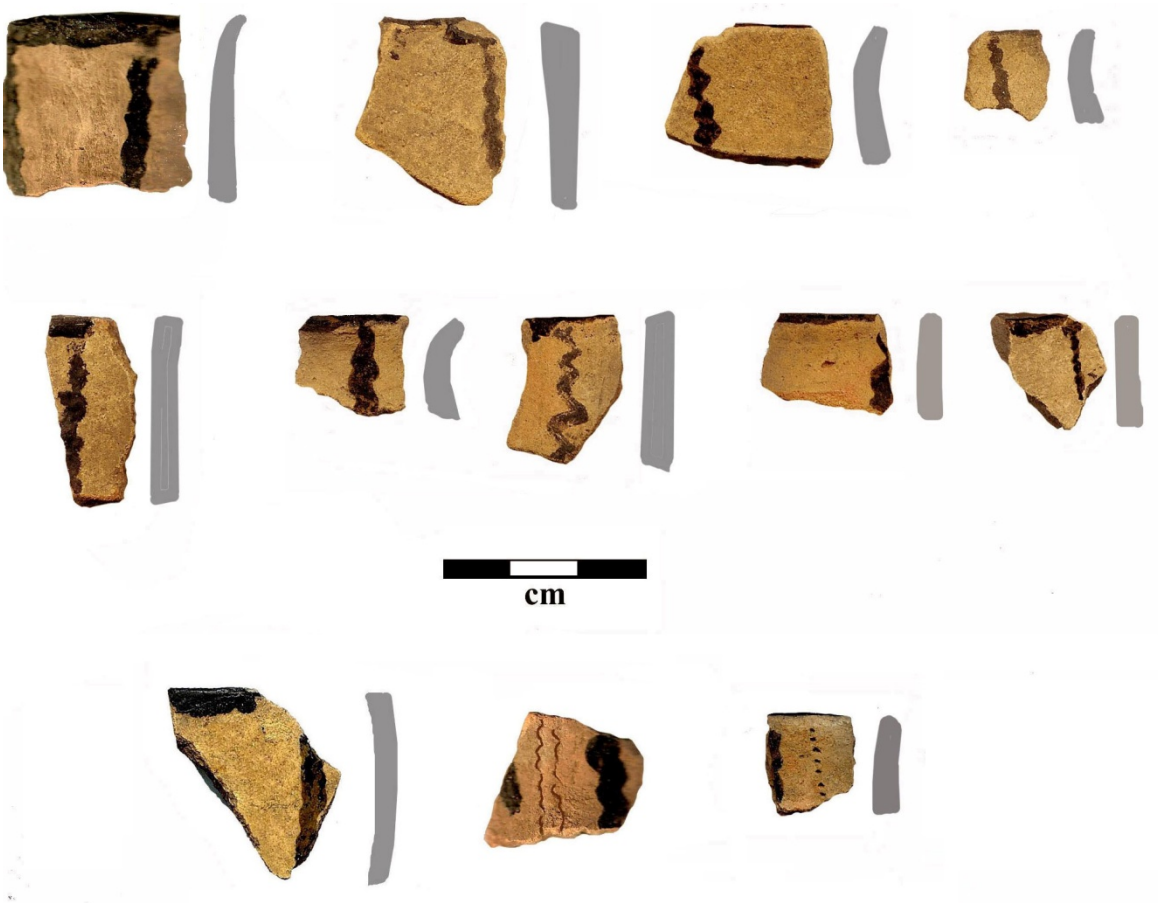

Figure 11. Rockport Black-on-Buff II sherds from the McGloin Bluff site. All are rim sherds, except for the vessel-neck sherd shown in the middle of the bottom row. Note zig-zag incising and row of punctations on the two specimens at the lower right. Silhouetted profiles show rim exteriors to the right.

slips can be seen to form a thin film under which sherds were fired to an underlying buff-to-orange oxidized color. Asphaltum designs are the same as those found in Rockport Black-on-Buff I and Rockport Black-on-Buff II. It is possible that the use of black asphaltum decorations on a white slip was inspired by the black-on-white ceramics of the Late Post-Classic Huasteca along the Gulf coastal plain to the south in the Mexican state of Tamaulipas and northern part of the state of Vera Cruz (e.g., Eckholm 1944).

Rockport Polychrome (Figure 13)

This is a rare but recurrent type in the Rockport phase area. It is typified by decorations made with combinations of black asphaltum-painted elements and contrasting coatings or bands of red slip. Based on the small sample of known examples that have been reported from the Kirchmeyer site (41NU11) on Oso Bay near Corpus Christi (Calhoun 1964), the McGloin Bluff site on the northern shore of Corpus Christi Bay (Ricklis 2010), and the Guadalupe Bay site (41CL2) on Guadalupe Bay near the mouth of the Guadalupe River (Weinstein and Hutchins 2002), a typical decorative theme consists of an asphaltum band on the vessel lip underlain by a band of red slip, both applied over a light-colored buff oxidized surface (Figure 13A, D-E). In other cases, a red-slip coating is applied to the vessel surface and a black band of asphaltum is painted along the vessel lip (Figure 13B-C, F). To date, the known examples appear to be sherds pertaining to jars and bowls.

The percentages of these various types represented at the McGloin Bluff site give an idea of the relative significance of each type within the Rockport ware series. The breakdown for the 351 of the

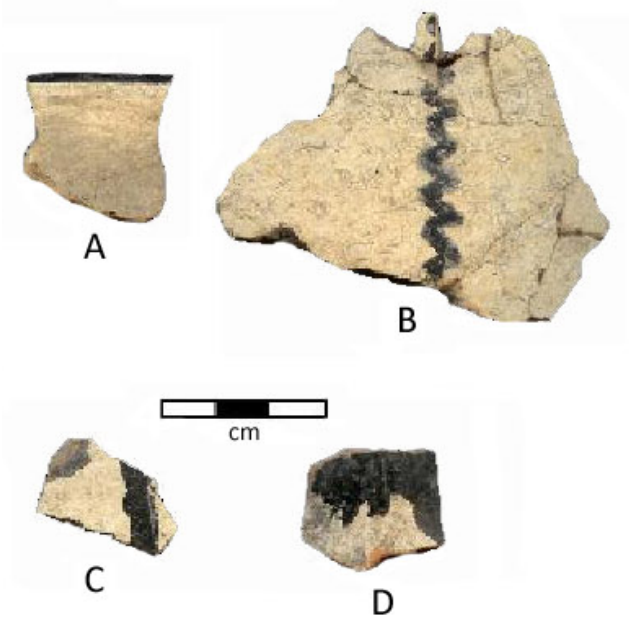

Figure 12. Sherds of Rockport Black-on-Gray (asphaltum decoration on grayish-white slip) from various sites in the central Texas coast region: A, rim sherd with asphaltum lip band; B, C, body sherds with vertical asphaltum squiggly lines; D, neck sherd with partial asphaltum coating.

366 analyzed rim sherds that could be typologically identified (Ricklis 2010) is shown in Table 3.

How representative these percentages are for the larger Rockport phase area remains to be established. Currently, the lack of consistency in type identifications makes inter-site comparisons rather difficult. A review of the report on the large ceramic sample from the Guadalupe Bay site (41CL2), located approximately 85 km north of McGloin Bluff, shows considerable similarity in the various formal technological and stylistic attributes (see Weinstein and Hutchins 2002), despite the markedly divergent approach those authors have employed in defining Rockport pottery types. Fine sandy pastes, occasional use of crushed bone temper, asphaltum lip bands, asphaltum vertical squiggly lines, asphaltum coating, uncommon use of white slips, and rare polychrome decorations are recurrent themes in the large samples of Rockport ware from both sites. At the same time, there are discernible differences. For example, Weinstein and Hutchins (2002:312) report a minimum of 85 sherds bearing exterior rim incised designs (i.e., assignable to the Rockport Incised type), which contrasts markedly with a total of only two such

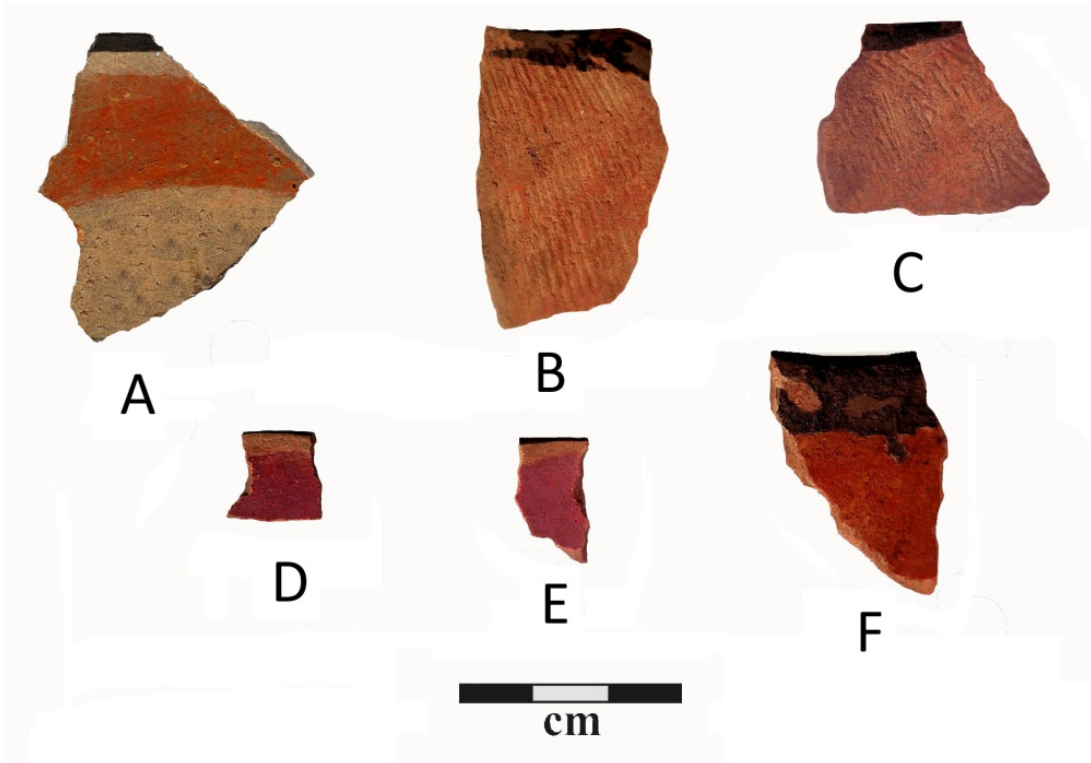

Figure 13. Rim sherds of Rockport Polychrome from the McGloin Bluff site (41SP11): A, D-E, asphaltum band on lip and band of red slip below lip; B-C, F, asphaltum lip band and overall red slip below the lip.

Table 3. Breakdown of Rockport Ware types from the McGloin Bluff site (41SP11).

Type	No. Specimens	% of Total
Rockport Plain	108	30.9
Rockport Black	103	28.5
Rockport Black-on-Buff I-A	79	22.5
Rockport Black-on-Buff II	28	8.0
Rockport Black-on-Buff I-B	13	3.7
Rockport Crenelated	10	2.8
Rockport Black-on-Gray	5	1.4
Rockport Polychrome	4	1.1
Rockport Incised	1	0.3

specimens from McGloin Bluff (one in the sample of 366 rim sherds subjected to full analysis, plus one much smaller specimen found among the remaining 655 rim sherds considered too small for such analysis; see Figure 6H-I). Thus, it is apparent that Rockport Incised is proportionally much better represented at Guadalupe Bay, a fact which may reflect that site's closer proximity to the Upper Texas coast area where incised rim decoration is much more common in the Goose Creek Incised and San Jacinto Incised pottery series. It is possible that when large samples are available from more sites, it will be feasible to identify additional patterned geographical variability in Rockport ware that may be interpreted to reflect spheres of cultural information flow and perhaps correlations with the locations of historically known Karankawa sub-groups of the Central Texas coast. Whether or not the most efficacious approach for making such comparisons will ultimately involve using the relatively coarse-grained distinctions afforded by basic typological definitions, or alternatively, will be found in consistent reporting at the more detailed level of attributes, remains to be seen.

ROCKPORT WARE FROM A DIACHRONIC PERSPECTIVE

The likelihood that ceramic technology was introduced to the Central Texas coast region via diffusion of ideas and knowledge from Native American groups in the Upper Texas coast has already been mentioned as an idea put forth by Campbell (1961). Subsequent researchers have essentially reiterated Campbell's view on the origins of Rockport ware. In her report on the Anaqua site (41JK8), located on the lower Lavaca River in Jackson County, Story (1968) discussed the co-occurrence of plain, sandy paste, Goose Creek-like ceramics and an abundance of Scallorn arrow points. She considered the pottery from Anaqua to be closely similar to the Goose Creek Plain ceramics of the upper coast region and an absence of asphaltum surface treatment distinguished this material from pottery of the Rockport series. Although no radiocarbon dates were obtained for these materials, the abundance of Scallorn points, generally known to predate Perdiz points (e.g., Prewitt 1981, 1985), the most common arrow point type in the Rockport phase, suggests a temporal priority for Goose Creek or Goose Creek-like pottery, at least in this more northerly portion of the central coast region.

At the Guadalupe Bay site, Weinstein and Hutchins attempted to identify changes in ceramics over time. While this effort met with only limited success, they did identify 157 sherds of what they considered to be Goose Creek pottery, which they differentiated from the site's much more abundant Rockport pottery on the basis of more coarse-grained and less well-sorted sand inclusions (Weinstein and Hutchins 2002:272-275). They identified two types, Goose Creek Plain and Goose Creek Incised, and further sorted these seven varieties. Notably, Weinstein and Hutchins included sherds with asphaltum coating (but not decoration) within certain of their Goose Creek type/variety groupings. Since asphaltum coating is an key attribute of Rockport Ware, these sherds might well be regarded as early expressions of the Rockport ceramic tradition. Larger, well-dated samples of

Central coast Goose Creek sherds and early Rockport pottery will need to be subjected to detailed comparative analyses in order to clarify this issue. Indeed, Weinstein and Hutchins did note that their Goose Creek sherds tended to be more abundant in the lower levels of the site deposits, suggesting a temporal priority over Rockport ware, observing that "it seems likely that Goose Creek ceramics had their highest popularity during the earliest Rockport occupation at Guadalupe Bay. After that, the percentages [of Goose Creek] drop dramatically…" (Weinstein and Hutchins 2002:275).

In short, the presently limited data suggest that the Goose Creek ceramic technology of the Upper coast diffused southward into the Central coast area at least as early as the Initial Late Prehistoric period (ca. A.D. 800-1200) and that it was then modified by local potters to ultimately develop into Rockport ware. One of the most diagnostic attributes of Rockport ware, asphaltum coating/decoration, may reflect the long-standing use of asphaltum to coat basketry containers in the Central coast area, where fragments of asphaltum with distinct basketry impressions are a recurrent trait in Late Archaic contexts (e.g., Campbell 1947, 1952; Ricklis 1995b, 1996). The transference of the use of asphaltum coating from basketry to pottery would have been a simple step, once the technology of pottery production was established in the Central coast area.

Certain findings at the Melon site (41RF21), a small bison-hunting/processing encampment on a branch of Copano Creek in Refugio County (Ricklis 1996:97-99), offer some further insight into the diachronic dimension of the development of Rockport ware. At this site, evidence was found for an early Rockport phase occupation, placed on the basis of radiocarbon dates on bison bones at ca. A.D. 1200-1300 (A.D. 1020-1420, combined 2 sigma calibrated age ranges). Extensive testing across the site indicated that Late Prehistoric materials of both the Rockport phase and the Toyah horizon were vertically concentrated at a depth of 25-30 cm below the surface, and a date on charcoal associated with Toyah artifacts also fell at ca. A.D. 1200-1300 (A.D. 1120-1400 2 sigma calibrated age range). The fact that Rockport ware sherds were concentrated in the southern half of the site and sherds of bone-tempered plain ware, typical of the Toyah horizon, were concentrated in the northern half at the same depth suggested that the site saw contemporaneous occupation by both coastal (Rockport) people and interior (Toyah) folk. The Rockport sherds were all typically sandy paste with crushed bone added as a tempering agent to some of the vessel clay bodies in sparse or moderate quantities; the Toyah sherds from the northern part of the site, in contrast, contained larger proportions of bone temper, frequently in profuse quantities, and lacked asphaltum coating or decoration. Interestingly, asphaltum surface treatment, while commonly present in the Rockport materials, consisted only of coatings and the lip-band decorative motif; the squiggly line designs found at most Rockport phase sites were absent (with the exception of a single example on a sherd from a near-surface context near the margin of the site, and probably representative of a different and later occupation of the site).

The findings suggest that the squiggly line motif may not have been in use as early as ca. A.D. 1250-1300 but, rather, that it was introduced and became a recurrent decorative motif somewhat later in the intra-regional evolution of the Rockport ceramic tradition. Perhaps the best chance for clarifying the stylistic evolution of Rockport ware will be in the excavation and analysis of pottery samples from small hunting camps such as the Melon site, where temporally discrete components can be more easily identified and analytically isolated than at large shoreline fish-procurement sites such as Guadalupe Bay and McGloin Bluff, at which long-term, seasonally recurrent occupations resulted in more or less mixed palimpsests of materials spanning several centuries (see data on the dating of the deposits at these sites in Weinstein [2002] and Ricklis [2010]).

ROCKPORT WARE AND THE EARLY HISTORIC KARANKAWA INDIANS

Given that the historic Karankawa Indians are known to have inhabited the same stretch of the Texas coast that is the setting for the Rockport phase of the immediately preceding Late Prehistoric and Protohistoric periods, it has been easily inferred that the archeological phase is representative of the pre-Contact Karankawa. If this is in fact the case, it can also be concluded that Rockport ware pottery was produced by Karankawa potters and that its stylistic expressions were, effectively, markers of Karankawan ethnic identity.

At least five named Karankawa subgroups are identifiable in late 17th to early 19th century historical documents, most of which were written by Spanish Colonial personnel linked to coastal plain missions and/or associated military presidios during the 18th century. From north to south along the coast, these groups were the Cocos, the Carancaguases (Karankawa proper), the Cujanes, the Coapites, and the Copanes (see Figure 1). Since Spanish colonial documents repeatedly refer to these groups as linguistically and socially interrelated—"del mismo nación" ("of the same nation"; see discussion in Ricklis]1996:4-10])—and noted their custom of freely intermixing with one another, it is not surprising that the combined groups should be archeologically represented largely, if not entirely, by the single material culture assemblage that defines the Rockport phase, the most diagnostic trait of which is Rockport ware pottery.

Beyond such generalized inferences, there are two fundamental and specific archeological facts that strongly support the correlation between the Rockport phase and the historic Karankawa peoples. The first of these is that glass and/or metal artifacts of European origin are documented in association with typical Rockport phase material culture assemblages on some aboriginal campsites, indicating partial contemporaneity of Rockport phase materials and Colonial-era European/Euro-American materials. As already mentioned, the persistence of occupation at large shoreline sites such as Guadalupe Bay (Weinstein 2002) and McGloin Bluff (Ricklis 2010) into the Colonial era is indicated by the presence of various items of European manufacture, including flintlock gun parts and early historic Euro-American pottery at Guadalupe Bay and a copper coin, a piece of reworked pewter, a hand-wrought iron spike, and a kaolin pipe bowl fragment at McGloin Bluff (plus a small blue-glass bead reported by Corbin [1963]). At the Linn Lake site on the lower Guadalupe River floodplain, Bill Birmingham of Victoria, Texas, found a flaked-glass arrow point and several fragments of patinated green glass, along with numerous sherds of Rockport ware ceramics (see www.Texasbeyondhistory.net, Coastal Prairies and Marshlands, Historic Encounters). From the Shanklin site (41WH8) near the lower Colorado River in Wharton County, Hudgins (1986) reported a Spanish piece-of-eight silver coin bearing the date 1738 and an iron keyhole escutcheon reworked into an arrow point in association with over 8,000 sherds of native Rockport asphaltum-decorated and crenelated-rim pottery and numerous flaked stone arrow points of the Colonial-era Guerrero type (see Turner et al. 2011:194-195). Although the Shanklin site is, strictly speaking, outside the Rockport phase area as defined here and elsewhere (Ricklis 1996; see Figure 2, herein), its apparent mid-eighteenth century date (based on the 1738 silver coin and the Guerrero points) suggests that it represents a northward expansion of Karankawa territory which attended native population declines due to epidemics of introduced Old World diseases and a resultant breakdown of pre-contact territorial boundaries (see Ricklis 1996:137-142).

Still more telling is the presence of abundant Rockport ware pottery from the sites of Spanish Colonial settlement known to have been occupied by Karankawa Indians and/or by Colonial settlers who regularly interacted with the Karankawa. Extensive excavations by the Texas Historical Commission at the Keeran site (41VT4), the location of LaSalle's ill-fated French Colony (1685-1688) on Garcitas Creek upstream from Matagorda Bay, as well as the somewhat later Spanish Presidio de la Bahía (1722-1726), resulted in the acquisition of large samples of both French and Spanish Colonial artifacts as well as an abundance of associated Native American lithic and ceramic artifacts. More than 20,000 sherds of native pottery were found in a horizontal distribution across the site that was isomorphic with the distributional pattern of Spanish Colonial artifacts (Bruseth et al. 2004), indicating direct association and presumable contemporaneity with the Spanish presidio during the 1720s. With only a few exceptions, the pottery could be assigned on the basis of both attributes and typology to the Rockport series (Ricklis 2007). Common types include Rockport Plain, Rockport Black-on-Buff I-A, Rockport Black-on-Buff II, and Rockport Crenelated (Figure 14). Most relevant for the present discussion is the well-documented historical fact that the local Clamcoehs/Carancaguases (Karankawa proper) Indians had direct relations with the Spanish presidio and the nearby earliest location of the Mission of Nuestra Señora del Espiritu Santo (Castañeda 1936). On the basis of the analyses of these materials, it has been suggested that the Spanish personnel at the presidio may have been obtaining and using Rockport pottery made by local Karankawa potters, a pattern of interaction analogous to that documented in later 18th century mission contexts in which non-Indians

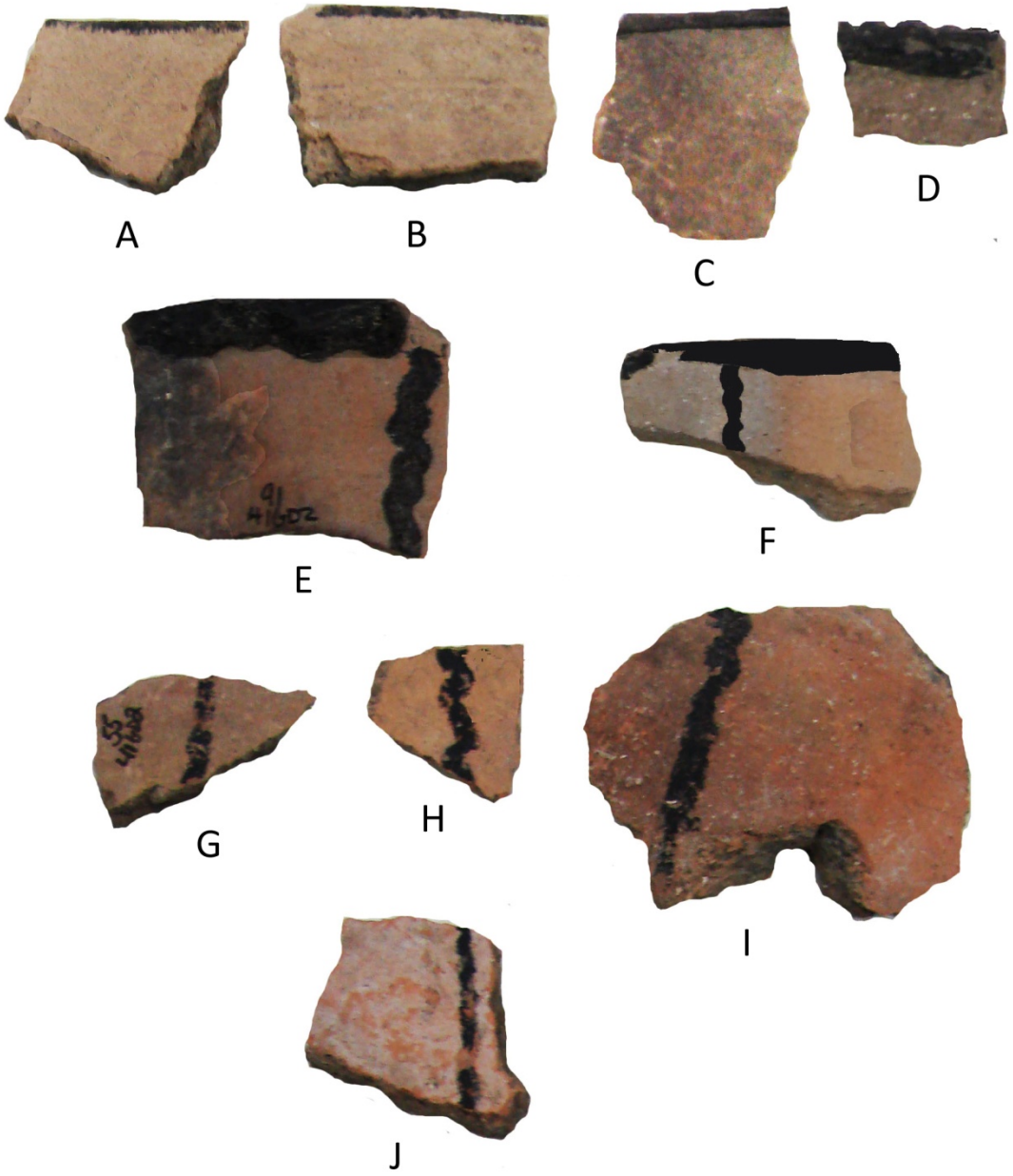

Figure 14. Sherds of Karankawa pottery from the site of Mission de Nuestra Señora del Rosario (41GD2), Goliad, Texas: A-C, rim sherds with asphaltum lip bands (Rockport Black-on-Buff I-A); D, rim sherd with notched lip and asphaltum lip band (Rockport Crenelated); E, F, rim sherds with asphaltum lip bands and vertical squiggly lines (Rockport Black-on-Buff II); G-H, body sherds with exterior vertical squiggly lines. Photos by the author, made at the Corpus Christi Museum of Science and History, where these materials are curated.

obtained and used Native ceramics, presumably to fill a need created by the limited availability of Colonial pottery that had to be transported from distant production centers far to the south in New Spain (Ricklis 2007).

The relations between the Karankawa and the Spanish mission-presidio complex on Garcitas Creek ended badly when, in 1726, the commander of the presidio ordered an attack on the resident Indians. Espiritu Santo mission, established initially for the Karankawa groups, was then moved to the banks of the Guadalupe River near present-day Victoria, Texas, and was finally relocated in 1749 to its final location on the San Antonio

River at present-day Goliad, where it housed Indian residents of the inland Aranama group, rather than coastal Karankawa people. Still determined, nonetheless, to develop viable relations with the coastal tribes, the Spanish authorities established a new mission for the Karankawas in 1754, also situated near the banks of the San Antonio River some four miles west of the new location of Espiritu Santo (Bolton 1906). It was appropriately named Mission de Nuestra Señora del Rosario de Los Cujanes ("Cujanes" being the mid-18th Century generic term for the combined Karankawan groups), and abundant historical documentation leaves no doubt that its native residents were primarily, if not exclusively, Karankawas (see also Ricklis 1996).

Excavations at the site of Rosario Mission in 1997-1998 (Ricklis 1999, 2000) resulted in the acquisition of a large sample of sherds (n=13,267) of native-made pottery (see Figure 14). In contrast to the native ceramic sherds (n=2,792) recovered during the same project from the nearby location of Espiritu Santo Mission, and which consisted of the profusely bone-tempered and generally undecorated pottery known generically as Goliad Ware (see Ricklis 1999, 2000) made by resident native people of the inland Aranama group, the Indian pottery from Rosario was clearly very closely related to coastal Rockport Ware. The key attributes of the Rosario pottery are: (a) sand in the clay body, most commonly in moderate-to-profuse amounts (as opposed to little or no sand in the Espiritu Santo pottery); (b) smooth vessel surfaces; (c) asphaltum coating and/or decoration on over 40 percent of the sherds (virtually absent in the Espiritu Santo pottery sample); d) typical Rockport-style asphaltum decorative motifs such as lip bands and exterior vertical squiggly lines; and (e) a minority of rims with notched/crenelated lips. The presence and abundance of these highly diagnostic Rockport ware attributes clearly establishes the Rosario pottery as an expression of the Rockport tradition within a Colonial mission setting. In view of the historically recorded fact that Rosario Mission was inhabited by Karankawa Indians, the link between Rockport pottery and the Karankawa is thus confirmed with virtual certainty. By logical extension, it can be inferred with equal confidence that the Late Prehistoric Rockport phase is the archeological expression of the pre-Contact Karankawa occupation of the Central Texas coast region.

The Rosario pottery does diverge in one way from that found at aboriginal, non-mission Rockport phase campsites in that crushed bone tempering is more frequent and is present in greater quantities than is typical at non-mission sites (although in significantly less abundance than in the contemporaneous Goliad ware from nearby Espiritu Santo Mission; Ricklis 1999, 2000). Apparently, the addition of bone temper to clay bodies, already practiced in a limited way by pre-Contact Karankawa potters (see Ricklis 1996:Appendix A) became more prevalent at the missions, perhaps due to influence from native potters at Espiritu Santo who were producing the heavily bone-tempered Goliad ware that had been derived from the pre-existing bone-tempered ceramic tradition of the inland Toyah horizon (see discussions in Ricklis 1999, 2000).

At the slightly later mission established for and occupied by the Karankawa, Nuestra Señora del Refugio (1795-ca. 1830), such acculturative influences became still more pronounced, with 89-94 percent of the pottery having either sparse or moderate amounts of bone temper and the remainder having profuse bone temper (Perttula 2002:234). Among rim sherds from the Refugio Mission, undecorated bone-tempered specimens are the most abundant (n=141), although sandy paste rim sherds with typical Rockport-style asphaltum decorations such as lip bands alone and lip bands with vertical exterior squiggly lines are also fairly well represented (n=8 and n=27, respectively; Perttula 2002:245-246), indicating the persistence of these traditional Karankawa stylistic expressions through the end of the 18th century and into the early decades of the 19th century.

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Aboriginal Ceramics Among Groups Living in the Prairie Savanna Region of Texas

Timothy K. Perttula and Linda W. Ellis

ABSTRACT

The aboriginal ceramics from sites in the Texas Prairie Savanna region of Texas represent an amalgam of ceramic traditions. Archeological evidence from numerous sites in the Prairie Savanna archeological region indicate this was an area of shifting cultural boundaries, and ceramic assemblages are technologically diverse. Ceramics along the eastern margins of the Prairie Savanna have affinities with the ceramics made by the East Texas Caddo, or possibly by "Prairie Caddo" groups, sometime after ca. A.D. 900-1000 and as late as the 16th and 17th centuries A.D. Ceramic assemblages along the east/southeastern boundaries of the Prairie Savanna often exhibit regionally distinct technological traditions that are closely related to the Mossy Grove Culture/Traditions of coastal and inland Southeast Texas, especially the manufacture of mainly plain sandy paste pottery. Ceramic assemblages often exhibit commingled occupations with ties to both the Southeast Texas Mossy Grove cultures and to the Caddo. Along the southern margins of the Prairie Savanna, ceramic assemblages exhibit strong coastal ceramic practices. In particular, sandy paste ceramics with bone inclusions become common in the archeological record ca. A.D. 1000. Otherwise undistinguishable from the sandy paste Goose Creek wares, they do vary technologically from the later bone-tempered wares described as Leon Plain, primarily a Central Texas ceramic tradition ware.

INTRODUCTION

Aboriginal ceramic sherds from sites in the southern part of the Post Oak or Prairie Savanna of Texas (Figure 1) are not particularly common, even on sites that have been subjected to extensive data recovery excavations (see Fields 2004). The rarity of aboriginal sherds has made it difficult to characterize their nature either spatially or temporally, or establish with any reasonable certainty their origins, ethnic affiliations, or relationships to other ceramic assemblages in the general region. Arnn et al. (2010:63) have noted that "archeological evidence from numerous sites in the Prairie Savanna archaeological region indicates an area of shifting cultural boundaries. Ceramic assemblages are technologically diverse and understanding this diversity will require a more comprehensive approach to ceramic studies than has been accomplished to date."

The Prairie Savanna Archeological Region is a geographic transition zone whose archeology reflects influences from adjacent archeological regions at different points in time (Perttula 2004; see also Bement et al. 1989; Fields et al. 2002; Kenmotsu and Perttula 1993; Kotter et al. 1991; Kalter et al. 2005; Skelton 1977). This is particularly true for the Late Prehistoric period (i.e., dating after ca. A.D. 900), where sites often show marked inter- and intra-regional differences in settlement patterns, chronology, and artifact assemblages. Ceramic assemblages, in particular, suggest a generalized fluidity of boundaries among the indigenous groups occupying and interacting in this broad environmental zone. The presence of pottery presents a challenge in terms of understanding both its distribution and its affiliation.

Archeological evidence from numerous sites along the east/southeast margins of the Prairie Savanna points to an area of shifting cultural boundaries. Ceramic assemblages are technologically diverse, demonstrating the variety of cultural influences in this region during the Late Prehistoric and Protohistoric periods. Assemblages in this region often exhibit regionally distinct technological traditions that are closely related to the "Mossy Grove Culture/Traditions" (Story 1990). In general, the Mossy Grove tradition defines the broad context of Woodland (in East Texas) and Late Prehistoric cultures located to the east/southeast, wherein

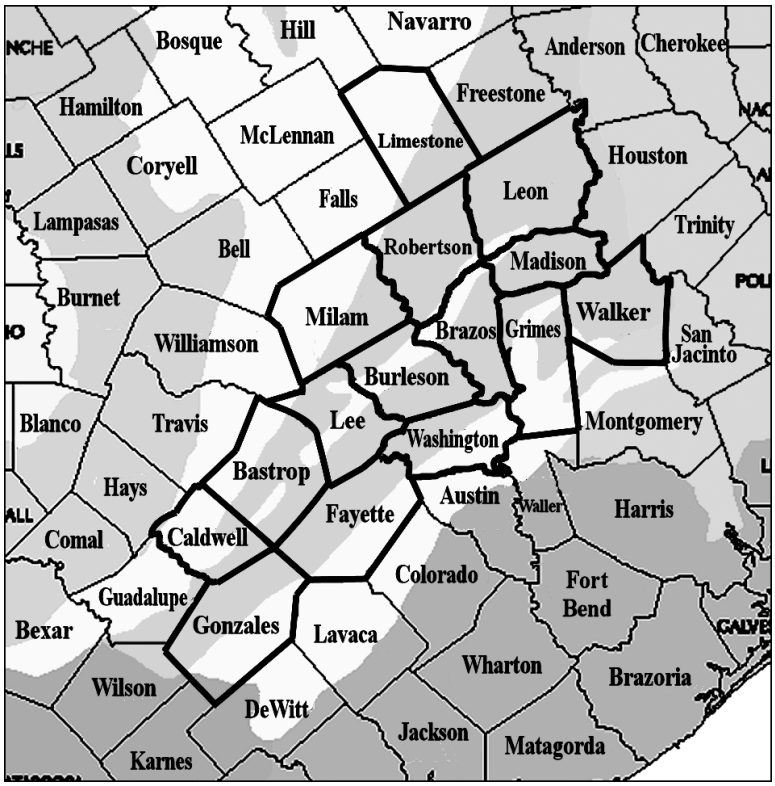

Figure 1. Counties in the Post Oak or Prairie Savannah superimposed on map of biotic zones. Green is Post Oak Savannah; light shade is prairie.

sites represent both a general cultural pattern and a regional cultural tradition that partly parallels the Caddo tradition/culture to the northeast and encompasses the archeological remains of what were elsewhere probably different ethnic and linguistic groups (Moore 1995; Perttula 1993; Story 1990). Assemblages often exhibit commingled occupations with ties to both the Southeast Texas Mossy Grove cultures and the Caddo cultures (Moore and Moore 1996; Rogers 1993, 1994, 1995).

Along the southern margins of the Central Texas and the Prairie Savanna archeological regions, ceramic assemblages' exhibit strong coastal influences (Hall 1981; Kalter et al. 2005; Rogers 1995; Skelton 1977). In particular, sandy paste ceramics with bone inclusions had low frequency representation in Southeast Texas beginning with their first enigmatic appearance in the archeological record ca. A.D. 950 (Aten 1983); however, they did obtain a minor frequency in the early Round Lake period (ca. A.D. 1000-A.D. 1350) through the Old River period (ca. A.D. 1350-A.D. 1700), especially in the Brazos Delta-West Bay area and the Conroe-Livingston area. Characterized by the addition of "5-25 percent bone fragments" in a sandy paste, they are otherwise undistinguishable from the sandy pastes of Goose Creek wares (Aten 1983) and vary technologically from the later bone-tempered wares described as Leon Plain found in Central Texas sites (Kenmotsu and Boyd 2012:12-13).

In summary, ceramic assemblages in this geographically transitional zone are technologically diverse, reflecting a number of distinct ceramic traditions. For example, Caddo ceramics with bone temper and distinctive design motifs are found in a number of assemblages in the Prairie Savannah (see Fields 2004; Ricklis and Collins 1994; Roger 1995; Story 1990). However, macroscopic and petrographic analyses of ceramics from other sites located in this zone suggest that many of the ceramics are the product of an indigenous population that developed a ceramic tradition(s) influenced by contacts with groups outside the area (see Kalter et al. 2005, Ricklis and Collins 1994). Thus, the question becomes, do the ceramics found at sites in this transitional zone represent a series of localized regional ceramic assemblages and types/wares? Addressing this will require a more comprehensive approach to the study of the ceramics found in this geographic transition zone that includes more consistent and detailed analyses of ceramic technology, well beyond the scope of this article. With this in mind, however, our discussion of the ceramics found in Prairie-Savannah sites focuses on the nature of different ceramic assemblages found in the region, primarily through a detailed comparison of specific assemblages from sites located within this zone.

CERAMIC ASSEMBLAGES IN THE PRAIRIE SAVANNA

Our discussions begin in the northern and eastern part of the Prairie Savanna, with assemblages in the Trinity and Navasota river basins

(see Figure 1). We then consider selected sites and assemblages in the western part of the Prairie Savannah, with assemblages in the Brazos and Colorado River basins.

Sites on a Western Tributary of the Trinity River, Leon County

Two sites (41LN436 and 41LN465) on a western tributary to the Trinity River contain decorated grog- and bone-tempered pottery with Caddo decorative styles (Perttula 2008a). The first site has brushed and Maydelle Incised sherds, indicative of use of the site after ca. A.D. 1250, while the other has ca. A.D. 1000-1200 Weches Fingernail Impressed, *var. Weches* and Holly Fine Engraved sherds. The ceramics from these sites are evidence of the widespread distribution of prehistoric Caddo pottery in the Post Oak Savanna and Trinity River basin (see also Fields 2004:367).There are also a few plain sandy paste sherds at the two sites that may be from a pre-A.D. 900 occupation.

Jewett Mine Sites, Trinity River Drainages

Fields et al. (1986:Table 23) noted that although clay paste ceramic sherds were predominant in prehistoric sites at Jewett Mine in Leon County, proportionally speaking, sandy paste sherds were more common in pre-A.D. 900 (what they termed the Early Ceramic period) contexts. Woodland period sherds in this area also include a few tempered with shell and a few others with a kaolin paste (Fields 2004:353-354). Post-A.D. 900 sites to post-15th century sites have primarily grog and bone-tempered ceramics, with decorations that resemble Caddo styles on vessels from sites in the Neches-Angelina river basins in East Texas (Fields 2004:360, 367 and Figure 12.14), including Holly Fine Engraved, Weches Fingernail Impressed, Maydelle Incised, brushed utility ware jars, Killough Pinched, Poynor Engraved, and Patton Engraved. Fields (2004:360) suggests that "some, and probably all [of the sherds], can be related to the Caddoan [sic] ceramic tradition in one way or another, be they pots made by Caddo peoples or copies made by local groups." Gadus et al. (2002:25) also indicate that most of the evidence of pottery use in the Jewett Mine sites dates to the latter part (after ca. A.D. 1300/1400) of the Late Prehistoric period.

Only a few of the sites with Late Prehistoric components at the Jewett Mine have substantial (>500 sherds) ceramic assemblages, including Moccasin Springs (41LN247D, Fields et al. 1991), Bottoms (41FT89, Fields et al. 1991; Jurney 1992), and McGuire's Garden (41FT425) (Gadus et al. 2002), all situated on tributaries to the Trinity River. Over 1010 sherds were analyzed in detail from the McGuire's Garden site. The archeological deposits at the site have been well dated to the period between A.D. 1260-1410 (Gadus et al. 2002:Figure 64).

The vast majority of the sherds from McGuire's Garden are tempered with grog (67 percent of the tempered sherds), grog-bone (13 percent), or bone (20 percent); about 4 percent have no temper or a sandy paste, and are probably from a Woodland period use of the site (Gadus et al. 2002:109). These are from jars of several sizes, bowls, carinated bowls, and bottles (Figure 2), with most of the vessels decorated on the rim and/or body.

Decorated sherds comprise 19 percent of the analyzed assemblage. Jars are decorated with brushing on the body, or with pinching or punctation, while they were decorated on the rims with cross-hatched, diagonal, and vertical incised lines or rows of tool and fingernail punctations. Bottles and carinated bowls have engraved design elements, including scrolls on the bodies of bottles and large hatched pendant triangles, open zones, zones bordered by curvilinear hatching, and diagonal and vertical lines (Gadus et al. 2002:Table 12). A similar range of utility ware and fine ware decorative elements are seen in Middle Caddo period ceramic assemblages in the upper Neches and Sabine River basins in East Texas (see Perttula, this volume). Gadus et al. (2002:120) conclude that the ceramic assemblage at the McGuire's Garden site reflects "interaction between prehistoric groups in the Jewett Mine area, and Caddoan [sic] groups located east and northeast of the Trinity River basin…[and] suggest some local interpretations of Caddoan [sic] ceramic traditions."

Boggy Creek, Leon County, Trinity River Drainage

Sites on Boggy Creek at Fort Boggy State Park in the Trinity River basin contain a mixture of tempered and non-tempered plain and decorated ceramics (Perttula et al. 2012). Six sites have plain sandy paste Goose Creek Plain, *var. unspecified* rim and body sherds: 41LN308, 41LN320, 41LN322, the Sweetgum site (41LN323), the Black Finger

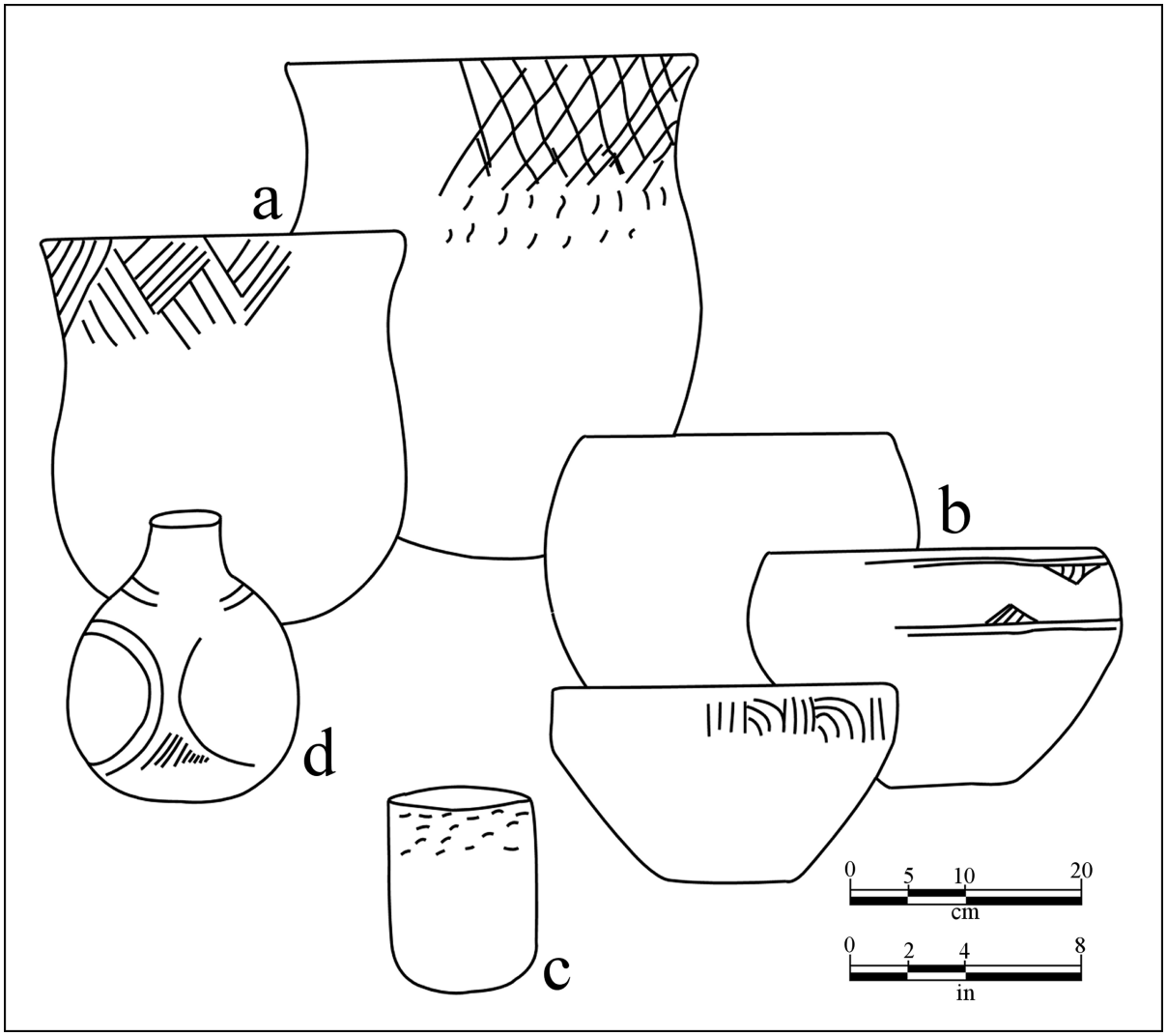

Figure 2. Reconstructed plain and decorated ceramic vessels at the McGuire's Garden Site (41FT425). Redrawn from Gadus et al. (2002:Figure 54): a, medium to large incised jars; b, engraved and plain bowls and carinated bowls; c, small punctated cylindrical jar; d, engraved bottle.

Tip site (41LN325), and the Last Chance Quarry site (41LN341). This ceramic type in this part of Texas was certainly made in pre-A.D. 900 Woodland period times (although it continued to be made by Late Prehistoric inhabitants of the Texas Post Oak Savanna). Work at the Gibbons Creek Lignite Mine in the Navasota River basin (see below) suggests that this sandy paste ware began to be made and used before A.D. 100 (Rogers 1991, 1993a, 1993b, 1994), if not earlier. The co-occurrence of Goose Creek Plain and Woodland period dart point types at 41LN308 and the Sweetgum site lends credence to the notion that these two sites, at least, have preserved Woodland period archaeological deposits.

Plain and/or decorated grog and bone-tempered Late Prehistoric (post ca. A.D. 800-900 Caddo-affiliated, although both bone and grog-tempered pottery dating after this time has also been found in coastal archeological sites, see Ricklis [2004]) ceramic sherds have been recovered from four sites: 41LN308, the Black Finger Tip site (41LN325), the Last Chance Quarry site (41LN341), and the Fern Slope site (41LN343); only the Fern Slope site does not also have plain sandy paste pottery. Sherds from decorated grog and bone-tempered vessels have incised, engraved, brushed-incised, and brushed decorative elements that may be associated with occupations by Caddo

peoples after ca. A.D. 1200, or they represent the product of the interaction of non-Caddo peoples in the Prairie Savannah with the East Texas Caddo; brushed utility ware jars began to be made by Caddo peoples in East Texas, particularly in the Neches and Angelina River basins, after ca. A.D. 1200-1250 (Perttula 2004).

Nine aboriginal ceramic sherds, eight body sherds and one rim, have been recovered at 41LN308. Three radiocarbon dates from the midden deposits at the site range from as early as 1400-1518 B.P. (A.D. 432-550) to as late as 963-1015 B.P. (A.D. 935-987). These calibrated age ranges indicate that much of the midden deposits accumulated during the latter half of the Woodland period, with some use of the midden area in the early part of the Late Prehistoric period. Two of the sherds, from midden deposits, are plain sandy paste Goose Creek Plain, *var. unspecified* body sherds from two different vessels. These are probably from bowls, based on their body wall thickness (5.1 ± 0.9 mm); one has a smoothed exterior, while the other has been smoothed only on the interior vessel surface. One of the sherds is from a vessel that was fired and cooled in a low oxygen environment, while the other came from a vessel that was fired and cooled in a high oxygen environment.

The other sandy paste sherds from 41LN308 (n=4) are from vessels tempered with either grog (50 percent) or bone (50 percent). All four of the sherds are from vessels fired in a reducing environment, and only one sherd (an engraved sherd) has been smoothed (interior surface only). Vessel wall thickness ranges from 6.7-9.5 mm, suggesting some large vessels were in use at the site, and the mean thickness is 7.6 ± 0.95 mm. One of these sherds is plain, but the other three are decorated. The first of the decorated sherds is an engraved fragment from a carinated grog-tempered sandy paste bowl (Figure 3a). The design consists of a zone of cross-hatching next to a zone of opposed engraved lines. Similar sherds have been noted from the ca. A.D. 1260-1410 occupation at the McGuire's Garden site (41FT425) at the Jewett Mine (Gadus et al. 2002:Figure 50b-d), also in the Post Oak Savannah in the Trinity River basin, and at 41LT12 in the Navasota River basin (Mallouf 1979). The second decorated sherd is a grog-tempered sandy paste jar with closely-spaced parallel incised lines (Figure 3b). It is from a vessel that was fired in a reducing environment, but cooled in the open air. The third decorated sherd is a parallel brushed jar body sherd. Brushed sherds are present in post-A.D. 1250 Caddo sites in East Texas as well as contemporaneous sites in East Central Texas that likely were not occupied by Caddo peoples. Brushed pottery may have been locally made or obtained in trade with a Caddo community.

The last three sherds have a clayey to silty paste and are tempered with either bone or grog. They are from vessels that were fired in a reducing environment, have no surface treatment, and have thin rim (5.1 mm) and body (mean thickness 6.25 ± 0.5 mm) walls. The one decorated sherd is a jar rim with a horizontal incised line encircling the vessel, and with at least one diagonal incised line on the rest of the rim; these diagonal lines appear to be widely-spaced on the rim, but no doubt continue around the rim as part of the motif (cf. Dunkin Incised).

Based on the depths of the different temper-paste wares at 41LN308, it is impossible to differentiate any that are stratigraphically earlier or later. The sandy paste sherds are found from 40-50 cm bs; the tempered sandy paste wares occur from 0-60 cm bs; and the clayey to silty wares were also recovered from 0-60 cm bs, all in a distinct midden deposit, as well as in non-midden deposits. It is possible that all three wares comprise distinct parts of a single ceramic assemblage, one that likely dates after the 13th century A.D. based on the few decorated sherds that are present. It is more probable, based in large measure on the three radiocarbon dates from the midden, however, that the few recovered sherds from temporally distinct ceramic wares have become mixed in the midden deposits by bioturbation.

The prehistoric ceramic assemblage from the Black Finger Tip site (41LN325) includes four rim sherds, 12 body sherds, and three base sherds. There are a number of temper and paste classes represented: sandy paste (n=4), grog-tempered-sandy paste (n=4), bone-tempered-sandy paste (n=2), grog-bone-tempered-sandy paste (n=1), grog-hematite-tempered-sandy paste (n=2), no temper-clayey-silty paste (n=1), grog-tempered-clayey-silty paste (n=4), and bone-tempered-clayey-silty paste (n=1). Sherds with a sandy paste (with or without temper) comprise 68 percent of the assemblage, and the sherds with a clayey-silty paste (with or without temper) account for the remaining 32 percent of the assemblage. Of those sherds that are tempered (n=14) and that have either one or two kinds of temper, 79 percent have grog inclusions,

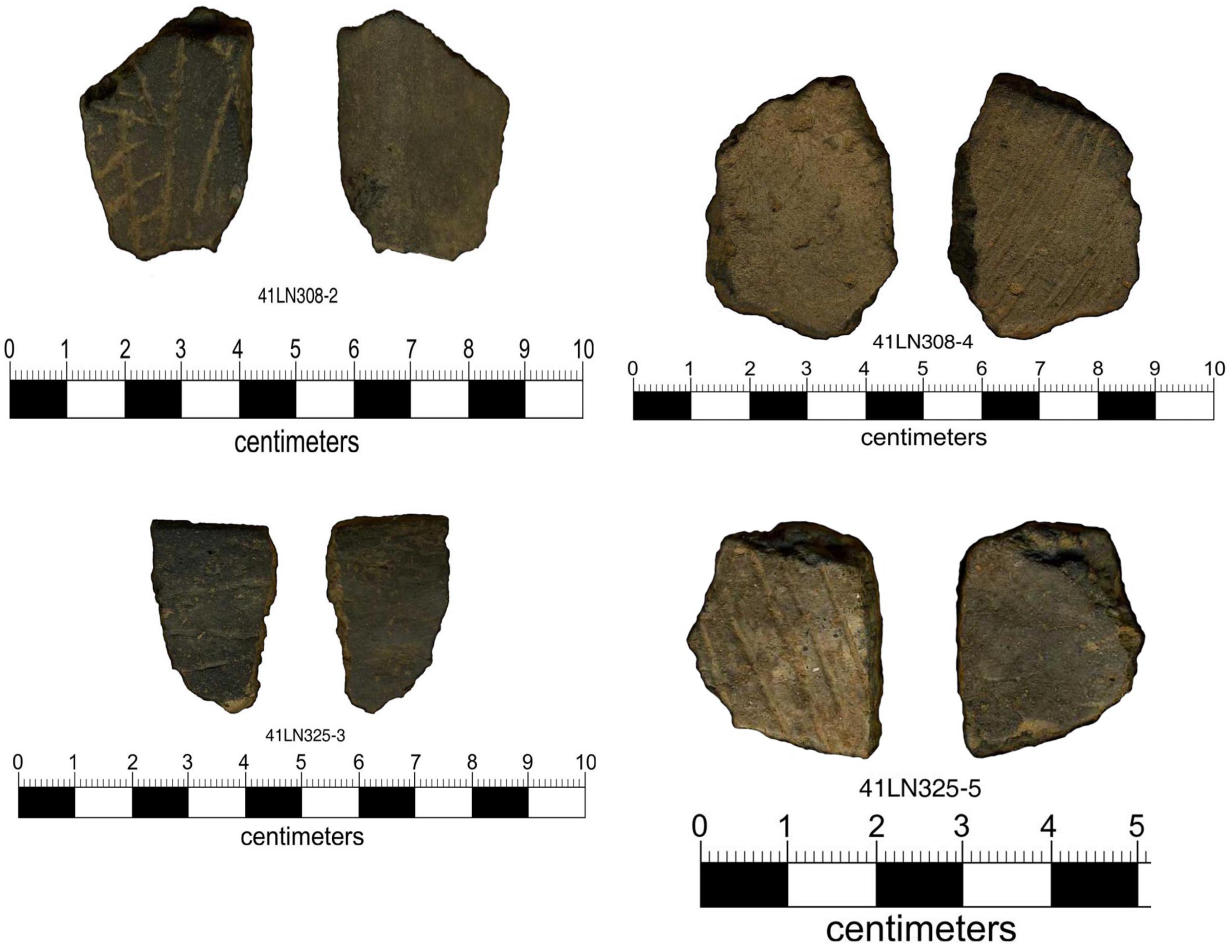

Figure 3. Decorated sherds from Fort Boggy State Park sites: a, engraved ceramic sherd from 41LN308; b, sherd with closely-spaced parallel incised lines from 41LN308; c, horizontal incised rim from the Black Finger Tip site; d, parallel incised body sherd from the Black Finger Tip site.

28 percent have bone inclusions, and 14 percent have crushed hematite inclusions. The two sigma calibrated age ranges of one date from near the top of the midden at the Black Finger tip site are A.D. 664-720 and A.D. 748-764, dating during the latter part of the Woodland period. These calibrated age ranges suggest that much of the midden deposits accumulated during the Woodland period.

The sandy paste sherds from the Black Finger Tip site are from vessels fired in a reducing or low oxygen environment that have been smoothed on either one or both vessel surfaces. Body sherds are thin-walled, ranging from 5.4-6.3 mm, with a mean thickness of 5.8 ± 0.5 mm. The flat base sherd (11.7 mm thick) is from a non-tempered vessel. This base sherd was from a vessel that was fired in a reducing environment and cooled in the open air. One of the sherds is a rim (8.4 mm thick) that appears to have been lip notched, but it is eroded. Lip-notched sandy paste sherds in the Woodland period sandy paste pottery assemblages from Lake Naconiche in East Texas—otherwise dominated by plain vessels, as are all Mossy Grove sites—come from archeological deposits dated between cal. 2230-1830 years B.P., during the early part of the Woodland period (Perttula 2008b). Ellis (2010:45) indicates, however, that lip notched sherds also have been found on Late Prehistoric sites along the Texas Gulf Coast in southeast Texas, particularly on sites in the Middle Coast.

Almost half of the sherds from the Black Finger Tip site are sandy paste sherds with temper inclusions of either grog, bone, and/or hematite. The bone-grog-tempered sandy paste sherd is a plain rim

sherd (with a direct rim profile and a rounded lip) that has been burnished on its interior surface; the vessel was fired and cooled in a reducing environment. Rim walls are 8.1 mm in thickness.

The plain bone-tempered sandy paste sherds include a rim with a direct profile and a rounded, exterior folded lip, with 7.6 mm thick walls; it has been smoothed on both interior and exterior surfaces. The other is a flat base sherd (10.5 mm thick). The sherds are from two different vessels fired in a reducing environment. The plain grog-hematite-tempered sandy paste sherds include a large circular but flat base sherd that is 8.2 cm in diameter and 11.3 mm thick; it has been smoothed on its exterior surface. It is from a vessel, probably a jar, that was fired in a reducing environment and cooled in the open air. The second grog-hematite-tempered sandy paste sherd is from the body (7.2 mm thick) of a vessel that was incompletely oxidized during firing.

The grog-tempered sandy paste sherds are plain, and 50 percent have interior-exterior surface burnishing and/or floating. Based on the firing conditions, each sherd is from a different vessel. Three of the sherds are from vessels fired in a reducing environment, with two of them subsequently cooled in the open air. The other sherd was from an incompletely oxidized vessel. The grog-tempered sandy paste sherds have moderately thick vessel walls, with a mean thickness of 7.43 ± 0.48 mm and a range of 6.9-8.2 mm.

The non-sandy paste and tempered sherds in the Black Finger Tip site ceramic sherds account for only 26 percent of the assemblage. The plain bone-tempered body sherd (7.0 mm thick) came from a vessel that was fired in a reducing environment and cooled in the open air. All four of the grog-tempered clayey to silty paste sherds are from decorated vessels. Three have incised decorations on the rim and upper body, including an opposed line element, a horizontal incised rim (see Figure 3c), and a sherd with parallel incised lines (see Figure 3d). The last decorated grog-tempered sherd has faint opposed brushed marks on the body, while the lower rim appears to have a series of vertical incised lines. The presence of a brushed sherd in the Black Finger Tip site ceramic assemblage points to at least some use of the site after ca. A. D. 1250.

Three of the four grog-tempered sherds were from vessels fired and cooled in a reducing environment, while the other was from an incompletely oxidized vessel. Two of the sherds had been either smoothed or burnished on their interior surfaces. The one rim sherd (7.2 mm thick) has a direct rim profile and a rounded lip. The three body sherds range from 5.5-7.5 mm in wall thickness, with a mean thickness of 6.7 ± 0.8 mm.

A bone-tempered rim sherd found by Corbin et al. (1994) during survey investigations, likely from a carinated bowl, was engraved with opposed lines on either side of an excised triangle element (Corbin et al. 1994:Figure 34). Although it was described as a "Late Caddoan [sic] style" engraved sherd by Corbin et al. (1994:Figure 34), it appears more plausibly on stylistic grounds to be from an Early Caddo style (ca. pre-A.D. 1300) Holly Fine Engraved vessel (see Suhm and Jelks 1962:Plate 39e, g, i) than any specific Late Caddo pottery type.

The diversity in temper-paste classes in the ceramics at the Black Finger Tip site is impressive, as is the dominance of Woodland period sandy paste sherds and non-sandy paste decorated sherds with resemblances to Caddo decorated pottery made in East Texas. The spatial and vertical distribution of the different kinds of wares suggests that there may have been two prehistoric occupations at the site where the peoples made and used pottery vessels. In the southern part of the site, plain sandy paste and plain grog- and grog-hematite-tempered sherds are found between 30-100 cm bs, and this may be the earliest occupation in this area; the one radiocarbon date from the upper part of the midden deposits suggests that these sherds predate ca. A.D. 800. Possible later ceramics in this area include an incised grog-tempered and plain bone-tempered sherd, plain grog-tempered sandy paste sherds, and plain grog-hematite-tempered sandy paste sherds, as well as the sandy paste lip notched rim sherd, and these may date after ca. A.D. 800. Conversely, in the central part of the site, there are three decorated grog-tempered sherds that may be part of a component that dates after ca. A.D. 1250 (because one of them has a brushed decoration). This possible component does have bone-tempered sandy paste, grog-bone-tempered sandy paste, grog-bone-tempered sandy paste, and sandy paste sherds.

The prehistoric archeological components at 41LN308 and the Black Finger Tip site (41LN325) were occupied beginning in the Woodland period, and then continued to be occupied in the Late Prehistoric period (e.g., to some time after ca. A.D. 1200/1300). The prehistoric ceramic sherds include both sandy paste Goose Creek Plain, and later grog- and bone-tempered decorated ceramic wares

that share stylistic and technological attributes with East Texas Caddo ceramic wares.

41WA185, Trinity River Basin

Several sites in the Trinity River and San Jacinto River basin in the Post Oak Savanna indicate that the earliest ceramics in this area are plain sandy paste (Goose Creek Plain, *var. unspecified*) and bone-tempered sandy paste pottery (Gadus and Fields 1997; Greaves 2002). For example, investigated archeological deposits at 41WA47 (Greaves 2002) and 41WA185 (Gadus and Fields 1997) suggest that bone-tempered sandy paste and sandy paste ceramics are abundant in pre-A.D. 900 deposits. At 41WA47, bone-tempered and sandy paste ceramic sherds are found in deposits that date (at 1 sigma, calibrated) between A.D. 70-900, while bone-tempered and sandy paste ceramic sherds from 41WA185 are in stratified deposits that date between A.D. 590-895 (1 sigma, calibrated). These early ceramics are associated with Gary and Kent dart points (Story 1990:275).

Later ceramics in this same area are tempered with grog and bone, and occasionally have decorated sherds from vessels that have Caddo ceramic styles (see Gadus and Fields 1997:Figure 4). At 41WA185, deposits with this sort of ceramic assemblage have been dated between A.D. 1375-1445 (1 sigma, calibrated). Contemporaneous archeological deposits at 41WA47 (with radiocarbon dates that range from A.D. 1460-1630), in the San Jacinto River basin, however, are dominated by sandy paste pottery (Goose Creek Plain), with only a few bone and grog-tempered sherds (Greaves 2002:Table 5-12).

Lake Limestone Sites, Leon and Limestone Counties, Navasota River Basin

Both bone and grog-tempered clay paste and sandy paste ceramics are found on prehistoric sites at Lake Limestone in the Navasota River basin (Prewitt 1975; Prewitt and Mallouf 1977; Mallouf 1979). The large sample (n=455) of sherds from the Old Union Bridge site (41LT12) includes plain sandy paste (n=17), kaolin and sandy paste (n=12), bone-sandy paste (n=124), grog-sandy paste (n=138), and bone-grog-sandy paste (n=160) sherds. About 25 percent of the sherds at the site are decorated, primarily from the tempered wares, and there are a variety of incised, punctated-incised, and engraved design elements that strongly resemble East Texas Caddo decorative styles (Mallouf 1979:Figures 24-25). At least one rim sherd is from a Poynor Engraved vessel that has been found in ca. A.D. 1400-1480 contexts in the upper Neches River basin in East Texas (Mallouf 1979:Figure 25f; see Perttula 2011:Figure 6-65). Mallouf (1979:46) concludes that "[a]ll design elements (engraved and line and punctate incised) and vessel forms (cylindrical jars and shallow bowls with straight-sided or slightly flaring rims and carinated bowls) represented at Lake Limestone fall generally within the Caddoan [sic] ceramic tradition."

Kosse Mine Sites, Navasota River Basin, Limestone County

Plain sandy paste pottery sherds resembling Goose Creek Plain, *var. unspecified* have been recovered from several sites at the Kosse Mine on a tributary to the Navasota River; these sites have Gary, Scallorn, and Perdiz points (Fischbeck et al. 2011), suggesting pottery was in use in both Woodland and Late Prehistoric periods. These sherds have fine sandy pastes and thin body walls, with floated surfaces, and are from vessels fired under variable conditions; one sherd from 41LT387 was smudged during firing.

Five sherds were recovered in investigations at 41LT354 at the mine (Fischbeck et al. 2012), three plain body sherds and two decorated body sherds. All were part of utility ware vessels. Three paste groups were defined based on microscopic examination of a freshly broken cross section of each sherd, and the presence or absence of specific sets of tempering agents.

The one sherd assigned to Paste Group 1 was manufactured from silty clay to which grog, crushed hematite, and larger-sized sand grains had been added (Figure 4c). Paste texture for this sherd appears laminated (i.e., a stepped or platy look, with relatively straight lamina oriented at an oblique angle) in cross section. This undecorated body sherd is small, and its exterior and interior surfaces were too weathered to determine its overall surface treatment. Its thickness averages 8.9 mm, and its overall coloration suggests that it was part of a vessel fired in a reducing environment, then cooled in a high oxygen environment.

The two sherds assigned to Paste Group 2 were both manufactured with a silty clay to which both bone and grog temper had been added. The

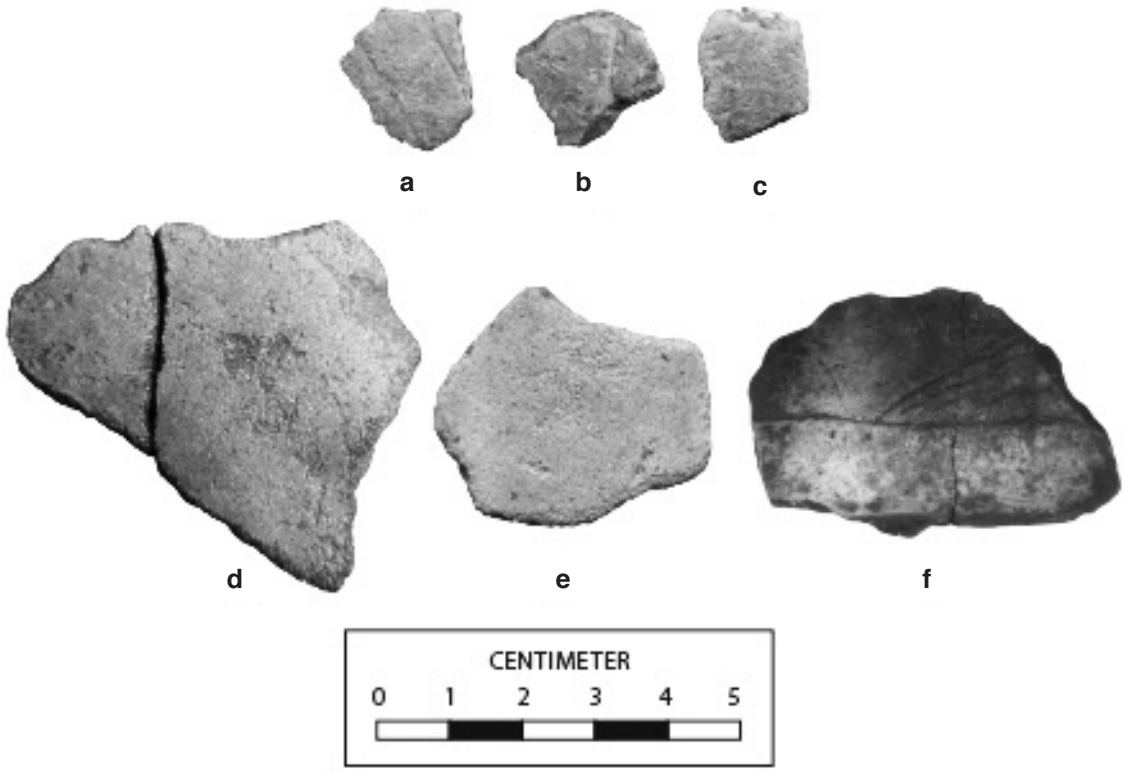

Figure 4. Plain and decorated sherds from 41LT354 and 41LT320 at the Kosse Mine in Limestone County, Texas: a-e, 41LT354 sherds; f, 41LT320.

overall matrix of the two sherds differs, in that one contains only crushed bone and grog and its paste texture is irregular (i.e., an uneven appearance due to the large inclusions added to the paste), while the other has larger-sized sand grains that had been added to the paste matrix, and its paste texture appears laminated in cross section. This indicates that these two sherds were part of two different vessels and that different paste preparation and forming techniques were used to manufacture them.

Both of these sherds are decorated, exhibiting one (see Figure 4b) or two (see Figure 4a) short segments of narrow incised lines that had been executed on a leather-hard paste. Unfortunately, both sherds are too small to determine an overall design motif, rendering them typologically indistinct. The exterior and interior surfaces of both sherds had been dry smoothed but left unburnished. The sherds range from 6.6-7.3 mm in thickness. The general coloration of both sherds indicates that they were part of vessels fired in a reducing environment, then cooled in a high oxygen environment.

Paste Group 3 includes two sherds with untempered sandy pastes (see Figure 4d-e). Both sherds have a paste matrix that contained sand falling within the very fine to fine size range and containing no additional tempering agents. The grains were fairly well-sorted, and the overall arrangement and orientation of the grains of both sherds are fine (i.e., a relatively uniform paste fabric having small, closely spaced irregularities across the face of the cross section) in texture.

Apart from their similar paste constituencies, the sherds differ in several respects. One (see Figure 4e) is thin, averaging 3.9 mm in thickness, and its curvature indicates that it was part of a small jar. Both the exterior and interior surfaces of this sherd had been floated, then burnished. Its light reddish-yellow color indicates that it was part of a vessel fired in an oxygen-rich environment. By contrast, the other sandy paste sherd (see Figure 4d) is much thicker, averaging 7.6 mm in thickness. Its surfaces had been floated, but left unburnished, and its grayish-brown color indicates that it was fired in a reducing atmosphere, then cooled in a high oxygen environment.

Based on their overall decorative and technological attributes, the five sherds recovered at 41LT354 suggest that the site was occupied by groups having different temporal and/or regional affiliations. The three tempered sherds in paste groups 1 and 2 are similar to Caddo ceramics found throughout the region. They were recovered from shallow depths (0-20 cm bs) at widely distributed locations.

The two non-tempered sandy paste sherds in Paste Group 3 were recovered from deeper levels associated with a large pit. Given their observed technological attributes, the two sherds in this paste group closely resemble the Bear Creek Plain type found in deep East Texas and/or the Goose Creek Plain types found in Mossy Grove Gulf Coastal Plain sites (see Aten 1983; Ellis 1992, 1995, 2002; Jelks 1965; Story 1990). This suggests that, at some point, the site may have had temporal and/or regional affiliations with prehistoric Woodland period groups in the Neches, and Angelina river basins in East Texas and/or the Mossy Grove culture area to the south-southwest (see Story 1990).

Fischbeck et al. (2011) also recovered a few non-tempered sandy paste sherds at 41LT56, 41LT310, and 41LT424 at the Kosse mine. These are from thin-walled vessels fired under relatively variable firing conditions in an atmosphere containing insufficient or reduced amounts of oxygen.

Another site at the mine, 41LT320, had an engraved sherd from a grog-tempered (and a clayey/silty clay paste) Poynor Engraved carinated bowl (Sherman et al. 2007; see Suhm and Jelks 1962:Plate 62a, c-i). This type is the principal fine ware in Frankston phase (ca. A.D. 1400-1650) Caddo sites in the upper Neches River basin in East Texas. The partial engraved design on the sherd (see Figure 4f) is from a motif that has a series of engraved squares on the rim with sets of diagonal engraved triangular elements within the four corners of each square. Every other square has diagonal engraved triangles on either side of the vertical lines that define the square. In addition to this Caddo sherd is a plain and thin-walled (5.4 mm) sandy paste body sherd. Both interior and exterior surfaces of the sherd have been floated and then burnished. Although sandy paste ceramics are produced in the Caddo area, the combination of paste and surface treatment found on this sherd is more characteristic of the manufacturing traditions found in the Mossy Grove Cultures to the south.

Robertson County Sites, Navasota River Basin

The ceramic assemblage from another site (41RT522) in the Navasota River basin is notable for the low number of sherds with any temper added to the naturally sandy paste of the clay (Perttula 2006a). The sherds are generally from relatively thin-walled (6-8 mm in thickness of the vessel body walls) vessels that have been fired in a reducing or low oxygen environment, and have a dark vessel core. The few decorated sherds (one horizontal incised, one curvilinear incised, and one brushed) would not be out of place in a Mossy Grove context, except for the brushed sherd, which occurs generally in a post-A.D. 1250 context in East Texas Caddo sites (see Perttula, this volume). The dominance of undecorated sandy paste sherds at 41RT522 is very similar to a series of sites in Southeast and East Central Texas (see Kalder et al. 2005:Figure 5-79), and these appear to be related to the Woodland period Mossy Grove Culture. The two 1 sigma radiocarbon dates from the assemblage are A.D. 630-710 and A.D. 590-690.

There are 25 sherds in the assemblage from 41RT522. The sherds—based on differences in temper, paste, and firing conditions--may be from as many as 11 different vessels. The sherds include the following groups: 15 that have a sandy paste (all undecorated); seven with no obvious temper but a silty or clayey paste; two with grog-temper; and one sherd with a sandy paste that also has grog tempering.

There is a small assemblage of ceramic artifacts from a Late Prehistoric site (41RT510) along the Navasota River in Robertson County (Perttula 2006b). There were 36 sherds in the collection that were documented. The sherds include five rims, 30 body sherds, and one base sherd. The sherds came from vessels that were quite thick, and probably relatively large, although no orifice diameter measurements could be obtained on the rims. The mean thickness of the rims is 8.50 ± 0.96 mm, while the body sherds have a mean thickness of 7.98 ± 1.36 mm. The one flat base is 11.0 mm in thickness.

The sherds are tempered with grit (or crushed pieces of hematite) (n=4), grog (n=19), bone (n=2), bone-grit (n=1), and grog-grit (n=2). The percentage of sherds with bone temper (8.3 percent) is quite a bit lower than those with some amount of grog temper (58.3 percent). Eight of the sherds do not have any obvious temper, but have a distinctive sandy paste. Many of the sherds with temper,

particularly those with grog, also have a sandy paste (n=21, 58.3 percent). A sandy clay was probably used in the manufacture of the vessels found at 41RT510.

The great majority of the sherds (83 percent) are from vessels that were fired in a reducing or low oxygen environment, and have a dark vessel core. Many of these same vessels were pulled from the fire and allowed to cool in the open air: 68.6 percent of the sherds have distinctive thin oxidized zones along the inside and outside cores of the sherds. Only one sherd was fired and cooled in a high oxygen environment, and 14.3 percent of the sherds are from vessels that were incompletely oxidized during firing, probably a result of a low firing temperature or short firing period.

Most of the sherds are from vessels that had either been smoothed or burnished on their interior and/or exterior surfaces. Almost 56 percent of the sherds show evidence of smoothing on the interior, and these are probably from cooking jars; 44 percent were smoothed on the exterior; and 16.7 percent were burnished on the exterior vessel surface. These sherds most likely come from bowls and carinated bowls meant to be used for serving foods. The plain rim sherds have direct profiles, with either rounded or flat lips.

Turpin and Carpenter (1994:17) recovered similar thick and undecorated grog-tempered sandy paste sherds at 41RT285 on Walnut Creek near its confluence with the Brazos River. This was in a context postdating A.D. 1250, with Perdiz arrow points and a few pieces of bison bone. Smoothed sandy paste and bone- and grog-tempered sandy paste pottery has also been reported on the Little Brazos and Navasota rivers in Robertson County (Good et al. 1980).

Only one of the 36 sherds—a grit-tempered body sherd—in the collection is decorated: it had a hematite-rich slip on interior and exterior surfaces. There are also an undocumented number of horizontal and diagonal incised and fingernail punctated sherds in the 41RT510 collection. The use of red-slipping as a form of decoration is common in prehistoric Caddo ceramic assemblages (especially those dating after ca. A.D. 1200) in some parts of East Texas, particularly in the upper Sabine and upper Big Cypress River basins. Doss Redware is sometimes found in Central Texas ceramic assemblages, but this distinctive ware is bone-tempered, while Goose Creek Red Filmed has a sandy paste (see Aten 1983; Winchell and Ellis 1991).

Is 41RT510 a prehistoric Caddo site in the Post Oak Savanna? Perhaps it is related to the south Prairie Caddo sites discussed by Shafer (2006), although this would be difficult to prove because the age of the site is not known. Nor are there clear examples in the assemblage of the kinds of artifacts thought to characterize south Prairie Caddo sites, namely early Caddo pottery similar to that found at the George C. Davis site on the Neches River in East Texas (Perttula 2004:Figure 13.3; Story 2000); deer metapodial beamers, Bonham-Alba arrow points, or Gahagan bifaces (Shafer 2006:5).

Based on the kinds of decorated sherds reported from the site, the overall thickness of the ceramic vessel walls, which are much thicker than bone-tempered sherds in Toyah phase assemblages, and the frequency of grog-tempered vessel sherds (as well as the rarity of bone-tempered vessel sherds), 41RT510 does not represent either an Austin or Toyah phase manifestation. The incised, punctated, and red-slipped sherds known to be in the 41RT510 collection would not be out of place in an assemblage of decorated and grog-tempered Caddo pottery found in East Texas on sites dating from ca. A.D. 900 to A.D. 1300 or thereabouts. Instrumental neutron activation analysis and petrographic analysis of sherds and clay sources need to be carried out at sites in the Post Oak Savanna to help establish whether the pottery found on prehistoric sites in this part of the Post Oak Savanna was made locally by relatively mobile hunter-gatherer groups, or had been obtained in trade with their Caddo neighbors.

Navasota River, Madison County Sites

The analysis of a small sample (n=58) of aboriginal ceramic sherds from three archeological sites along the Navasota River in Madison County, Texas (Perttula 2013), indicates that plain sandy paste ceramic vessels (Goose Creek Plain, *var. unspecified*) and a few decorated sandy paste vessel sherds are the most common ceramic wares, accounting for almost 80 percent of the sample. This ware was likely made and used locally. This is followed by lesser amounts of plain grog-tempered sherds (8.6 percent), plain and decorated bone-tempered sandy paste sherds (6.9 percent), plain and decorated bone-grog-tempered sherds (3.4 percent), and a plain grog-tempered and sandy paste sherd (1.7 percent). The dominance of sandy paste sherds in sites in this part of East Central Texas

suggests that the three sites represent separate components of the inland Mossy Grove Culture. The analysis of radiocarbon-dated ceramic assemblages at a number of sites on Gibbons Creek in the Navasota River basin (see below) suggest that the plain and decorated sandy paste and bone-tempered sandy paste ceramic wares recovered from these Madison County sites are likely the product of occupations that dated from ca. 114 B.C. to A.D. 993, while a later occupation with a bone- and grog-tempered brushed sherd at 41MA29 (considered to be a trade ware from an East Texas Caddo group) likely dated between A.D. 1175-1406. If we examine these same sites for decorated sandy paste and bone-tempered sandy paste sherds, 1 sigma calibrated radiocarbon dates from deposits with these kinds of sherds range from 2122-957 B.P. (see Rogers 1991, 1993a, 1993b), or from as early as 172 B.C. to A.D. 993, for the sandy paste wares, and after ca. A.D. 400 for bone-tempered sandy paste ceramics. The vast majority of sherds from the three Madison County sites were very likely made and used locally in this ca. 1150 year interval of the Woodland period and early part of the Late Prehistoric period.

The three Madison County sites appear to have individual components within the same aboriginal ceramic tradition. This tradition is recognized by a preponderance of plain sandy paste pottery (Goose Creek Plain, *var. unspecified*), and this plain sandy paste pottery represents a distinctive aspect of the material culture remains of the inland Mossy Grove Culture defined by Story (1990:258 and Figure 39). These sites are found in the Brazos, Trinity, and Neches-Angelina river basins in Southeast, East Central, and East Texas. Other ceramic traditions to the west and southwest, in the Gulf Coastal Plain, the Balcones Escarpment, and the Edwards Plateau, are dominated by Toyah phase bone-tempered wares in Central and South Texas (Kenmotsu and Boyd 2012), bone-tempered sandy paste wares in Central and East central Texas, and sandy paste and grog-tempered wares along the central and upper Texas Coast (Arnn et al. 2010; Aten and Bollich 2011; Ellis 2010).

A grog- and bone-tempered brushed sherd from 41MA29 represents a second and even later Late Prehistoric use, as well as evidence of the widespread distribution of prehistoric Caddo pottery in parts of the Post Oak Savanna (see Fields 2004:367; Perttula 2008a). The brushed sherd in the 41MA29 collection would not be out of place in an assemblage of decorated and grog-tempered Caddo pottery found in East Texas on sites dating after A.D. 1250 or thereabouts.

GIBBONS CREEK MINE AREA, GRIMES COUNTY SITES, NAVASOTA RIVER BASIN

Prehistoric ceramic sherds at sites along Gibbons Creek in the Navasota River basin have been found regularly associated with dart points (Gary and Kent types), Scallorn arrow points, and Perdiz arrow points (i.e., Brown 1987; Rogers 1993a). Most of the pottery found on sites in this area are plain and decorated sandy paste sherds that share characteristics of the Goose Creek wares, but more extensive work at a few sites have recovered larger assemblages with tempered (i.e., bone and/or grog) wares, some of which are also decorated. Investigations at a series of sites along Gibbons Creek in the Navasota River basin have radiocarbon dates from archeological deposits (Rogers 1991, 1993a, 1993b, 1994, 1995), which permits the recognition of the initial appearance and adoption of ceramics in this area, as well as changes in this local ceramic tradition.

These calibrated radiocarbon dates from the Gibbons Creek area indicate that plain sandy paste pottery (generally thick and with floated surfaces) was made and used as early as cal 2064 years B.P., or 114 B.C., but more frequently after ca. A.D. 300, in the Navasota River basin, and it was the most common ceramic ware (Rogers 1995:167). At 41GM200, for example, Goose Creek Plain jar sherds were found in a deposit dated to A.D. 890 ± 120 (Rogers 199152, 61), while deposits at 41GM201 have Goose Creek Plain body sherds that are dated at A.D. 20 ± 100, A.D. 480 ± 80, A.D. 490 ± 90, A.D. 610 ± 90, and A.D. 670 ± 60 (Rogers 1991:65, 77, 1993b:116), the Goose Creek Plain sherds date to A.D. 710 ± 70 at 41GM224 (Rogers 1994:116, 140), and the Goose Creek Plain sherds from 41GM240 date to A.D. 350 ± 60 (Rogers 1991:100, 106). The ceramics from 41GM201 also include a sandy paste punctated rim sherd, several sandy paste red filmed (Goose Creek Red Filmed) sherds (Rogers 1993b:Table 29). One of the red filmed sherds has a series of cross-hatched engraved lines on it (Rogers 1993b:173, 175), and may be associated with deposits that date between A.D. 860-1120. The floated and burnished sandy paste sherds from 41GM181, which were

typed as Alabonson Dry Smoothed and Whiteoak Floated, are associated with deposits that have radiocarbon dates of A.D. 10 ± 60, A.D. 270 ± 50, and A.D. 580 ± 90 (Rogers 1993b:43, 68, 70, 84, 102). At 41GM205, the ceramics include both Goose Creek Plain and a punctated sandy paste and bone-tempered ware (San Jacinto Incised, *var. Jamison*) in a soil horizon dated to A.D. 810 ± 90 (Rogers 1991:80), as well as a plain sandy paste bone-tempered body sherd, and several thin (4.0 mm) burnished sandy paste sherds in deposits with radiocarbon dates of A.D. 790 ± 100 and A.D. 1740 ± 70 (Rogers 1993b:211-212). These various wares continued to be made in this area until at least cal 520 years B.P. or A.D. 1430. Plain bone-tempered sandy paste pottery are found in archeological deposits at the Gibbons Creek mine that date as early as between ca. A.D. 380-800, after which plain and decorated bone-tempered sandy paste sherds are more common (see Rogers 1991, 1993a, 1993, 1995).

One of the better known sites at Gibbons Creek is 41GM281, located along Peach Creek in the lower Navasota River basin in Grimes County. Over 120 m^3 of fill was removed from the site, yielding more than 25,000 artifacts dating to the middle part of the Late Prehistoric period (A.D. 1250-1400) (Rogers 1993a, 1995). Engraved, brushed, brushed-incised, incised, incised-punctated, and punctated sherds (Figure 5) from grog-tempered, bone-tempered, and sandy paste sherds occur in a component that has calibrated (1 sigma) radiocarbon ages that range from A.D. 1160 to A.D. 1440 (Rogers 1995:Table 34).

The ceramic assemblage included 1483 sherds, 750 of which were analyzed in detail. Untempered sandy paste sherds comprised the major paste group (57 percent), although relatively large numbers of bone-tempered sherds (38 percent) were also found; grog-tempered sherds account for 5 percent of the assemblage. Most of the tempered sherds also had a sandy paste. The identified ceramic types point to southeastern and eastern affiliations, and include upper coast types such as Goose Creek Plain, San Jacinto Incised, Alabonson Smoothed, and Caddo grog-tempered types such as

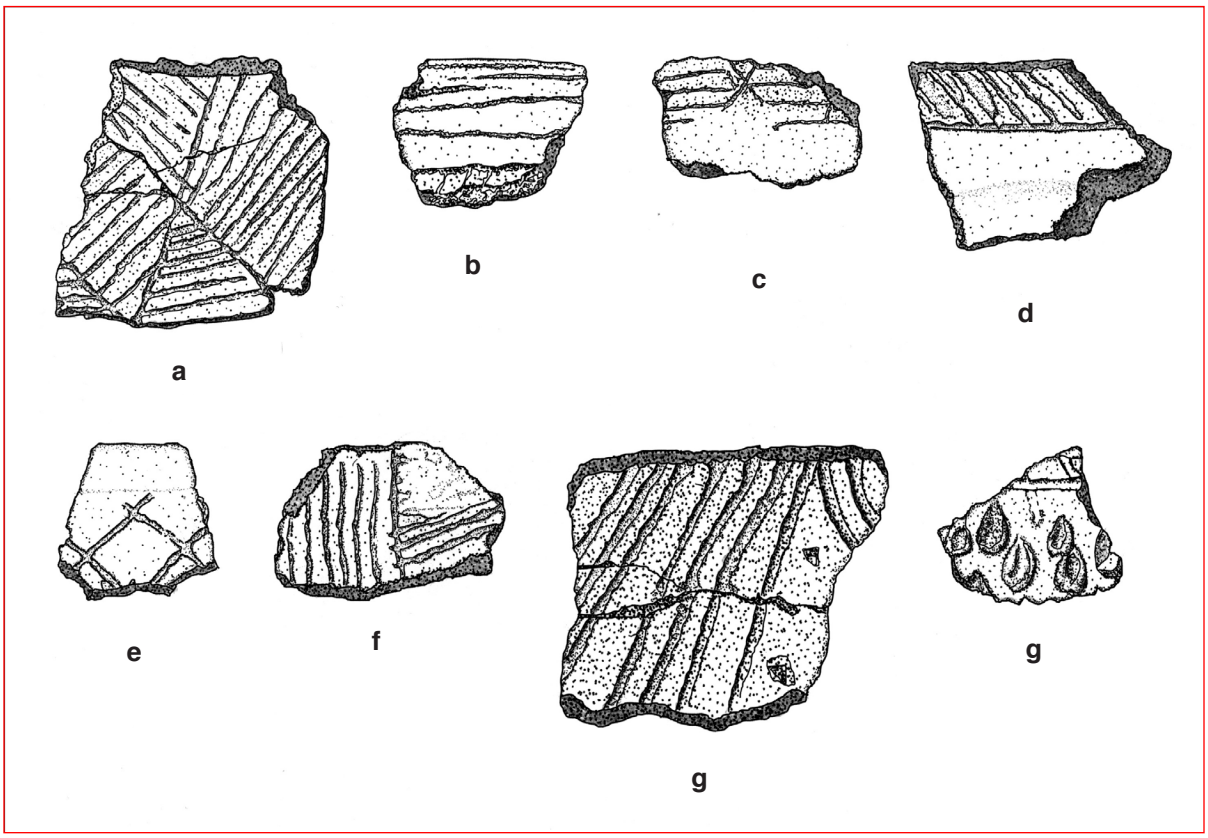

Figure 5. Decorated ceramic sherds from 41GM281. Redrawn from Rogers (1995:Figures 35a-e and 36a-b, d): a-e, incised decorations; f, Holly Fine Engraved; g-h, incised-punctated decorations.

Holly Fine Engraved and Dunkin Incised (see Figure 5a, f). One engraved sherd with portions of an engraved and hatched triangle (Rogers 1993a:97) has a decorative element seen in post-A.D. 1260 ceramic assemblages at Jewett Mine and Lake Limestone. Petrographic analysis performed on 14 samples (Skokan 1995) show definite similarities between the 41GM281 sherds and those recovered at the Sandbur site (41FY135), particularly with regard to the percentage of matrix, the ratio of matrix to pore space, and the average grain size; all of the analyzed sherds had a sandy paste. Rogers (1995:115-116, 131) suggests "that the pottery of Gibbons Creek reflects an indigenous tradition, while exposed and influenced by outside contacts, maintained an identity of its own," but noting that the grog-tempered ceramics "were obtained from trade or other types of contact with adjacent groups, while sandy paste and bone-tempered wares were produced locally."

Similar decorated incised (parallel lines) and incised-punctated sherds (tool and fingernail impressed), sandy paste and bone-tempered, have been recovered from 41SM282 (Rogers 1993a:116, 1995:Figure 55). One sigma calibrated radiocarbon dates from 41SM282 range from A.D. 860-1030 to A.D. 1250-1400 (Rogers 1995:Table 41).

Little River in the Brazos River Drainage, Milam County

Investigations at 41MM341 on the Little River, an eastward-flowing tributary to the Brazos River, recovered ceramics (n=17) from a buried archeological component or components that dates from ca. A.D. 900-1300 or slightly later (ca. A.D. 1400) (Gadus et al. 2006:125, 136; Perttula 2001). These include one burnished sandy paste sherd, 14 bone-tempered sherds, one with exterior burnishing, from at least one thick-walled vessel, likely a jar, and two other sherds tempered with bone and grog. These sherds are from a carinated bowl decorated with a single broad horizontal incised line on the rim.

Brazos River, Burleson County

A small assemblage (n=72) of ceramic sherds from a post-A.D. 900 component at 41BU16 along the Brazos River are considered to be representative of a local ceramic tradition (Roemer and Carlson 1987:121). The assemblage includes thin and plain sandy paste sherds (46 percent, although several may have had a red slip), plain sandy paste sherds with bone temper (21 percent), plain sandy paste sherds with grog temper (9 percent), and various decorated sherds. Several sherds are described as incised with red paint in the lines, but the illustrations in Roemer and Carlson (1987:Figures 28d-e, 29a-c, and 30c) are clearly engraved with what must have been a red pigment rubbed in the engraved lines.

Two of the decorated sherds have a sandy paste. One has portions of a red slip, while the other has horizontal and vertical engraved lines and a red pigment. The other decorated sherds have a sandy paste, but are tempered with grog (n=8) and bone (n=8). These sherds have incised (parallel and opposed lines) and engraved (with panels and cross-hatched zone) decorative elements, with clear resemblances to East Texas Caddo decorative styles. None of the decorated sherds can be identified to specific types, but it is suspected that the component dates from ca. A.D. 900-1400.

At Winnie's Mound (41BU17), a small number of plain sandy paste sherds were found, including a rim from a large jar (36 cm orifice diameter) (Bowman 1985:50). The sherds wee found in association with Scallorn arrow points (Bowman 1985:63).

Brazos River, Washington County

Excavations at Washington-on-the Brazos (41WT5) recovered a small sample (n=10) of prehistoric pottery (Brewington 1995). The sherds have coarse to fine sandy pastes (probably Goose Creek Plain, *var. unspecified*) with smoothed to floated surfaces; body wall thickness ranges from 4.0-7.0 mm. The one sandy paste decorated sherd is from a bowl with parallel incised lines. Brewington (1995:211) suggests it is "reminiscent of some types of Caddoan [sic] wares."

Yegua Creek Basin, Lee County, Brazos River Drainage

The Chesser site (41LE59) has a single plain and thin (6.0 mm) sandy paste body sherd with a floated exterior surface (Rogers and Kotter 1995:115). The sherd is from archeological deposits with 1 sigma calibrated age ranges of A.D. 450-600, A.D. 450-597, and A.D. 727-891 (Rogers and Kotter 1995:Table 12).

Middle Yegua Creek, Lee County, Brazos River Drainage

There is an interesting assemblage of sherds from the Boriack Bog locality in Lee County, Texas (Perttula 2009). The assemblage includes five rims, 63 body sherds, and three base sherds. The majority of the sherds are from bone-tempered or sandy paste vessels made using a coiling technique; the vessel sherds are relatively hard and are from well-joined vessels, probably simple bowls and jars.

Approximately 93 percent of the Boriack Bog sherds have a bone temper (crushed and burned bone) added to the vessel paste. Less than 3 percent have either grog (crushed ceramic sherds) and/or hematite temper inclusions, and in each case, these aplastics were secondary temper agents in vessels with bone tempering. Almost 31 percent of the sherds are from vessels that also have a naturally sandy paste, being made from naturally sandy or self-tempered clay, while the others have either a clay or silty paste.

The majority of the sherds are from vessels that have been smoothed on their exterior (52 percent) or interior (37 percent) surfaces. The smoothing was probably done to lower the permeability and increase the heating effectiveness of particular vessels in cooking tasks. In other cases—especially the interior slipped or red washed vessels—the well-smoothed or burnished interior surfaces may have been advantageous in the repeated use of these wares as food serving vessels. The purpose of exterior smoothing and burnishing may have been for stylistic and display purposes, creating a flat and lustrous surface well-suited to highlight the slipped or washed vessel surface. Between 7-16.9 percent of the vessel sherds from the Boriack Bog locality have either interior or exterior vessel burnishing.

Almost 79 percent of the sherds are from vessels that were fired in a low oxygen or reducing environment. Most of these vessels in turn were cooled in a high oxygen environment (72 percent), indicating that the vessels were pulled from the fire and allowed to cool in the open air. The remainder of the sherds from the Boriack Bog locality are from vessels fired in a high oxygen or oxidizing environment (6 percent) or were incompletely oxidized during firing (16 percent). The consistency in how the vessels were fired indicates that the potters who made these vessels were well-versed in regulating firing and cooling temperatures as well as maintaining control over the final finished end product, namely the manufacture of durable and relatively hard vessels.

The Boriack Bog vessels have relatively thin vessel walls, but a relatively thick base. The rims are 6.46 ± 0.62 mm in mean thickness, compared to 6.54 ± 0.73 mm in thickness for body sherds, and 9.7 ± 0.9 mm for the base sherds. The overall thickness of the walls of these vessels, as well as their relative uniformity in thickness from the rim to near the base, would have been well suited to the cooking and heating of foods and liquids and would have contributed to their ability to withstand heat-related stresses. Another factor that would influence vessel body wall thickness would be the sequence in which a vessel was constructed. Vessels constructed from the bottom up, as these vessels likely were, would tend to have thinner walls moving up the vessel body towards the rim, with the lower portion of the vessel—especially the base—usually significantly thicker than the upper portions of the vessel.

Of the sherds from the Boriack Bog locality, 13 are considered to be decorated, including 11 body sherds from at least six different vessels with an interior red slip or red wash, one body sherd from another vessel (with a sandy paste) with faint brushing marks on the exterior surface, and a sherd from an eighth vessel (bone-tempered) with parallel brushing marks overlain with several broad incised lines. The few undecorated rims in the assemblage also suggest that some of the vessels in use at the site were left plain, at least on the rim.

Slipped or washed vessels are not a common feature of aboriginal ceramic assemblages from East Central Texas sites, but five sherds from 41FY74, described as being bone-tempered sandy paste sherds with a reddish color (Kalter et al. 2005:213; Skelton 1977), may be related to the interior slipped sherds from the Boriack Bog area. Red slipped sherds are also present in the assemblage from 41BU16 on the Brazos River (see above). Other sites with bone-tempered pottery having a "fugitive red" decoration or a "red wash" include several post-A.D. 1200 Toyah phase sites in Central Texas (Ricklis and Collins 1994:Table 47) and other sites along the upper Texas coast.

Brushed pottery is also found in East Central and Central Texas sites, some likely to have been of East Texas Caddo manufacture and occurring on vessels with both grog and bone temper, but with other brushed vessels of local derivation, including

Boothe Brushed from several Toyah phase sites in the Brazos and Colorado River basins (Ricklis and Collins 1994:Table 47; Suhm 1955). Both petrographic and instrumental neutron activation analysis of a sample of East Central Texas brushed sherds would need to be conducted to determine which kinds of brushed pottery vessels were of local manufacture and which vessels were likely to have been obtained in trade with East Texas Caddo groups.

Despite the similarities between the Boriack Bog decorated sherds and the range of decorated sherds in selected Toyah phase sites, the Boriack Bog ceramics are not considered to be of Toyah phase affiliation, primarily because of the high incidence of sandy paste sherds at Boriack Bog and other sites in the post oak savannah of East Central Texas. Instead, the bone-tempered, bone-tempered/sandy paste, and sandy paste sherds from Boriack Bog are thought likely to be part of a local Late Prehistoric ceramic tradition that still remains to be clearly defined, one that may have been "influenced by contacts with groups outside the area" (Kalter et al. 2005:219), including Caddo groups to the east and Toyah phase groups to the west and southwest.

The aboriginal ceramic sherds from the Boriack Bog locality are part of an indigenous East Central Texas ceramic tradition dating from at least ca. A.D. 1200-170, as ceramic sherds were found buried in deposits not stratigraphically far above those that contained a Perdiz arrow point. This ceramic tradition is characterized by the manufacture of both well-smoothed bone-tempered and bone-tempered sandy paste vessels, most of which are plain, along with non-tempered sandy paste vessels. Some of the bone-tempered and sandy paste vessels are decorated, however, including examples at Boriack Bog with an interior red slip or red clay wash or faint brushing. Comparable ceramic assemblages have been reported in the Navasota, Brazos, and Colorado river basins (see Kalter et al. 2005:Figure 5-79), including 41FY74 (Skelton 1977), 41FY135 (Kalter et al. 2005), and 41GM281 (Rogers 1995).

Fayette County Sites, Colorado River Basin

The Sandbur site (41FY135) ceramic assemblage totaled 81 sherds. During analysis, seven temper/paste groups were identified: (1) bone temper/coarse sandy paste; (2) bone temper/sandy paste; (3) sandy paste; (4) coarse sandy paste; (5) coarse bone temper/sandy paste; (6) coarse bone temper/coarse sandy paste; and (7) bone temper/clay paste (Kalter et al. 2005). Most are undecorated. Among the few sherds that are decorated, decorative elements include incised lines and punctations. One sherd with a drill hole was also found. Sherd thicknesses vary from 5 mm to 7 mm. Surfaces are largely smoothed with some evidence of burnishing. Several sherds exhibited scraping on their exterior and/or interior surfaces. The oxidization patterns noted on the sherds indicate the use of multiple firing environments that ranged from oxidized to reduced.

Eleven sherds from the Sandbur site were submitted for petrographic analysis and five sherds were submitted for instrumental neutron activation analysis (INAA). In general, the petrographic analysis confirmed the paste groups established during macroscopic examination, with any differences being primarily due to the relative abundance of sand in the paste matrix and the average size of the sand grains. Approximately 35 percent of the assemblage had been tempered with crushed bone that occurred in varying proportions, representing between 10 percent and 66 percent of the inclusions in the matrix. In general, the petrographic analysis of the Sandbur site ceramics showed marked similarities to many of the sandy paste and bone-tempered paste groups found at the Allens Creek sites in Austin County (Hall 1981), the Cedar Bridge site (41FY74), and 41GM281. In addition, INAA results indicate that the compositional variations of the five submitted samples are closely analogous to the compositional variation of ceramics from East/Southeast Texas. The characteristic oxidation patterns and scored surfaces observed on several of the Sandbur site sherds are reminiscent of ceramics found in assemblages in the Brazos Delta-West Bend Area (see Ellis 2000, 2003; Ellis, L.W. and Ellis, G.L. 1996a, 1996b). Thus, the ceramic assemblage at the Sandbur site suggests the presence of multiple ceramic traditions that are closely tied to each other.

The Cedar Bridge site (41FY74) is located along Cedar Creek in the Colorado River basin about 4.6 km upstream from the Sandbur site. In general, the ceramics recovered at the Cedar Bridge site closely resemble those found in Southeast Texas coast assemblages. The ceramic assemblage (n=552) at 41FY74 was divided into three groups (Skelton 1977). Group A (n=449) includes four subgroups that are presumed to be related. Only

minor color changes separate the four subgroups. Pastes in this group have non-plastic inclusions consisting of large amounts of rounded sand grains, with small proportions of pulverized bone (0.2 m - 2 m in diameter). All are undecorated. Surfaces are floated on the exterior and interior, but they are rarely polished. Nineteen percent are smudged.

Group B (n=53) has two subgroups. Ceramics in this group have paste fabrics containing large amounts of fine rounded sand grains. All are undecorated, with floated exterior and interior surfaces that are rarely polished. Six percent are smudged.

Group C (n=12) includes sherds with variable pastes. All are "crumbs" less than 1 cm in size and/or badly eroded. The only decorated sherd in the assemblage (one exhibiting small linear punctations) is included in this group.

Santa Maria Creek Site (41CW104), Caldwell County, Texas

The Santa Maria Creek site in Caldwell County dates after ca. A.D. 1600, during the latter part of the Late Prehistoric and Protohistoric periods. Analyses of paste attributes in the small sample of ceramics (n=25) identified three paste groups; however, the majority of the ceramics (76 percent) are bone-tempered wares (Ellis et al. 2012). The bone used to temper the ceramics occurs as small, crushed, angular fragments that are relatively sparsely distributed throughout a sandy paste matrix containing fine-to-coarse-sized sand grains. A small percentage (20 percent) of the ceramics contains natural sands with no additional tempering agents. Only one bone-and-grog tempered sherd was found. The textural differences between the 25 sherds suggest that different "paste recipes" were used to manufacture the ceramics found at the site. Given their overall sandy matrix and general textural differences, the Santa Maria Creek ceramics closely resemble those found in assemblages located to the south/southeast (Aten 1983; L. Ellis and G. Ellis 1996a, 1996b, Hall 1981; Winchell and Ellis 1991).

Second, all exterior and interior surfaces on the Santa Maria Creek ceramics had been floated. This surface treatment mode also has a high frequency occurrence in Mossy Grove assemblages located to the east/southeast. In fact, ceramics with floated surfaces have demonstrated spatial and temporal variability at a number of inland and coastal sites in the region (L. Ellis and G. Ellis 1996a, 1996b, 1999; Hamilton 1988; Wheat 1953; Winchell and Ellis 1991). It should, however, be noted that this surface treatment mode has been inconsistently recorded, partly due to its tendency to weather away. Thus, it may be more widespread that presently known.

Third, the presence of sherds with smudged interior surfaces suggests a specific firing technique that may prove valuable in assessing regional firing practices. The low percentage of sherds (8 percent) at the site that exhibit smudged interior surfaces is consistent with research that shows a distributional disjunction between ceramic traditions located to the north/west and those located toward the east/coastal regions (Ellis 2010; L. Ellis and G. Ellis 1996a, 1996b; Hamilton 1988). Again, this attribute has been inconsistently recorded or mentioned, but not quantified.

All of these attributes speak to the presence of different manufacturing traditions and/or broad scale interactions with neighboring groups with different ceramic traditions. In particular, when the Santa Maria Creek ceramic assemblage is compared with other sites in the region, they seem to align more closely with the ceramic traditions to the east/southeast.

This assessment is further supported by the INAA results on 15 sherds. The distribution of paste composition (i.e., paste constituency and paste texture) among the Santa Maria Creek site ceramics indicates that more than one paste preparation and fabricating technique was used to manufacture the vessels. This could indicate changing ceramic manufacturing techniques among members of the same cultural group or it could also indicate the presence of different ceramic traditions associated with different cultural groups. The results of the INAA show some patterned variability among the 15 samples, largely due to four samples whose compositional variability differs from the other 10 samples (see below). For example, sample CW222 shows elevated concentrations of many elements such as chromium and scandium. Interestingly, this sherd was the only bone-and-grog-tempered sherd recovered at the site.

The remaining 10 samples show greater similarity and likely represent the local production of ceramic vessels. This is suggested by the comparison of the Santa Maria Creek site samples to the 15 compositional groups thus far identified in the Central Texas Database (see Creel et al. 2012).

Most of these 15 compositional groups represent localized production. While the Santa Maria Creek site samples do not match any of the current small groups, there is a match with one of the larger reference groups that points to the regionally local production of most of the samples. When comparisons were made between the ceramics from the Santa Maria Creek site and the Sandbur site, there is evidence of small scale production and localized exchange between the two sites. This suggests that the bone-tempered ceramics found at sites in this transitional zone may indeed represent a series of localized regional ceramic types.

Summary and Conclusions

Archeological evidence from a number of sites indicate that ceramic vessels in the Prairie or Post Oak Savanna of east central Texas began to be made by aboriginal groups ca. 2000 years ago, but they were not common and did not become key elements of specific assemblages until perhaps 1000 years ago, and only then in certain parts of the region, particularly sites in the Trinity and Navasota River basins. The earliest ceramics in the region were non-tempered and plain sandy paste jars and bowls with burnished and/or floated surfaces, most likely related to Goose Creek Plain and Bear Creek Plain sandy paste ceramics found on sites in inland and coastal settings in Southeast and East Texas. Plain sandy paste bone-tempered wares in the region are documented as early as A.D. 70 in the Trinity River basin (Walker County) and by ca. A.D. 400 in the Navasota River basin (Grimes County). Eventually, after ca. A.D. 400, potters that made these sandy paste wares began to occasionally decorate them with incised and punctated design elements, or they applied a thin red wash or slip to one or both vessel surfaces.

More dramatic changes in the aboriginal ceramics in the region occurred after ca. A.D. 900/1000, when vessels began to be made with grog, bone, and hematite temper mixtures. Vessels generally had a sandy paste, but in other instances, clayey or silty pastes were chosen for use in vessel manufacture. Different vessel forms came into use alongside jars and bowls of various sizes and volumes, including bottles and carinated bowls. At this same time, decorated grog, bone, and grog- and bone-tempered vessels from local sites had styles/decorative elements closely resembling Caddo pottery made in East Texas (see Perttula, this volume), as well as Southeast Texas coastal pottery (see Aten 1983).

Much of the ceramics resembling Caddo pottery styles are found in Prairie Savanna sites in the Trinity and Navasota River basins that date after ca. A.D. 1200-1400. Elsewhere in the Post Oak Savanna, little in the way of Caddo pottery has been documented from sites in the middle and lower reaches of the Brazos and Colorado River basins. Although detailed instrumental neutron activation analysis (INAA) and petrographic studies have not been completed on many Prairie Savanna ceramics, Creel et al.'s INAA findings (this volume) suggest that much of the Caddo pottery found in Prairie Savanna sites was made in East Texas by Caddo potters, and the vessels were probably the product of periodic trade between Caddo and non-Caddo peoples. In certain circumstances, however, some of the Caddo pottery found in the region was probably made by Caddo peoples who at certain times in the past (particularly after ca. A.D. 1300/1400) established permanent settlements in parts of the Trinity and Navasota River basins.

These temporal and spatial differences in the character of aboriginal ceramic assemblages in the Prairie Savanna indicate the existence of different manufacturing traditions and/or broad scale interactions with neighboring groups with different ceramic traditions. In some cases, ceramics on Prairie Savanna sites seem to align with the ceramic traditions to the east/southeast in East and Southeast Texas, including coastal groups. When comparisons were made between the ceramics from sites in the Prairie Savanna, there is evidence of small scale production and localized exchange, and the development of localized ceramic practices.

Bone-tempered wares were present throughout the region long before bone-tempered Leon Plain pottery began to be made by post-A.D. 1200 Toyah phase groups in Central Texas (see Creel et al., this volume); plain bone-tempered sandy paste ceramics are found at sites in this region dating as early as ca. A.D. 70 in the Trinity River basin and as early as ca. A.D. 400 in the Navasota River basin. Thus, we have two temporally and geographically distinct technological traditions based on the use of bone temper, and there are probably several others yet to be recognized, depending on site locations in the Post Oak Savanna. It is clear that not all bone-tempered sherds in this region are "Leon Plain."

To enhance our understanding of aboriginal ceramics, in addition to the basic documentation

of the character of sherd assemblages, it is important that ceramic studies be done that look at the technological variability of the sherds in Prairie Savanna assemblages. This would include the systematic sorting of key variables such as paste constituency, paste texture, thickness, and firing attributes, as well as decorative elements (when present). More extensive radiocarbon dating of archeological sites in the region is needed to better establish with precision the initial appearance and age of ceramic-bearing assemblages. The direct dating of residues on sherds would also be of chronological utility, but the study of those residues could also contribute information on the range of foods that were processed and cooked by peoples living in the Prairie Savanna.

Ultimately, a thorough ceramic analysis requires an integrated approach that includes a suite of studies that used together provide an effective means of addressing process-oriented research problems, as well as questions addressing spatial/temporal distributions. Only by expanding our theoretical and methodological research designs can we begin to discuss the role that ceramics may have played among native groups living in this part of Texas.

Every study of prehistoric ceramics centers on three basic questions: (1) How were pots made? (2) How were they used? (3) Where and when were they used? Answering the first two questions requires a basic understanding of ceramic technology and its place within a larger technological system that incorporates the use of pottery. Answering the third question requires knowledge of the distributions of specific ceramic traditions and, by implication, the technological attributes specific to those traditions. Thus, any comprehensive technological analysis of ceramics in the Prairie Savanna, or any other part of what is now Texas, should provide an understanding of the ways in which pottery use influenced pottery manufacture, and vice versa, as well as how pots are distributed across space and through time. Pottery technology involves both the human activities that made the pot, as well as the technological activities involved in the use of the pot. Because ceramic technology encompasses a number of multi-faceted components that are both abstract (e.g., the need and the conceptual notion of how to fulfill that need) and physical (e.g., the production of the finished product, its properties, and its actual use), the study of ceramic technology is best understood if we have some means of organizing its basic components.

If the pottery cycle is viewed as a continuous flow from dust (clay) to dust (grog), then the technology of prehistoric ceramics can be summarized in several basic processes (Ellis 1992; Van der Leeuw 1984). The need for some type of ceramic product arises. Based on the potter's experiences, both as an individual and as a member of a particular group, he/she devises a strategy for meeting that need. In the pottery production stage, the potter acquires the raw materials and tools (apparatus/hardware). Then, using his/her idiosyncratic and/or cultural technological knowledge (technique/software), the potter constructs and/or decorates a pot by making a set of choices in a process sequence executed within a particular organization of production and decorative choices, either alone or in cooperation with others. Once the pot is finished, it becomes a tool in the end-state technology of pottery use. When the pot breaks, its sherds may become the apparatus/hardware in yet another technological system (i.e., as spindle whorls, grog tempering for new pots, or ceramic knives, etc.) or they may drop out of the system entirely to become part of refuse. That is where archeologists begin their attempts to unravel the pottery cycles of specific peoples, living in the Prairie Savanna region of Texas or elsewhere, at particular times and places.

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Woodland Ceramics in East Texas and a Case Study of Mill Creek Culture Ceramics

Linda W. Ellis

ABSTRACT

East Texas Woodland period ceramic assemblages often exhibit vessels representing one or more of the three major regional Woodland period ceramic traditions: Fourche Maline, Mossy Grove, and Mill Creek. After summarizing the general characteristics of these ceramic traditions, this article presents the results of a detailed comparison of the ceramic assemblages found at four key sites located within the Sabine River drainage in the Mill Creek Culture area: the Hawkwind (41HS915), Resch (41HS16), Folly (41RK26), and Herman Ballew (41RK222) sites. Located within a 40-60 km radius of each other, these four sites provided an excellent opportunity to compare early ceramic assemblages from known sites and expand our database of technological and decorative attributes associated with Woodland period ceramics in East Texas.

INTRODUCTION

The end of the Archaic and the beginning of the Woodland period in East Texas is marked by significant changes in technology, subsistence, and settlement patterns. The archeological evidence suggests that these changes were characterized by the gradual addition of new technologies over a millennium or more (Cliff 1998:100). During the 1,300 years between ca. 500 B.C. and A.D. 800, the Woodland people living in East Texas were primarily hunter-gatherers or small-scale horticulturists who lived in increasingly larger groups for longer periods of time, maintaining longer-term (re)occupations at single sites. Increasing evidence suggests that drainage basins served as geographically based social boundaries (Black and Story 2003; Ellis et al. 2012; Perttula and Nelson 2004).

While there is some evidence of possible daubed pole and thatch structures, habitation features such as midden deposits, the remains of earth ovens, storage pits, and/or burned rock concentrations are often found in Woodland period sites (Black and Story 2003; Perttula 2004; Rogers et al. 2001; Webb et al. 1969). Changes in the subsistence regimes are indicated by ground stone tools such as pitted stones, manos, grinding slabs, mullers, and anvils that appear in assemblages in increasing numbers (Webb et al. 1969:67; Ellis et al. 2012). Throughout much of the Woodland period, lithic raw material utilization remained similar to that of the Late Archaic; however, after ca. A.D. 700, the use of dart points such as Gary and Kent gave way to expanding stem arrow points. Excavations at burial mounds sites such as the Coral Snake Mound (Jensen 1968a, 1968b; McClurkan 1966; McClurkan et al. 1980) and the Jonas Short Mound (Jelks 1965) and their accompanying non-local burial goods such as translucent quartz, copper beads, ear spools, and marine shells suggest that Woodland sites were part of a much broader regional cultural pattern. These broad-scale cultural interaction spheres are also reflected in the presence of Lower Mississippi Valley (LMV) Tchefuncte and Marksville ceramics, as well as Williams Plain pottery, that accompany the introduction of ceramic technology to the region. LMV ceramics occur with some frequency in early to middle Woodland period sites (ca. 400 B.C. to A.D. 400) (Story 1990; Webb et al. 1969); however, sometime after 200 B.C., the use of locally made pottery becomes more widespread, albeit in relatively small numbers (Schambach 2001; Perttula 2004). A decreased residential mobility may have led to the location of sites more closely associated with significant plant food resources whose processing was facilitated by the increasing use of ceramic vessels (Cliff 1998:104–105; Corbin 1998:115; Moore 1995; Perttula 2010). While the reasons for these shifts in subsistence, technology,

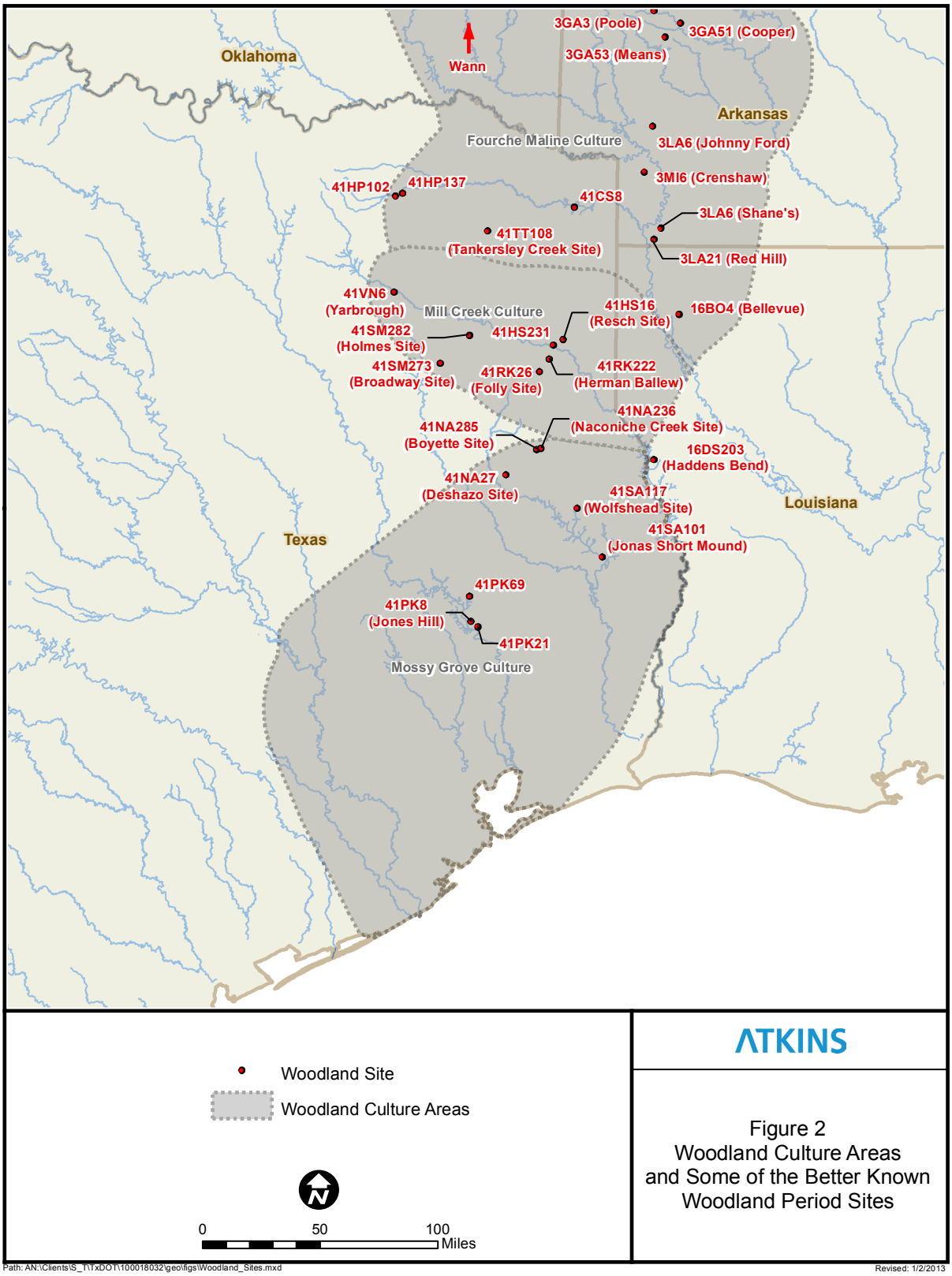

Figure 1. Woodland culture areas and some of the better known sites.

and settlement patterns are still the subject of discussion, the archeological evidence shows that Woodland period sites in East Texas share certain similarities to sites from eastern Oklahoma, southwestern Arkansas, northwestern Louisiana, and into Southeast Texas. At the same time, there are also certain key differences. Based on these differences, three major Woodland Period traditions, whose boundaries partially overlap, have been identified in East Texas (Perttula and Nelson 2004; Schambach 2002; Story 1990) (Figure 1). Based on current research, these three cultural traditions appear to be temporally contemporaneous, dating from around ca. 500 B.C. to ca. A.D. 800 (Schambach 2002; Rogers et al. 2001; Perttula 2008, ed.).

The most distinctive of these are the Fourche Maline cultural tradition that encompasses portions of southwestern Arkansas and adjacent areas of Oklahoma, Louisiana, and Texas (Schambach 1998, 2002), and the Mossy Grove cultural tradition that covers an area extending from southwestern Louisiana, southeastward along the upper Texas Gulf coast, and inland into the southern part of the Texas Pineywoods (Aten 1983; Aten and Bollich 2011; Story 1990). Between these two more-well-defined cultural traditions lies what Perttula and Nelson (2004) has termed the Mill Creek culture, in an area centered in East Texas, primarily sites in the Big Cypress and Sabine River basins and the upper portion of the Angelina River basin (Perttula and Nelson 2004; Rogers et al. 2001; Webb et al. 1969).

FOURCHE MALINE

The Fourche Maline culture covers an area lying south of the Arkansas Valley in western Arkansas that extends into the Ouachita Mountains of eastern Oklahoma, and southeast into northwestern Louisiana (Schambach 2002:91 and Figure 5.1). In East Texas, it extends to just south of the Red River and its tributary, the Sulphur River. Schambach (1998, 2001, 2002) sees the Fourche Maline culture area as being much more extensive, including sites as far south as George C. Davis (41CE19) and the lower reaches of the Trinity River, but these inclusions are deemed highly conjectural by Black and Story (2003) and Story (1990:277, 293).

The Fourche Maline cultural tradition has its beginnings in pre-ceramic Archaic times, with pottery making its first appearance somewhere around 300 B.C. in Oklahoma (Leith 2011) and around 400 B.C. in Arkansas (Schambach 1982). Sites are typically relatively large, with deep middens, often containing burials, suggesting possibly continuous occupation based on horticulture and a less mobile lifestyle (Schambach 2001:21–22). Artifacts commonly found at Fourche Maline sites include Gary dart points, seed grinding stones, boatstones, double-bitted axes (probably hoe-like gardening tools), modeled clay platform pipes, and Poole clay pipes.

The Fourche Maline ceramic tradition is known for its plain and minimally decorated vessels, the most common forms being flower-pot shaped jars and bowls with flat disc-shaped bases (Schambach 2002:91–93). Ceramics typically are thick walled and tempered with a variety of materials including clay/grog, crushed bone, "grit," and/or sand. The most common pottery type is Williams Plain, followed by Cooper Boneware and Ouachita Plain (Schambach 1998, 2002). Evidence of contact with LMV peoples is represented by small quantities of Tchefuncte, Marksville, and Coles Creek pottery types recovered at many of the larger sites; however, many of these appear to be locally made, and may or may not be temporally contemporaneous with these pottery types as they were defined in the LMV (Schambach 2001).

Some of the earliest evidence of the Fourche Maline culture comes from sites along Fourche Maline Creek in eastern Oklahoma and the Ouachita and Red River valleys in southwestern Arkansas and the Great Bend area of northwestern Louisiana (Bell 1980; Schambach 2002). One of the notable sites in this area is the Wann (34Lf27) site. Among the 2,932 sherds found at the site, over 92 percent were Williams Plain (Sharrock 1960:38). The paste was described as poorly mixed, with an unpulverized, granular clay temper. Paste color varies from gray to dark brown. Rims were normally straight with predominately rounded, then tapered lip edges, but rims with flattened lip edges were present. Thicknesses are highly variable, but average around 12 mm. Bases are overwhelmingly flat, thick, and circular in outline; however, a small number of square bases were also recovered. No complete pots were found, but the primary form was apparently large bowl-shaped vessels.

The remaining 8 percent of the ceramics included an array of variously tempered wares. A total of 155 sherds were classified as possible variants of Williams Plain. They were clay-tempered,

with sparse amounts of hematite and quartz sand inclusions evenly distributed in the well-mixed paste fabric. Paste color was normally black. Surfaces were well smoothed and thicknesses ranged from 4-7 mm with an average of 5 mm. Rim forms suggest simple straight walled vessels with lip edges most often flattened. Among the 155 sherds, 74 were decorated. Decorative attributes involved incised lines with motifs consisting primarily of chevrons, but parallel straight lines, parallel wavy lines, bulls eye patterns, and circles enclosed within connected diamond patterns also occurred. In most cases, the designs terminate at an incised straight line, often running parallel to the rim.

The first to identify the Fourche Maline tradition outside of Oklahoma was W. Raymond Wood (1981) in his report on the Poole site (3GA3), located on the upper Ouachita River in southwestern Arkansas. The WPA excavated three plots across an alluvial terrace and found burials in each area, as well as the remains of a large rectangular house in one area, but there was no evidence of the typical Fourche Maline black midden (Wood 1981). Of the nearly 600 sherds associated with the Fourche Maline occupations at the Poole site, over 92 percent were classified as Williams Plain. An additional 6 percent were categorized as Williams Incised (Wood 1981:33–34). A few modified platform pipes were also recovered.

South of the Poole site, Fourche Maline components have been identified and described at the Means (3HS3) and Cooper (3HS1) sites (Schambach 1998). In the Great Bend region, Fourche Maline components have been identified at several key sites such as Johnny Ford (3LA5), where diagnostic artifacts included Cooper Boneware and Williams Plain pottery (Schambach 2001). At Fourche Maline sites in these areas, ceramics are abundant and compose a significant proportion of the artifact assemblage.

In nearby northwestern Louisiana, the earliest pottery is irregularly distributed and appears to have been fairly sporadic until the Middle Woodland period (ca. 100 B.C). Cultural influences from the LMV Tchefuncte (ca. 500 B.C.–A.D. 1) and Marksville (ca. A.D. 1–400) groups are evident in the technological similarities observed in the local wares. While many of the ceramics recovered here are characterized by crude, poorly wedged, and non-tempered pastes, the majority of Middle Woodland period ceramics are relatively thick, undecorated wares with coarse grog- and/or bone- tempered pastes. Late Woodland period pottery was dominated by jars and simple bowls with relatively thick walls. Although grog, grit, and bone-tempered vessels occur, assemblages are usually dominated by grog-tempered wares and bone-tempered wares are rare (Girard 2012).

Sites with discrete Woodland components are not numerous in the far northeastern part of Texas, and our knowledge of such sites comes in large part from salvage excavations in the Sulphur River basin carried out in anticipation of the Texarkana and Cooper reservoirs (Story 1990:303–309). The Cooper Reservoir area is located in the Middle to South Sulphur River drainage. In the upper portion of the basin, sites with Woodland components include such sites as Arnold (41HP102) and 41HP137 (Fields et al. 1997; McGregor et al. 1996). The presence of three distinctive groups of ceramic artifacts at the Arnold site include a number of thick-walled base and body sherds from flowerpot-shaped vessels reminiscent of Williams Plain, and ceramics with decorative techniques reminiscent of one or another of the Coles Creek types common in the LMV (Doehner and Larson 1978). The Texarkana Reservoir area is located in the lower portion of the Sulphur River basin. Archeological investigations in this area have identified a number of sites, one of the most notable being the Snipes (41CS8) site (Jelks 1961), with both Williams Plain and Coles Creek Incised vessels.

MOSSY GROVE CULTURE/ TRADITION

The Mossy Grove culture/tradition lies to the south of the middle Sabine River basin, occupying an area that extends from the Brazos River Delta up the Texas coast to the Sabine River Delta and adjacent southwestern Louisiana (see Figure 1). The earliest ceramics appear in and around the Sabine Lake and the Galveston Bay area and are technologically related to the Tchefuncte and Marksville types of the LMV. The archeological evidence shows that the technological traditions and adaptive strategies evinced during the Woodland period represent regionally distinct manifestations that Story (1990) has labeled the Mossy Grove Culture/Tradition. Story (1990:Figure 39) presented this designation as a heuristic concept to link and facilitate discussion of a number of similar yet locally distinct cultural manifestations.

Most characteristic of the Mossy Grove culture is its sandy paste ceramic tradition. In contrast to the thick-walled, flat-bottomed Fourche Maline wares, Mossy Grove ceramics are typically thinner and decorated ceramics occur in low frequency. When decorated, they most often have narrow incised lines and punctations. Mossy Grove ceramic assemblages are dominated by sandy paste wares with thin walls, floated surfaces, and rounded or conical-shaped bases. Bone- and/or grog-tempered wares do not appear until late in the Mossy Grove ceramic sequence (ca. A.D. 800–1000) (Aten 1983; Aten and Bollich 2011; Moore 1995; Story 1990).

Within the Mossy Grove tradition, regional variations in settlement and subsistence patterns and technology indicate two subregions: the Coastal margins and the Inland Coastal Plain. Both temporal and spatial differences existed between the two subregions (Aten 1983; Ellis and Ellis 1995; Ricklis 2004; Story 1990), with the presence of sandy paste ceramics being the most unifying trait.

Beginning around 2,500 years ago, the inland Mossy Grove culture encompassed Woodland period archeological sites that extended as far inland as the Neches and Angelina River basin and into the upper portions of Attoyac Bayou in East Texas (Perttula 2008, 2010; Story 1990). Sites in this area point to a people who were primarily "hunting-gathering foragers" with relatively mobile settlements and a material culture dominated by plain sandy paste ceramics and dart points. By about A.D. 500–600, there appears to be a shift is settlement location from the uplands/high ridge tops to the low sandy ridges overlooking the confluence of small drainages and river floodplains. This hints at a developing sedentism possibly tied to a shift in subsistence strategies (Cliff 1998; Corbin 1998; Perttula 2008).

Compared to Fourche Maline assemblages in the Great Bend region of the Red River (Schambach 2002), the cultural material found at Woodland period Mossy Grove sites is much less abundant. Material from habitation sites in the Neches-Angelina area such as Deshazo (Story 1995) and sites in the Lake Naconiche area, such as the Boyette site (41NA285) and Naconiche Creek (41NA236), are not nearly as rich or the artifacts nearly as varied (Perttula, ed. 2008). In general, archeological deposits at inland Mossy Grove sites are marked by small lithic scatters, small numbers of sandy paste sherds, a few ground stone tools, and fire-cracked rocks. Several sites in the Livingston Reservoir area, such as Jones Hill (41PK8), 41PK21, and Crawford (41PK69), also have Woodland period components (Ensor and Carlson 1988; McClurkan 1968). The earliest occupation at the Jones Hill site has been dated to A.D. 540, and the artifact assemblage is in line with similarly aged Mossy Gove sites given the presence of plain sandy paste pottery and Gary dart points (McClurkan1968). At 41PK21, the assemblage also includes Gary and Kent dart points and plain sandy paste or sand-tempered pottery; however, Marksville Stamped sherds were also recovered.

MILL CREEK CULTURE/ TRADITION

Our knowledge of the Mill Creek culture comes primarily from sites located in the Big Cypress and Sabine River basins and the upper portion of the Angelina River basin in East Texas (Ellis 2012; Perttula, ed. 2008; Perttula and Nelson 2004; Rogers et al. 2001; Webb et al. 1969). While the Woodland period components from sites in the Mill Creek culture area show distinct similarities amongst one another, there are also discernible contrasts with the neighboring and roughly contemporary Fourche Maline cultures to the north and the Mossy Grove cultures to the south (see Figure 1).

The earliest pottery in the Mill Creek culture area dates to around 500 B.C., and ceramic assemblages at Mill Creek sites are quite small when compared to Fourche Maline or Mossy Grove sites (Perttula and Nelson 2004; Rogers et al. 2001). They are, however, more technologically variable, exhibiting a mix of plain sandy paste wares, bone-tempered wares, and thinner grog-tempered wares. Since thinner grog-tempered wares occur early in the Mill Creek culture area, they are more likely to be related to LMV wares than to the later-occurring grog-tempered Mossy Grove ceramics. There is also a high representation of ceramics with laminated and contorted paste textures, reminiscent of LMV Tchefuncte and Marksville wares (Girard 1995; Hays and Weinstein 2010; Story 1990). The relatively thick bone-tempered sherds found at several Mill Creek sites may be related to the Fourche Maline type Cooper Boneware (Schambach 1998, 2002). Similarly, the sandy paste wares with smoothed surface treatments may be analogous to the Ouachita Ironware type (Schambach 1998,

2002). While bone-tempered ceramics do not appear until late in the sequence in parts of the Mossy Grove culture area (post–A.D. 900 in the Conroe-Livingston area) (Aten 1983; Story 1990), the presence of sandy paste ceramics exhibiting floated surface treatments would more comfortably fit with the Goose Creek sandy paste tradition of the Mossy Grove area (Ellis 1992, 1995; Winchell and Ellis 1991). In fact, the cultural remains recovered from sites in the upper Neches-Angelina area, the northernmost extension of the Mossy Grove culture area, show a clear affinity with Mossy Grove material in the Conroe-Livingston Reservoir area, where sandy paste ceramics with floated surfaces are quite common (McClurkan 1968; Shafer 1968). One of the main differences between ceramic-bearing assemblages at sites in this part of the Mossy Grove cultural area and ceramic assemblages in Middle Sabine River basin sites such as Folly (Jarvis 1972), Resch (Webb et al. 1969), Herman Ballew (Perttula 2001), and Hawkwind (Ellis et al. 2012) are the presence of large quantities of bone-and-grog-tempered ceramics that suggest closer ties to the LMV (Story 1990:279).

The same holds true for the locally made variants of the Tchefuncte-like pottery recovered at Mill Creek sites (Perttula 2001; Webb et al. 1969:33–35 and Figure 9). In the LMV, this highly distinctive pottery type is defined on the basis of its relatively soft, clay-tempered paste (Ford and Quimby 1945; Phillips 1970; see also Gertjejansen and Shenkel 1983). The sherds tend to be very light weight due to the large voids in the paste. Usually poorly fired, pastes sometimes contain small amounts of fine sand, bits of carbonized vegetal material, and/or crushed hematite. Exterior surfaces are usually floated and often decorated with stamped designs, incised lines, and/or punctations. The most common vessel forms are simple globular jars. Also common are "teat-shaped" or "wedge-shaped" basal supports, often occurring in sets of four.

Although what appear to be Tchefuncte-like ceramics are found in Mill Creek assemblages (Perttula 2001; Webb et al. 1969), these distinctive ceramics also occur frequently in Mossy Grove assemblages (Aten 1983; Aten and Bollich 2011; Story 1990). In both areas, however, the technological attributes of these locally made variants only loosely fit the standard type description of LMV Tchefuncte (Aten 1983; Aten and Bollich 2011; Ellis and Ensor 1998; Perttula 2001; Phillips 1970; Webb et al. 1969; Winchell and Ellis 1991). Their contorted or laminated pastes are the defining characteristics; however, sherds from East and Southeast Texas have paste fabrics that generally contain higher proportions of sand inclusions and are temper-less. By contrast, Tchefuncte vessels manufactured in the LMV have less sand, and the base and rim forms differ (Aten and Bollich 2011; Ellis and Ensor 1998; Winchell and Ellis 1991).

Thus, while the Mill Creek ceramics share some elements of both the Fourche Maline and Mossy Grove ceramic traditions, Mill Creek ceramic assemblages also show conspicuous variations. In general, Mill Creek sites possess ceramics in much lower numbers; however, they exhibit a much wider variety of temper and paste types. Ceramic assemblages are composed primarily of undecorated wares, but when decorated, they most often exhibit broad U-shaped design elements reminiscent of LMV decorative motifs. Interestingly, while ceramics are lower in overall frequency of occurrence at Mill Creek sites, decorated ceramics occur in higher percentages in Mill Creek ceramic assemblages than they do in Mossy Grove ceramic assemblages. The technological diversity of Mill Creek ceramic assemblages are one of the more telling contrasts and one that speaks to the blending of distinct ceramic traditions in this region. Examples from several sites will illustrate this diversity.

Site 41HS231 is situated atop a high interfluve along Hatley Creek just north of its confluence with the Sabine River (Dockall et al. 2008:57). It had a rather ephemeral late Woodland occupation. Of the 235 sherds recovered from the site, only 15 were associated with the Woodland component. One incised and punctated sherd was tentatively identified as Coles Creek Incised, and portions of two Williams Plain vessels were also recovered. Vessel 1 was a small undecorated, cup-shaped container with flaring walls. Its upper body measured 6.2-6.5 mm in thickness and its base is 10.7 mm thick. It was a grog-tempered vessel whose black core, exterior, and interior surfaces indicate that it was fired in a reducing atmosphere. Vessel 2 was an undecorated, medium-sized flowerpot shaped vessel. It has a grog-tempered paste and thick walls measuring between 11.4-12.3 mm. Its base ranges from 18.7 mm in the center to 24.3 mm near the wall juncture (Dockall et al. 2008: 86-87 and Figure 4.24-4.26). Both vessel sections were

recovered near the bottom of a trash pit. A radiocarbon date obtained from charred wood found in the lower portion of the pit yielded a 2-sigma calibrated age range of A.D. 660-810.

The Holmes site (41SM282) is another example of a site that shows the presence of more than one pottery manufacturing tradition (Walters and Perttula 2010). The site is located near the headwaters of Simpson Creek, approximately 13 km from its confluence with the Sabine River. Its small, but interesting, ceramic assemblage is stylistically similar to the LMV types Coles Creek Incised, *var. Coles Creek*, Chevalier Stamped, *var. Chevalier*, and Marksville Stamped, *var. Troyville* (Walters and Perttula 2010:Figure 2). Given the estimated dates on these three types (see Brown 1998), the site was most likely occupied ca. A.D. 700-850 by a Late Woodland period group. The relative abundance of the Coles Creek Incised ceramics in East Texas between A.D. 900-1000 certainly leaves open the possibility that the Holmes site may also have been occupied during the Formative Caddo period (Walters and Perttula 2010:40). More intriguing are the results of Instrumental Neutron Activation Analysis (INAA) conducted on one of the Coles Creek Incised, *var. Coles Creek* sherds, which indicates that at least one of the Coles Creek Incised sherds from the site was made from a local clay (Walters and Perttula 2010:37 and Figure 3). Thus, it appears to be a locally made vessel and not a trade vessel, leading Walters and Perttula (2010:40) to believe that "the LMV-looking sherds from this East Texas site represent ceramics whose stylistic decorative attributes were borrowed by local potters from other aboriginal groups, probably in Northwest Louisiana rather than the more distant LMV."

The Browning site (41SM195A) is not far from the Holmes site, and is located on a small tributary in the Sabine River basin. The site has a buried Woodland component that has a 2 sigma calibrated date of A.D. 625-880 (Shafer and Walters 2010). The ceramic sherds sample (n=40) includes both plain (n=35) and decorated (n=5) sherds. Most are from grog-tempered vessels (70 percent), 15 percent are grog-hematite-tempered, and 10 percent have grog and bone temper. Almost half of the sherds have a sandy paste, and two of these sandy paste sherds are non-tempered. Decorated sherds have straight incised lines, and may be from Coles Creek Incised vessels (Shafer and Walters 2010:131). INAA on two sherds indicates that they are from vessels made from local middle Sabine River clays.

At the Broadway site (41SM273), located on Mud Creek, a tributary of the Angelina River, the Woodland component had about 130 sherds, primarily grog-tempered and relatively thin walled. A significant number of the sherds contained bone and hematite inclusions; however, the bone-tempered sherds were not as thick or as coarsely tempered as Cooper Boneware. Very few coarse sandy paste sherds were recovered, and no obvious LMV ceramics were found. Approximately 13 percent were decorated, a rather high number when compared to contemporaneous sites (Perttula and Nelson 2004:159). Radiocarbon dates indicated that the site may have been occupied between ca. A.D. 120 and 800 by Woodland peoples (Perttula and Nelson 2004:38).

The variations in ceramic assemblages and other site differences suggest that a distinct cultural pattern existed in the Mill Creek Culture area of East Texas. Sorting out its spatial and temporal implications will take consistent and detailed analyses of ceramic attributes from well excavated ceramic-bearing Woodland sites. Toward this end, the remainder of this article presents the results of a detailed comparison of the ceramic assemblages found at four key sites located within the Sabine River drainage and the Mill Creek Culture area (see Figure 1): the Hawkwind (41HS915), Resch (41HS16), Folly (41RK26), and the Herman Ballew (41RK222) sites. These sites have all been the focus of extensive archeological excavations and their distinctive assemblage variations set them apart from similarly aged sites in the Fourche Maline and Mossy Grove areas (Ellis et al. 2012; Webb et al. 1969, Jarvis 1972; Rogers et al. 2001). All are located in the middle Sabine basin within a 40-60 km radius of each other. Thus, they provide an excellent opportunity to not only compare early ceramic assemblages from known sites but to expand our database of technological and decorative attributes associated with Woodland period ceramics in East Texas.

Hawkwind (41HS915)

The Hawkwind site is located in the Potter's Creek floodplain, in south central Harrison County, Texas (see Figure 1). The site was identified in 2008, and testing (Abbott et al. 2009) and data recovery excavations (Ellis et al. 2012) were carried

out at the site in 2009. Although large numbers of fire-cracked rocks were recovered, no intact features were identified. The Woodland period ceramic assemblage was small (n=157 sherds). The primary goal of the work was to assess the site in terms of Woodland period adaptations in the middle Sabine River basin, and the analyses focused on the recovered ceramic and lithic assemblages. Radiocarbon dating of both carbonized organic material, the carbonized residue found on five sherds, and the bulk sherd dating of one other sherd indicate multiple occupations of the site. The artifacts and radiocarbon dates suggest that the primary occupations occurred during the Early to Late Woodland periods (between ca. 400 B.C. and A.D. 890) (Ellis et al. 2012).

Resch (41HS16)

The Resch site is also located on Potter's Creek, roughly 600 m to the northeast of the Hawkwind site. It occupies an area of "only a few acres" atop a terrace (Webb et al. 1969). While artifacts attested to various occupations between the Middle Archaic and Caddo periods, the Woodland period was particularly well represented. The investigations produced 1,541 sherds with a wide diversity of mostly Woodland ceramics, as well as ceramics closely resembling one or more of the LMV ceramic traditions. Radiocarbon dates range from 400 B.C. to A.D. 300, but the site's poor stratigraphic preservation precludes secure identification and dating of specific components.

Folly (41RK16)

The Folly site occupied two knolls overlooking Dry Creek in northeastern Rusk County (Jarvis 1972), approximately 35 km southwest of the Hawkwind site. In 1972, prior to the site's being flooded by Martin Lake, testing was conducted at the site. These investigations produced 26 ceramic sherds. Temper was highly variable among the recovered sherds, and Jarvis noted the similarity of pottery from this site with the ceramics recovered at the Resch site, with the presence of an unusual style of rim notching being present at both sites. Although no charcoal was recovered for radiocarbon dating, the small size of the assemblage and the types of artifacts recovered suggested a brief Woodland period occupation by a small group (Jarvis 1972).

Herman Ballew (41RK222)

Located on a toe slope above Mill Creek in Rusk County, the Herman Ballew site lies approximately 40 km west-southwest of the Hawkwind site. The site was subjected to data recovery investigations in 1993 and 1994 (Rogers et al. 2001). Paleoindian to Caddo artifacts and features were found, but the site also had a large Woodland component, which included the majority of the site's 225 ceramic sherds (Perttula 2001). Sixteen features were recorded, including burned rock scatters, rock-lined hearths, and storage or cooking pits (Rogers et al. 2001). Radiocarbon analysis dates the Woodland period occupations at Herman Ballew to between ca. 200 B.C. and A.D. 800, with ceramic sherds from pre- and post-A.D. 400 occupations (Perttula and Nelson 2004:159). These sherds are of a variety of pastes and tempers, much more similar to neighboring Mill Creek sites within the middle Sabine River basin than those found at sites associated with the Fourche Maline or Mossy Grove cultures (Perttula 2001).

COMPARATIVE ANALYSES OF FOUR WOODLAND PERIOD CERAMIC ASSEMBLAGES

As some of the best documented sites in the region, the Woodland ceramic assemblages found at the Hawkwind, Resch, Folly, and Herman Ballew sites provide an excellent opportunity to compare the ceramic attributes that characterize Woodland period ceramics by using technological attributes identified in previous regional analyses (Perttula 2001; Perttula and Nelson 2004; Schambach 1998, 2002; Webb et al. 1969). Interestingly, most of the characteristics initially recognized by Webb et al. (1969) in the analysis of the Resch site ceramic assemblage have remained important to the characterization of Woodland period ceramics.

To speak to a broad range of issues, an analysis must be comprehensive enough to capture the array of stylistic and technological diversity found on any one group of ceramics. In Woodland assemblages where plain wares predominate and in the absence of whole vessels or vessel sections large enough to discern typologically distinct decorative motifs, one way to distinguish subtle differences between relatively similar ceramics is to look at the technological variations found on individual sherds (see Lechtman 1977; Livingood 2007;

van der Leeuw 1984). Research indicates that for prehistoric potters, variations in key technological attributes such as temper, surface treatment, and thickness bear a direct relationship to the desired use of the pot (see Bronitsky 1986; Perttula 2000, 2009a, 2009b; Rice 1987; Winchell and Ellis 1991). Thus, the ceramics considered here were characterized according to a suite of key technological and, when possible, stylistic attributes. Each of these attributes provides information about the abstract (i.e., the technical knowledge) and the concrete (i.e., the raw materials) components of the pottery-making process, which in turn tells us something about the different choices made at various stages in that process. These differences, in turn, provide a basis for comparing the technological and stylistic variability of specific ceramic assemblages to the technological and stylistic variability found in other ceramic assemblages.

All sherds were examined under 20 X binocular magnification. The attributes recorded for each sherd in the analyzed samples included: (1) paste category (i.e., paste constituency and paste texture), (2) basic exterior and interior surface treatment, (3) exterior and interior decorative treatment, (4) forming attributes (including morphological class [i.e., body, base, or rim], rim diameter, and average thickness), and (5) firing environment (i.e., oxidizing or non-oxidizing). This information enables finer-grained typological and technological distinctions, which in turn allows a fuller characterization of the assemblage even in the absence of whole vessels and identifiable types, thereby providing a basis for placing the ceramics within a broader regional ceramic context. This analysis also draws on supporting evidence from other Woodland period ceramic-bearing sites in the region and the results of petrographic analysis and INAA.

The analysis began with the systematic analysis of the ceramic sherds recovered at the Hawkwind site. Next, employing the same suite of attributes used to characterize the Hawkwind ceramics, a sample of the ceramics recovered at the Resch site and the entire Folly site ceramic assemblage were reanalyzed, thus enabling comparability of the ceramic attributes associated with all three sites. This data, along with Perttula's (2001) detailed analysis of the ceramics from the Herman Ballew site, assured that the ceramic assemblages from four of the major middle Sabine River basin sites were examined in a similar manner, therefore enabling a more accurate comparative analysis of the ceramics recovered from each site.

Following analysis at the macro-scale of all sherds, 17 sherds from the Resch site and two sherds from the Folly site were selected for INAA and petrographic analysis. Ceramic petrography compares the mineral suites, paste characteristics, and inclusions for similarities, while INAA is useful in further identifying elemental compositions and possible shared clay source areas. With this in mind, a raw clay sample collected 400 m southwest of the Resch site was also submitted for petrographic analysis and INAA.

The sherd samples from the Resch and Folly sites were chosen on the basis of their similarity to sherds recovered from the Hawkwind and the Herman Ballew sites (e.g., similarities in paste, rim attributes, and decorative attributes). A representative sample of sherds (n=20) from the Hawkwind site was also submitted for ceramic petrography and INAA. Analyses of the 39 sherds and one clay sample from these three sites provide a comprehensive baseline database for Woodland ceramics in East Texas.

Hawkwind Site (41HS915) Ceramic Assemblage

Analysis of the 157 ceramic sherds from the site involved an initial sort of all the sherds in the assemblage in order to identify those that could be conjoined or confidently be determined to be part of the same vessel (i.e., fitters). Identifications were made on the basis of similarity in paste, decorative motifs, and/or distinctive surface modifications. When fitters were identified, they were treated as single sherds for purposes of analysis. Treating conjoined sherds as single sherds avoids skewing the analysis toward attributes overrepresented by multiple fragments of a single vessel. After the 36 fitter sherds were identified, all undecorated body sherds less than 2 cm in diameter were culled (n=29), leaving 92 sherds in the analyzed sample. These 92 sherds include 10 rim sherds, 65 body sherds, 11 lower body sherds, five bases, and one possible flange fragment from a boat-shaped bowl or possibly even an effigy vessel.

Paste textures and paste constituencies among the Hawkwind ceramics are highly variable, reflecting the same "disconcerting diversity" first observed by Webb (Webb et al. 1969) at the Resch site. Four categories of paste texture were

identified, and six major paste groups were identified, with group designation based on whether or not the paste fabric contained (1) non-tempered sandy pastes, (2) tempered sandy clays, (3) only clay/grog, (4) only bone, (5) both bone and clay/grog, or (6) only shell. Within each primary paste group, subgroups were defined on the basis of predominant grain size and any additional tempering agents observed in the paste fabric.

The specific textural categories were established on the basis of two criteria: (1) overall arrangement and orientation of the grains observed in the paste fabric, and (2) the presence or absence of any intervening pores or voids. Observations about the textural aspects of a sherd's general morphology and overall configuration provide information on the extent to which the clay was manipulated during paste preparation (e.g., wedging, kneading) and primary forming (e.g., the fusion of coil joints). In addition, variability of paste texture is also influenced by the amount, shape, and size of non-plastic inclusions and the manufacturing techniques employed by the potter during primary forming (Shepard 1976:117–120). Some additives are used in their natural state (i.e., coarse sand) and others (i.e., sherds, bone, shell) are ground, crushed, or pulverized. Some materials break into relatively uniform grain size or natural planes (i.e., disintegrated sandstone or shell) while other materials have no natural planes or cleavage (i.e., sherds or bone) to determine the size of the particles that will be formed. Thus, paste texture is directly related to the type of added or naturally occurring inclusion found in the paste, and the potter's method of paste preparation.

In all, four categories of paste texture are represented at the Hawkwind site. Fine pastes have small, closely spaced irregularities across the face of the cross-section. The irregularities are generally due to the presence of larger than average sand grains, small chunks of hematite, or carbonized pieces of vegetal material; however, the overall appearance of the paste fabric is still relatively uniform, and rarely are coil junctures visible. Only one of the analyzed sherds has a fine paste texture, and it occurred on one of the non-tempered sherds. Irregular paste textures have large, widely-spaced irregularities such as hematite nodules, occasional coarse-sized sand grains, and small gravels, crushed charcoal fragments, or burned-out chaffs of vegetal material. The paste fabric appears uneven, and the coil junctures are sometimes visible. Twenty-three percent of the sherds have paste textures that appear irregular in cross-section. Blocky pastes have textures that are similar to those classified as irregular except that the irregularities are larger and the paste fabric appears even more uneven. Coil junctures are often visible and loosely consolidated due to the large inclusions. Ten sherds (11 percent) have paste textures that appear blocky in cross section. Laminated pastes have a stepped or platy look. In cross-section, the relatively straight lamina are oriented at an oblique angle rather than being parallel or perpendicular to the sherd surface. Coil junctures usually appear beveled. The direction of the lamina, as well as the alignment of the coil junctures, provides information about forming techniques. For example, when laminas are angled toward the interior, this suggests that scraping was done in an upward motion on the exterior of the vessel and in a downward motion on the interior. By far, the largest number of sherds (65 percent) have pastes textures that appear laminated in cross-section.

Thus, if the various textural categories represent locations on a continuum that moves from loosely worked clay (i.e., contorted) to more thoroughly worked clay (i.e., fine), then the preponderance of the Hawkwind sherds fall toward the loosely worked end of the continuum. These textural differences also suggest the variable use of different "paste recipes" (see Ellis and Ensor 1998; L. Ellis and G. Ellis 1996a, 1996b; Livingood 2007; Winchell and Ellis 1991) in that different "recipes" require different aplastic inclusions be added to the paste, which in turn affects the manipulation of the basic clay fabric during primary forming. In effect, the larger the inclusions, the more difficult it is to work the clay and achieve a more consistent paste fabric. Conversely, silty sand with finely crushed inclusions allows for better working of the basic paste fabric, thereby enabling the potter to produce a finer-textured paste fabric.

Paste constituency was obtained by the microscopic examination of a freshly broken cross section of each sherd. Analyses revealed that the basic paste fabrics of the Hawkwind ceramics began with non-tempered, fine sandy-to-silty clays to which a range of tempering agents had been added. These tempering agents occurred as single additives or in combinations of additives that included one or more of the following: clay/grog, bone, shell, discontinuously larger-sized sand grains, crushed hematite, and/or crushed charcoal or other organic

material. Six primary paste groups were identified, with group designation based on whether or not the paste fabric contained (1) non-tempered sandy pastes, (2) tempered sandy clays, (3) only clay/grog, (4) only bone, (5) both bone-and-clay/grog, or (6) only shell. Within each primary paste group, subgroups were defined on the basis of predominant grain size and any additional tempering agents observed in the paste fabric.

Paste Group 1 (PG1) includes only 4 percent of the analyzed sherds. The sherds consist of a relatively heterogeneous blend of untempered sands. One sherd with a paste fabric consisting primarily of fine-sized sands was assigned to PG 1a. Three sherds whose basic paste fabric consists primarily of very fine-sized sands were assigned to PG 1b. All four sherds have laminated paste textures.

PG2 includes four tempered sherds that were assigned to two subgroups. Subgroup PG 2a includes two sherds with very fine sandy pastes that had been tempered with crushed hematite. Both of these sherds stand out from the rest of the collection in that they have decorative elements that resemble one or another of the LMV types. Specimen 80.6 is a rim sherd with a laminated paste texture that resembles the type Marksville Incised, *var. Yokena* (Figure 2b), and specimen 83.3 has a fine paste texture and appears to be a local variant of a Marksville type (see Figure 2c).

Subgroup 2b includes two sherds with laminated paste textures whose paste fabric is composed of predominantly silt-sized particles that had been tempered with crushed hematite. Lot 74.1 (see Figure 2a) is a small, untyped decorated body sherd. Specimen 113.1 is unusual as it appears to be a flange fragment from a boat-shaped bowl or effigy vessel.

The paste matrix of the sherds assigned to PG 3, 4, 5, and 6 also contain large amounts of natural sand inclusions; however, the paste fabric of the sherds assigned to these four paste groups had been tempered with a variety of non-plastic inclusions such as clay/grog, bone, shell, crushed hematite, charred organic material, and/or larger-sized sand grains. The presence of clay/grog, bone-and-clay/grog, bone, or shell served as the main criteria for group membership.

PG 3 is clay/grog-tempered. This paste category denotes a paste that includes detectable amounts of clay/grog (i.e., raw clay/crushed sherds). Often the terms "clay-tempered" and "grog-tempered" are used interchangeably to describe ceramics to which "clay-like" inclusions had been added to the basic paste fabric; however, there are subtle distinctions between the two in that "clay-tempered" generally implies the mixing of different types of unfired clay lumps, whereas "grog-tempered" implies the addition of fragments of fired sherds. At the Hawkwind site, both types of inclusions were observed. In some sherds, grog is recognizable as relatively angular fragments that stand out from the surrounding paste matrix. The fragments can be recognized by their distinct texture, lineations, and/or surface variability that are oriented differently than the overall paste matrix. In other sherds, the inclusions appear as rounded clay lumps that often differ in color and texture from the surrounding paste matrix. Their differential presence denotes the mixing of multiple clays or the addition of lumps of dried clay during primary forming, which points to the "intentional" blending of clays to achieve a particular consistency. There are, in fact, ethnographic examples of potters who mix two parts of relatively coarse clays "tempered" with one part finer clay (Rye and Evans 1976:20). Such mixing of clays occurs more often in areas where large deposits of relatively coarse residual clays are common (Bishop et. al. 1982:317). While some researchers suggest that these rounded clay lumps result from carelessness in grinding and sifting of the clay during primary forming rather than being intentional additions to the paste (see Weaver 1963), Rice (1987:408) makes a valid point when she notes that whether the potter consciously chose to modify the properties of the clay by adding specific tempering agents (or in this case mixing different clays), simply adding them to the overall clay matrix clearly modifies the original clay's workability, drying, firing, and use-related properties. Thus, regardless of how the additives came to be in the paste matrix, "temper" has a quantitative implication simply because it is present in sufficient amount(s) to modify the properties of the clay matrix. Therefore, given the general characteristics of the ceramics with clay lump inclusions and the frequency with which they occur, these ceramics are considered to be tempered. Since both clay lumps and grog often occur in the same sherd, the term clay/grog is used to denote the presence of fired or unfired clay and/or grog in the paste.

PG3 includes 32 sherds. The largest number (n=30) of those have clay/grog paste constituencies to which varying combinations of crushed hematite, discontinuously larger-sized sand grains, and/or charred organic material had also been added.

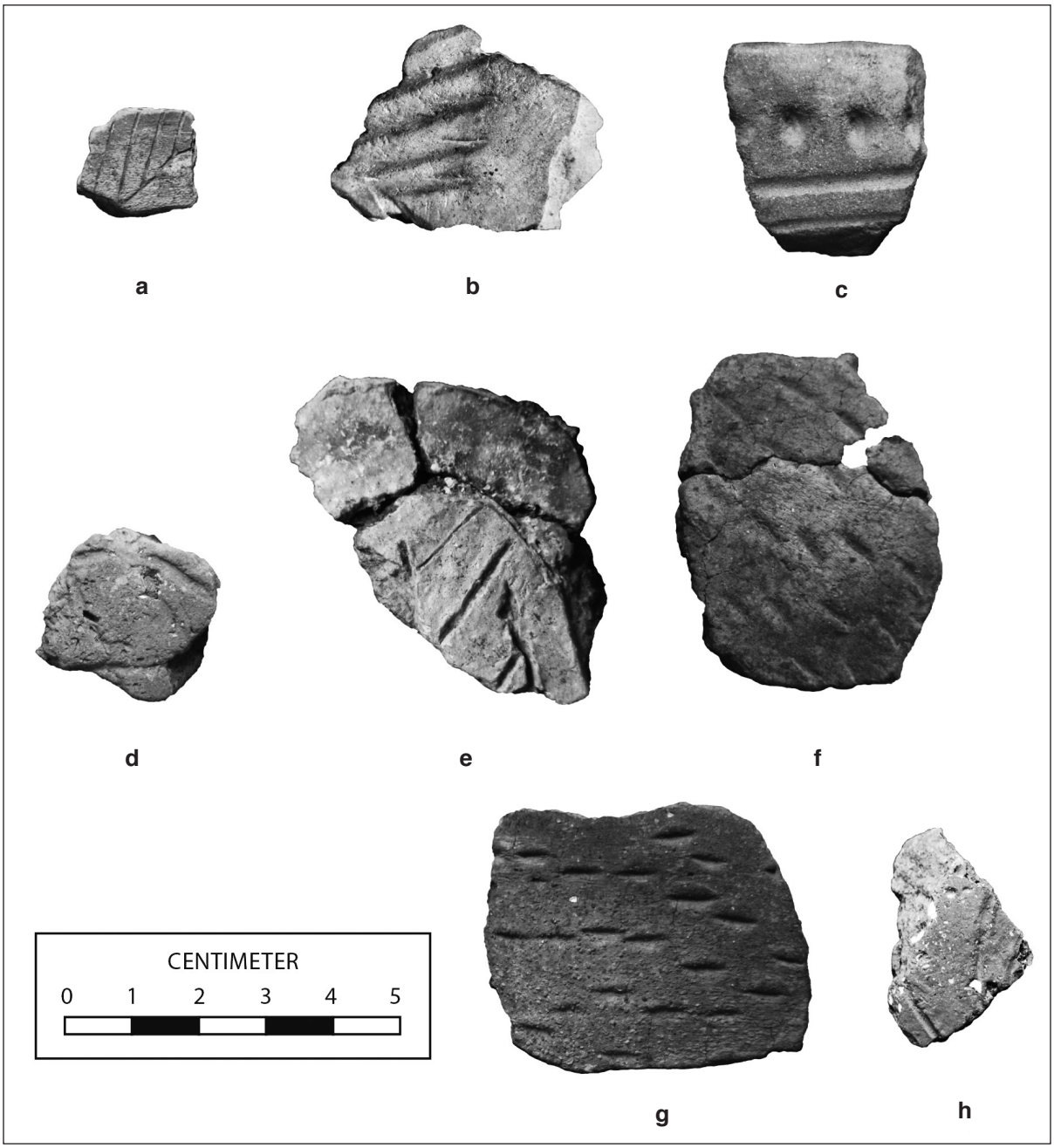

Figure 2. Hawkwind site (41HS915) decorated ceramics: a, body sherd with fine line incisions; b, body sherd with broad line incisions, cf. Marksville Incised, *var. Yokena;* c, cf. Marksville rim sherd with broad line incisions and shallow tool punctations; d, body sherd with broad line incisions and a row of partial punctations along one broken edge, cf. Churupa Punctated; e, body sherd with broad line incisions, cf. Marksville Incised, *var. Yokena;* f-g, body sherds with fingernail punctations; h, body sherd with three widely spaced broad, curved lines.

Three subgroups were defined. PG3a (n=3) has clay/grog embedded in a paste matrix that consists primarily of very fine sand. PG3b includes 28 sherds whose basic paste fabrics consist primarily of silt-sized particles, and the one sherd assigned to PG3c has a clay paste. Further subdivisions were made based on the variety of additional tempering agents (i.e., crushed hematite, discontinuously larger-sized sand grains, and/or charred organic material) observed in the paste. In all,

eight different combinations of tempering agents were noted. Paste textures among the clay/grog-tempered sherds varied somewhat. Although the majority have paste fabrics that appear laminated in cross section (52 percent), sherds with irregular paste textures are relatively common (30 percent). Six sherds have blocky textures.

PG 4 is bone and clay/grog-tempered. PG4 (n=20) includes sherds that had been tempered with both bone and clay/grog. Based on the predominant grain size observed in the basic paste fabric, three subgroups were defined. PG4a (n=5) contains bone and clay/grog embedded in a paste matrix composed predominantly of fine-sized sand. The paste fabric of the sherds assigned to PG4b (n=8) contains primarily very fine-sized sand, and PG4c (n=7) includes sherds whose paste matrices are composed primarily of silt-size particles. Again, a variety of other tempering agents, such as crushed hematite, coarse-sized sand grains, and/or charred organic material, had also been added to the paste matrix. In all, 11 different combinations of tempering agents were found in PG4. Paste textures among the clay/grog-tempered sherds were fairly equally distributed between those with irregular pastes (n=9) and those with laminated pastes (n=8). Three sherds exhibit blocky paste textures.

PG 5 is bone-tempered. PG5 includes 30 sherds tempered with bone. Three subgroups were identified, with membership in the subgroups again being defined on the basis of the predominant grain size observed in the paste fabric. PG5a (n=13) includes sherds in which the bone temper was embedded in a paste matrix composed predominantly of fine sand. PG5b (n=15) are sherds whose basic paste fabric consists primarily of very fine sand, and PG5c includes two sherds whose paste matrix contain primarily silt-sized particles. In addition to the bone inclusions, 47 percent of the sherds in this paste group also contain discontinuously larger-sized sand grains or crushed hematite. In all, eight different combinations of tempering agents were observed. Paste textures among the bone-tempered sherds are overwhelmingly laminated in cross section (n=27). Two sherds have irregular paste textures, and one has a blocky paste texture.

PG 6 is shell-tempered[1]. PG6 includes two sherds. In both sherds, the shell is embedded in a paste matrix of primarily silt-sized particles. No additional tempering agents had been used. Both sherds appear laminated in cross section.

A closer look at the distribution of paste textures across paste groups suggests that there are distributional differences associated with different paste groups (Figure 3). While the majority of the sherds in PG5 have laminated paste textures, irregular and blocky paste textures are proportionately greater among the clay/grog-tempered

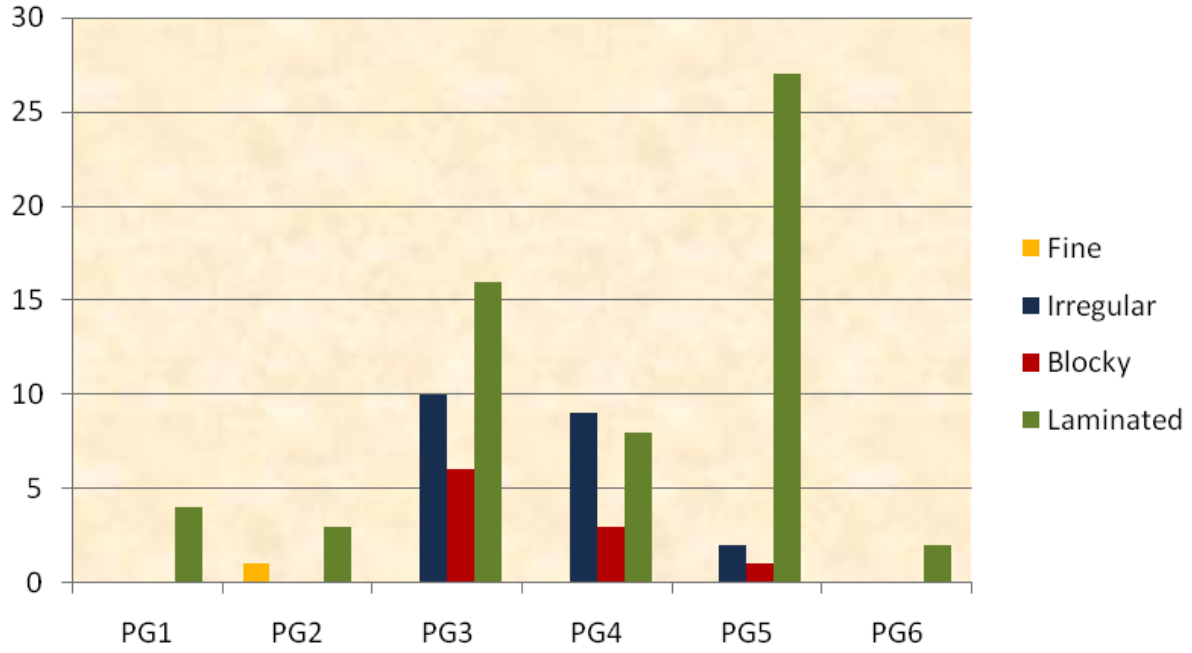

Figure 3. Distribution of paste textures across paste groups at the Hawkwind site.

sherds (PG3), and among the bone-and-clay/grog-tempered sherds (PG4). The sherds with irregular paste textures slightly outnumber those with laminated textures.

In summary, paste textures and paste constituencies among the Hawkwind ceramics are highly variable. Six major paste groups were identified, with 32 different combinations of tempering agents having been used to manufacture the vessels found at the site. The high variability noted in paste constituencies and paste textures indicate that several different paste preparation and/or fabricating techniques had been used to manufacture vessels.

Among the 77 sherds with recognizable exterior surfaces, surface finish seems fairly equally distributed between floated/unburnished (n=39) and dry-smoothed/unburnished (n=36). Two sherds have dry-smoothed/burnished exteriors. By contrast, the majority of interior surfaces are dry-smoothed/unburnished (50 percent), and one sherd is dry-smoothed/burnished. Twenty-seven sherds (29 percent) have floated/unburnished exterior surfaces, and one sherd has a red-floated interior surface.

Overall, burnishing was not a preferred technique at the Hawkwind site as only three sherds had been burnished. Burnishing is a finishing technique that requires a great deal of effort and is affected by factors such as the properties of the clay, the mechanical operations of the burnishing technique itself, and firing. Ethnographic evidence also indicates that burnishing was often done in stages: (1) initial burnishing with one hard tool, and (2) a finer burnishing with a different hard tool (Dietler and Herbich 1989). Thus, it may be that any functional significance or aesthetic appeal these surfaces may have had was not enough to outweigh the extra effort. Or, it may be that attempts at burnishing were more cursory. Thus, any surface luster produced during the attempt was simply lost during the firing process.

Although dry-smoothed and floated exterior surfaces are fairly equally distributed across the sherd sample, there appear to be distinct preferences for one technique over the other when looking at particular paste groups (Figure 4). Dry-smoothed exterior surfaces are more common to the clay/grog-tempered sherds (PG3), and this surface finish occurs somewhat more frequently on the bone-and-clay/grog-tempered sherds (PG4). However, floated surfaces are much more common on sherds that contain only bone temper. In addition, dry-smoothed burnished surfaces only occur on grog-tempered sherds, and red floated surfaces only occur on those sherds that contain bone (PG5) and/or clay/grog and bone (PG4) temper. Floated surfaces also appear to be the favored surface finish among the non-tempered sandy paste (PG1) and sand-tempered (PG2) sherds. This same correlation was also noted by Webb et al. (1969:21) among the

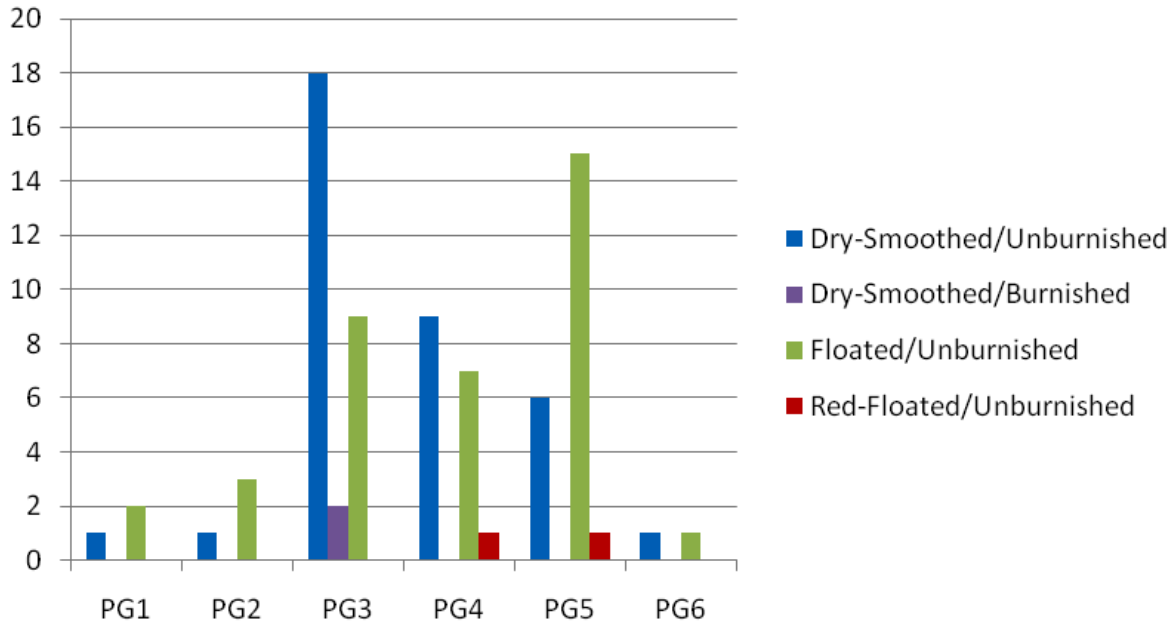

Figure 4. Distribution of basic exterior surface treatment modes across paste groups at the Hawkwind site.

sandy paste sherds found at the Resch site. Thus, this association does hint at some meaningful differences in the distribution of the various surface treatment modes.

Nine percent of the sherds recovered at the Hawkwind site are decorated (see Figure 2), and all involved techniques that displaced or penetrated their surfaces. All but one of the decorated ceramics are body sherds. One body sherd has a series of narrow lines that intersect a diagonal line (see Figure 2a). Two body sherds have fields of closely spaced fingernail punctations (see Figure 2f-g). None of the three are typologically distinct.

Four body sherds exhibit broad U-shaped lines. One small body sherd has two opposing curved lines and what appear to be the remnants of small punctations along one of the broken edges (see Figure 2d). Although the sherd is small, its design elements suggest that it may be a local variant of the type Churupa Punctated. The broad U-shaped designs on the remaining three sherds appear to be local variants of one or another of the Marksville types. One sherd has four closely spaced lines that intersect the remnants of a diagonal line (see Figure 2b). This sherd resembles Marksville Incised, *var. Yokena*. The second specimen (see Figure 2e) has what appears to be a modified triangle motif executed on a wet paste. Bulk sherd organics in this sherd dated it to a calibrated 2-sigma age range of A.D. 390-540. Specimen 142.1 has remnants of two widely spaced curved lines executed on a leather-hard paste (see Figure 2h). The only decorated rim recovered from the site exhibits a design motif that is reminiscent of LMV Marksville types (see Figure 2c). The broad U-shaped design elements observed on the Hawkwind sherds, as well as the low percentage (9 percent) of decorated sherds are both consistent with other Woodland period sites in the region (Perttula and Nelson 2004; Rogers et al. 2001; Webb et al. 1969).

In general, thicknesses are highly variable both within the same sherd, as well as among different sherds in the sample. The body sherds range in thickness from 5.3-11.1 millimeters (mm), with an average thickness of 7.5 ± 1.1 mm. Comparing the average thickness of the plain body sherds (7.5 ± 1.1) to the average thickness of the decorated rims (7.4 ± 1.4), the decorated body sherds are somewhat thinner and exhibit a higher standard deviation, while the mean thickness of both the plain and decorated rims is virtually the same at one and two standard deviations. There are, however, some noticeable differences in the average thickness of body sherds associated with particular paste groups (Table 1). Since the thickness of the vessel wall is directly related to the intended appearance and function of the vessel (see Rice 1987:227–228), it may be that the bone-and-clay/grog-tempered wares may have served a different function(s) than those tempered only with bone or only with clay/grog. This same pattern was also observed at the Resch site where sherds having only bone temper were the thickest and those with clay/grog temper were the thinnest (Webb et al. 1969:19). This supports the use of different "paste recipes" and strengthens the argument that there may be some functional difference between the vessels associated with these three paste groups.

The base fragments are also highly variable, ranging in thickness from 8.2-13.3 mm, with an average thickness of 11.3 ± 1.9 mm. Most appear to have been rounded or rounded flat, with no abrupt change in contour. The average thickness of the lower body sherds (10.0 ± 0.6 mm) is thinner and exhibits a lower standard deviation than the bases. However, it is not unexpected that the lower body sherds would be somewhat thinner than the bases, but definitely thicker than the body sherds.

The overall rim characters of the 10 rim sherds indicate that the vessels in use at the Hawkwind

Table 1. Thickness attributes for body sherds in the major paste groups* from the Hawkwind site.

	Mean Thickness (mm)	Maximum Thickness (mm)	Minimum Thickness (mm)	Standard Deviation (mm)
PG3—Body Sherds	6.8	8.5	5.3	0.95
PG4—Body Sherds	7.6	9.2	6.6	0.76
PG5—Body Sherds	8.3	11.1	6.6	0.91

*PG1, PG2, and PG6 not included due to the small number of sherds in each category.

site were fairly simple straight-walled bowls or jars. This is reflected in the fact that the majority of rims (n=8) were direct in profile, having been carried to the lip edge with no significant change in orientation. Lip profiles are however, highly variable. None of the lip edges had been decorated. Since the only distinctive feature of a direct rim is the lip, the variability in the rounding and flattening of lip profiles suggests some functional distinctions between the vessels. If the overall vessel shape is controlled by the need for containers that serve particular purposes (Shepard 1976:344), then the vessels at the Hawkwind site appear to include a narrow range of small to medium-sized simple vessels that given their highly variable lip edges served a broad range of functions.

At the Hawkwind site, the general variation in color development observed on sherd surfaces and paste cores clustered more toward the darker end of the color spectrum. This firing pattern indicates that most of the vessels found at the site were fired in less-controlled atmospheres with insufficient or reduced amounts of oxygen. This could have resulted from several factors such as: (1) the firing temperature being too low, (2) the maximum temperature not being sustained long enough, (3) the firing atmosphere having insufficient oxygen, or (4) some combination of all three variables.

Table 2. Morphological classes in the reanalyzed ceramic sample from the Resch site.

Morphological Class	N
Plain body	30
Decorated body	20
Base	14
Plain lower body	15
Plain upper body/near rim	2
Plain rim sherd	68
Decorated Rim	12
Total	161

Table 3. Count and percent of paste textures at the Resch site.

Paste Texture	N	Percentage
Irregular	24	14.9
Blocky	23	14.3
Laminated	93	57.8
Curvilinear	11	6.8
Contorted	10	6.2
Total	161	100.0

RESCH SITE (41HS16) CERAMIC ASSEMBLAGE

The Resch site ceramic assemblage includes a total of 1,541 sherds, and roughly 10 percent (n=161) of the Woodland period ceramics recovered were reanalyzed. The sample included a selection of plain rim sherds, bases, and decorated sherds (Table 2). A grab bag approach was taken when choosing the sample of plain body sherds from the various paste categories. Examination of the 161 sherds in the analyzed sample followed the ceramic methods outlined above.

Each of the 161 sherds in the analyzed sample was assigned to a paste category according to the general character of its fired clay fabric. Analyses revealed the presence of five categories of paste texture in the reanalyzed sample (Table 3). This diverse array of textures ranges from loosely worked (i.e., contorted) to fairly well worked (i.e., irregular); however, the majority cluster toward the loosely worked end of the spectrum, with 71 percent of the sample being either laminated, curvilinear, or contorted.

Microscopic examination of each sherd also identified five paste groups. The presence or absence of specific sets of tempering agents determined group membership.

The one sherd assigned to Paste Group (PG)1 had been manufactured with a heterogeneous mixture of sand that is predominantly in the very fine size range, containing no additional tempering agents. Due to the relatively uneven mixing of the sands, its paste texture appears irregular in cross section.

PG 2 includes nine tempered sandy paste sherds. Three subgroups were identified. PG2a includes two sherds whose basic paste fabrics contain primarily sand in the very fine size range, both of which had been tempered with crushed hematite. One has a laminated paste texture, and one has an irregular paste texture. Subgroup PG2b includes six sherds whose paste fabric is composed of

predominantly silt-sized particles to which crushed hematite, coarse-sized sand, and/or charred organic material had been added. Paste textures varied from irregular (n=1) to laminated (n=3) to curvilinear (n=2). One sherd was assigned to subgroup PG2c. The basic paste fabric of this sherd is composed primarily of silty clay tempered with fine-sized sand. It has a loosely consolidated paste fabric that appears laminated in cross section.

The paste matrix of the remaining sherds assigned to PG 3, 4, 5, and 6 also contain large amounts of natural sand inclusions; however, the paste fabric of the sherds in these four paste groups had been tempered with a variety of inclusions such as clay/grog, bone, shell, crushed hematite, charred organic material, and/or discontinuously larger-sized sand grains. The presence of only clay/grog, only bone-and-clay/grog, or only bone served as the main criteria for group membership.

PG 3 at the Resch site is clay/grog-tempered. This paste category includes detectable amounts of clay/grog (i.e., clay lumps and/or crushed potsherds). Both types of inclusions were observed in the paste fabric. In some sherds, grog is recognizable as relatively angular fragments that stand out from the surrounding paste matrix. The fragments can be recognized by their distinct texture, lineations, and/or surface variability that are oriented differently than the overall paste matrix. In other sherds, the inclusions appear as rounded clay lumps that often differ in color and texture from the surrounding paste matrix.

PG3 includes 68 sherds. Three subgroups were defined. PG3a includes two sherds with clay/grog embedded in a paste matrix consisting primarily of fine sand. PG3b includes 13 sherds whose basic paste fabrics consist primarily of very fine sand. The sherds assigned to PG3c include those whose basic paste fabrics are composed primarily of silt-sized particles. Further subdivisions were made based on the variety of additional tempering agents (i.e., crushed hematite, discontinuously larger-sized sand grains, and/or charred organic material) observed in the paste. In all, 10 different combinations of tempering agents were noted.

Paste textures among the clay/grog-tempered sherds also varied considerably. The majority have paste fabrics that appear laminated in cross section (n=35). Sherds with irregular (n=13) and blocky (n=13) paste textures are the next most common. Four sherds appear curvilinear in cross section, and three sherds have contorted paste textures.

PG 4 (n=35) includes sherds that had been tempered with both bone and clay/grog. Based on the predominant grain size observed in the basic paste fabric, two subgroups were defined. PG4a (n=8) contains bone and clay/grog embedded in a paste matrix composed predominantly of very fine-sized sand. The paste fabric of the sherds assigned to PG4b (n=27) contain primarily silt-sized particles. Again, a variety of other tempering agents, such as crushed hematite, coarse-sized sand grains, and/or charred organic material, had also been added to the paste matrix. In all, eight different combinations of tempering agents were observed among the sherds assigned to PG4.

Paste textures among the bone- and clay/grog-tempered sherds are quite varied and include all texture types. Sherds with laminated paste textures (n=18) are the most prevalent. Sherds with blocky (n=8) and irregular (n=4) paste textures are the next most common. Curvilinear (n=2) and contorted (n=3) textures were also observed.

PG 5 includes 48 sherds that had been tempered with bone. Four subgroups were identified, with membership in the subgroups again being defined on the basis of the predominant grain size observed in the paste fabric. PG5a (n=7) includes sherds in which the bone temper was embedded in a paste matrix composed predominantly of fine-sized sand. PG5b (n=12) includes sherds whose basic paste fabric consists primarily of very fine sand. PG5c (n=27) includes sherds whose paste matrix consists primarily of silt-sized particles. PG5d (n=2) includes sherds with a paste matrix consisting primarily of silty-clay paste. In addition to the bone inclusions, 44 percent of the sherds in this paste group also contain discontinuously larger-sized sand grains, charred organic material, and/or crushed hematite. In all, 12 different combinations of tempering agents were observed. Paste textures among the bone-tempered sherds are overwhelmingly laminated in cross section (n=35); however, all texture types were observed. Four sherds have irregular paste textures, and two sherds have blocky paste textures. Curvilinear (n=3) and contorted (n=4) paste textures were also observed.

In summary, both paste textures and paste constituencies are highly variable. Five major paste groups were identified among the reanalyzed sample of sherds, with at least 35 different combinations of tempering agents used to manufacture the vessels at the site. Five different paste textures were identified. While the overwhelming majority

of textures appear laminated in cross section, the presence of multiple textures indicates that more than one paste preparation and/or fabricating technique was used to manufacture the vessels at the Resch site. Because different paste "recipes" require different aplastic inclusions be added to the paste, this affects the manipulation of the basic clay fabric during primary forming. A closer look at the distribution of paste textures across paste groups provides some evidence for this in that there are proportional differences in the paste textures associated with different paste groups (Figure 5).

While the majority of the sherds in PG3 and PG4 have laminated paste textures, irregular and blocky paste textures have a higher representation (38 percent and 34 percent, respectively) in these two paste groups than they do in PG5. By contrast, fully 73 percent of the sherds in PG4 were laminated, with the remaining 27 percent being fairly equally distributed across the remaining textures. Pastes containing clay/grog-temper (PG3) and bone-and-clay/grog-temper (PG4) are more thoroughly worked than the other paste groups. This may in part be due to the fact that a large percentage of the bone and/or grog used to temper the paste had been crushed, making it easier to work the clay and achieve a more consistent paste fabric.

Different "paste recipes" may also have functional and/or temporal implications. Since a large percentage of the bone used to temper the sherds in PG5 had also been crushed, the overwhelming majority of laminated paste textures associated with bone-tempered sherds suggests a more consistent manipulation of the clay during primary forming. If a vessel's porosity and permeability are directly related to the size, shape, and position of the pores, or voids, existing between the solid particles in the clay body (see Rice 1987), then the high frequency of bone-tempered sherds with laminated paste fabrics may represent vessels manufactured to serve some specific purpose. In any event, the highly variable paste constituencies and paste textures found in the reanalyzed sample indicate that several different paste preparation and/or fabricating techniques were used to manufacture vessels found at the Resch site. These findings mirror Webb et al.'s (1969) original assessment of the "disconcerting diversity" of the ceramics found at the site.

Basic surface treatment modes also varied. Visual inspection of sherds in the reanalyzed sample determined that five different techniques had been used to finish the surface of vessels found at the Resch site (Table 4). Among the sherds in the analyzed sample, 4 percent of the exterior surfaces and 12 percent of the interior surfaces are too weathered to accurately determine their surface finish.

Among the sherds with recognizable exterior surfaces, the majority of surfaces had been

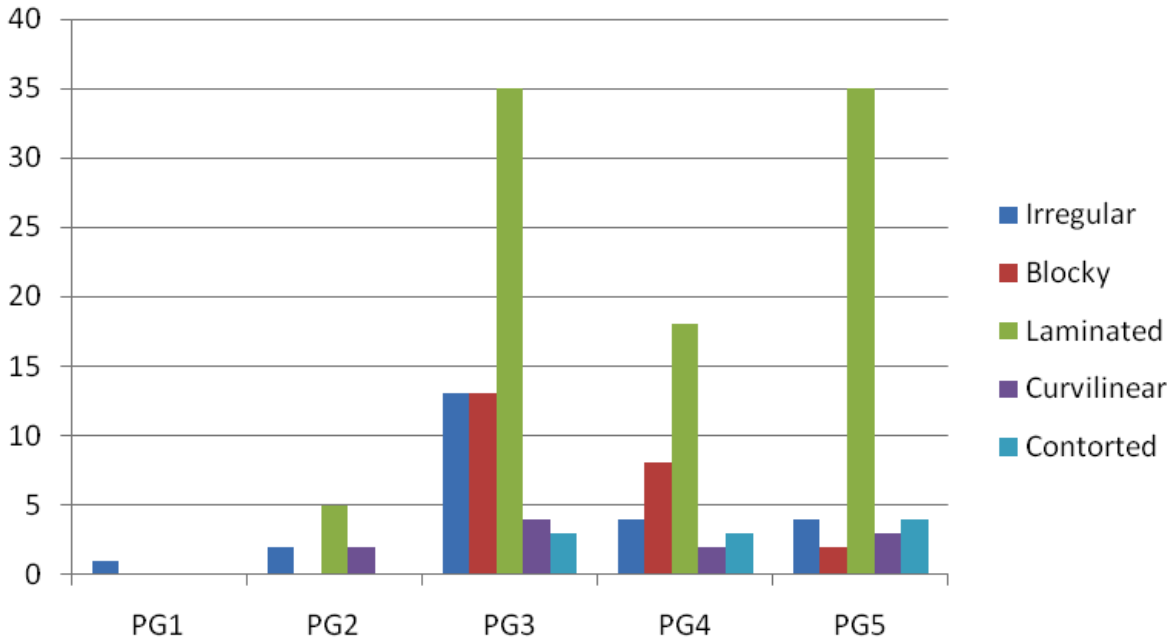

Figure 5. Paste textures associated with the five paste groups observed at the Resch site.

Table 4. Frequency and percent of exterior and interior surface finishes observed on the reanalyzed sample of sherds from the Resch site.

Basic Exterior Surface Finish	N	Percent	Basic Interior Surface Finish	N	Percent
Dry-Smoothed/ Unburnished	54	33.5	Dry-Smoothed/Unburnished	81	50.3
Dry-Smoothed/Burnished	33	20.5	Dry-Smoothed/Burnished	12	7.5
Floated/Unburnished	61	37.9	Floated/Unburnished	45	28.0
Floated/Burnished	5	3.1	Floated/Burnished	1	0.6
Red-Floated/Burnished	1	0.6	Red-Floated/Unburnished	2	1.2
Weathered	7	4.4	Weathered	20	12.4
Totals	161	100.0	Totals	161	100.0

dry-smoothed (54 percent), and the surfaces of 33 of those had also been burnished. The surfaces of 61 sherds had been floated, but left unburnished, while five sherds had been floated and then burnished. In finishing the surface of one reconstructed vessel section (Webb et al. 1969:Figure 7o), red pigment had been added to the water used to wet the surface during the floating process, resulting in a distinctive red-floated surface that had then been burnished.

The majority of interior surfaces had also been dry-smoothed (n=93); however, fewer of the interior surfaces had been burnished (7 percent). Forty-five sherds (28 percent) have floated/unburnished interior surfaces, and one sherd has a floated/burnished interior surface. Two sherds had red-floated/unburnished interior surfaces.

Although dry-smoothed surfaces are the most prevalent surface finish, their distribution varies disproportionately among paste groups (Figure 6). Among the clay/grog-tempered sherds (PG3) and the bone-tempered sherds (PG5), the split between dry-smoothed surfaces and floated surfaces are relatively equal. While among the bone-and-clay/grog-tempered sherds in PG4, dry-smoothed surfaces are roughly three times as prevalent as floated surfaces. By contrast, floated surface finishes are overwhelmingly preferred among the sand-tempered (PG2) sherds.

Just as different "paste recipes" have functional and/or temporal implications, it may be that particular surface treatment modes offer some functional advantage. The distribution of sherds

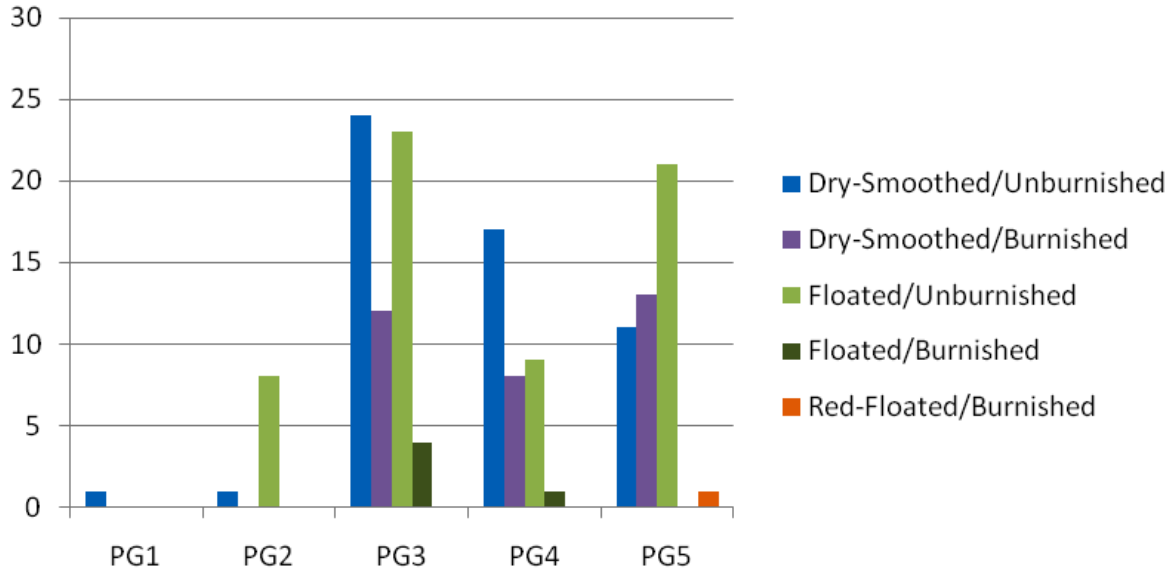

Figure 6. Distribution of basic exterior surface treatment modes across paste groups at the Resch site.

with dry-smoothed/burnished surfaces hints at this. While dry-smoothed surfaces are differentially distributed across paste groups, so too are dry-smoothed surfaces that had been burnished. This is especially true of the sherds in PG5, where the frequency of sherds with dry-smoothed/burnished surfaces actually outnumbers those whose dry-smoothed surfaces had been left unburnished. Since a vessel's porosity and permeability are directly related to the size, shape, and position of the pores, or voids, existing between the solid particles in the clay body, one way to influence or offset any adverse effects created by large inclusions in the paste fabric is to burnish the surface of the vessel. Because burnishing smoothes and compacts surface particles, this finishing technique not only helps to reduce permeability and porosity, but it also renders the vessel more serviceable by making its surface harder and more resistant to abrasion (Rice 1987:350–355). Thus, the higher frequency of sherds in PG5 that have dry-smoothed/burnished surfaces may be related to some specific function that bone-tempered vessels served. This assumption also seems to support the earlier argument that the high frequency of bone-tempered sherds with laminated paste fabrics may represent vessels manufactured to serve some specific purpose because roughly half of the sherds in this category also have dry-smoothed/burnished surfaces.

Thus, it appears that different surface finishing modes are associated with different paste groups, and that these differences may be related to some functional differences among vessels manufactured with different tempering agents. Alternatively, difference in surface treatment modes may have temporal implications, as has been demonstrated at several sites in the Mossy Grove culture area (Ellis and Ensor 1998; Winchell and Ellis 1991).

Twenty percent (n=32) of the sherds in the reanalyzed sample from the Resch site are decorated. This relatively high percentage is a factor of the sampling strategy employed for this analysis as only 5.8 percent of the 1,541 sherds recovered at the Resch site were decorated (Webb et al. 1969). The inclusion of such a large percentage of decorated sherds in the reanalyzed sample does, however, provide a more representative sample of the decorative attributes associated with the Woodland period sherds found at the site.

The decorative elements on the 32 decorated sherds all involved techniques that displaced the surface (Figures 7-8). On 66 percent of those, decorative techniques involved the use of broad U-shaped line (Figure 7a, b, d-e, g, and i). On four sherds, broad lines had been used in combination with punctations (Figure 7c, f and Figure 8b). On another six sherds, punctations (n = 4) (see Figure 7k and Figure 8j) and pinched (n=2) (see Figure 8h) elements were the sole decorative elements. Decorative techniques executed on a wet paste were equally as common as those executed on leather-hard pastes.

Lip decoration was the sole decorative element on three rims. Two bone-tempered rims with rounded lip profiles have a series of fairly deep diagonal notches or tick-marked incisions cut into their lip edge (Figure 8e). The third rim, from a small bone-and-clay/grog-tempered bowl, has a crenellated lip edge (Figure 8i). On a fourth rim, decorative elements occur on both the rim and the upper body (see Figure 8a). This unusual direct rim has a flat lip edge with diagonal incisions crosscutting the lip edge, and is framed by a shallow, horizontal, incised line that encircles the rim immediately below the lip. Similar tick-marked and crenellated rims were found at the Folly site, and one direct/flat rim with lip notching was also recovered at the Herman Ballew site (Rogers et al. 2001:Appendix F). Lip notching is an attribute frequently found on Mossy Grove ceramics.

Thicknesses are highly variable both within the same sherd, as well as among different sherds in the reanalyzed sample, supporting the pattern observed by Webb et al. (1969:19) in their original analysis of the Resch site ceramic assemblage. The body sherds in the reanalyzed sample (n=50) range in thickness from 4.1-10.9 mm, with an average thickness of 8.0 ± 1.6 mm. When the average thickness of the plain body sherds (8.0 ± 1.6 mm) is compared to the average thickness of the decorated body sherds (8.0 ± 1.8 mm), there is only a very slight difference between the two.

The 15 lower body sherds were identified on the basis of their curvature and their proximity to the actual base (Figures 9-10). They range in thickness from 6.5-12.8 mm, with an average thickness of 9.6 ± 1.8 mm. Several of these represent large vessel sections illustrated and described in Webb et al. (1969) (Figure 9b-c). Among the 15 reanalyzed lower body sherds are three that Webb et al. (1969:32–33 and Figure 10b-c) classified as Tchefuncte Plain. However, examination of these sherds during reanalysis, their basic paste fabric and surface finish indicate that they more closely resemble the Tchefuncte types found in Mossy

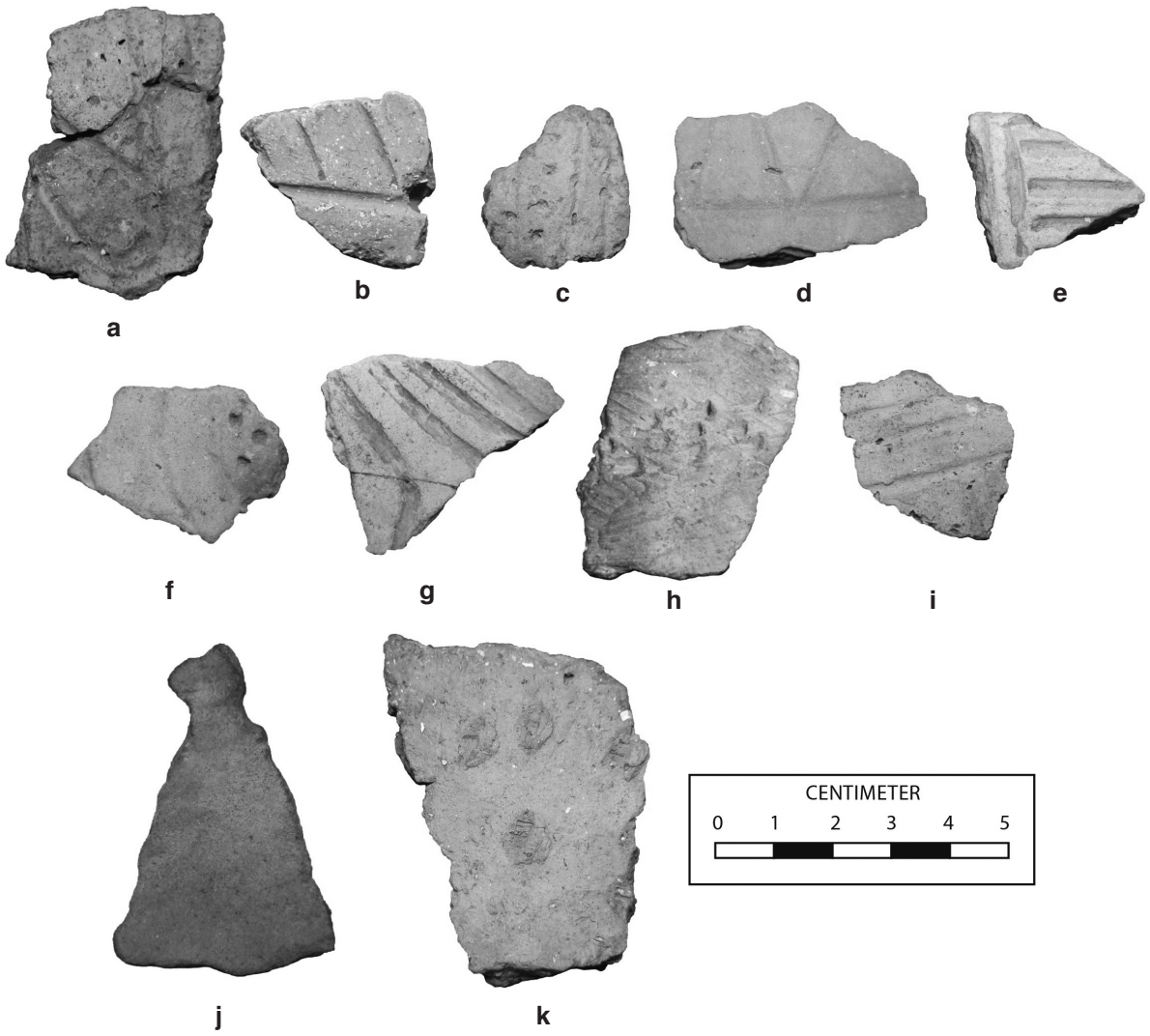

Figure 7. Decorated and modified sherds from the Resch site: a, body sherd with broad curved line incisions; b, body sherd with intersecting broad line incisions; c, body sherd with incised lines and punctations, cf. Churupa Punctated; d, body sherd with intersecting broad line incisions; e, body sherd with intersecting broad line incisions, cf. Marksville Incised, *var. Yokena;* f, body sherd with incised lines and punctations, cf. Churupa Punctated; g, body sherd with broad curved line incisions; h, shallow incised lines with "drag and jab" punctations; i, body sherd with broad line incisions; j, plain body sherd with side-by-side drill holes; k, body sherd with fingernail punctations.

Grove ceramics (Aten and Bollich 2011; Ellis and Ensor 1998; Winchell and Ellis 1991) (Figure 9d). There is one reconstructed lower body section (Figure 9c) that does seem closely related to the standard typological description of Tchefuncte. The sherd was not described or illustrated in Webb et al. (1969), but was reexamined in 2011. Its paste consists of grog and crushed hematite embedded in a silty paste, and the large voids in its contorted paste texture make it extremely light in weight. It had been fired in a high-oxygen environment, but perhaps its most telling attribute is an attached "teat-shaped" basal support. Thus, the presence of two technologically different Tchefuncte-like sherds at this site suggests the presence of two distinctive early ceramic traditions, each with their own version of Tchefuncte ceramics.

The 14 reanalyzed bases are highly variable, with thicknesses ranging from 4.4-19.9 mm, with an average thickness of 12.0 ± 4.3 mm. This variability was due to the range of basal forms present at the site (Webb et al. 1969:26–27 and Figure

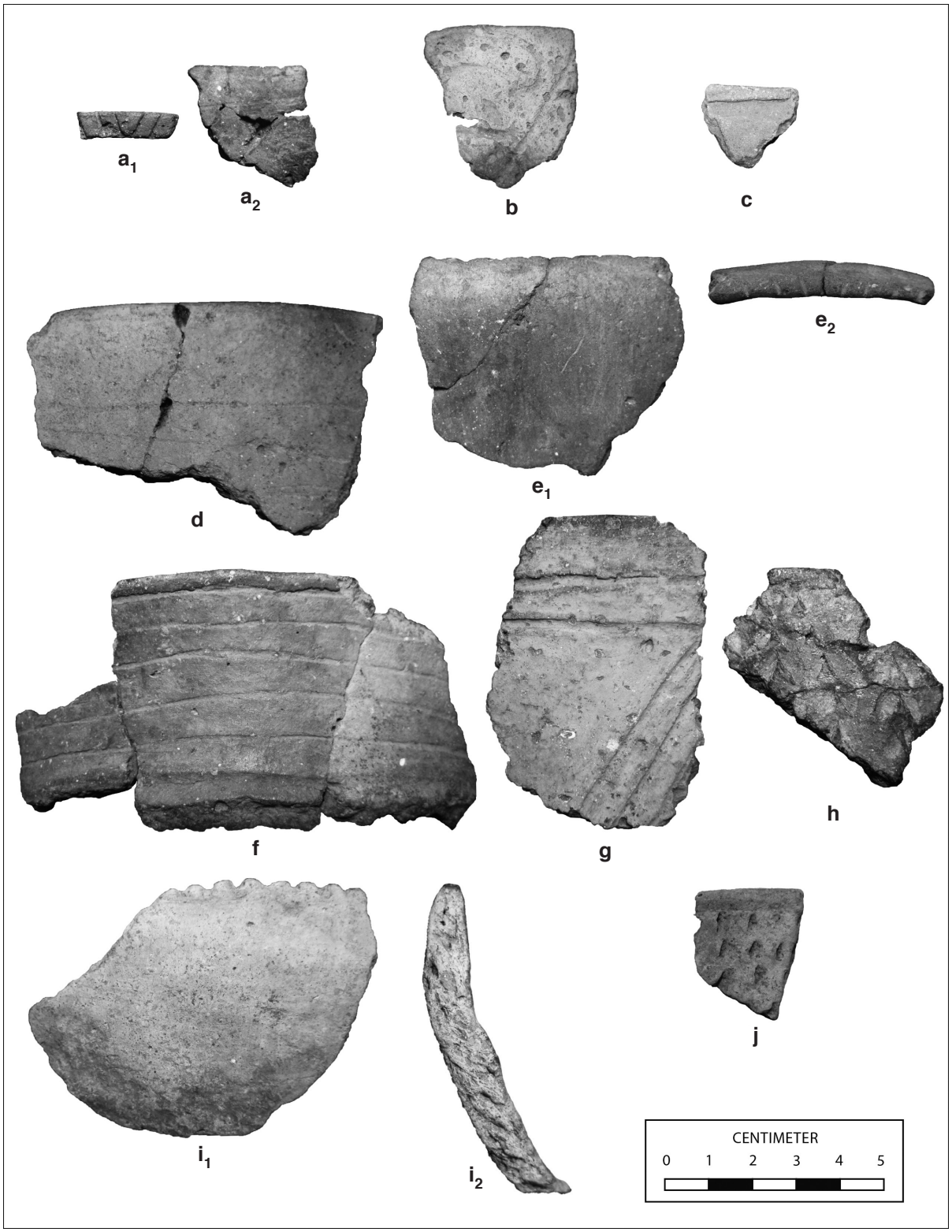

Figure 8. Decorated rim sherds from the Resch site: a_1, lip edge with diagonal tick marks, and a_2, interior view of rim sherd with lip decoration; b, incised lines and punctations, cf. Churupa Punctated; c, broad line below the folded lip edge; d, narrow incised horizontal lines; e_1, lip edge with tick marks, and e_2, exterior view of rim; f, incised lines, cf. Coles Creek; g, broad intersecting lines; h, Alexander Pinched; i1, exterior view of rim with crenellated lip edge, and i_2, cross-section view of laminated paste texture; j, field of stylus punctations.

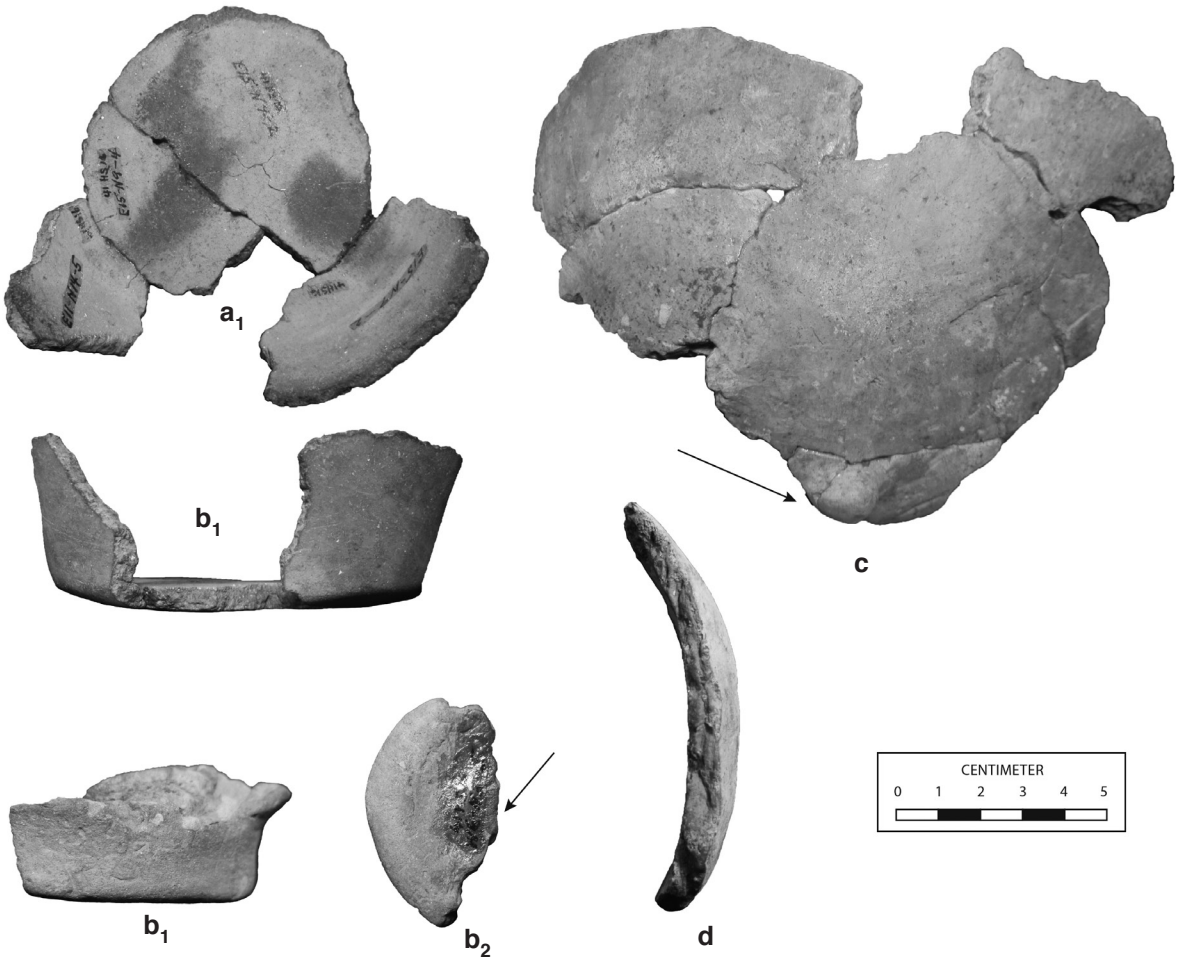

Figure 9. Base and lower body sherds from the Resch Site (Part 1): a_1, interior view of flower pot shaped base, and a_2, exterior view; b_1, exterior view of annular base, and b_2, view of ventral concavity; c, Tchefuncte lower body sherd with "teat-shaped" node (see arrow); d, cross-section view of Tchefuncte lower body sherd with contorted paste.

7o–q, w). Four of the bases reconstructed by Webb (1969:26–27) are among those reanalyzed (see Figures 9a and 10f). These four basal sections measured 9.2 cm, 10.0 cm, 11.5 cm, and 12.4 cm in diameter. They are disc-shaped, flat, or gently concave on the interior and gently rounded or convex on the exterior (Webb et al. 1969:26–27 and Figure 7o–q). Basal fragments in the reanalyzed sample also include similar shapes. In all, five different basal forms were recognized. The majority are rounded or rounded flat in contour (see Figure 10f); however, several interesting other forms were also observed. One small fragment with a remnant podal support (see Figure 10e) is a variation of the "teat-shaped" node observed on the lower body sherd discussed above (see Figure 9c). Also found was an annular base with a ventral concavity (see Figure 9b) and two bases with distinctive flowerpot shapes (see Figure 9a and Figure 10d).

A total of 80 rim sherds were analyzed, and 68 were plain (Figures 11-12) and 32 were decorated (see Figure 8). The rim sherds range in thickness from 4.2-11.8 mm, with an average thickness of 7.1 ± 1.7 mm; however, the decorated rims are noticeably thicker that the plain rim sherds. The decorated rims range in thickness from 5.5-9.8 mm, with an average thickness of 8.0 ± 1.2 mm. The plain rims are thinner, ranging from 4.2-11.8 mm in thickness. The average thickness is 7.0 mm, but they exhibit a slightly higher standard deviation (± 1.7).

The majority of the rims in the reanalyzed sample (n=38) are thinned in profile; however, direct rims (n=26), those having no distinctive break in contour or change in thickness, are also quite common. When

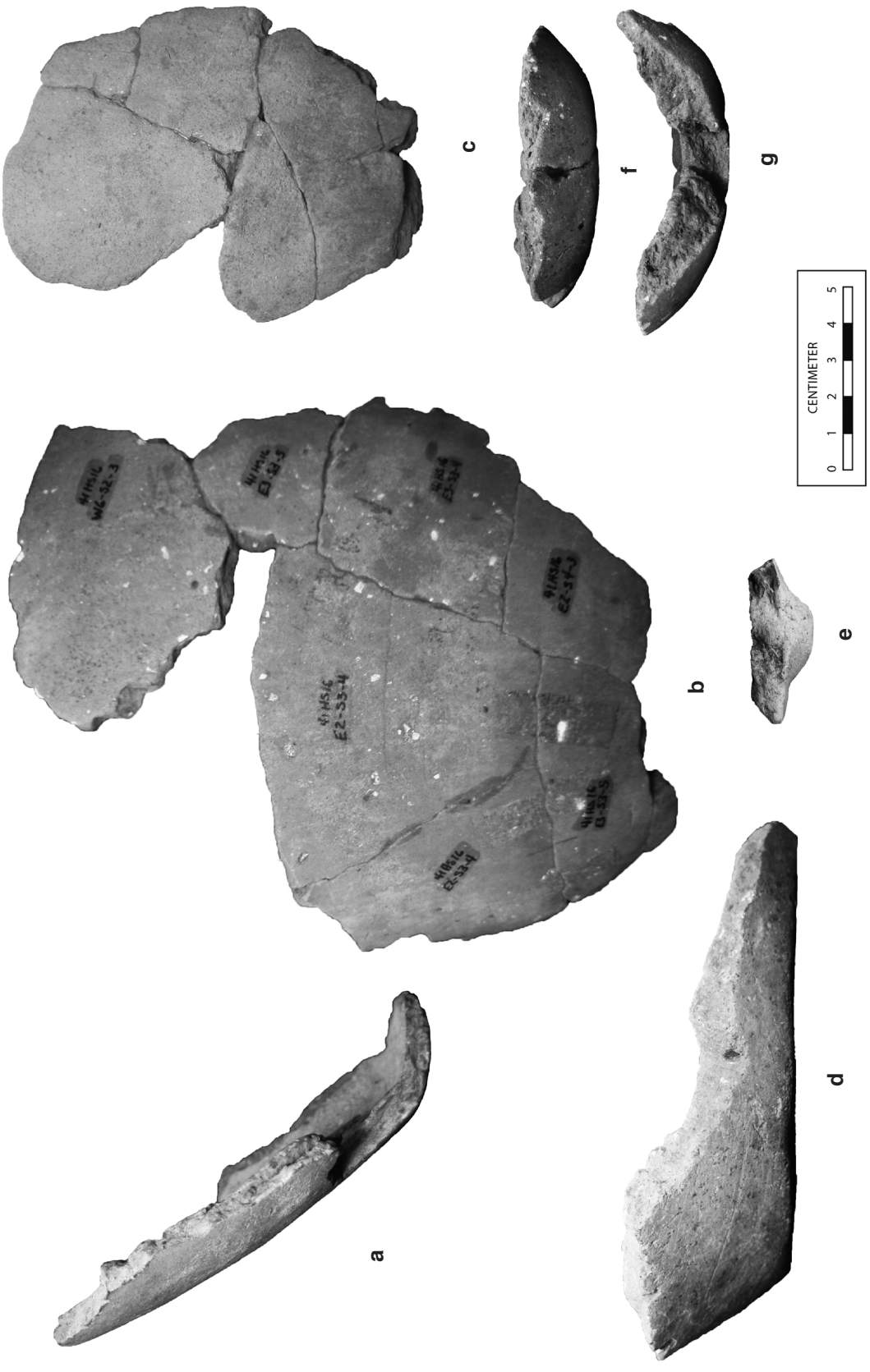

Figure 10. Base and lower body sherds from the Resch site (Part 2): a, rounded flat base; b, reconstructed lower body section; c, reconstructed lower body section; d, flowerpot base; e, base fragment with podal support; f_1, cross-section of rounded base; and f_2, exterior view of rounded base.

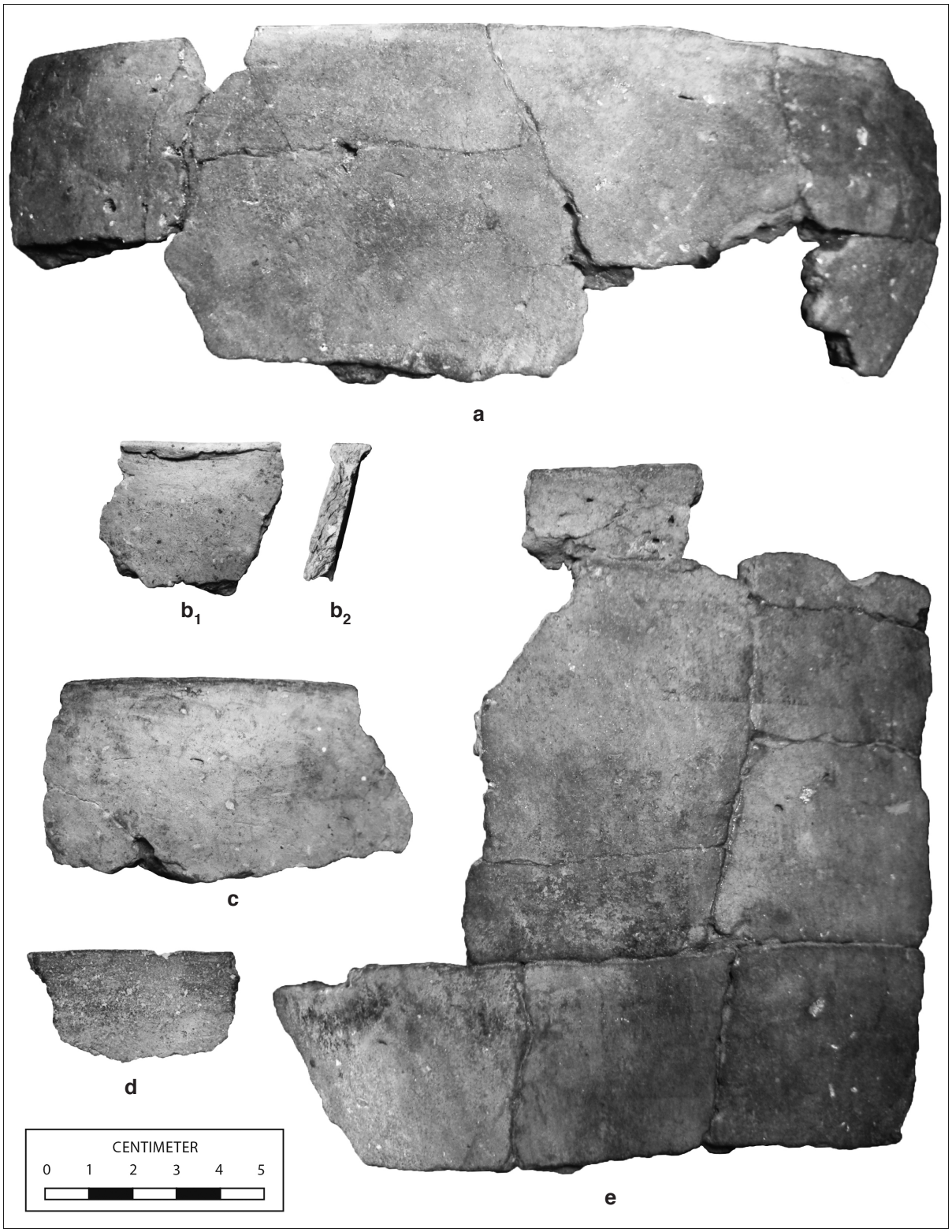

Figure 11. Plain rim sherds from the Resch site (Part 1): a, reconstructed rim section; b_1, exterior view of rim with folded lip, and b_2, cross-section view of rim with unusual lip edge and laminated paste texture; c, plain rim; d, plain rim, and e, reconstructed rim and upper body section.

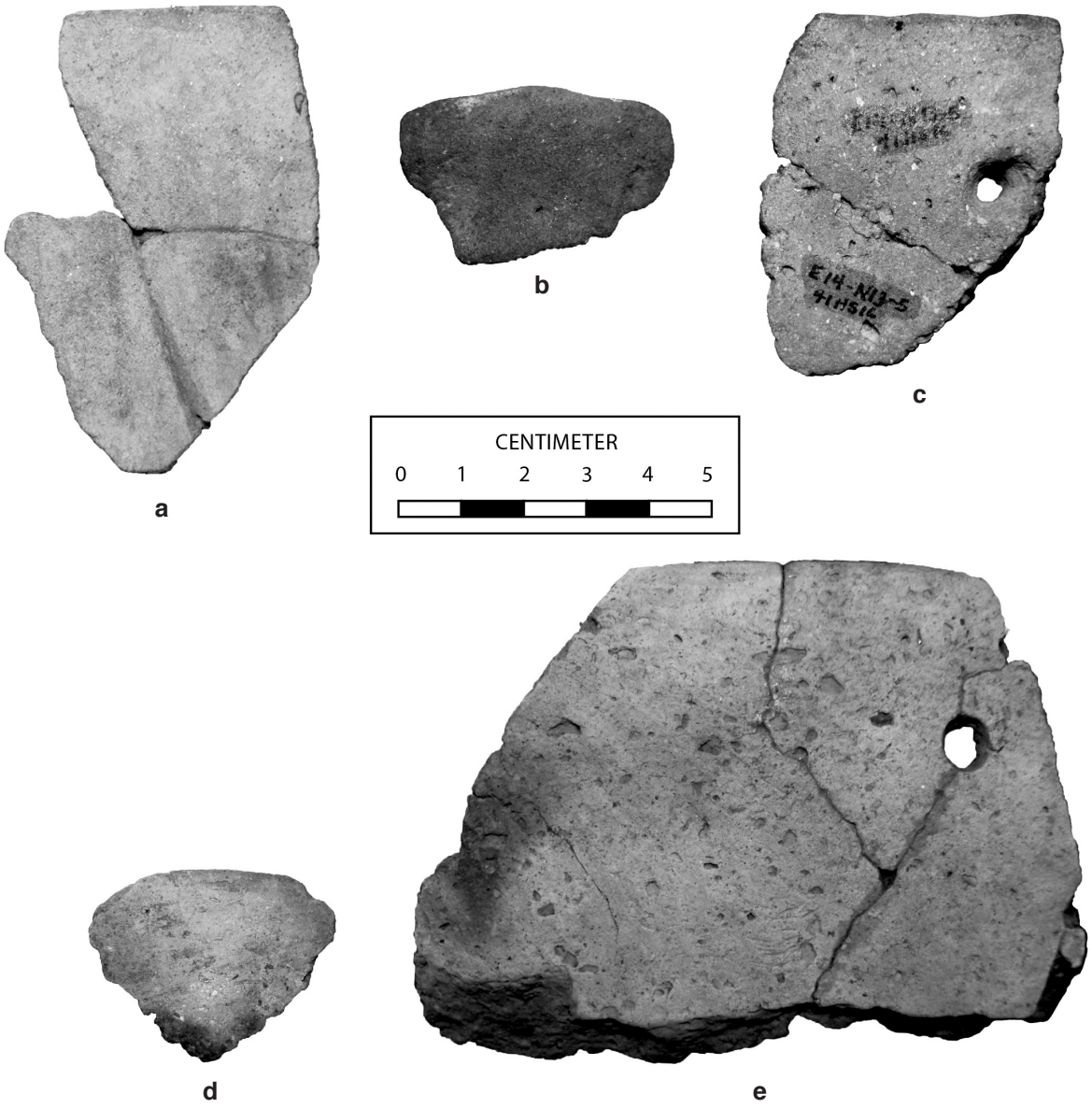

Figure 12. Plain rim sherds from the Resch site (Part 2): a, reconstructed rim section; b, unusually thick rim sherd; c, interior view of plain rim with drill hole; d, a small cup fragment, and e, exterior view of plain rim with drill hole.

the rim is set off from the wall of the vessel by a curve or an angle, the rim is expanding and/or contracting. Seventeen percent of the reanalyzed rims exhibited some variation of this rim profile.

An articulated rim is set off by a curve or an angle, while a direct rim is straight with no change in orientation (Rice 1987:214). At Resch, 47 percent of the rims are straight with no significant change in orientation, indicating a large number of simple fairly straight-walled bowls or open-mouthed jars. Thirty-six percent of the rims are articulated, with outflaring or slightly outward-curving forms. Slightly inverted rims (n=13) were also found, indicating vessels with somewhat restricted orifices.

Among the rim sherds, the shape of the lip edge is highly variable. The majority (53 percent) are either flat or had been rounded slightly and then flattened; however, 44 percent have lip edges that had been rounded or tapered and then rounded. Several rims have folded lip edges. On one interesting plain rim (see Figure 11b_1-b_2), the process had created a distinct ridge that overlaps both the

exterior and interior margin of the rim.

Two rims have beveled lip edges. On one plain rim, the beveled edge is angled toward the interior. On one decorated rim, classified as Alexander Pinched, the beveled edge is angled toward the exterior (see Figure 8h).

Only four of the rim sherds have decorated lip edges. Three have diagonal tick marks that cross-cut the lip edge (see Figure 8a_1, e_2). One has a series of closely spaced impressed notches that form a distinctive crenellated lip edge (see Figure 8i_1-i_2).

Diameters were obtained from 32 rim sherds. The rim sherd with the smallest diameter (4.5 cm) appears to be from a small bone-tempered cup (see Figure 12d). The rim sherds with the largest diameter (15 cm) are both plain wares, one of which is the reconstructed rim section of a bone-and-clay/grog-tempered bowl (see Figure 11a). The mean vessel diameter for the 32 rims was 10.3 cm ± 3.0 cm, with diameters randomly scattered along the continuum. This suggests that the vessels in use at the Resch site included small to medium-sized bowls and jars that probably served an array of purposes (i.e., cooking, serving, etc.).

In summary, the vessels in use at the Resch site were fairly simple, straight-walled bowls and jars having primarily unrestrictive orifices. This is reflected in the large percentage (47 percent) of vessels whose straight rim forms exhibit no significant change in orientation. However, the large number of articulated rims (n=28) with their outflaring forms suggest vessels that may have been designed for pouring. Further, the highly variable lip profiles may indicate some functional distinctions between vessels. This assumption is also loosely supported by the large number of plain rims and the fact that only four of the rims have decorated lip edges (i.e., rims were designed for functional purposes rather than for decorative appeal). If we assume that overall vessel shape is controlled by the need for containers that serve particular purposes (Shepard 1976:344), then the vessels at the Hawkwind site appear to include a fairly narrow range of simple pots that served a range of functions.

Surface and core coloration of the sherds indicate variations in firing atmospheres, a condition also noted in the analysis conducted by Webb et al. (1969). The general variation in color development observed on surfaces and paste cores clustered more toward the darker end of the color spectrum. This firing pattern indicates that most of the vessels found at the site were fired in less controlled atmospheres with insufficient or reduced amounts of oxygen. This could have resulted from several factors: (1) the firing temperature being too low, (2) the maximum temperature not being sustained long enough, (3) the firing atmosphere having insufficient oxygen, or (4) some combination of all three variables.

One other firing attribute noted by Webb et al. (1969:21–22) was the presence of smudged interior surfaces on 33 percent of the sherds in the Resch assemblage. Smudging is a distinctive variant of open-air firing, most likely resulting from the vessel having been packed with some type of vegetal material, then fired in an inverted position. This specific firing technique creates an extreme reducing atmosphere wherein carbon is deposited on the surface and in the pores of the vessel, producing a characteristic dark gray to black finish. This surface results from the firing process itself and differs from the blackened surfaces that result from using clays containing large amounts of organic material (Hally 1983; Hamilton 1988; Rice 1987:158; Shepard 1976:88–90). This firing variant was also noted on 3 percent of the sherds in the reanalyzed sample.

FOLLY SITE CERAMIC ASSEMBLAGE

While the original Folly site report indicates that 26 sherds were recovered from the site (Jarvis 1972), examination of the assemblage by Ellis (2012) resulted in the refitting of several sherds, thereby reducing the total number of recovered sherds to 17: 11 plain body sherds, two decorated body sherds, three decorated rim sherds, and one plain lower body sherd.

As with the Hawkwind and the Resch ceramics, the ceramic assemblage from the Folly site exhibited variable paste textures and paste constituencies. Microscopic examination of a freshly broken cross section of each sherd revealed five paste groups (Figure 13), with the presence or absence of specific sets of tempering agents determining group membership. Both paste textures and paste constituencies among the Folly site ceramics are highly variable. There are 11 different combinations of tempering agents having been used to manufacture vessels found at the site. These highly variable paste constituencies and paste textures indicate that several different paste preparation and/or fabricating techniques had been used to manufacture the sherds found at the site.

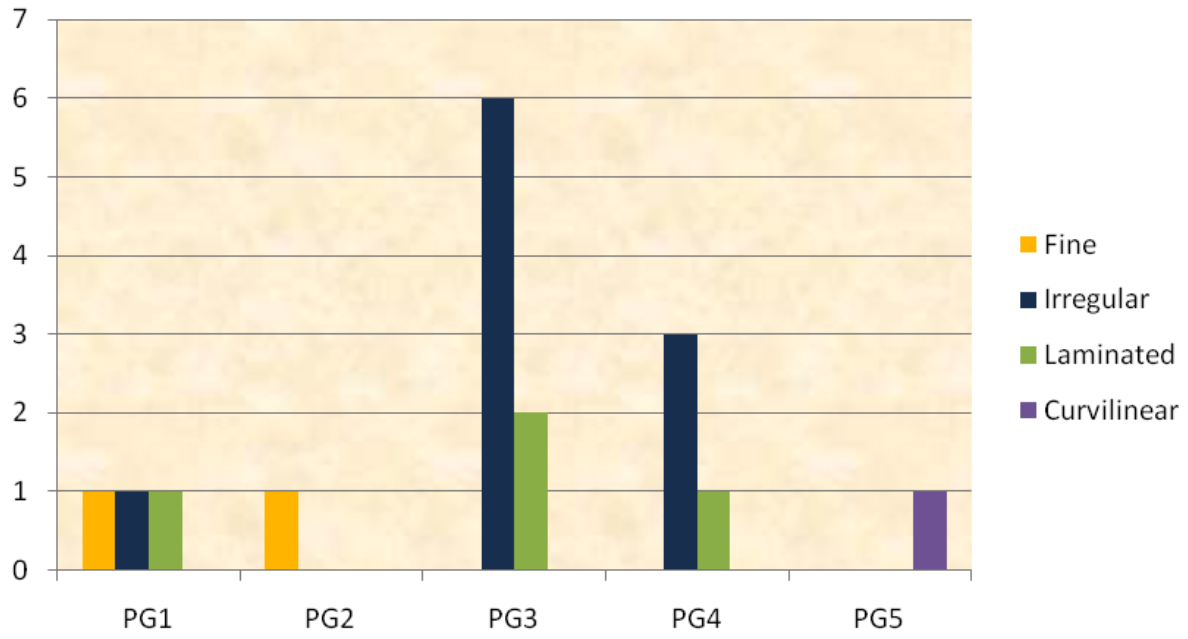

Figure 13. Count of paste textures in each paste group at the Folly site (41RK26).

The three sherds assigned to Paste Group (PG)1 had been manufactured from non-tempered sandy to silty clays and contained no additional tempering agents observed in the paste. Two subgroups were defined on the basis of the predominant grain size of the basic paste fabric. PG1a includes two sherds whose basic paste fabrics contain a heterogeneous mixture of sand predominantly in the fine size range (Wentworth 1933). One has an irregular paste texture and one has a laminated paste texture. The one sherd included in PG1b has a silty paste fabric with a texture that appears fine in cross section.

PG2 includes one sherd whose basic paste fabric is composed predominantly of sands falling within the very fine size range and tempered with finely crushed hematite. Its paste texture appears fine in cross section.

The eight sherds assigned to PG3 had been manufactured with very fine to silty clays to which clay/grog temper had been added. PG3a includes one body sherd with a very fine sandy paste matrix to which clay/grog and larger-sized sand grains had been added. This sherd has an irregular paste texture. PG3b includes seven sherds with clay/grog inclusions embedded in a paste fabric of predominantly silt-sized particles to which at least one additional tempering agent (i.e., charred organic material or crushed hematite) had been added. Paste textures appear either irregular (n=6) or laminated (n=2) in cross section.

PG4 includes four sherds tempered with both bone and clay/grog that are embedded in a predominantly silty paste. Two of the sherds contain no additional tempering agents, while crushed hematite or charred organic material had been added to the paste of the other two sherds. The majority appear irregular in cross section (n=3). One has a laminated paste texture.

PG5 includes one bone-tempered sherd whose paste fabric consists primarily of silty clay, and has a loosely consolidated paste fabric that appears curvilinear in cross section. This paste texture is similar to laminated; however, rather than being straight, the laminas appear curved or circular in cross section and the coil junctures appear distended, indicating less-thorough manipulation of the clay during primary forming. This sherd may be an example of Cooper Boneware as described by Schambach (1998).

Visual inspection of the sherds identified two different techniques used to finish the surface of vessels found at the Folly site. Among the sherds in the analyzed sample, 35 percent of the exterior surfaces and 41 percent of the interior surfaces are too weathered to accurately determine their surface finish. Among the sherds with recognizable exterior surfaces, dry-smoothed/unburnished surfaces are somewhat more prevalent than floated/unburnished

surfaces. Since floated surfaces weather more quickly than dry-smoothed surfaces, it may be that floated surfaces are underrepresented, especially given the high percentage of sherds with weathered surfaces. None of the sherds had been burnished.

Twenty-nine percent (n=5) of the sherds are decorated, and all involve techniques that displace or penetrate their surfaces. Two are body sherds and three are rim sherds. One small body sherd exhibits two broad U-shaped lines framing a field of fine cross-hatched lines (Figure 14a). Unfortunately, not enough of the design motif is present to assign it to a particular type. The second decorated body sherd (see Figure 14d) has a single broad U-shaped line that runs horizontally across the face of the sherd. Given its thickness, this clay/grog-tempered sherd may be from a Williams Incised vessel.

On two rim sherds, the decorative elements were confined to the lip. Both had lip notches that had been impressed rather than cut into the lip edge (see Figure 14b, e); however, the depth, width, and spacing between the notches vary. The third rim has an unusual crenellated decorative element (see Figure 14c). Rather than cross-cutting the lip edge, the crenellations are wide, shallow, and angled downward onto the body as if suspended from

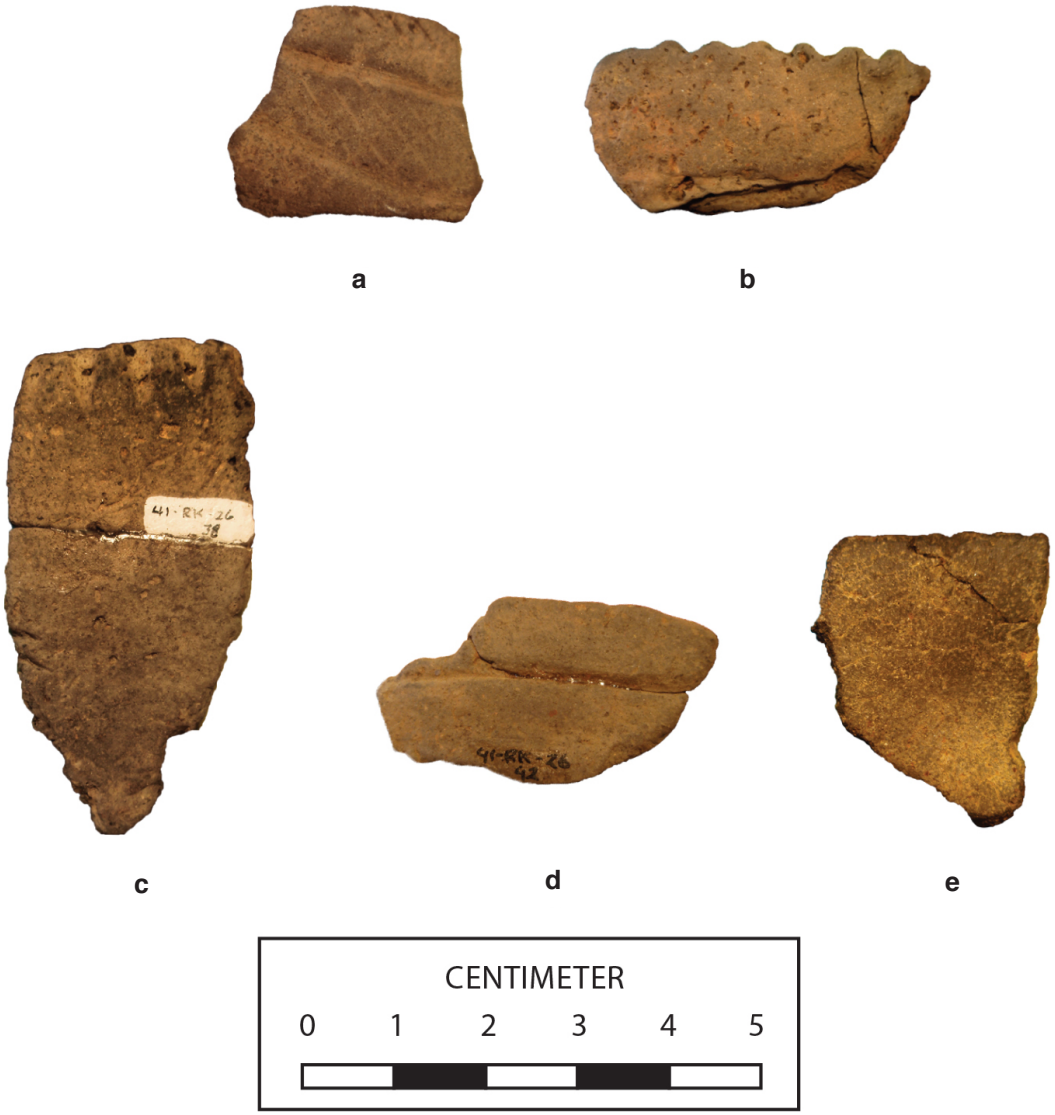

Figure 14. Decorated ceramics from the Folly site: a, body sherd with broad U-shaped lines framing a field of fine cross-hatched lines; b, lip notched rim sherd; c, rim with impressed lip notching; d, body sherd with broad U-shaped incised line; and e, interior view of notched rim.

the lip edge. None of the decorated rims are typologically distinct. Additional attributes recorded for each rim include rim profile, rim form, lip profile, lip decoration, and diameter (Table 5).

In general, thicknesses are highly variable both within the same sherd as well as among different sherds in the sample. The body sherds range in thickness from 4.8-10.4 mm, with an average thickness of 7.0 ± 1.4 mm. The one lower body sherd is 13.0 mm thick. The three rims range in thickness from 6.9-7.0 mm, with a mean thickness of 6.9 ± 0.06 mm. Two of the rims were sufficiently large to measure their orifice diameters. The diameter of specimen 41RK26-32.1 (see Figure 14b) is estimated at 10.5 cm, and the diameter of specimen 41RK26-38 (see Figure 14c) is estimated at 14 cm.

At the Folly site, the general variation in color development on sherd surfaces includes a range of dark and light colors; however, paste cores suggest that the vessels had been fired in a reducing environment (n=4) or in less-controlled firing atmospheres with insufficient or reduced amounts of oxygen (n=13). This firing pattern could have resulted from the firing temperature being too low, the maximum temperature not being sustained long enough, the firing atmosphere having insufficient oxygen, or some combination of all three variables.

Based on their overall decorative and technological attributes, the 17 sherds recovered at the Folly site have a great deal of technological variation. The percentage of decorated sherds (29 percent) represented in the assemblage is relatively high when compared to other Woodland sites in the region, and the range of decorative elements is considerable given the small size of the collection. The possible Williams Incised sherd suggests a link to Fourche Maline ceramics. The three non-tempered sandy paste sherds, the one sand-tempered sherd, and the distinctive lip notching found on two of the rim sherds are attributes closely related to Mossy Grove ceramics. Similar lip-notched rim sherds were also recovered at the Resch site.

SUMMARY OF THE COMPARATIVE ANALYSIS

Most of the decorative and technological attributes initially recognized by Webb et al. (1969) in the analysis of the Resch site ceramic assemblage remain important in the analysis of Woodland period ceramics in East Texas. Primary among these are paste constituency, paste texture, basic surface finish, vessel shape, and thickness. While the majority of Woodland period ceramics are overwhelmingly plain wares, decorative elements, when present, also display certain similarities. Thus, the decorative and technological ceramic data from the Hawkwind, Resch, and Folly sites, as well as the ceramic data from the Herman Ballew site (Perttula 2001), provides an excellent opportunity to compare and expand our database of technological and decorative attributes associated with Woodland period ceramics in the region.

Analyses of paste attributes at the Hawkwind, Folly, and Herman Ballew sites have identified the same highly variable pastes and "disconcerting diversity" observed by Webb et al. (1969) at the Resch site. Reanalysis of a representative sample of the Resch site ceramics supports this assessment. Microscopic examination of paste cross sections identified five major paste categories, indicating at least 35 different combinations of tempering agents were used to manufacture the vessels at the Resch site. This same diversity can be seen in the Hawkwind ceramic assemblage where six major paste groups and 32 different combinations of tempering agents were identified. Even at the Folly site with its relatively small ceramic assemblage, five major paste categories and 11 different combinations of tempering agents were identified (Figure 15).

This diversity is also supported by the results of the INAA performed on the ceramic sherds and raw clay sample from the Resch, Hawkwind, and Folly sites. Because there are no temporally comparable samples from Woodland contexts in the region, comparisons were made to the East Texas Caddo database. The results show similarities between the Resch, Hawkwind, and Folly samples and the main Caddo group for Sub-region 7 in the middle Sabine River basin (see Perttula, this volume). The submitted raw clay sample could also be assigned to the Sub-region 7 (Group 1), and it clusters with a small group from the Hawkwind and Resch sites that show elevated levels of chromium and zirconium. These new Woodland period ceramic samples show a slightly greater compositional variability than do the later Caddo samples from an ever larger area.

At the Herman Ballew site, Perttula (2001) describes the ceramic assemblage as being low in number (n=225 and two vessel sections) and overall density (Perttula 2001:Table 18), but the diversity of paste classes was quite impressive, including 12 different paste and/or temper classes

Table 5. Characteristics of the rim sherds at the Folly site (41RK26).

Lot #	Rim Profile	Rim Form	Lip Profile	Lip Decoration	Thickness (mm)	Diameter (cm)
RK26-32.1	Direct	Slightly outflaring	Flat	Notches impressed, not cut; widely spaced	7.0	10.5
RK26-43	Thinned	Straight	Interior rounded	Notches impressed, but more closely spaced than on rim RK26-32.1	6.9	–
RK26-38	Direct	Straight	Flat	Crenellated	6.9	14

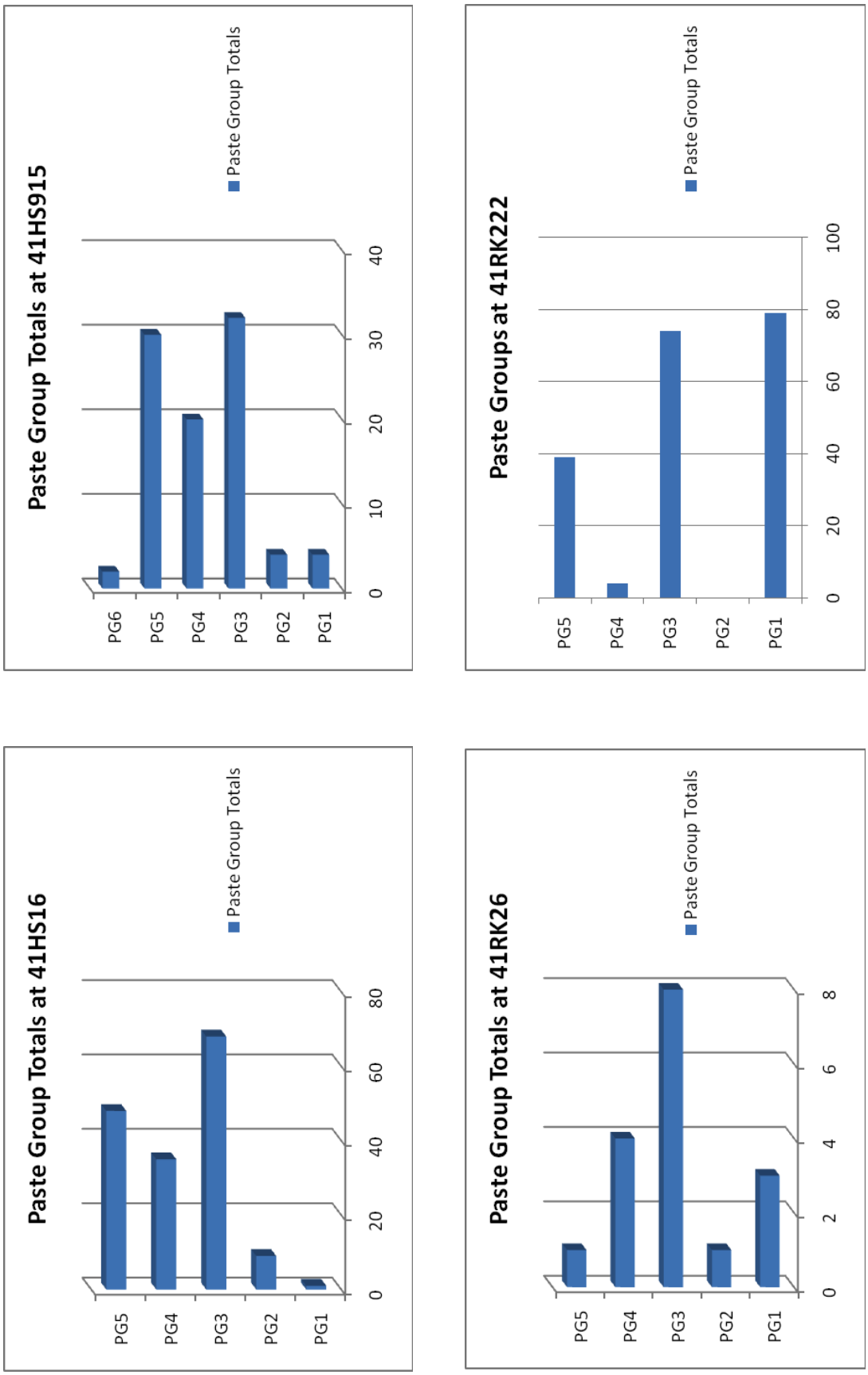

Figure 15. Comparison among paste groups found at the Hawkwind, Resch, Folly, and Herman Ballew sites.

(Perttula 2001:Table 19). Because the classification criteria for individual paste classes was somewhat different (Perttula 2001:98-109) from those used to define paste classes at the Hawkwind, Resch, and Folly sites, the following comparisons are based on roughly equivalent categories that enable overall comparisons among the various paste groups from each site. Proportionately speaking, the diversity of paste groups at the Herman Ballew site is similar to those identified in ceramic assemblages at the Resch, Folly, and Hawkwind sites, even though the distribution of specific paste groups varies from site to site.

The frequency of non-tempered sandy paste wares is proportionately higher at the Herman Ballew and Folly sites, while these wares have only negligible representation at the Resch and Hawkwind sites (see Figure 15). There are high proportions of sand present in the paste matrix of many of the tempered paste groups found at all four sites, and in a large percentage of these, the discontinuous size ranges of the sand suggests that sand had been added to the predominantly silty clay matrix. This relatively sandy constituency of pastes is supported by the petrographic analyses performed on selected sherds from the Hawkwind, Folly, and Resch sites, where measurable quartz was the predominant mineral identified in every sample (Rogers 2012).

Bone-tempered wares are fairly well represented at the Resch site and the Hawkwind site, but occur proportionately less frequently at the Herman Ballew site, and this paste group has only minor representation at the Folly site. Conversely, bone- and-clay/grog-tempered sherds have only negligible representation at the Herman Ballew site, but have a proportionately similar representation at the other three sites.

Clay/grog-tempered sherds represent the major paste group in all four ceramic assemblages. While this paste group is the most prevalent, there is also a great deal of internal variability in the clay/grog-tempered sherds found at each site. At three sites, however, many of the sherds found in this paste group also contained large amounts of sand inclusions. This is also true at the Herman Ballew site where 31 of the recovered grog-tempered sherds have sandy constituencies.

One interesting characteristic of the clay/grog-tempered ceramics is the presence of both grog and "clay-like" inclusions in sherds. Possible "rounded clay pieces" or grog inclusions were observed in the paste matrix of sherds recovered at the Herman Ballew site (Perttula 2001:107). At the Hawkwind and Resch sites, these same grog and "clay-like" inclusions were observed in the basic paste fabric of many of the sherds. The grog stands out from the surrounding paste matrix and can be recognized by its distinct texture, lineations, and/or surface variability that are oriented differently than the overall paste matrix. In other sherds, the inclusions appear as rounded clay lumps that often differ in color and texture from the surrounding paste matrix. In some instances, both grog and clay lumps occur in the same sherd. The use of fired and crushed clay as an additive may introduce multiple clays in a paste during primary forming (Rogers and Heffington 1985:88–90, 92). Such mixing of clays occurs more often in areas where large deposits of relatively coarse residual clays are common (Bishop et al. 1982:317; Stahman et al. 2012).

To speak to this issue, the raw clay sample was submitted for INAA and petrographic analysis. Petrographic analysis of the raw clay sample shows that among its many constituents it also contained 8 percent clay lumps and 2 percent opaque material (possibly hematite). If the raw clay itself contains clay lumps, then it may be that the clay lumps occurring in the paste matrix of many of the Resch and Hawkwind ceramics result from carelessness in grinding and sifting of the clay during primary forming, a hypothesis long ago asserted by Weaver (1963). Even so, microscopic analysis of many of the clay/grog-tempered sherds from the Resch and the Hawkwind sites show large numbers of clay lumps that differ in color and texture from the surrounding paste matrix, which could indicate that Woodland potters were mixing two types of clays whose constituents included clay lumps.

The same holds true for the opaque material (probably hematite) in the raw clay. If hematite constituents are naturally present in the clay, the small randomly dispersed hematite (assumed to be finely crushed) that was observed in the paste matrix of many of the analyzed ceramics may in fact be natural inclusions rather than added ones. However, regardless of intentionality, its presence in the clay may modify its properties. In short, the presence of naturally occurring clay lumps and opaque material (probably hematite) in the raw clay poses some very intriguing questions about the variability in paste constituency and further illustrates the need for collecting more raw clay samples. If, in fact, Woodland settlement patterns

followed particular drainage basins, then systematically targeting the collection of clay samples along the various drainages might provide valuable data for tracking the movement of pots across the landscape (e.g., Reese-Taylor 1993).

Analysis of paste texture at the Resch, Hawkwind, and Folly sites also show some interesting variability (Figure 16). The dispersal of paste textures is differentially distributed across paste groups, which in turn suggests that more than one paste preparation and/or fabricating technique was used to manufacture the vessels at each of the three sites.

As noted above, the classification criteria used by Perttula (2001) to record individual ceramic paste classes at the Herman Ballew site differed somewhat from those used here. Thus, the only paste textures specifically quantified for the Herman Ballew ceramics were those that were either laminated (n=16, 7 percent) or contorted (n=17, 8 percent). While sherds with laminated and contorted pastes are not proportionately as high at the Herman Ballew site as they are at the Hawkwind, Resch, and Folly sites, this is not necessarily unexpected given the large number of non-tempered sandy paste sherds found at Herman Ballew. If the various textural categories are viewed as representing locations on a continuum that moves from loosely worked clay (i.e., contorted) to more thoroughly worked clay (i.e., fine), then the absence of large, irregular inclusions such as bone or grog allows for better working of the clay during primary forming, thereby enabling the potter to produce a finer-textured paste. Not surprisingly, the paste matrix of many of the sherds with contorted and laminated pastes have possible "rounded clay pieces" or grog inclusions (Perttula 2001:107).

Another interesting observation relates to the distribution of sherds with laminated (n=60) and irregular (n=21) paste textures at the Hawkwind site. If pastes become better worked through time, then one would expect an increase in irregular textures with a more or less corresponding decrease in pastes exhibiting laminated textures; however, this does not necessarily appear to be the case given the results of the radiocarbon analyses of residue found on the interior of four clay/grog-tempered sherds from the site.

Dating of these four sherds yielded date ranges spanning a 700 year period of time. Two of the four were plain body sherds with laminated paste textures. The residue on one of these two sherds yielded a 2 sigma calibrated date range of A.D. 20–130, and the residue found on the other sherd returned a 2 sigma calibrated date range of A.D. 600–660. The other two plain body sherds have irregular paste textures. The residue from one of these sherds has a range of A.D. 60–210 (2 sigma calibrated), and the residue from the other sherd has a 2 sigma calibrated range of A.D. 720–740. If the residue actually dates the last use of the pot, then the pots having laminated pastes were in use throughout much of the Woodland period. It may be that the continued long-term use of pots with laminated pastes may reflect consistent manipulation of the clay during primary forming to create a specific texture that was functionally related rather than temporally related.

Just as different "paste recipes" have functional implications, it also appears that different surface finishing modes may be functionally related. At the Hawkwind, Resch, and Folly sites, dry-smoothed surfaces are the most common surface treatment modes; however, at the Hawkwind and the Resch sites, floated surfaces were almost as common. Different surface finishing techniques are differentially associated with particular paste groups and these differences are likely related to functional variations among vessels (Figure 17). At the Folly site, surface treatment varied little, but this may simply be a factor of the small sample size and the weathering of many sherd surfaces. At the Herman Ballew site, surface treatment modes are somewhat difficult to quantify because both dry-smoothed and burnished surfaces were lumped together (Perttula 2001) so it was not possible to separate the prevalence of one technique over the other. He did, however, note that approximately 34 percent of the sherds from Area 1 and 39 percent of the sherds in Area 2 had surfaces that had been either smoothed or burnished, which represents around 37 percent of the sherds at the site. The remainder were classified as unsmoothed. This suggests that dry-smoothed and burnished surface treatment modes were not as common at Herman Ballew as they were at the other three sites. As an aside, it may be that many of the surfaces that were defined as unsmoothed had actually been floated. These surfaces, which are quite common on sandy paste ceramics found in the Mossy Grove culture area (L. Ellis and G. Ellis 1996a, 1996b, 1999; Hamilton 1988; Wheat 1953; Winchell and Ellis 1991), weather quite easily so it is quite possible that the Herman Ballew sherds with unsmoothed surfaces were floated surfaces that had simply weathered away.

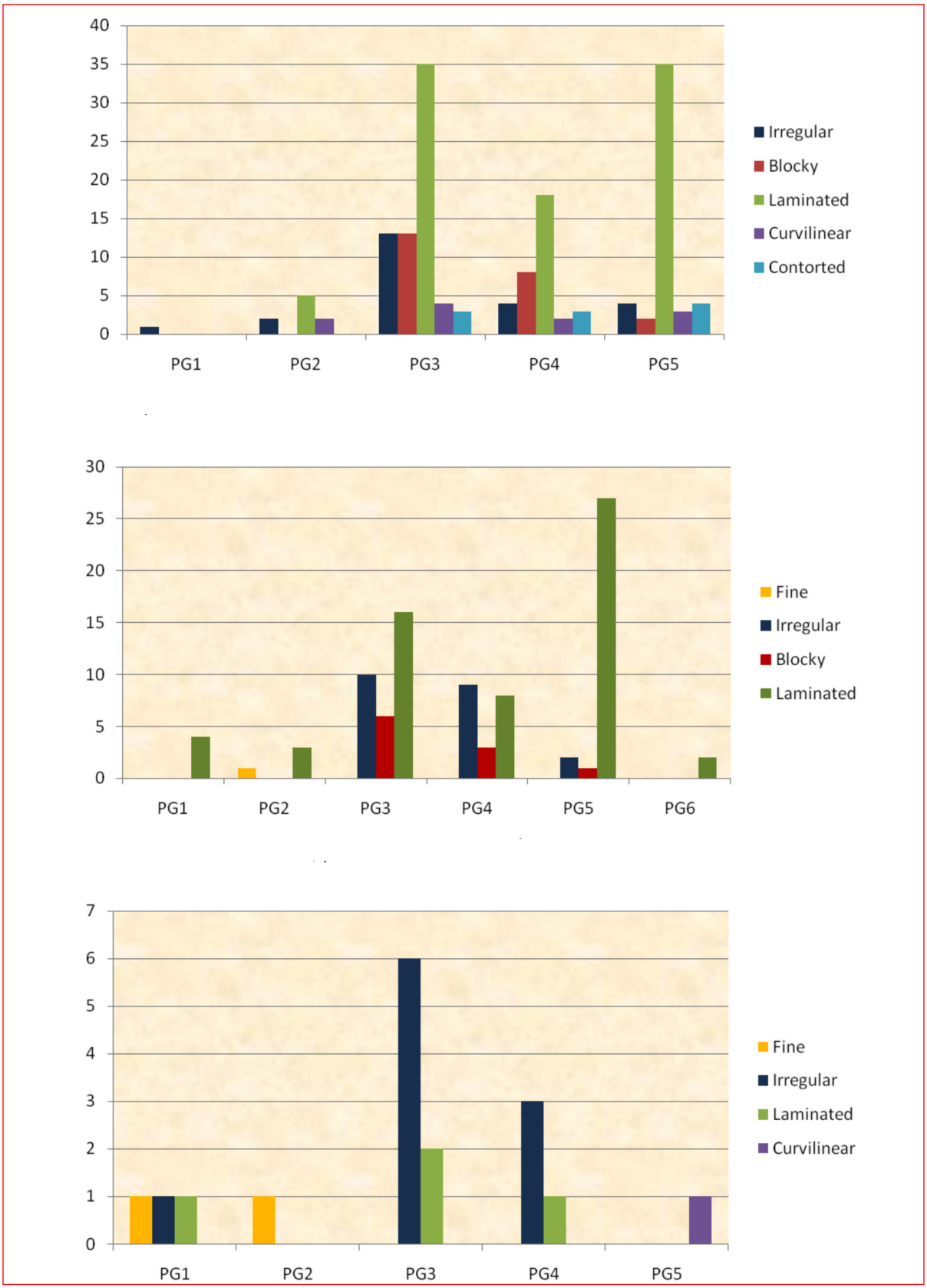

Figure 16. Paste textures present at the Resch, Hawkwind, and Folly sites.

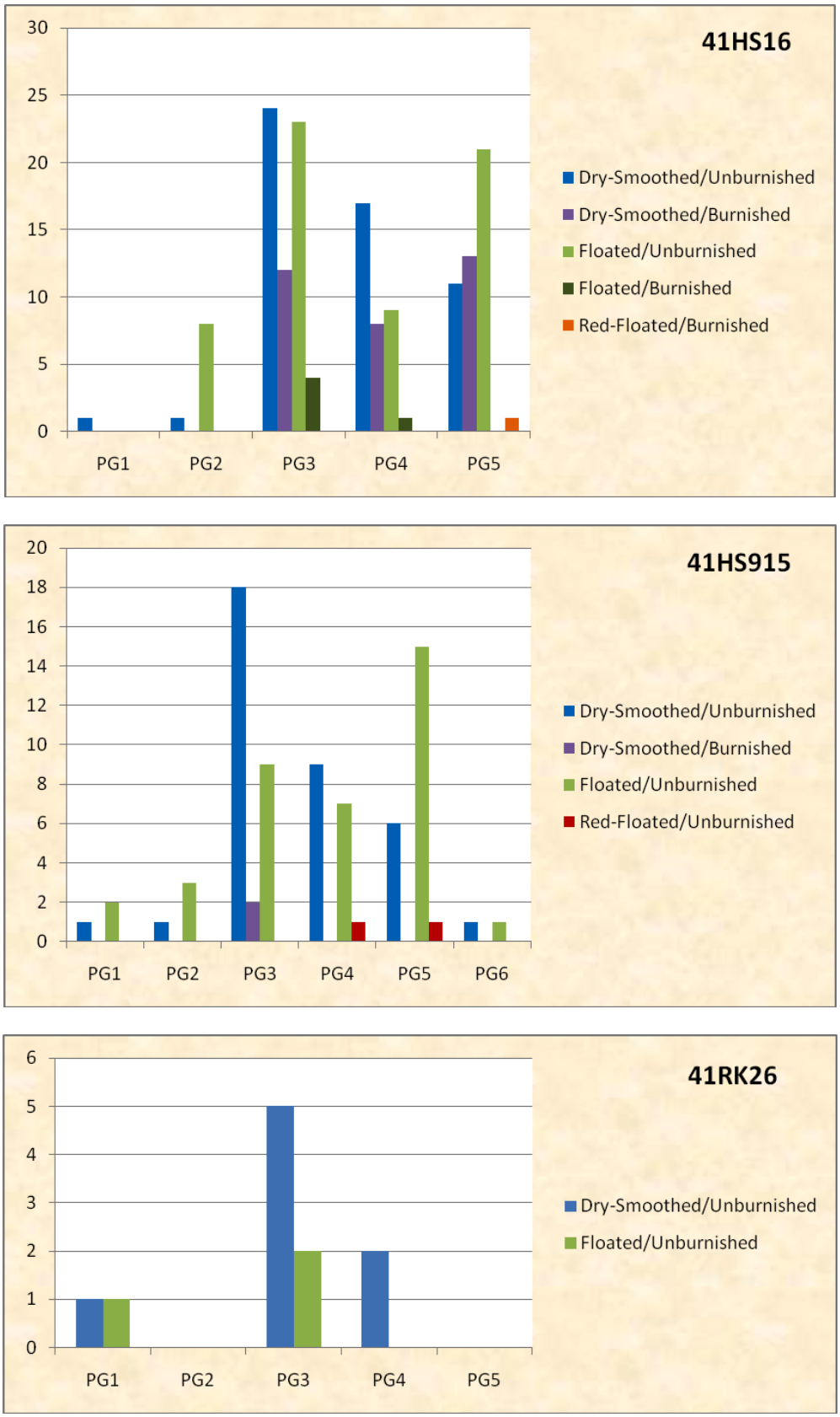

Figure 17. Summary of exterior surface treatment modes at the Hawkwind, Resch, and Folly sites.

Burnishing is another surface finishing technique that has differential representation at all four sites. None of the sherds at the Folly site and only three of the sherds at the Hawkwind site had been burnished. Less than 37 percent of the sherds at the Herman Ballew site had been burnished, but, by far, the use of vessels with burnished surfaces was most prevalent at the Resch site. If this finishing technique renders a vessel more serviceable by making its surface harder, less permeable, and more resistant to abrasion, then the prevalence of vessels with burnished surfaces hints at some functional difference in the use of vessels at the Resch site. Or, it may simply be that surface luster was better preserved there than at the other sites. In summary, similar surface treatment modes were used to finish the surfaces of vessels manufactured at all four sites; however, specific techniques were differentially distributed across paste groups both within particular sites and among sites. These differences may indicate different groups of people who had different ceramic-manufacturing traditions. Alternatively, they could indicate the same group of people who were manufacturing functionally specific pots that were used for the extraction and/or processing of different resources.

Pairing paste and surface treatment attributes with decorative attributes and other attributes such as thickness, vessel shape, and rim characteristics further highlights the overall ceramic variability within and among sites. The Resch ceramic assemblage, by sheer density and variety of ceramics, differs from the ceramic assemblages at the other three sites. The array of ceramic attributes found in the Resch ceramic assemblage is more technologically variable than those found in the Hawkwind, Folly, and Herman Ballew ceramic assemblages. This notable variability could be because Resch was more intensively occupied and/or excavations at the site were extensive enough to recover a larger sample of ceramics. Finally, the variability in technological and decorative attributes noted on the ceramics from the Hawkwind, Resch, Folly, and Herman Ballew sites point to a time of experimentation during which Woodland potters incorporated aspects of multiple technological traditions.

Decorative treatments at all four sites cluster around a relatively narrow range of techniques that primarily involve broad U-shaped incised lines and punctations. Lip decoration is infrequent, but when it does occur, it usually involves notches or crenellations cut or impressed into the lip edge. This type of decoration is especially prevalent at the Folly site where three of the five decorated sherds are rims with notched or crenellated lip edges (see Figure 14).

At the Hawkwind site, four of the eight decorated sherds were assigned tentative typological identifications (see Figure 12). The only decorated rim found at the site was a sandy paste sherd with two parallel U-shaped incisions that are reminiscent of those found on LMV Marksville types, but the row of shallow circular depressions just below the rim is unusual. Other identified types included two Marksville Incised, *var. Yokena* body sherds and one possible Churupa Punctated sherd.

At the Herman Ballew site, decorative elements included lip-notched rim sherds and a variety of incised, stamped, and punctated specimens (Perttula 2001:114–117 and Figures 39-40). Among the 15 decorated sherds, one distinctive Marksville Stamped body sherd was found. Eleven of the remaining sherds were tentatively identified as Marksville Incised, Churupa Punctated, Alexander Pinched, Coles Creek Incised, French Fork Incised, and Evansville Punctated. These types all suggest links to both the Fourche Maline Culture area and the LMV.

Decorated ceramics at the Resch site included a broader range of design elements than did the decorated sherds found at the other three sites. These sherds included a variety of pinched and punctated design elements, wide or narrow incised lines, or some combination of incised lines and punctations. One unusual drag-and-jab motif was also found (see Webb et al. 1969:Figure 22), as well as a number of rims with lip decoration only. During the 2011 reanalysis, the sample of decorated sherds (n=32) included only Woodland period ceramics. Early LMV types such as Alexander Pinched, Churupa Punctated, Tchefuncte Plain and Tchefuncte Stamped, Marksville Incised, *var. Yokena*, Marksville Stamped, and Coles Creek Incised were also found.

Given their close proximity to each other, the question arises as to whether the Hawkwind site could have been occupied by the same Woodland group(s) that occupied Resch, Folly, and Herman Ballew. By implication, this question must take into consideration the temporal span of the site. Webb et al.'s (1969) research at the Resch site included four radiocarbon dates that yielded dates of 410 B.C., 300 B.C., 200 B.C., and A.D. 100. A reevaluation of these earlier dates was done by Perttula (1997:330) in which the radiocarbon dates were corrected for

isotopic fractionation and then calibrated. This yielded calibrated dates ranging between 555 B.C. and A.D. 325, effectively extending the Resch site occupation by more than 300 years. The presence of early Fourche Maline and LMV types and Mossy Grove sandy paste rims with lip decoration fit well with this time span. It also suggests that the Resch site had a wide interaction sphere that included contacts with groups representing a number of ceramic-manufacturing traditions.

At the Herman Ballew site, three of the radiocarbon dates obtained from Area 1 fall within a calibrated date range of 70 B.C.-A.D. 230. Perttula (2001:119–124) felt that the Woodland sherds in this area could confidently be associated with the first date range. Area 2 was more intensively occupied and appears to have only Woodland period ceramics. The radiocarbon dates obtained for Area 2 suggest that the site was occupied at two different time periods, with the most likely temporal interval dating between A.D. 77-685.

The early Woodland period ceramics could be differentiated based on the presence of plain ceramics with contorted and laminated pastes, the plain bone-tempered wares believed to be the Fourche Maline type Cooper Boneware (Schambach 1998), and the large number of plain, sandy paste wares. Also associated with this early Woodland period component are the Marksville Stamped and the possible Churupa Punctated sherds. A later post–A.D. 400 Woodland period component is exemplified by thick grog-tempered, probably Williams Plain sherds, the thinner grog-tempered sandy paste pottery, and the large number of non-tempered sandy paste wares. While dominated by plain wares, the presence of possible Evansville Punctated, *var. Rhinehart* and French Fork Incised, *var. Larkin* sherds also suggests a later Woodland period component.

Unfortunately, no radiocarbon dates have been obtained for the Folly site; however, the presence of the one possible Williams Plain sherd and the one bone-tempered sherd resembling the Cooper Boneware type as defined by Schambach (1998) points to at least one occupation during the early Woodland period. Further, the proportions of relatively thin sandy paste sherds, the clay/grog-tempered sherds, and the lip-notched/crenellated rims more closely resemble the Herman Ballew ceramic assemblage than the Hawkwind ceramic assemblage.

At the Hawkwind site, radiocarbon dates obtained from organic remains (primarily hickory nuts), sherd residue, and sherd bulk organics indicate multiple occupations dating from the Late Archaic to the end of the Woodland period. Most intriguing are the dates obtained from the residue found on the interior of four of the sherds. If it is assumed that these residues actually date the last use of these four vessels, then the dates suggest occupations during the early, middle, and late Woodland periods. All four of the sherds are grog-tempered plain wares, but two have sandier pastes and two have silty pastes. The two sandier paste sherds date earlier than those with silty pastes. As previously discussed, if the laminated vs. irregular textures are tied more closely to function, then it may be that sandy paste constituencies are more closely tied to earlier assemblages than later assemblages, possibly due to shifting social/group interactions. For example, if Woodland potters in the Sabine River basin were borrowing from other ceramic technologies, then it may be that contacts with the sandy paste potters of the Mossy Grove Culture tradition influenced their choice of clay sources during the early Woodland period.

In addition to the sherds with dated residues, an A.D. 390–540 date derived from the bulk dating of the organic material in a Marksville Incised, *var. Yokena* sherd (see Figure 2e) was also obtained. The date on this sherd is consistent with the post–A.D. 400 Woodland components at the Herman Ballew site where a probable Marksville Incised, *var. Yokena* sherd was also recovered. Similarly, several Marksville Incised, *var. Yokena* sherds were also recovered at the Resch site. If the corrected and calibrated dates for the Resch site extend the age range of the site to A.D. 325 (Perttula 1997:330), then the presence of this type at the Resch site seems to be somewhat earlier than expected. However, given the date on the Marksville Incised, *var. Yokena* sherd recovered at the Hawkwind site, it may be that this type dates somewhat earlier than A.D. 400 in the Sabine River basin. This is said with some caution because bulk sherd dating is a relatively new technique that has often yielded inconsistent dates (Darden Hood, personal communication, 2011). In general, the types recovered at the Hawkwind site fit well with the radiocarbon dates obtained on both the organic remains and the sherds.

SUMMARY AND CONCLUSIONS

The archeological evidence from East Texas sites with Woodland period components point to

a cultural landscape that is marked by changes in lifestyle occurring in tandem with technological changes, the most notable of these being the introduction of ceramics. Broad-scale cultural interaction spheres are reflected in the presence of Lower Mississippi Valley (LMV) Tchefuncte and Marksville ceramics that occur with some frequency in early to middle Woodland period sites (ca. 400 B.C. to A.D. 500).

In East Texas, Woodland period sites share certain similarities to sites covering a broad geographic area from eastern Oklahoma, southwestern Arkansas and northwestern Louisiana, and into Southeast Texas. The evidence of this is seen in the subtle, and not so subtle, differences among assemblages associated with each of the three major cultural traditions recognized in East Texas. For example, ceramic assemblages at Mill Creek sites are quite small in number when compared to Fourche Maline or Mossy Grove sites. They are also more technologically variable, exhibiting a mix of plain sandy paste wares, bone-tempered wares, and thinner grog-tempered wares that are more likely to be related to LMV wares than to the later occurring grog-tempered Mossy Grove ceramics. The relatively thick bone-tempered sherds found at some Mill Creek sites are more likely to be related to the Fourche Maline type defined as Cooper Boneware, as bone-tempered ceramics do not appear until late (after A. D. 900) in the ceramic sequence in much of the Mossy Grove culture area. Similarly, the sandy paste wares with smoothed surface treatments may be analogous to the Ouachita Ironware type; however, the presence of sandy paste ceramics exhibiting floated surface treatments would more comfortably fit with the Goose Creek Plain sandy paste tradition of the Mossy Grove area. There is also a high representation of ceramics with laminated and contorted paste textures, reminiscent of LMV Tchefuncte and Marksville wares that date to between ca. 800 B.C. and A.D. 200. Thus, East Texas Woodland period ceramic assemblages often exhibit a blend of ceramics whose attributes represent multiple technological traditions. Distinguishing which ceramic tradition specific Mill Creek assemblages are more temporally or spatially affiliated with will require more systematic comparative analyses of collections that focus on technological attributes. This study represents just such an approach.

What does this analysis tell us about these four Woodland period sites located in the middle Sabine River basin? First, analyses of the technological and decorative attributes at the Hawkwind site illustrate the same technological variation noted at the other three sites. Second, reanalysis of the Resch and Folly site ceramics, as well as the results of the petrographic and INAA on selected sherds from both sites, confirmed the technological variability of ceramic paste characteristics recovered from both sites. Paste attributes at all four sites were highly variable. In addition to grog, clay lumps, and or/bone temper, both sand-tempered and non-tempered sandy paste wares were also identified. High proportions of sand were present in the paste matrix of many of the tempered paste groups found at all four sites, as were various other additives such as crushed hematite and charcoal. Proportionately speaking, the diversity of paste groups in all four assemblages is similar, even though the distribution of specific paste groups varies from site to site.

All four ceramic assemblages include primarily simple vessels with straight walls and highly variable lip edges. They vary in thickness from one paste category to another, but rims with flat lip edges are generally much thicker than rims with rounded or tapered-rounded lip edges, and it appears that this change from flat, thick rims to rounded, thinner rims may be temporally related. Bases were incredibly variable, ranging from flat disc-shaped and flowerpot styles to round or rounded flat to nodal supports. All of which point to broad-scale interactions with neighboring groups.

Surfaces are primarily dry-smoothed, but floated surfaces and burnished surfaces have differential representation at each site. While primarily undecorated plain wares, when decorated, motifs generally cluster around a narrow range of techniques that included broad U-shaped lines that were as likely to have been executed on leather-hard pastes as on wet pastes. Incised lines are primarily straight, but curved incisions seem to be more closely associated with tempered wares resembling LMV types. Fingernail, stylus, and tool punctations were also common. Lip decoration occurs infrequently, but when it does, it usually involves notches or crenellations cut or impressed into the lip edge.

Many of the more complicated designs mimic motifs common to LMV or Fourche Maline ceramics, but the technological attributes of the sherds suggest they are locally made variants. This is supported by the results of the INAA performed on 39 ceramic sherds and one raw clay sample from

the Resch, Hawkwind, and Folly sites. The results show similarities between the Resch, Hawkwind, and Folly samples and the main Caddo group for the middle Sabine River basin in East Texas, indicating they were locally manufactured.

Petrographic analysis of the raw clay sample showed that among its many constituents were clay lumps and opaque material (possibly hematite). Since the paste matrix of many of the analyzed sherds appeared to have been tempered with clay lumps and/or crushed hematite, the appearance of both constituents in the raw clay itself suggests that they may in fact be natural inclusions rather that added ones. That being said, microscopic analysis of many of the clay/grog sherds show large numbers of clay lumps that differ in color and texture from the surrounding paste matrix which could indicate that Woodland period potters were mixing two types of clays whose constituents included clay lumps.

In conclusion, comparisons between the ceramic assemblages at these four sites show definite technological similarities, as well as a number of differences. In many cases, the same sets of ceramic attributes are differentially represented at the different sites, which suggest that this differential representation may have functional implications for the activities carried out at each site. Finally, the variability in technological and decorative attributes noted on the ceramics from the Hawkwind, Resch, Folly, and Herman Ballew sites point to a time of experimentation during which Woodland potters incorporated aspects of multiple technological traditions. From the thick grog-tempered Fourche Maline wares with their plain flat bases, to the non-tempered sandy paste Mossy Grove wares with their round bases, to the LMV wares with their podal supports, Woodland period ceramic assemblages point to a time of innovation during which potters in this area of East Texas incorporated an array of technological attributes derived from other ceramic-bearing groups with whom they interacted. This begs the question: how closely connected were the Woodland period populations associated with the Fourche Maline, the Mill Creek, and the Mossy Grove traditions? Further, what level of social interaction existed among the various Woodland period groups? And, to what degree do the differences we see at various sites simply result from within-group variability in the adoption of specific technologies? It will take the identification and excavation of more Woodland period sites to fully investigate these questions.

END NOTES

1. These two sherds are possibly the only non-Woodland sherds in the assemblage; however, there is considerable spatial and temporal diversity in the manufacture and use of shell tempered vessels in East Texas Caddo sites (Perttula et al. 2011). While shell-tempered vessels did not become a ubiquitous part of ceramic assemblages until sometime after ca. A.D. 1300, there is some evidence for the early use of shell-tempered ceramics in the general region. The Woodland period use of shell-tempered pottery has been documented at two sites in the Trinity River basin, Bird Point Island (41FT201) and Adams Ranch (41NV177). At Bird Point Island, shell-tempered pottery was recovered from zones dating between A.D. 100-700. At Adams Ranch, calibrated radiocarbon dates suggest that the first use of shell-tempered pottery occurred at the site between A.D. 257-675. Thus, the presence of two shell-tempered sherds at the Hawkwind site may simply be an aberrant Woodland period occurrence.

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Caddo Ceramics in East Texas

Timothy K. Perttula

ABSTRACT

The distinctive Caddo Indian pottery from sites in East Texas developed from local Woodland period ceramic antecedents about ca. A.D. 850, well after the first pottery was made in the region beginning about 2500 years ago by ancestral Caddo hunter-gatherers. The technological and stylistic practices that came to characterize the fully developed East Texas Caddo ceramic traditions, namely the styles, vessel forms, and functional character of the ceramics found in habitation and mortuary features on Caddo sites, can be employed to examine the importance of ceramics in the cooking and serving of foodstuffs, in the lives of agricultural peoples, as mortuary offerings, and as a means to establish and maintain the social identity of contemporaneous Caddo groups. I will also consider how the study of ceramics has been used to establish the chronology and temporal span of the Caddo occupation of East Texas, and demonstrate the geographic extent and interrelationships of Caddo groups.

Pottery is a complicated and multifaceted technology, whether past or present, and efforts to oversimplify this complexity and reduce it to a few meager dimensions of variability are a disservice to the field as a whole. "Doing" ceramic analysis has always required of its practioners an enormous tolerance of ambiguity because there is as yet no unifying theory and there are no easy answers. For most of us, that is what keeps it interesting (Rice 1996:191).

INTRODUCTION

Ceramic vessels and vessel sherds are ubiquitous and abundant on ancestral Caddo Indian sites in East Texas, part of the Southern Caddo area (Figure 1), that date from as early as ca. A.D. 800/850 to the early 19th century. These ceramics are very diverse in decorative styles, methods of manufacture, surface treatment, firing, and chemical composition, and this has proved useful in the acquisition of information on the stylistic and technological character of geographically distinctive ancestral Caddo ceramic assemblages and how they have changed through time. The study of Caddo ceramics has also provided crucial insights into chronological and temporal issues in the archeological record, the character of social relationships between groups in the region, different culinary traditions, the context of ceramic manufacture and production, mortuary practices, and exchange/interaction between Caddo groups as well as exchange/interaction with non-Caddo groups (see Dowd 2011; Early 2012; Perttula 2002, 2011; Gadus and Fields 2012).

The most distinctive material culture item of the ancestral Caddo groups living in East Texas were the ceramics they made primarily for cooking, storage, and serving needs. The decorative styles and vessels forms of ceramics found on sites in the region hint at the variety, temporal span, and geographic extent of a number of ancestral Caddo groups spread across the landscape. The diversity in decoration and shape in Caddo ceramics is substantial, both in the utility ware jars and bowls, as well as in the fine ware bottles, carinated bowls, and compound vessels. Ceramics are quite common in domestic contexts on habitation sites across the region, and also occur as grave goods in mortuary contexts.

The Caddo made ceramics in a wide variety of vessel shapes, and with an abundance of well-crafted and executed body and rim designs and surface treatments (e.g., Early 2012). From the archeological contexts in which Caddo ceramics have been found, as well as inferences about their manufacture and use, it is evident that ceramics were important to the ancestral Caddo in: the cooking and serving of foods and beverages, for the storage of foodstuffs, as personal possessions, as incense burners (see Lankford 2012), as beautiful works of art and craftsmanship (i.e., some vessels

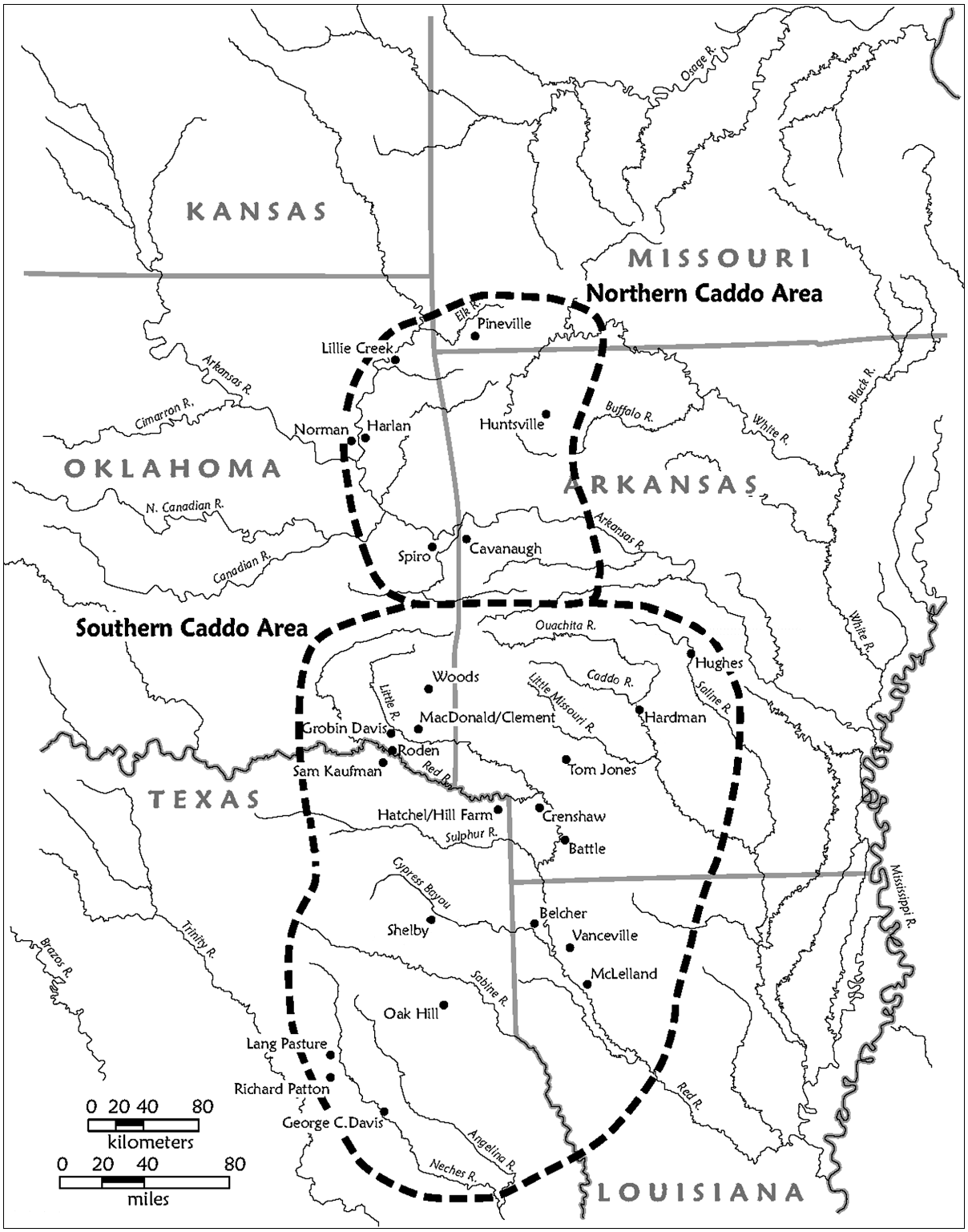

Figure 1. The Caddo archeological area at its maximum extent.

were clearly made to never be used in domestic contexts), and as social identifiers; that is, certain shared and distinctive stylistic motifs and decorative patterns on ceramic vessels marked closely related communities and constituent groups.

Recent investigations at the Timber Hill site (41MR211) indicate that the aboriginal Caddo ceramic tradition continued in full-force in East Texas until the late 1830s (Parsons et al. 2002:35), as did traditional culinary practices of the Caddo people. It appears that the ceramics at Timber Hill were made and used for cooking, re-heating, serving, and storage of food stuffs, and probably had the same range in vessel form and size as earlier Caddo ceramics in East Texas. Even after extensive contact with Europeans, presumably more than a century after the introduction of metal cookware (i.e., iron kettles), the Caddo continued to use and maintain their long-established ceramic tradition. This strongly implies that traditional means of food processing and culinary practices were maintained by the Caddo living at Timber Hill and that they held fast to their cultural and social traditions even in the face of extensive European contact.

The Caddo ceramics found at the Timber Hill site are an interesting and apparent amalgamation of the traditions of different but ethnically related Kadohadacho groups because they are diverse in terms of tempers used in the vessel paste (i.e., shell temper favored by some Caddo groups, and grog and bone by others), and in the range of decorations seen on the fine wares and utility wares. In another example of Caddo ceramic manufacture and use/culinary continuity, several mid-1830s Caddo vessels apparently collected from Caddo peoples living in northwestern Louisiana are similar in vessel shape to 18th century vessel forms and they have recognizable Historic Caddo engraved motifs (Perttula 2001).

The discussion of the Caddo ceramic tradition in this article emphasizes the acquisition of information on the stylistic and technological character of ancestral ceramic assemblages in Caddo sites in the Pineywoods and Post Oak Savannah natural regions of East Texas (Figure 2). Chronology, social relationships, culinary traditions, the context of ceramic manufacture and production, and exchange/interaction between Caddo groups (and between Caddo groups and non-Caddo groups in the Southeast, Midwest, and Southern Plains) are also addressed. I also assess the place of the Caddo pottery made and used at specific Caddo sites within the context of intra-region ceramic traditions and practices, and how the understanding of those may provide insights into the Caddo peoples that lived in East Texas for more than a millennium.

CERAMIC WARES

There are basic distinctions that can be recognized in Caddo ceramic assemblages between plain wares, utility wares, and fine wares. The same range of forms was made by Caddo potters in all three wares: carinated bowls, bottles, bowls, and jars. These were forms that were obviously

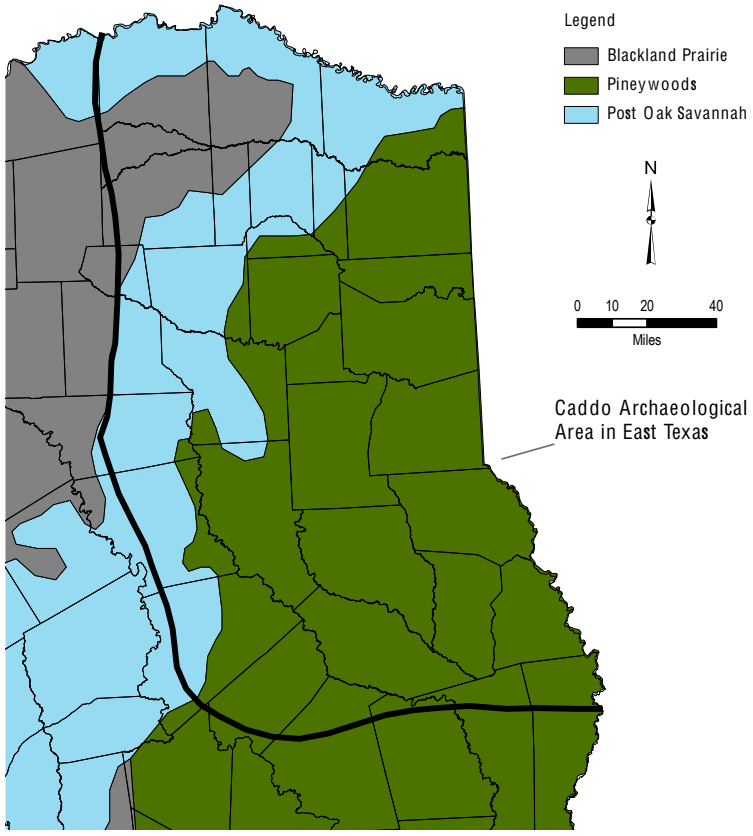

Figure 2. The Caddo archeological area in East Texas.

considered appropriate by the Caddo as to the kinds of vessels being made and used in different parts of East Texas. The particular shape and form of these vessels is a hallmark of the technology and style of Caddo pottery vessels in East Texas, and these shapes and specific vessel forms would have been immediately recognizable (e.g., Stark 2003:212) to other Caddo as belonging to those of a particular social group. Sadie Bedoka, a Caddo-Delaware woman, noted in the 1930s that potters from one Caddo group could tell those of another simply by the different pottery shapes (e.g., La Vere 1998:92).

Utility ware vessels were used for cooking, storage, and probably other culinary activities; they tend to have a coarse paste, thick body walls, smoothed interior surfaces, and are decorated with wet-paste designs (i.e., decorations were made with tools and fingers prior to the vessel being fired, when the vessel had a wet exterior surface). Thicker body walls on utility ware vessels were likely related to the performance needs of the cooking pot to withstand thermal shock and cracking during use. Typical utility vessel shapes included small to large jars, as well as a variety of conical and simple bowl and bottle forms, most of the latter in the earlier Caddo ceramics (and the historic Caddo ceramics) being plain and unpolished. The utility vessels have carbon encrustations, food residues, and soot stains, suggesting they were employed by the Caddo over open fires as cooking pots. Some of these kinds of vessels were used primarily for storage (those with large orifice diameters and vessel volumes) of foodstuffs and liquids.

Incised and punctated utility vessels were commonly used by Caddo groups in East Texas, particularly before ca. A.D. 1300-1400, but they were also decorated in a variety of other ways. Brushing of vessel bodies is a form of surface treatment on utility wares that is notable after ca. A.D. 1250 in the Big Cypress Creek basin and the Neches-Angelina river basins, and in sites in the middle reaches of the Sabine River and on the lower Sulphur River. Other types of decorations and/or surface treatments on later Caddo utility vessels included neck-banding, brushing, ridging, appliqued, and combinations of zoned and diagonal incised and punctated designs on the rim and body of jars. In historic Caddo times, dating after ca. A.D. 1650/1700, rows of fingernail punctations on the rim of everted-rim Emory Punctated-Incised jars are also a common decorative treatment in Caddo sites along the Red River and in the upper Sabine River basin. Handles and lugs were present on some of the utility vessels, especially on ancestral Caddo sites dating after ca. A.D. 1250.

Fine wares are engraved and red-slipped vessels that were used for food service and to hold liquids, as well as for other purposes (effigy vessels and other vessel forms that may have held pigments or tobacco). They tend to have fine pastes, with finely crushed tempers, are frequently burnished on interior and/or exterior vessel surfaces (except the bottles, which were burnished on exterior surfaces only), and have relatively thin body walls compared to the utility wares. There is an impressive diversity of vessel forms among the Caddo fine wares. This includes carinated bowls, deep compound bowls, double and triple vessels (conjoined or fused bowls and bottles, and bottles), ollas, zoomorphic and anthropomorphic effigy bowls and bottles, ladles, platters, rim-peaked jars, gourd and box-shaped bowls, and chalices.

Plain wares have technological attributes common to both utility wares and fine wares, except that the plain ware vessels remain undecorated. The common occurrence of plain bowls and bottles in East Texas Caddo plain ware assemblages suggests that they were mainly used for food service and to hold liquids, as with the fine wares.

The East Texas Caddo made fine wares, plain wares, and utility wares that were tempered, almost without exception, with grog (crushed sherds) or bone, although burned and crushed shells were used as temper after ca. A.D. 1300 among most of the middle Red River Caddo groups (i.e., McCurtain phase Caddo groups in the Kiamichi-Red River confluence area) and on later Caddo sites in the lower and upper Sulphur River basin (Perttula et al. 2012). The use of bone by Caddo potters as temper varied significantly by region (cf. Perttula and Ellis 2012:Table 8-24). After adding the temper to the clay, the kneaded clay was formed into clay coils that were added to flat disk bases to form the vessel, and the coils were apparently smoothed with a round river pebble to create the finished vessel form. Decorations and slips were added before, as well as after, baking in an open fire, and commonly the vessels were then burnished and polished; red ochre and white kaolinite clay pigments were often added to the engraved decorations on bottles, compound bowls, and carinated bowls.

These kinds of ceramics were designed to serve different purposes within Caddo communities and family groups—from that of a cooking pot

to the mortuary function of a ceremonial beaker or bottle with iconographic significance (see Gadus, this volume)—and this is reflected in differences in paste, surface treatment, firing methods, decoration, and vessel form between the three wares.

STYLISTIC DISTINCTIONS

The stylistic analysis of Caddo ceramics from sites in East Texas focuses on the definition of recognizable decorative elements, patterns, and motifs on the rim and/or body of the quite diverse fine wares (i.e., the engraved and red-slipped vessels, including carinated bowls and bottles) and utility wares, usually cooking or storage jars and simple bowls. These decorative distinctions have both temporal and geographical distributions across East Texas (Story 1990a), and in some cases, across the broader Caddo area, and the recognition and unraveling of those distributions has been key to the reconstruction of settlement and regional histories of different Caddo communities as well as their socio-cultural character.

The stylistic distinctions that have been recognized in East Texas Caddo ceramics are based primarily on the pioneering typological research done by Alex D. Krieger, Clarence Webb, Dee Ann Suhm (Story) and Edward B. Jelks in the 1950s and early 1960s (Suhm et al. 1954; Suhm and Jelks 1962). Suhm and Jelks (1962) presented descriptions of 60 Caddo ceramic types that had been identified in Caddo sites in East Texas and the Caddo archeological area up to that time. Suhm and Jelks (2009:3) have more recently suggested that since 1962:

> the Caddoan [sic] types, at least those found in Texas, have changed surprisingly little, more tweaked than substantially altered. Elsewhere in the Caddoan [sic] area, a relatively modest number (considering the amount of pottery usually found at the sites) of new types have been defined, although many varieties of existing types have been introduced and design motifs, even design element categories, have been recognized, especially by archeologists working in Arkansas.

Thus, it is fair to say that the ceramic types defined by Suhm et al. (1954) and Suhm and Jelks (1962) are still useful classificatory constructs for Caddo archeological research. Perttula (n.d.) notes, however, that some 38 new Caddo ceramic types have been recognized in East Texas archeological sites since the mid-1960s—some better defined than others—but most of them are poorly known among archeologists that work on Caddo sites in the region. Some new varieties have also been identified among several of the well-known types defined in Suhm and Jelks (1962), including Poynor Engraved, Hume Engraved, Ripley Engraved, and Wilder Engraved, and these varieties appear to have more discrete temporal and geographic boundaries than when first defined in the 1950s. Nevertheless, many archeologists working in the East Texas Caddo area continue to rely, erroneously, on the estimated ages of types offered by Suhm and Jelks (1962), when with the advent of relatively extensive radiocarbon dating of Caddo sites in the region (Perttula and Selden 2011)—and the seriation of burials in cemeteries (see Perttula 2011)—much more accurate temporal estimates for the manufacture and use of defined pottery types have been established.

As mentioned above, the fine wares were usually well-burnished, and decorated with fine-line incised or trailed (as with Keno Trailed) and engraved designs, or had a slip added to one or both vessel surfaces. The earlier Caddo fine ware designs (i.e., before ca. A.D. 1250) are curvilinear, rectilinear, and horizontal, with dominant geometric patterns as well as scrolls, and frequently cover the entire vessel surface; other fine ware designs simply are placed on the rim, or sometimes on the interior rim surface. In general, the earlier Caddo fine wares across East Texas (and indeed extending across much of the Caddo area itself) are quite uniform in style and form, suggesting that a broad and extensive social interaction existed between Caddo groups across the region, in concert with an extensive trade and exchange of vessels made by craftspeople. The use of a red hematite slip on interior and/or exterior surfaces of carinated bowls and bottles occurs with some regularity in ca. A.D. 1100-1450 ceramic assemblages in various parts of the region (particularly in the upper Sabine and Cypress drainage basins), and in the case of the distinctive type Maxey Noded Redware, the squat, long-necked bottles also have appliqued and/or punctated designs below the neck of the bottle.

The later Caddo fine ware designs (after ca. A.D. 1250) in East Texas include scrolls, scrolls with ticked lines, scrolls and circles, negative

ovals and circles, pendant triangles, diagonal lines and ladders, and S-shaped motifs. These kinds of decorative elements continued in use in historic Caddo ceramics (that is, until about A.D. 1800 or later). They are best exemplified by the intricate scrolls, ovals, and circles on Hudson Engraved and Keno Trailed bottles and Natchitoches Engraved bowls among Red River Caddo groups; the scrolls and tick marks of Patton Engraved among Hasinai Caddo groups south of the Sabine River in the Neches River basin; and the pendant triangles and engraved scrolls on Womack Engraved bowls on the upper Sabine and the middle Red River basin.

Because later Caddo fine wares are stylistically diverse across East Texas, there are very specific differences in vessel shapes, designs, and decorative attributes between Caddo ceramics in individual drainages, or even within specific smaller segments of river and creek basins. This diversity can be reasonably interpreted to be representative of the territory of specific Caddo social groups across the landscape. In historic Caddo times, ceramic vessel forms and decorations are considerably more homogeneous across much of the Caddo area than they were between ca. A.D. 1250-1680, suggesting extensive intra-regional contact between contemporaneous Caddo groups.

Assemblage Comparisons

In this section are depictions of ceramic vessel decorations and forms from ancestral Caddo assemblages of different ages across East Texas. As will become apparent, East Texas ceramic assemblages are diverse in decorative treatment as well as in the relative abundance of both plain wares and engraved wares, particularly from east to west across the area from the Red River to the Neches River. This diversity in vessel decoration (and likely also a diversity in vessel forms) suggest the existence of several different Caddo groups and their associated ceramic traditions living in this region as early as ca. A.D. 850/900 that were developing their own ethnic and stylistic expressions and ceramic practices.

The pottery types identified in the decorated sherds and vessels known to come from ca. A.D. 850-1200 East Texas Caddo sites include: (a) the engraved fine ware types Hickory Engraved, Holly Engraved, and Spiro Engraved, and (b) the utility ware types Coles Creek Incised, Davis Incised, Dunkin Incised, Weches Fingernail Impressed, Kiam Incised, East Incised, Hollyknowe Ridge Pinched, Crockett Curvilinear Incised, and Crenshaw Fluted (Figures 3 and 4). All of these types would be expected to be present in ca. A.D. 850/900-1200 Caddo sites in the East Texas, Northwest Louisiana, and Southwest Arkansas regions, along with several other types (such as Duren Neck Banded, Bowles Creek Plain, Smithport Plain, Evansville Punctated, Wilkinson Punctated, Harrison Bayou Incised, etc.), but the relative proportions of the different ceramic types vary from site to site and through time across the region.

Among the utility wares in ca. A.D. 850-1200 Caddo sites in East Texas, the most common decorative methods on vessels, and on sherds from vessels, are incised (especially horizontal incised elements), punctated, and incised-punctated designs (see Figure 3a, c-d, f and Figure 4a). Crockett Curvilinear Incised and Pennington Punctated Incised sherds and vessels are present in pre-A.D. 1200 ceramic assemblages, but occur in considerable frequencies only at the George C. Davis site. An analysis of the ceramic assemblages from well-dated unit excavations at George C. Davis (see Stokes and Woodring 1981:Table 26; Perttula 1997:Table 1, as amended using IntCal09 [Reimer et al. 2009]), suggests that both types are present in unit excavations that date from cal A.D. 897-1276, virtually the entire span of the prehistoric Caddo occupation (see Story 2000), with Crockett Curvilinear Incised most common between cal A.D. 1027-1223 and Pennington Punctated Incised most common throughout the occupation at the site.

Some vessels have horizontal incised lines above rows of vertically oriented punctations, and have straight or parallel incised lines adjacent to a zone of tool punctations. Rows of tool punctations also occur between the incised lines (see Figure 3b). This decorative element is noted in ceramic assemblages at Early Caddo sites in East Texas (Newell and Krieger 1949:Figure 38m-n; Bruseth and Perttula 2006:Figure 26d; Perttula 2011, ed.: Figures 35b and 36a) and Northwest Louisiana, where it is called band punctated (Figure 4b, see Webb 1963:Figure 9r-s, u; Jeffrey S. Girard, April 2010 personal communication).

Early Caddo sites in East Texas are characterized by both fine ware and utility ware sherds, and a considerable number of plain ware vessels. Fine ware engraved vessels dominate the vessel

Figure 3. Ceramic sherds from an Early Caddo context at the Mound Pond site (41HS12) and the Henry Chapman site (41SM56): a, Coles Creek Incised; b, Band Punctated rim; c, incised rim and body sherds; d, incised-punctated rim sherds; e, red-slipped, engraved, and Crockett Curvilinear Incised sherds; f, incised-punctated rim sherds from the Henry Chapman site.

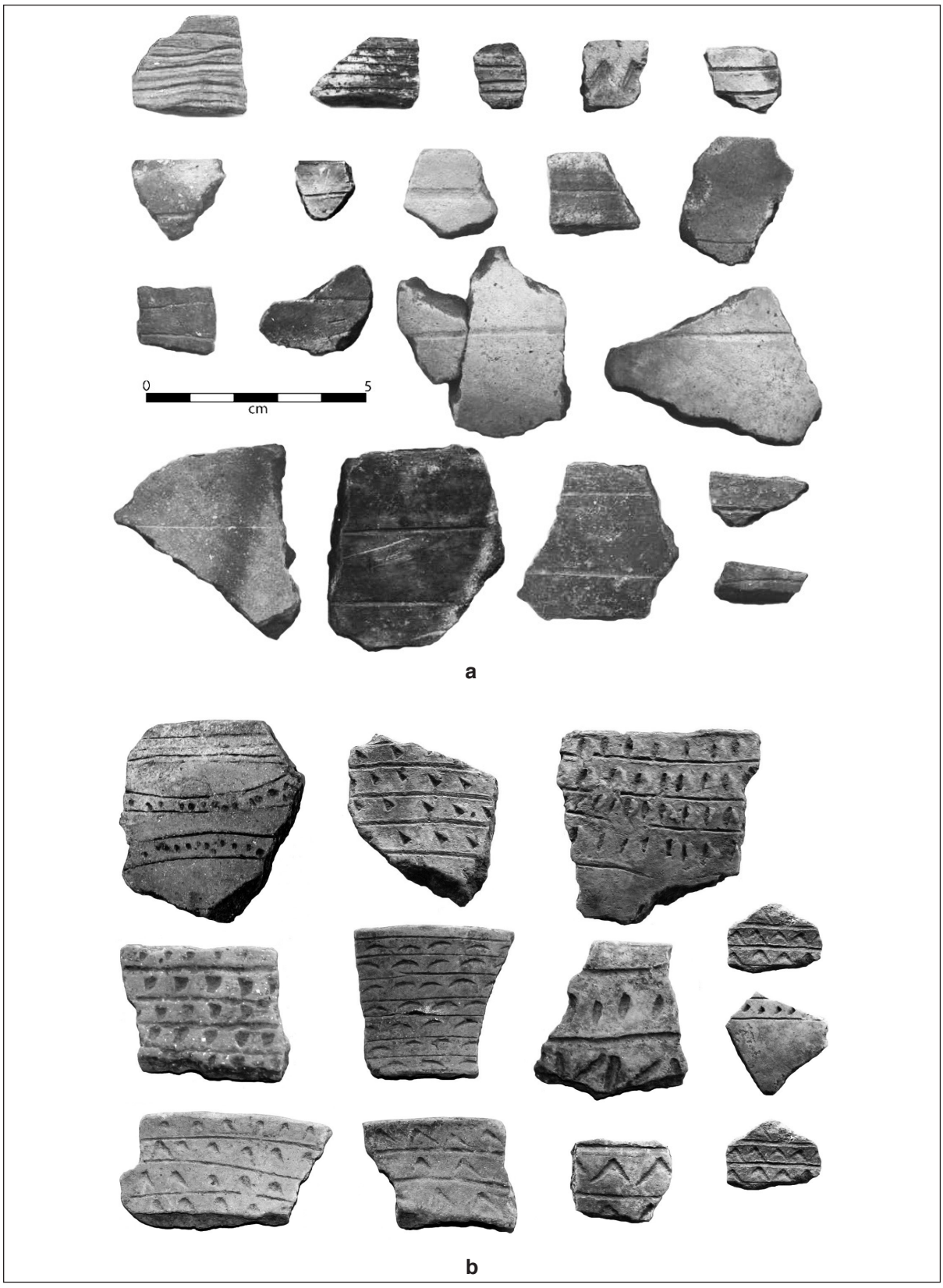

Figure 4. Ceramic sherds from Early Caddo contexts at the Mound Plantation site (16CD12) in Northwest Louisiana: a, horizontal incised sherds; b, Band Punctated sherds. Images courtesy of Jeffrey S. Girard.

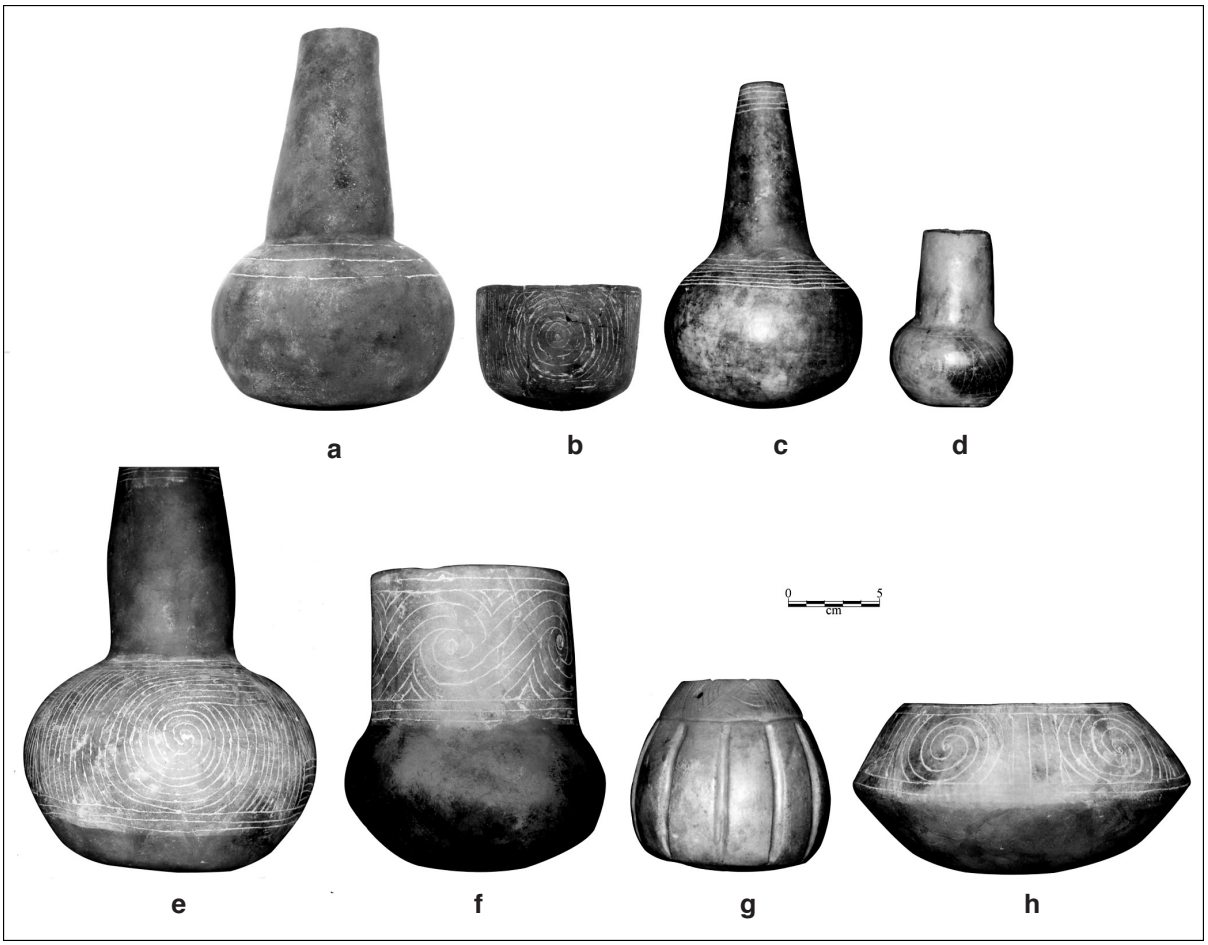

Figure 5. Engraved vessels from the Boxed Springs site (41UR30): a, c, Hickory Engraved; b, e-f, Spiro Engraved; d, Holly Fine Engraved; g, Spiro Engraved fluted bowl; h, engraved panels and scrolls.

collections at both Boxed Springs and the George C. Davis sites, particularly Hickory Engraved and Holly Engraved (Figure 5a, c-d), as well as Spiro Engraved (Figure 5b, e-f). In these Early Caddo sherd assemblages, engraved fine wares comprise between 16.5-30.8% of all the decorated sherds; red-slipped sherds are rare (see Figure 3e).

Coles Creek Incised sherds and vessels are present in several Early Caddo sites in East Texas, albeit at low frequencies in decorated vessel and sherd assemblages (Figure 6a; see also Figures 3a and 4a). At the George C. Davis site, for example there are only nine Coles Creek Incised sherds in an assemblage of more than 100,000 sherds and 15 whole vessels (Story 1990b:746). The most common variety is *var. Coles Creek* (Phillips 1970), and this variety apparently dates from ca. A.D. 900-1050 in Early Caddo contexts as well as the lower Ouachita River valley in the Lower Mississippi Valley (Girard 2009b:52). In general, the Coles Creek Incised vessels and sherds from sites in the Caddo area are similar "in decorative designs and sometimes in vessel form, but not usually in details of paste" (Story 1990b:736) to vessel sherds in the Lower Mississippi Valley. They do not represent settlement of the area by Lower Mississippi Valley peoples. Girard (2009b:52) suggests there was a period of strong Lower Mississippi Valley Coles Creek influence among Caddo peoples in parts of the Caddo area between ca. A.D. 900-1050, and this influence (and presumably considerable contact) is most notably detected in the character of the ceramic wares.

In Northwest Louisiana, Girard (2009a:27-28, 2009b:52) has developed a relatively detailed ceramic chronology for the period between ca. A.D. 900 and ca. A.D. 1200. According to Girard (2009a:27-28):

Between A.D. 900 and 1050, decorated specimens increased in number, but still constituted only about 10 percent or less of most assemblages. Horizontal incising was common, and distinctive elements associated with Coles Creek Incised, var. *Coles Creek* (overhanging lines, sometimes with underlying triangular punctations) often occurred. I suspect that the type Weches Fingernail Punctated is a regional variant of this Coles Creek theme. Body sherds with large fingernail punctations (e.g., Kiam Punctated Incised) also appeared. This interval might be the time of initial use of engraved pottery, although percentages were very low. Between A.D. 1050 and 1200 a substantial increase in the amount and diversity of decorated pottery took place, when types such as Dunkin Incised, Pennington Punctated Incised, Crockett Curvilinear Incised, Hollyknowe Pinched began to constitute substantial percentages of decorated assemblages. It is likely that jars with brushed surfaces were made in the 12th century, but did not begin to dominate assemblages until the Middle Caddo period (A.D. 1200-1500).

The occurrence and relative proportion of Coles Creek Incised pottery in ceramic assemblages from Early Caddo sites in Northwest Louisiana and at the Mound Pond site (41HS12) near Caddo Lake is considerable, dwarfing its use on most East Texas Caddo sites of the same age. At the Mounds Plantation site (16CD12), in pre-A.D. 900 archeological deposits, Coles Creek Incised (or related horizontal incised sherds) comprise

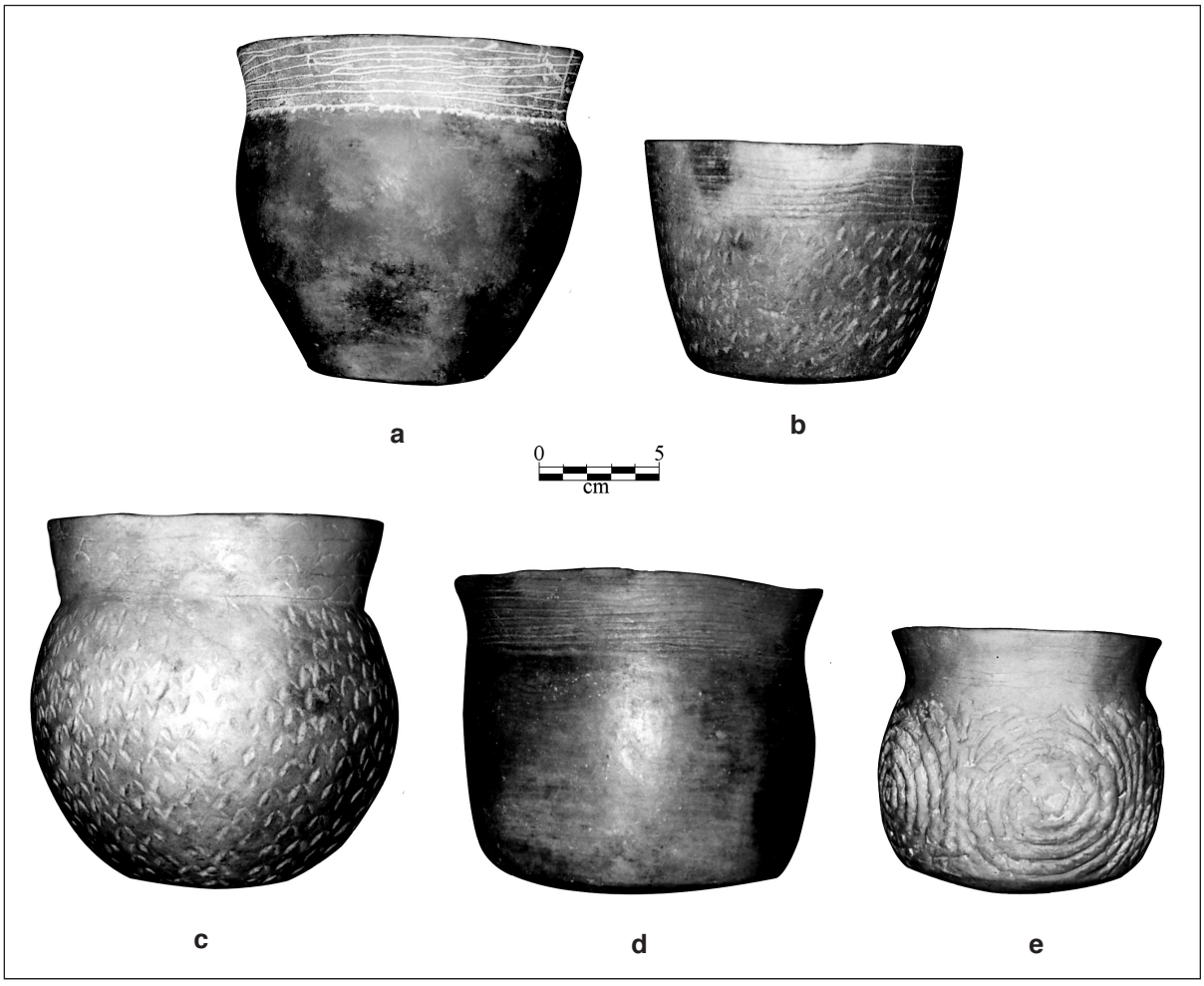

Figure 6. Utility ware vessels from the Boxed Springs site: a, Coles Creek Incised; b, Kiam Incised; c, Weches Fingernail Impressed; d, horizontal incised; e, Hollyknowe Pinched Ridge.

between 91.6-100% of the decorated sherds (Webb and McKinney 1975; Girard 2009b, 2012). At the James Pace site, with median calibrated ages of A.D. 780 and A.D. 1010 (see Girard 1994; McGimsey and van der Koogh 2001) on the Sabine River , apparently occupied between ca. A.D. 800-1000, Coles Creek Incised pottery, including *var. Hardy* (n=190), *var. Coles Creek* (n=87), *var. Mott* (n=71), and *var. Greenhouse* or *var. Blakely* (n=6), accounts for 72% of the decorated sherds (Story 1990b:Table 77).

Coles Creek Incised pottery diminished after ca. A.D. 1050 at Mounds Plantation, and at the Smithport Landing site, as clearly indicated by its very high frequencies in sub-mound midden deposits in Mound 3 (75%, estimated to date from ca. A.D. 900-1050) to moderate frequencies in the Mound 3 fill (49%, estimated to date from A.D. 1050-1200); only 7.7% of the decorated sherds from Mound 2 (with a calibrated radiocarbon date of A.D. 989-1146) are from Coles Creek Incised vessels, and none of the decorated sherds from Mound 6 are from Coles Creek Incised vessels. In other Northwest Louisiana sites, Coles Creek Incised sherds represent about 10% of the decorated sherds, and these sites tend to date after ca. A.D. 1000 (Perttula 2011, ed.: Table 14). For instance, at the Hanna site (Thomas et al. 1980), with mean calibrated radiocarbon dates that range from A.D. 978-1260, only 10.6% of the decorated sherds are from Coles Creek Incised vessels. These later sites have Davis Incised, Dunkin Incised, Kiam/Hardy Incised, and Hollyknowe Ridge Pinched utility ware vessels and sherds, as well as moderate amounts of Crockett Curvilinear Incised, Pennington Punctated Incised sherds, and sherds from vessels decorated with punctated elements.

Early Caddo plain ware vessels include bottles, bowls, carinated bowls, and jars (Figure 7). The relatively high frequency of plain rims (47.6%) among all the rim sherds in habitation deposits at the Early Caddo Boxed Springs site indicate that plain vessels comprise a substantial part of the vessels made and used by the Caddo inhabitants of the site. More than 42% of the 169 vessels in the Boxed Springs cemetery were also plain wares (Perttula 2011, ed.: Table 11),

The Middle Caddo period (ca. A.D. 1250-1450) in East Texas is marked by a considerable stylistic heterogeneity in the decorated ceramic wares of aboriginal Caddo groups (Hart and Perttula 2010:203-204). This appears to be related to the fact that Caddo communities at this time "became economically, as well as socially and politically, more autonomous" (Girard 2010:205), and this autonomy led to innovations in ceramic traditions, both in new styles of decoration as well as new vessel forms and attributes (i.e., strap handles on both fine wares and utility wares, vessel legs, Redwine mode rims, etc., see Walters [2010]).

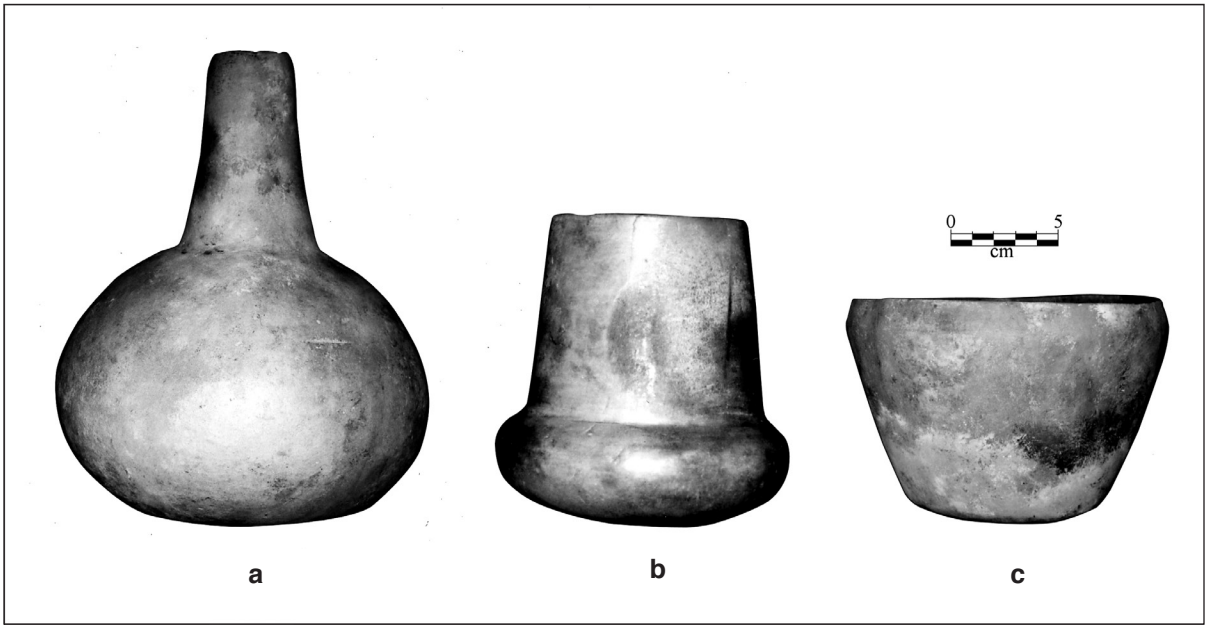

Figure 7. Plain ware vessels from the Boxed Springs site: a, bottle; b, deep bowl; c, carinated bowl.

There are distinctive engraved motifs in this East Texas Caddo style zone and ceramic tradition. These include engraved rattlesnake motifs (see Walters 2006; Hart and Perttula 2010), hatched or cross-hatched curvilinear and vertical ladders or narrow panels (Figure 8c), as well as hatched and cross-hatched circles and ovals (Figure 8f), triangles, pendant triangles, or rectangular panels with engraved triangles. The engraved rattlesnake motif represents a local expression of Beneath World creatures (Figure 8a-b). In some instances, there are engraved vessels with vertical and triangular panels filled with concentric circles. A number of the engraved fine ware vessels have horizontal interlocking, slanting, and vertical scrolls—including negative S-shaped scrolls (Figure 8g)—as their principal motif. There are also rayed circles/sun elements (Figure 8d, g) and the swastika cross-in-circle. The use of red slips to cover one or both surfaces of fine ware bowls, carinated bowls, compound bowls, and bottles (Figure 8e) is another distinctive feature of some Middle Caddo ceramic complexes in East Texas, especially those of groups living in the upper parts of the Sabine, Cypress, Sulphur, and Red River basins.

Decorated utility wares in East Texas Middle Caddo ceramic traditions have a similar broad range of common elements and motifs. This includes diagonal, diagonal opposed, horizontal, and cross-hatched incised lines on vessel rims; rows of tool, fingernail, and cane punctates on utility ware rims and/or bodies; triangular and circular incised zones filled with punctations; appliqued nodes, ridges, and fillets as decorative elements and design dividers (see Figure 8h); and brushing, either as the sole decoration on the rim and the vessel body, or on the rim or body in combination with incised, punctated, and appliqued decorative

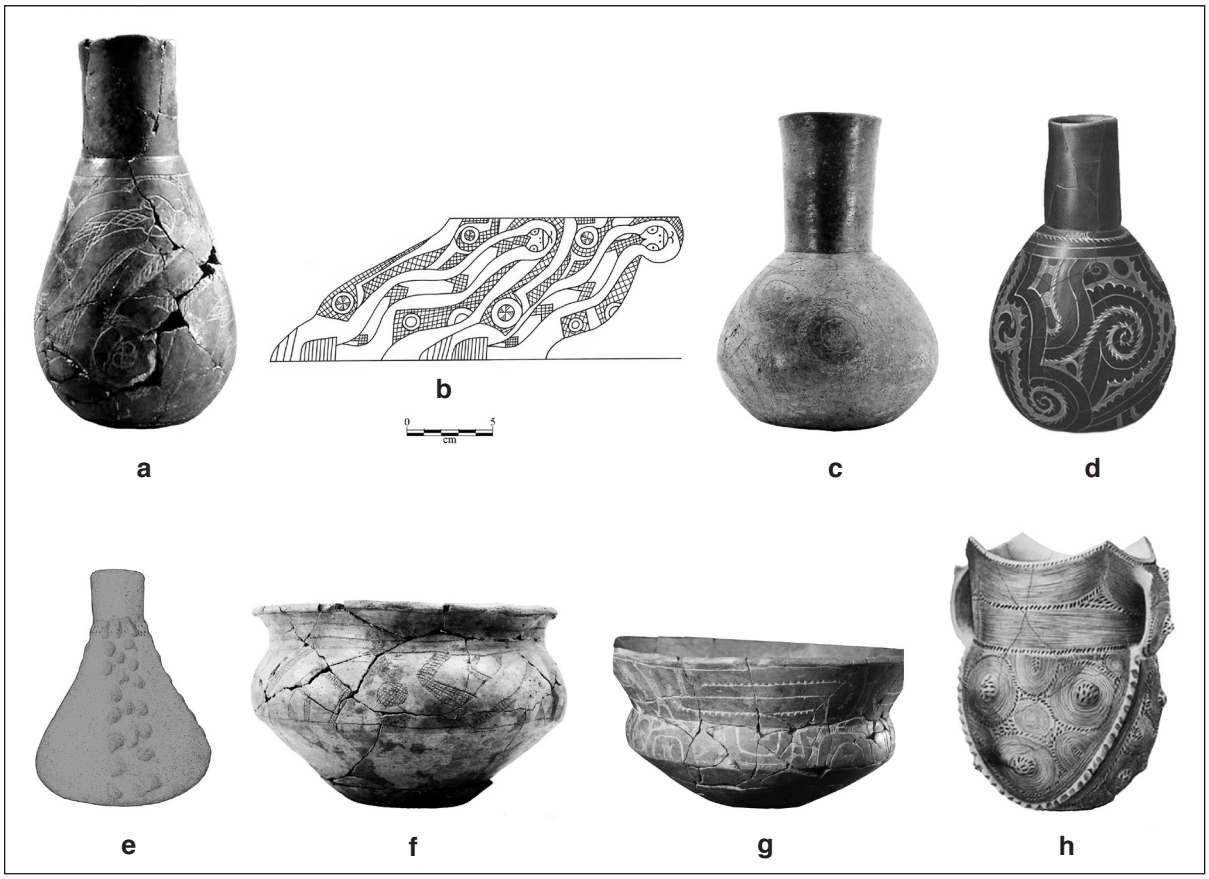

Figure 8. Middle Caddo period vessels: a-b, Nacogdoches Engraved bottle with rattlesnake motif; c, Nacogdoches Engraved bottle; d, Haley Engraved bottle; e, Maxey Noded Redware bottle; f, Nacogdoches Engraved compound bowl; g, Tyson Engraved compound bowl; h. Haley Complicated Incised jar. Provenience: a-c, f, Washington Square Mound site (41NA49); d, h, Haley site, Southwest Arkansas, from Moore (1912: Plates 39 and 40); e, Woodbury Creek site (41RA49), image courtesy of Lance Trask; g, Tyson site (41SY92), image courtesy of Tom Middlebrook.

elements. Brushed utility wares are more abundant in the eastern part of the region after ca. A.D. 1250, but only a minor part of ceramic assemblages in the western part of East Texas (especially the upper parts of the Sabine and Sulphur River basins, see Perttula and Ellis [2012:Table 8-24]).

Late Caddo (ca. A.D. 1450-1680) ceramics retain their stylistic heterogeneity, but these assemblages of fine ware, utility ware, and plain wares are part of and associated with recognizable and relatively geographically coherent socio-political entities that arose out of the earlier and distinctive archeological traditions of the Caddo peoples. Caddo groups of varying sizes, complexity, and local history were widely distributed across both major and minor streams in the area (Figure 9). Subtle population and territorial readjustments, coupled with continued mound building in some

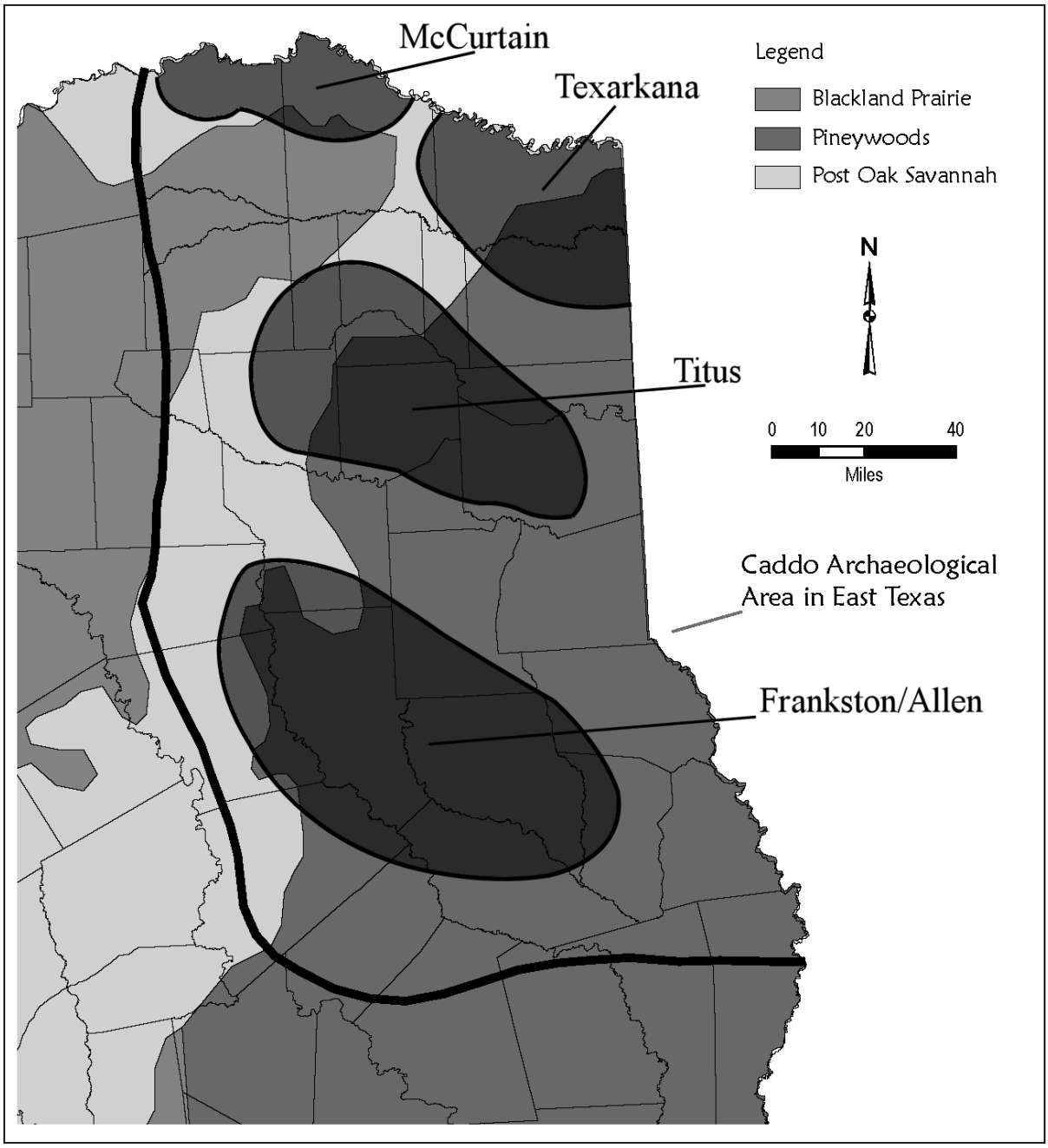

Figure 9. Late Caddo (post-A.D. 1450) phases in East Texas. Map prepared by Lance Trask.

major valleys (including the Sabine, Big Cypress, and Red River basins), trade activities (salt and bow wood), and other pursuits suggests these were prosperous farmers with sustainable social and political organizations. For want of a better term, these socio-political entities are recognized as phases in the regional archeological record, including the McCurtain and Texarkana phases along the Red River, the Titus phase in the Big Cypress and Sabine River basins, and the Frankston and Allen phases in the Neches-Angelina river basins.

McCurtain phase fine ware ceramics are well represented by Avery Engraved compound bowls, deep bowls, and bottles (Figure 10a, d, h), often times red or black-slipped, with chevron, semi-circular, and scroll curvilinear motifs (Skinner et al. 1969; Perttula 1992:Table 11), as well as Simms Engraved carinated bowls (Figure 10c, e). Simms Engraved, *var. Darco* is a post-A.D. 1650 fine ware style in late McCurtain phase contexts as well as other East Texas sites in the lower Red River and Sabine River basins.

Later fine wares (i.e., dating after ca. A.D. 1500) in McCurtain phase sites include Hudson Engraved and Keno Trailed vessels. Other fine wares include engraved jars with simple motifs (see Figure 10f-g), along with horizontal engraved effigy bowls with modeled bird heads (see Figure 10i). The very common use of a bird's head appendage on effigy vessels, and a review of North American Indian maize myths by Lankford (2008:37), may be linked to the point that in these myths, maize is commonly described in a "maize-as-a-gift" tradition, as in a gift from a divinity or their emissary; this is the case among the Caddo, for instance (Lankford 2008:Figure 2.1). One of those emissaries is a bird. Perhaps, then, the bird on the effigy bowls made by East Texas Caddo potters is a unique symbolic representation of the bird emissary that brought corn in all its abundance to these Caddo people.

The utility wares in McCurtain phase sites primarily include Nash Neck Banded and Emory Punctated-Incised jars (Figure 11a-c), as well as McKinney Plain; these vessels have a plain rim and vertical appliqued strips on the vessel body. These jars will often have peaked rims and strap handles, with separate and distinctive design elements on the rim as opposed to the body.

The incensario form (see Figure 11d) has been suggested to have been a ritual vessel form "for tobacco usage among the Caddo in early historic times" (Lankford 2012:55). Suhm and Jelks (1962:Plate 26a, c) label them rattle bowls, and examples are known from several Red River valley Caddo sites.

Late Caddo Texarkana phase contexts at the Hatchel site (41BW3) include fine wares of the

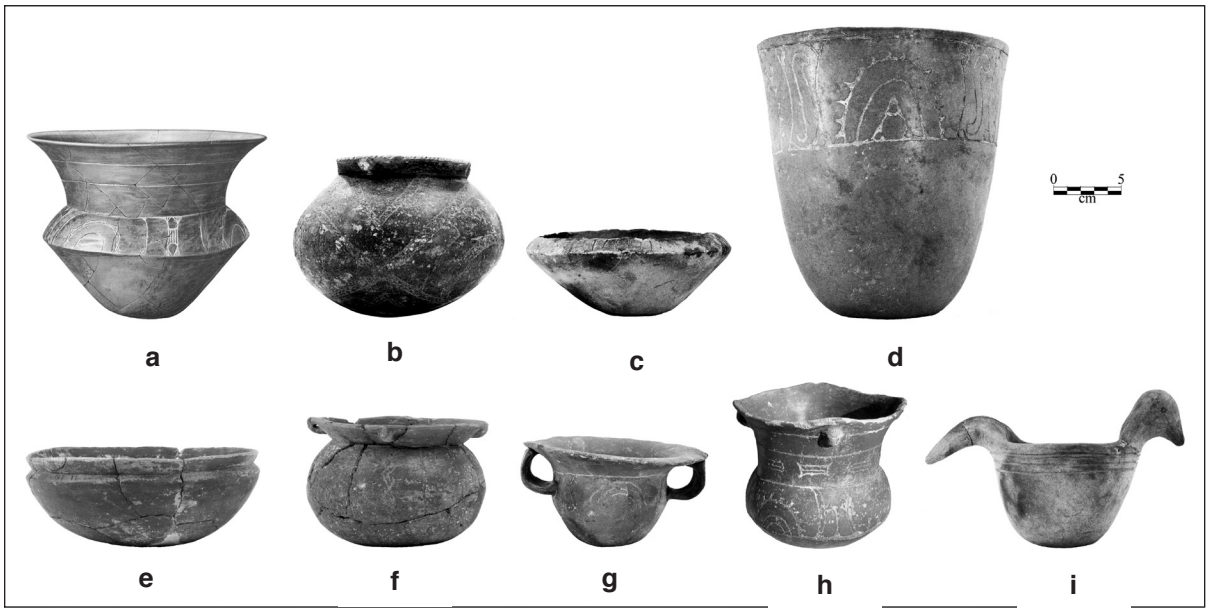

Figure 10. McCurtain phase engraved vessels: a, d, h, Avery Engraved; b, Hudson Engraved; c, Simms Engraved; e, Simms Engraved, *var. Darco;* f-g, Engraved jar; i, engraved effigy bowl. Provenience: a, Foster Place (3LA27), from Moore (192:Plate 43); b, e-f, Sam Kaufman (41RR16); c-d, g, i, Boyce Smith collection from Red River sites; h, Jim Clark site, Red River County, Texas.

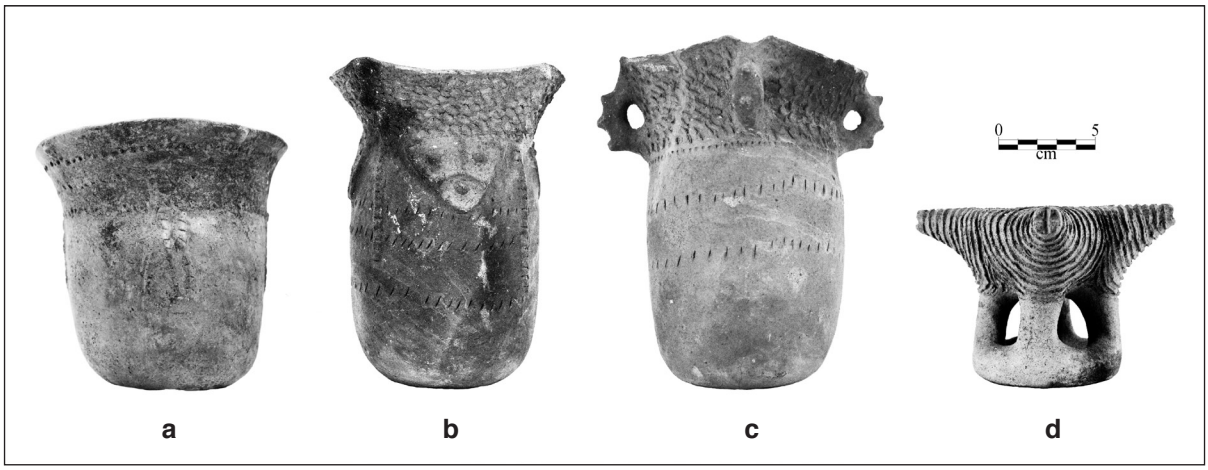

Figure 11. Decorated utility wares from McCurtain phase sites: a, Emory Punctated-Incised; b-c, Nash Neck Banded; d, incensario form (see Lankford 2012:Figure 6b). Provenience: a, Sam Kaufman (41RR16); b-d, Boyce Smith collection from Red River sites.

types Simms Engraved, Barkman Engraved, Hatchel Engraved, Hodges Engraved, Taylor Engraved, and Keno Trailed, and these are primarily grog and grog-bone-tempered. Shell-tempered ceramics are rare (Perttula and Nelson 2003), and are primarily from red-slipped vessels or vessels traded from other Red River Caddo groups.

Foster Trailed Incised is a common utility ware vessels in Texarkana phase sites, along with McKinney Plain, and an assortment of punctated, brushed, brushed-incised (Karnack Brushed-Incised), brushed-appliqued, neck banded, and appliqued or ridged vessels. The latter may be from Belcher Ridged vessels (Webb 1959:136-139). Noded vessels have also been found in burials at the Hatchel site (Perttula 2005:Figure 11b).

Fine ware ceramic wares in Titus phase sites, especially in cemeteries where they were placed as funerary offerings, are dominated by several recently defined varieties of Ripley Engraved (Perttula, Walters and Nelson 2010a-b), including carinated bowls, compound bowls, simple bowls, bottles, jars, and ollas. These have a diverse range of vessel motifs, most of them featuring scrolls, continuous scrolls, scrolls and circles, and circles and nested triangles, or pendant triangles on rim panels, as well as scroll arms with excised brackets, negative ovals, S or SZ-shaped elements (see Gadus, this volume), and triangles; red and white clay pigments were commonly applied to the engraved designs on many of the vessels. A sample of over 2000 vessels from 17 Titus phase cemeteries in the Big Cypress Creek basin (Perttula and Sherman 2009:Table 17-4) indicate that Ripley Engraved vessels account for approximately 50% of the entire vessel sample, especially carinated bowls (Figure 12d-e), compound bowls (Figure 12g) and bottles (Figure 12a).

Other important fine wares from Titus phase sites include Wilder Engraved bottles (see Figure 12b), jars, and ollas (see Figure 12c), Taylor Engraved carinated bowls and bottles (Suhm and Jelks 1962:Plates 75 and 76), Bailey Engraved, and Simms Engraved (see Figure 12h) carinated bowls and deep bowls. A new type—Turner Engraved (see Figure 12f)—found on compound bowls has pendant triangle and large hatched and cross-hatched triangle engraved elements, and rim peaks with ovals, negative ovals, and negative S-shaped elements.

Titus phase utility ware vessels in the same sample of vessels from Titus phase cemetery contexts primarily include Harleton Appliqued jars (Figure 13e) with intricate appliqued elements on the vessel body, Bullard Brushed vessels (Figure 13a), La Rue Neck Banded (Figure 13b), Maydelle Incised, Karnack Brushed-Incised, Pease Brushed-Incised, and utility ware jars decorated with combinations of incised, punctated, and/or brushed elements, including rows of punctations (Figure 13c). Jars regularly had rim peaks, where the vessels were divided into quarters, which may be symbolic of the Caddo's view of the world. Plain bowls often held pigments used in grave-side rituals.

Moore Noded vessels (see Figure 13d) have small appliqued nodes that cover the entirety of

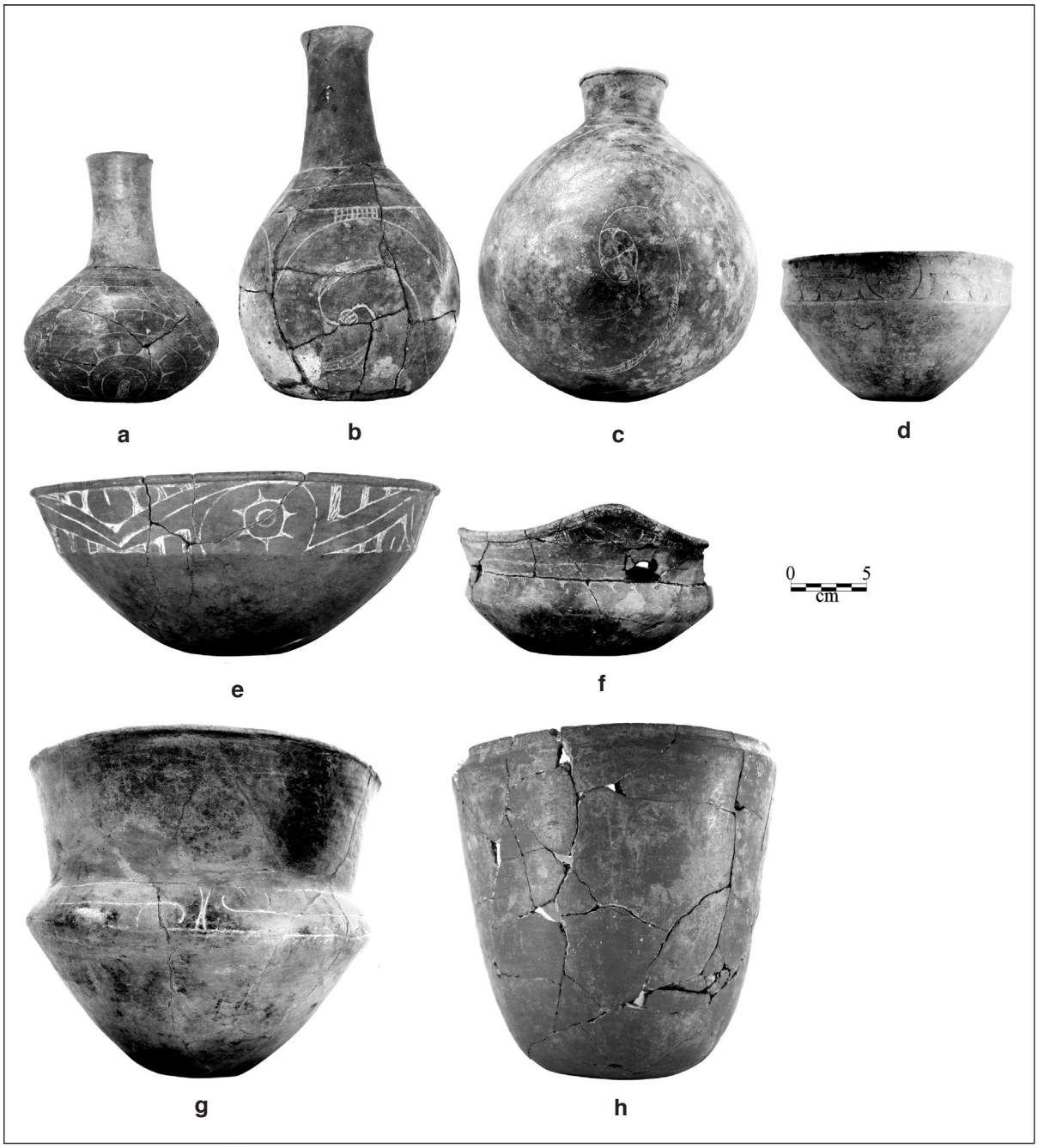

Figure 12. Titus phase fine ware vessels: a, Ripley Engraved, *var. unspecified* bottle; b, Wilder Engraved, *var. Wilder* bottle; c, Wilder Engraved, *var. Wilder* olla; d, Ripley Engraved, cf. *var. McKinney* carinated bowl; e, Ripley Engraved, *var. Cash* carinated bowl; f, Turner Engraved, *var. Horton* compound bowl; g, Ripley Engraved, *var. unspecified* compound bowl; h, cf. Simms Engraved red-slipped deep bowl. Provenience: a-b, e-f, h, Johns site (41CP12); c, County Road site (41CP244); d, Shelby Mound (41CP71); g, Tuck Carpenter (41CP5).

the vessel surface. They are also common at the contemporaneous Hatchel site (41BW3) near Texarkana, Texas (Suhm and Jelks 1962:Plate 26b, d, g), and other sites in the Great Bend area of the Red River valley. Similar knobby or noded vessels found in the American Southwest and Central Mississippi Valley have been suggested to have been ceramic Datura fruit effigies used for the storage and consumption of prepared datura (or jimson weed), a hallucinogenic plant (Huckell and

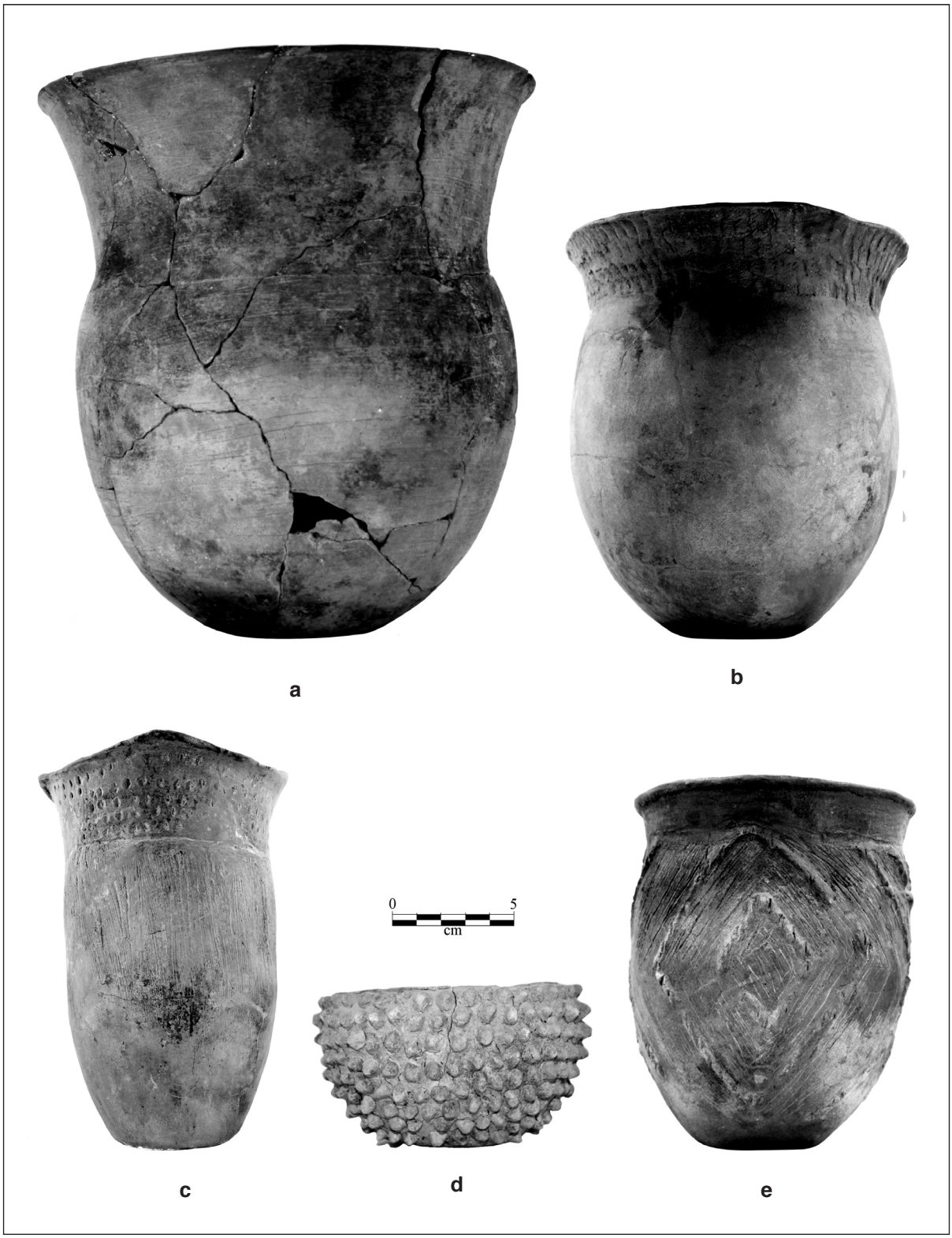

Figure 13. Titus phase utility ware vessels: a, Bullard Brushed; b, La Rue Neck Banded; c, Punctated-brushed peaked rim jar; d, Moore Noded bowl; e, Harleton Appliqued. Provenience: a, d, Johns site (41CP12); b-c, Tuck Carpenter (41CP5); e, Shelby Mound (41CP71).

Vanpool 2006:152-153; Lankford 2012:60). The Caddo were known to consume datura and peyote as part of shamanistic rituals (see Swanton 1942), and these noded vessels may be reflective of these rituals being used after ca. A.D. 1450 by ancestral Caddo peoples living in East Texas.

In the upper Neches River basin after ca. A.D. 1450, the principal fine wares are several varieties of Poynor Engraved bowls and carinated bowls (Figure 14a-e; see Perttula [2011]), followed by Poynor Engraved bottles of various forms, Patton Engraved (dating mainly after ca. A.D. 1650, in Allen phase contexts), Hood Engraved effigy ware vessels, with or without tail riders (Figure 14g), and beaker-shaped Hume Engraved bottles (Figure 14f).

Among the utility wares in Frankston phase contexts, the major types include Bullard Brushed (Figure 15c), Killough Pinched (Figure 15a), Maydelle Incised (Figure 15b), punctated jars, and brushed-punctated jars of unidentified types. Most of the plain wares are simple bowls, carinated bowls, and several forms of bottles.

In historic times, Caddo ceramic vessels, primarily bowls of various forms, jars, bottles, held liquids and foods. They were also used for cooking and serving foods, such as corn, atole, a corn gruel pounded into a flour and mixed with water or milk (Chapa and Foster 1997:149, fn 6), and tamales (see Swanton 1942:157-158; Chapa and Foster 1997:149). In 1690, Alonso de Leon noted the use of "pots and casserole dishes," filled with beans, corn, and pinole, made of powdered corn and sugar (Chapa and Foster 1997:150, fn 1). Other vessels were reported in historic times to have held incense, body paints/pigments, and corn meal offerings.

The historic Caddo ceramic assemblage at the Clements site (41CS25), a late 17th to early 18th century Nasoni Caddo settlement and cemetery near the headwaters of Black Bayou, a tributary to the Red River, includes bottles, an olla, jars, bowls, compound bowls, and carinated bowls. Bottles are the most common vessel form (44%, including two unique small and narrow forms), followed by carinated bowls (30%), jars (15%), simple or

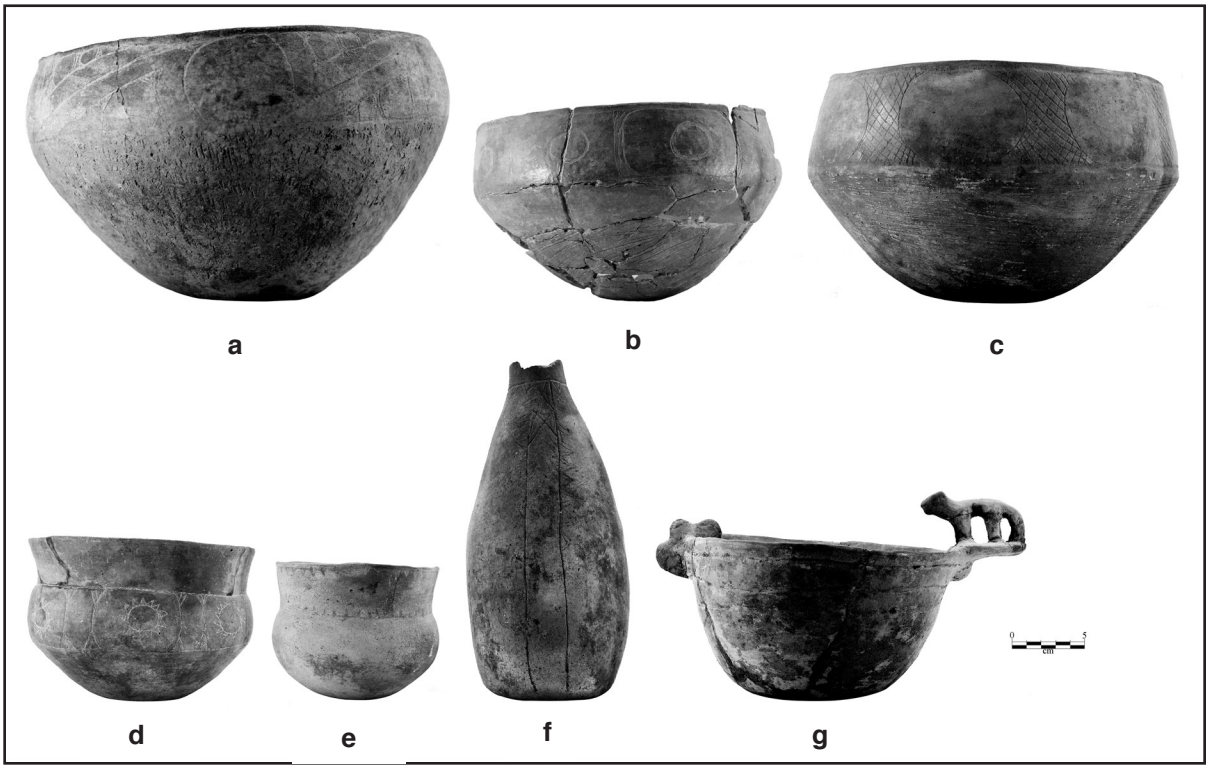

Figure 14. Frankston phase fine ware vessels: a, Poynor Engraved carinated bowl; b, d, Poynor Engraved, *var. Lang*; c, Poynor Engraved, *var. Hood*; e, Poynor Engraved, *var. Freeman*; f, Hume Engraved, *var. unspecified*; g, Hood Engraved, *var. Allen* effigy vessel. Provenience: a, Boyce Smith collection from East Texas sites; b-d, f-g, Mrs. J. M. Cook (41AN1); e, J. M. Cook Farm (41AN2).

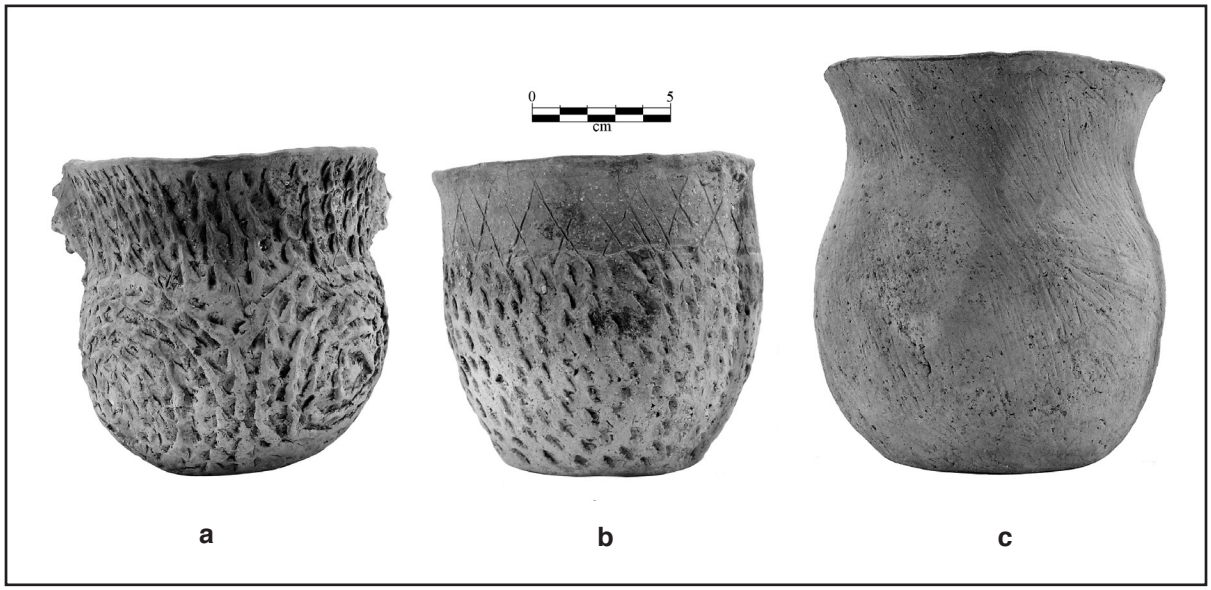

Figure 15. Frankston phase utility ware vessels: a, Killough Pinched; b, Maydelle Incised; c, Bullard Brushed. Provenience: a-b, Mrs. J. M. Cook (41AN1); c, Fred McKee (41AN32).

conical bowls (6%), and compound bowls (6%). The lion's share of the vessels from the Clements site are fine wares, as only four vessels (12%) are utility ware jars.

In terms of the ceramic types represented in the funerary vessels, the principal types are Hodges Engraved (Figure 16d) with negative scrolls defined by cross-hatched or hatched scroll dividers, Taylor Engraved (Figure 16a), and Simms Engraved (Figure 16b). Other known types among the fine wares include Keno Trailed (Figure 16c), Bailey Engraved, and Fatherland Incised, and there are several narrow beaker-shaped engraved bottles in the assemblage (Figure 16e). In the utility wares, there are single vessels of Clements Brushed, Pease Brushed-Incised, Cass Appliqued (Figure 16g), and Mockingbird Punctated. Another simple jar has been red-slipped (Figure 16h).

One unique bottle form from the Clements site is a spool-necked and red-slipped engraved bottle (see Figure 16f). There are red-slipped scrolls and triangular areas in relief across the body and at the base of the vessel, and red-slipped areas around the scrolls and triangular areas have been scraped away (showing the original color of the vessel before it was slipped) to emphasize the distinctive red scrolls. This form of decorated bottle has been defined as Hatinu Engraved, because of the red (Hatinu is the Caddo word for red), raised scrolls (Perttula et al. 2010a). Other examples of Hatinu Engraved have been noted in collections at the Hatchel site (41BW3), the Friday site along the Red River in southwestern Arkansas (Moore 1912:Figures 106 and 107), the Battle site, in a private collection from another site in Arkansas (Townsend and Walker 2004:Figure 19), examples from sites in Clark County, Arkansas and the Carden Bottoms along the upper Arkansas River in southwestern Arkansas, and in a very late Titus phase site (Shelby Mound, 41CP71) in the Big Cypress Creek basin in northeastern Texas. Bonds (2006:Figures 2, 83, 160, 432, 491, 523, 536, 541, 556, 585, 628, and 632) also illustrates a number of unprovenienced Hatinu Engraved bottles in the hands of private collectors. It appears that Hatinu Engraved is a late 17th-early 18th century Caddo pottery type that was probably made in the Great Bend area along the Red River, and traded/exchanged with other contemporaneous Caddo and non-Caddo groups.

Overall, the range of decorated ceramic vessels from the Clements site compare favorably with the decorated fine wares and utility wares recovered from Texarkana, Belcher, and Chakanina phase Caddo sites on the Red River. This includes such well-known sites as Hatchel (41BW3), Battle (3LA1), Cedar Grove (3LA97), and Belcher (16CD13) (Figure 13), as well as contemporaneous American Indian sites in the Ouachita River basin of northern Louisiana.

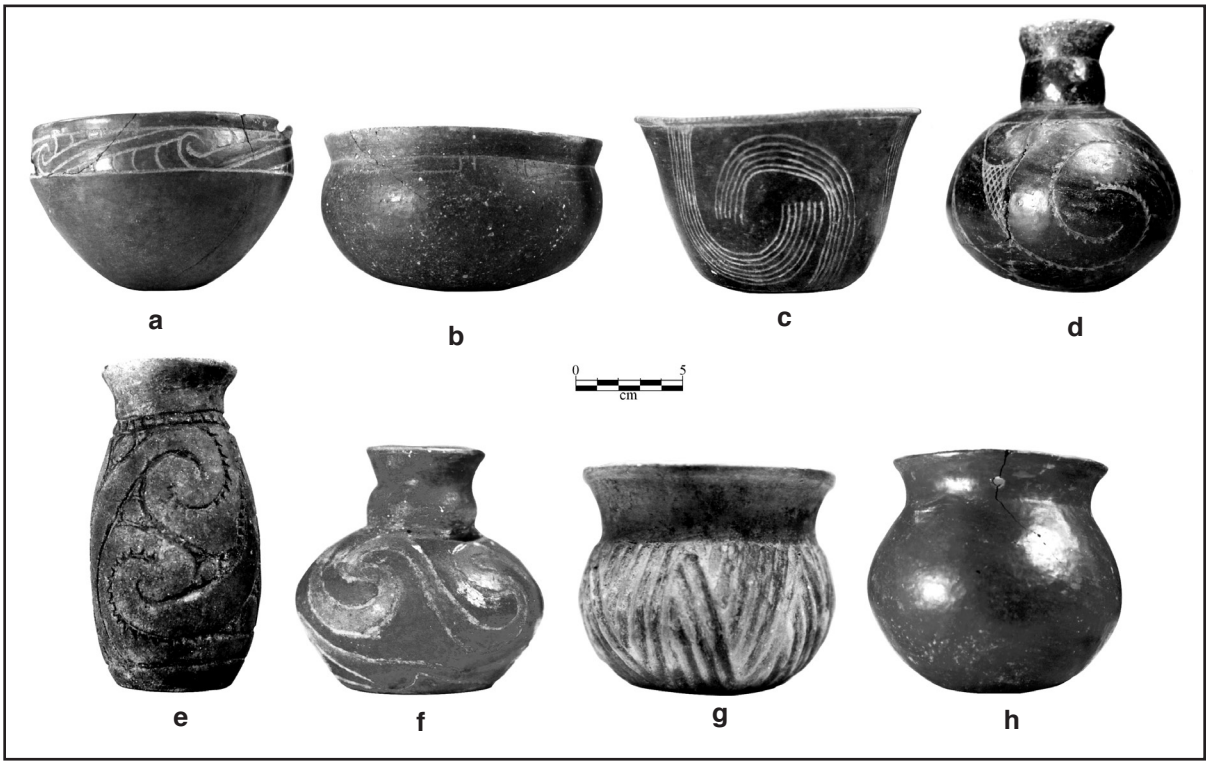

Figure 16. Vessels from the ca. A.D. 1680-1720 Clements site (41CS25), Cass County, Texas: a, Taylor Engraved carinated bowl; b, Simms Engraved, *var. Darco* compound bowl; c, Keno Trailed bowl; d, Hodges Engraved bottle; e, narrow engraved bottle; f, Hatinu Engraved bottle; g, Cass Appliqued jar; h, red-slipped jar.

In historic times, the archaeology of the Hasinai Caddo groups is associated with the Allen phase (ca. A.D. 1650-early 1800s) (see Figure 9). "The Allen phase is believed to have developed out of the Frankston phase, and more importantly, to have shared the same form of organization, kinds of inter-group interaction, and settlement patterns" (Story and Creel 1982:34). The groups who during the Allen phase occupied the Neches and Angelina river basins were direct ancestors of the Hasinai tribes who were living in or near the Spanish missions that had been periodically established and maintained in the region between ca. 1690-1731, and they continued to live there until the 1830s (see Jackson 1999:Plate 98).

The most distinctive of the fine ware ceramics from Allen phase sites are Patton Engraved bowls and carinated bowls (see Suhm and Jelks 1962:Plate 59). The decoration on Patton Engraved vessels consist primarily of a series of simple horizontal or curvilinear engraved lines with tick marks on the vessel rim, either triangular-shaped tick marks, linear tick marks, or oval-shaped tick marks (Figure 17a, c-d, f).

Other fine wares include Hume Engraved, *var. Allen* vessels with rows of larger (i.e., larger than tick marks) engraved triangles (but not apparently hatched) that are pendant to a straight line (Perttula 2008:Figure 2f). Similar vessels are present at the Henry M. site (41NA60, Perttula et al. 2010b:Figure 16a-c).

Although not commonly found in East Texas (see Figure 17e), the most distinctive of the historic Caddo fine wares is Natchitoches Engraved, widely distributed across the southern Caddo area. This is a ware found most often as carinated bowls (but also as bottles) with elaborate engraved scrolls, ticked lines, S-shaped elements, and negative ovals surrounded by cross-hatching or hatching on vessel bodies, and rectilinear design elements, ticked lines, and negative ovals on the rim (Figure 18).

Other important fine wares in post-A.D. 1685 East Texas Caddo sites include Keno Trailed, Simms Engraved, Hudson Engraved, Womack Engraved (see Figure 18b), and Avery Engraved (Perttula 1992:Table 14). Utility wares include Foster Trailed-Incised and Emory Punctated-Incised, as well as untyped vessels with various wet paste

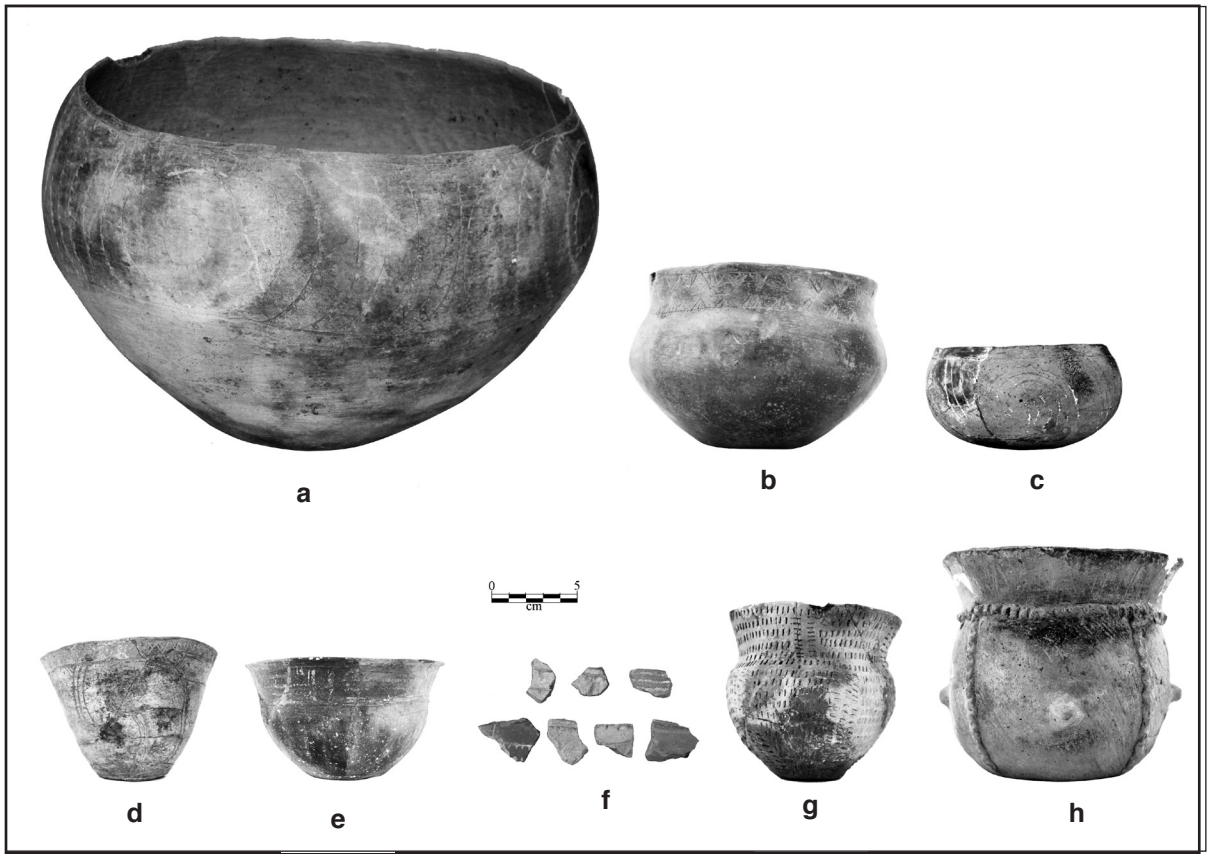

Figure 17. Historic Caddo Allen phase vessels and sherds: a, c-d, Patton Engraved bowls; b, cf. Hume Engraved bowl; e, cf. Natchitoches Engraved bowl; f, Patton Engraved sherds; g, Punctated jar; h, Brushed-appliqued jar. Provenience: a, 41AN184; b, d-e, g-h, Deshazo (41NA27); c, Stephens Farm (41NA202); f, J. T. King (41NA15).

designs. Gregory and Avery (2007:45-48)) include Ebarb Incised, with hachured rims and scrolls, as well as Constricted Neck Punctated (Gregory and Avery 2007:49-54) as Northwest Louisiana historic Caddo utility wares.

Technological Distinctions

Here, I consider important technological attributes of the domestic ceramics made by Caddo groups, including the use of different tempers, the character of the vessel paste, and firing conditions. These analyses highlight the essential continuity in ceramic manufacture and practice during the course of the Caddo occupation of East Texas. The principal technique used in the manufacture of Caddo ceramics was the building of vessels using coils, beginning at the flat disk-shaped base and working up the vessel body. Using the coiling method, coils of clay, in the form of ropes, rolls, or fillets, were built up to create the desired size and height of the vessel. Coiling is a technique especially suited to the construction of large, sturdy vessels, such as storage jars (Rice 1987:128), but in the case of Caddo potters, coiling of plastic clays led to the manufacture of a wide variety of vessel forms of varying sizes.

Fine ware vessels are consistently made thinner than the decorated utility ware or plain ware sherds. These variations in vessel wall thickness are likely related to functional and technological decisions made by Caddo potters in how these different wares were intended to be used in local Caddo households. The less substantial vessel walls in some of the utility wares would be well suited to the cooking and heating of foods and liquids and, because heat would have been conducted efficiently while heating rapidly, would have contributed to their ability to withstand heat-related stresses. Also, the much thicker utility ware vessels

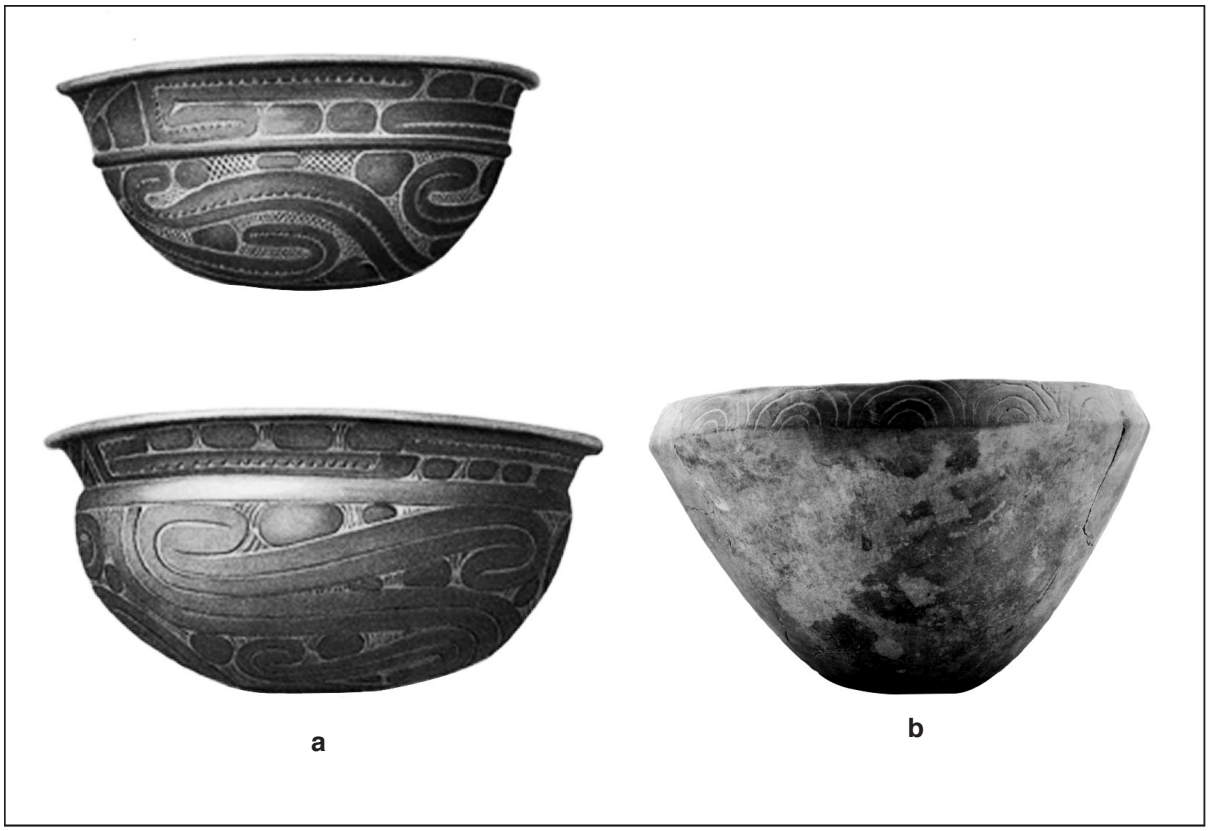

Figure 18. Other Historic Caddo ceramics: a, Natchitoches Engraved carinated bowls, from the Glendora site in northern Louisiana, from Moore (1909:Plate 5); b, Enis Smith site (41UR317), courtesy of the Gregg County Historical Museum.

(with rim thicknesses greater than 9 mm and body wall thicknesses greater than 10-11 mm) would have created stronger and more stable vessels, and would have been well suited for use as long-term storage containers (Rice 1987:227). Fine wares were probably intended for use in the serving of foods and liquids, and thinner and less porous vessel walls would have helped to maintain the temperature of served food and liquids; thinner and lighter vessels would have also contributed to the ease with which serving vessels could be handled, used, and transported.

Another factor that would have influenced vessel body wall thickness would have been the sequence in which a vessel was constructed (Krause 2007:35), of which there are a wide variety of choices available to potters (cf. van der Leeuw 2002:243-256). Vessels constructed from the bottom up, as Caddo vessels seem to have been, would tend to have thinner walls moving up the vessel body towards the rim, with the lower portion of the vessel—especially the base, likely made separately, and thus available to serve as a support during later vessel construction—usually significantly thicker than the upper portions of the vessel.

Larger jars (with very thick rim and body walls, >9-10 mm) were probably used for short term storage, simply because they would be less easily moved about during cooking, while larger carinated bowls and compound bowls may have been employed in communal food serving; serving vessels and cooking jars tended to be in the 1-2 liter range, and thus likely intended for individual household use. Most of the utility ware jars were used for cooking, based on their form as open containers, as well as the presence of soot deposits, either heavy or light, as well as preserved charred organic remains on one or both vessel surfaces. Sherds from analyzed Caddo jars tended to have residues formed on the interior of vessels that are related directly to cooking, as well as soot deposits build up from wood combustion, indicating that vessels were placed over an open fire during use (Hally 1983:9). Bowls may have also been used for serving food, like the carinated bowls, but many of them lacked surface decorative embellishments.

Bottle sherds, used for storing and carrying liquids, also were a common utilitarian form made for the use of site occupants.

A number of conditions would have contributed to the longevity or use-live, of a given Caddo vessel, including: "(1) basic strength, in terms of wall hardness and thickness, and vessel size, (2) use and reuse frequency and variation, (3) drying and storage practices, (4) opportunity for breakage, especially due to children and animals, (5) the potential for vessel repair [and] (6) the number of vessels in the household inventory" (Deal 1998:168). Smoothed and burnished grog-tempered pottery combines strength, thermal shock resistance, resistance to breakage, and low permeability, and, thus, may have lasted for a considerable length of time, especially if the vessels being used were large in size (see Arthur 2006:93). Vessel breakage, by whatever means, nevertheless, occurred with regularity at Caddo sites because they were used on a daily basis, particularly the cooking vessels, and this resulted in a large accumulation of pottery sherds inside and outside house structures and in outdoor activity areas at sites.

The high frequency of grog tempering in East Texas Caddo ceramic assemblages, and in each ware, represents a specific attempt on the part of Caddo potters to slow the oxidation process of the ceramic vessels during firing. This would have created darker-colored vessels in a reducing (or low oxygen) firing environment (or lighter tan, orange, and brown colors in oxidizing environments), while allowing them to be fired longer, and producing a harder ceramic vessel (Rice 1987:354; Teltser 1993:532, 540). Since grog has expansion coefficients comparable to the coefficients of the clay paste most commonly seen in Caddo pottery vessels—especially with the finely crushed grog pieces regularly used in the fine wares—this would have contributed further to the ability of fired vessels to withstand heat-related stresses, as well as increasing their flexural strength (Rice 1987:362).

Gamble (2007:198) has suggested that the addition of grog temper to pottery clay reflects more than simply a functional choice for potters. Instead, he interprets the temper choice as 'the inclusion of the ancestors in the next generation of pots." Thus, following this interpretation of temper use, every grog-tempered pot made by a Caddo potter can be construed as a link in an evolving ceramic tradition and a continued reinforcement of social identity.

Hematite may have been added to the paste of certain vessels strictly as a matter of personal choice by individual Caddo potters, but it may have served a useful purpose nonetheless. That is, like feldspar (often also found in microscopic quantities in the paste of Caddo vessels, see Perttula [2000]), the occurrence of crushed grains of hematite in the paste would have enhanced a vessel's ability to melt and fuse the paste constituents during firing, thus resulting in a dense, hard body, and a reduced vessel porosity (Rice 1987:96). Similarly, the addition of a coarse temper like hematite pieces would have aided a vessel's ability to withstand thermal shock.

Crushed and burned bone may have been added to a vessel's paste for the same reason. Namely, that crushed and burned bone produces with little effort an angular particle shape whose coarseness and size gave vessels tempered with it the ability to withstand thermal shock (e.g., Whittlesey 2004:287).

The majority of the vessels and sherds from Caddo sites have a clayey to silty paste. Clays used for vessel manufacture were probably gathered from nearby alluvial settings, but certainly within a short (1-7 km away, at most) distance from the settlement (Arnold 2000:343; Arthur 2006:52), so that an inordinate amount of time and energy was not expended by potters in hauling clay back to the site. Arthur (2006:52) points out that potters are likely to select lower quality clays for vessel manufacture than high quality clays if the latter are farther away.

I assume that the pottery found at Caddo settlements—at least the vessel sherds from domestic contexts—was very likely to have been made on site by potters that lived there. Available chemical analyses of vessel sherds at more than 170 sites (Perttula and Ferguson 2010) in East Texas (see below) suggests that the analyzed sherds (more than 1280 at present) were made from local East Texas clays. Depending upon the site and the type of ware, a significant percentage of Caddo vessel and vessel sherds examined in detail have a sandy paste, suggesting that a naturally sandy clay was occasionally selected by Caddo potters for use in making particular kinds of vessels.

A number of detailed analyses of Caddo vessel sherds from East Texas sites show that they are from vessels fired in a variety of different ways, presumably reflecting personal preferences in firing, the desired vessel color, the kind of clays that were used, and the functional and technological

requirements of the kinds of vessel forms that were being manufactured at sites. After drying, vessels were fired in an open fire, with the vessels either set atop the fire or nestled in the coals and ash.

Most of the sherds from Caddo sites that have been analyzed in detail are from vessels that were fired in a low oxygen or reducing environment. A particular firing method was to fire a vessel in a low oxygen environment, but then pull it from the fire to cool in the open air. This left either one or both vessel surfaces a lighter reddish-brown to brown oxidized color, probably a preferred color for plain wares and fine wares, along with occasional vessels that were fired to a gray, black, or dark grayish-brown color.

In general, recent analyses of Caddo vessels and sherds indicate that there are significant differences in how utility ware, plain ware, and fine ware vessels were fired. Fine ware and plain wares were better made and better fired (at least in terms of regulating the firing temperature), and they were probably fired longer in a low oxygen environment than the utility wares. The Caddo potters exerted more control over the end product of fine ware and plain ware vessel manufacture than they did with the utility wares, primarily to produce a harder ceramic. Firing conditions tended to be more heterogeneous among the utility wares (including the incompletely oxidized vessel sherds), likely the product of the multi-purpose nature of these vessel forms, as they were used for cooking pots and storage containers. As long as the porosity of the utility wares was not excessive, and there was a good balance between clay plasticity and temper constituents, they did not need to be fired for as long a time as the harder fine wares to be quite serviceable vessels without being subject to diminished strength from cumulative thermal fatigue as well as cracks and fractures (Steponaitis 1984).

The orifice diameters of Caddo vessels, used for cooking, food service, and the storage of food stuffs and liquids, can provide some indication of the scale of food preparation and food serving, in that vessels ranged in size from those suited for individual use (less than 1-2 liters in volume) versus other large to very large vessels (greater than 5-6 liters) intended to be used by multiple individuals, probably in the context of feasting activities. That the vessels from Caddo sites are all hollow wares (i.e., jars, bowls, and carinated bowls), it seems likely that the Caddo diet was based almost entirely on liquid-based foods cooked in jars, including stews, corn and bean dishes, and gruels.

Mortuary vessels on Caddo sites were made in a wide variety of sizes. Surely these vessels held liquids and foodstuffs for the deceased to use on the journey to the House of Death. In most cases, the vessels included with the deceased by his or her living relatives easily would have held multiple servings of food and liquids (perhaps enough to last for the 6 day journey). Nevertheless, the very large size of some of the carinated bowls and compound bowls (food serving vessels) from many cemeteries—which would have been well-suited for communal food serving—suggests that the vessels may have been intended by the Caddo to serve multiple purposes in mortuary rituals. These could have included use of the vessels in grave-side rituals and daily food offerings by the relatives of the deceased, after which they were placed in the graves as final accompaniment once the "Sixth Day Feast" had been concluded (see Gonzalez et al. 2005:57-58).Although it is likely the case that individuals, villages, and communities made different decisions about the placement and kinds of specific ceramic vessel funerary offerings, as a result of widespread personal and social contacts, these decisions were much the same for Caddo peoples across East Texas, with the exception of the social and religious elite who were buried in shaft tombs at mound centers. It is fair to say that the character of the ceramic vessels from burials reflect closely-shared beliefs, rituals, and cultural practices among these East Texas Caddo groups in what adult males and females, as well as children, needed in life, and "needed in the other life" (Swanton 1942:205).

TRADE AND EXCHANGE OF CADDO VESSELS

Caddo ceramics were apparently widely traded in Texas, as they have been found in significant quantities on North Central, East Central, Central, and inland Southeast Texas archeological sites. The earlier Caddo ceramics (dating before ca. A.D. 1300) were most widely distributed in the upper Trinity and Brazos River basins of North Central Texas, and in inland Southeast Texas, while the Late Caddo ceramic wares appear to have been most commonly exchanged with East Central and Central Texas groups after A.D. 1300 (Kibler 2012), as well as with prehistoric peoples living along the Trinity River in inland Southeast Texas.

Caddo ceramic fine wares were also traded extensively in parts of the Midwest and Southeastern U.S., most notably after ca. A.D. 1300-1400 with Native American groups living in the Lower Mississippi Valley of Arkansas and Louisiana, as well as far afield to groups living in central Kansas and Iowa (Perttula 2002:Figure 5.1).

It also appears to be the case that Caddo groups in East Texas had an active intra-regional trade and exchange network where pottery vessels (and their contents?). For example, Perttula and Ellis (2012:250-251) suggest, based on instrumental neutron activation analysis and petrographic analysis, that between 13.9-22.2% of the analyzed sherds from the Hickory Hill site—a small Middle Caddo settlement—were from non-local sources from other East Texas Caddo groups. In a summary of similar analyses done at the Pine Tree Mound site (41HS15)---a large Late Caddo mound center—Gadus and Fields (2012:Table 6.19) suggest that almost 22% of the analyzed sherds are from non-local ceramic vessels.

CHEMICAL AND PETROGRAPHIC ANALYSIS OF CADDO CERAMICS

One recent advance in the study of Caddo ceramics is increasing our knowledge about prehistoric stylistic, technological, and functional changes in this material culture. Compositional analyses using petrographic and chemical (instrumental neutron activation analysis [INAA]) characterizations are now being used with regularity on samples of Caddo ceramics to discern manufacturing techniques, the source and regional distributions of particular wares, and the functional characteristics of different kinds of vessels (Perttula and Selden 2012). Analyses of the chemical and petrographic constituents in the pastes of Caddo ceramic assemblages across East Texas has shown that there appear to be consistent paste differences between the ceramics in each of the river and creek basins (Figure 19). This is turn seems to reflect the local basin-specific production by Caddo groups of ceramic vessels from locally available clays, with some evidence for the exchange of vessels from one group to another in different basins. This type of analysis will hopefully continue to be used for considerations of cultural affiliation, and trade and exchange between Caddo and non-Caddo groups, as well as for discerning manufacturing techniques, raw material use, source/regional distributions of particular wares, and specific functional characteristics of different kinds of vessels.

The regional analysis of the chemical compositional make-up of Caddo pottery has the potential to help with the reconstruction of "how people created, modified, or moved items within a particular landscape" (Kantner 2008:54). It is likely that the vast majority of the Caddo pottery found on sites was produced at the household or community level, and then distributed and used locally, with an unknown quantity of that pottery being made for trade or exchange with neighbors, both near and far-flung. However, the INAA database available at present is not sufficiently robust, because of the apparent chemical heterogeneity in locally abundant clays and the still limited number of sites with INAA sherd or clay samples in all parts of East Texas, to establish with certainty the source of clays used by Caddo potters or to link those clays with tempered Caddo pottery vessels and vessel sherds of known styles and temporal ranges. Continued INAA analyses from a range of sites—and on both utility and fine wares—will be important in establishing production locales and their spatial scope, as well as delimiting both the kinds of pottery made in each production locale and the extent to which they made have been traded and exchanged amongst neighboring Caddo groups.

SUMMARY AND CONCLUSIONS

The Caddo ceramics found in domestic and mortuary contexts at hundreds, if not thousands, of ancestral Caddo sites in East Texas include fine wares (engraved and slipped carinated bowls, compound bowls, bowls, and bottles used for food serving and to hold liquids), utility wares (brushed and wet-paste decorated jars and an occasional bowl used primarily for cooking, but also for storage), and plain wares, including bowls, jars, and bottles. There are technological and stylistic differences between the wares at sites and between different Caddo groups living in East Texas, and the Caddo potters that made these vessels clearly had a considerable range in choices and practices in how they were made and decorated (cf. van der Leeuw 2002:241-243; Stark 2006:24). The range of differences were overall rather minor in technological practices, however, except in the case of certain decorative and stylistic elements,

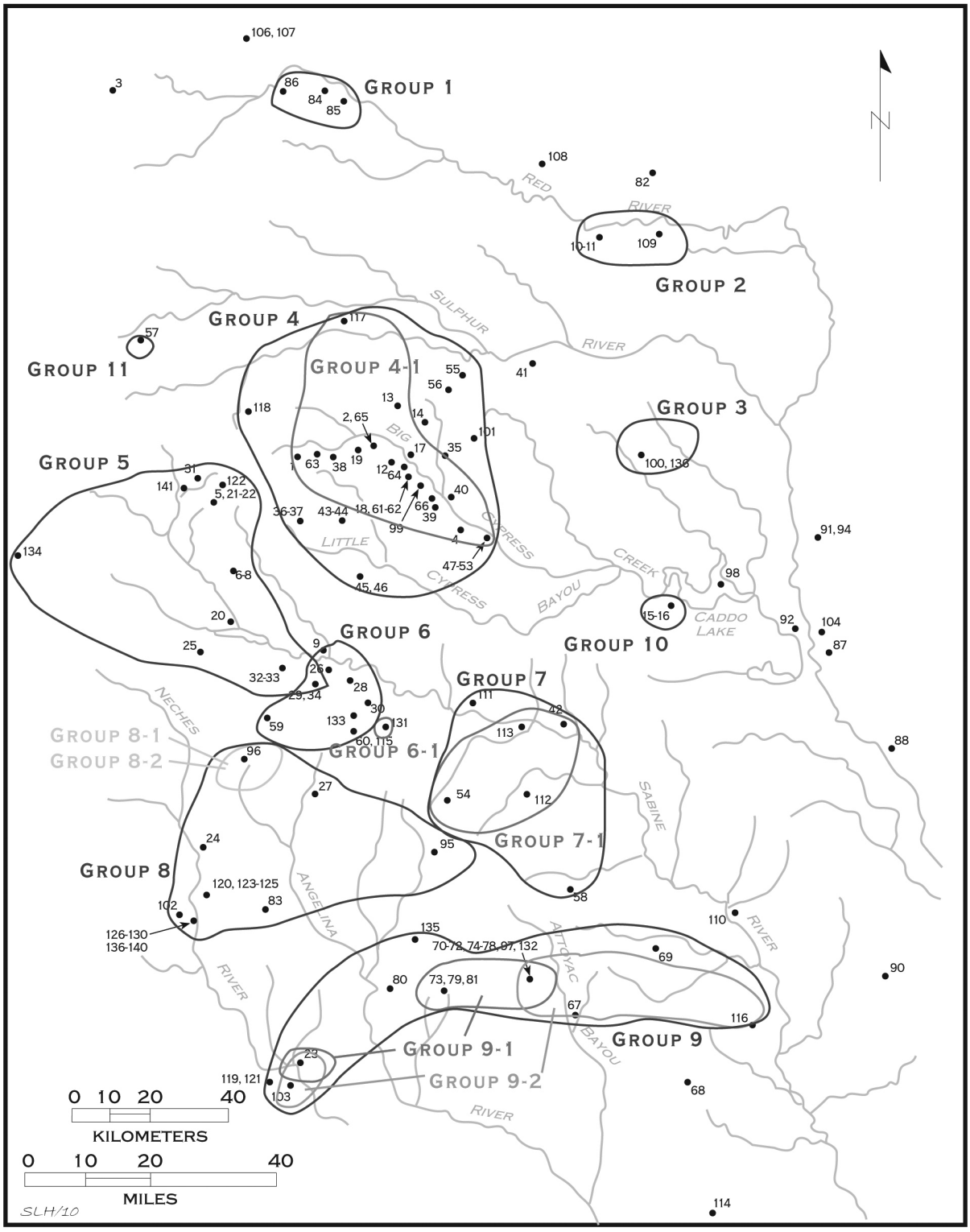

Figure 19. Defined ceramic chemical groups 1-11 in East Texas, as of 2010.

of which there are a great diversity in East Texas Caddo decorated wares. This stylistic diversity in the decorated wares on East Texas Caddo sites has led to the recognition of distinctive stylistic motifs and types that have unique spatial and temporal distributions (although these are still being

refined), and these distributions can be linked with the identification of culturally specific Caddo groups, phases, and vessel assemblages in the East Texas archeological record.

The ubiquity of these wares at sites indicate that they were available to all the Caddo that lived at various settlements, and that there was no restricted access to the use of fine wares in domestic contexts. These same wares are also found in mortuary vessel assemblages across the region, but in very different proportions, with an increased emphasis on fine wares as one of the principal funerary offerings.

Ceramic ethnoarcheological studies (Stark 2003:202-204) over the years have demonstrated that there is a consistent logic and sequence to the production of low-fired hand-made earthenware vessels such as those made and/or used domestically by ancestral Caddo peoples living in sites across East Texas. These steps would have included, from first to last: (a) procurement of materials such as the clay and temper, as well as fuel; (b) preparation of materials, including the crushing, cleaning, size sorting, or mixing of clays and tempers to prepare the paste; (c) construction of the vessel, beginning with the base, and then building the walls, along with finishing treatments, among them smoothing and burnishing; (d) decoration of the vessel (at least wet-paste utility wares), including occasionally adding a hematite-rich slip; (e) drying and firing; and (f) post-firing treatments, which in the case of Caddo fine wares also included the engraving of certain fine ware vessels, as well as surface burnishing (Stark 1999:Table 3.1; see also Arthur 2006:29-54; Deal 1998:37-51; Tschopik 1941:17-41). Clays used for vessel manufacture were likely gathered from nearby alluvial settings, particularly the more easily processed alluvial clay bodies, but certainly within a short (1-7 km away, at most) distance from the settlements. Depending upon the site and the type of ware, clay temper and paste recipes were diverse, with Caddo potters using particular recipes to make particular kinds of fine ware, utility ware, and plain ware vessels.

Finally, over the years, archeological interests in the study of Caddo ceramic artifacts have centered around a few major and venerable themes: (a) classification and typology of ceramic artifacts for cultural historical purposes; (b) the measurement of time with changes in ceramic styles and functions; (c) the compositional characterization of ceramic materials; and (d) the performance of pots as tools, in conjunction with a study of the social factors that relate to the specific ways that pottery function as tools. Thematically and theoretically, these still represent pertinent and viable ceramic research approaches today.

Certainly a principal research issue of Caddo ceramic analysis done in East Texas includes first refining or bracketing the age and intra-site chronological relationships of the ceramics at a particular site, starting from any available radiocarbon and luminescence/TL dates from features or archeological deposits, and investigating differences and similarities in ceramic decoration and manufacture. Attributes of the ceramics can then be employed to establish the occupational history of a particular site as reconstructed from ceramic stylistic analyses (particularly variation in decorative elements and motifs in both the utility ware and fine ware), and then determining structure and feature relationships through time at a site by defining temporally distinct ceramic assemblages.

There is a general consensus among archeologists that stylistic expressions, and variations in that expression, in material culture, dress, body ornamentation, food practices, etc. can be a measure of social identity. However, the recognition of style in archeological materials is more than "the *material correlate*" [emphasis in the original] of social affiliation" (Wobst 1999:120). Patterns of style reflect variability in both individual choices as well as social group membership, and therefore the existence and pervasiveness of styles in material culture—the concern here being the existence of local styles of ceramic decoration in East Texas Caddo sites and assemblages—reflect the strength of interaction between individuals (individual potters), the form of cultural transmission (i.e., from parent to child; from a teacher to a pupil; from older to younger members of a social group; or between unrelated individuals, see McClure 2007:Table 1), and the ability of styles to be inherited from one generation to the next. In actual fact, ceramic practice among Caddo potters would have dictated the range of acceptable variation (a rather impressive variation at that, particularly among the fine wares) in stylistic choice that were maintained for generations.

Styles of decoration on Caddo pottery vessels seem to have changed rapidly, more rapidly than functional forms of tools and pottery vessels (see Rogers and Ehrlich 2008:3418). This interpretation follows from the idea that stylistic traits have a relatively rapid turn-over because of their use

in generating and reinforcing cultural identity, their selectively neutral character (i.e., stylistic elements have no differential effect on survival), and the potential high variation between individuals and groups in learning and replicating specific shared styles, particularly (in the case of ceramics) if Caddo potters were producing vessels largely independent of one another rather than in craft workshops, that together comprise a ceramic tradition at any one moment in time.

These same stylistic analyses can be employed to answer broader questions of the social and cultural affiliation of Caddo groups, and the place of a particular site within a specific community of Caddo people, through stylistic and vessel morphological comparisons with collections from other broadly contemporaneous Caddo sites in the local area. It is important that the stylistic analysis of Caddo ceramics from sites in East Texas focus on the definition of recognizable decorative elements in the fine wares and utility wares.

There is another productive approach to the analysis of Caddo ceramic vessels and sherds from East Texas sites that should be pursued, and that is ceramic practice. By ceramic practice, I mean the decorative, technological, and formal attributes of sherds and whole vessels that were chosen and practiced by a potter or group of potters when they made pottery vessels within a distinctive social community or network of socially related individuals (see Eckert 2008:2-3, 10-13). As Stark (2006:22) puts it, "people reproduce their cultural and social positions through daily practice, that daily practice is structured by basic organizational principles," and that daily practice is expressed through tendencies and trends (*habitus*) "that develop as a practical solution to a particular demand within the framework of certain environmental and cultural conditions" (Eckert 2008:10).

These choices and tendencies exhibited in the manufacture and decoration of ceramics by Caddo potters indicate that the consideration of ceramic practice is an ideal medium for the study of technical systems (the tools and technical capabilities), social interaction, style, and social identity, as well as the dissemination of relevant behaviors between individuals (van der Leeuw 2002:241). Thus, the particulars of ceramic practice and technical choice that can be identified in a temporally (and socially) related group of aboriginal Caddo sites are a means to recognize socially defined groups that closely interacted, transmitted "knowledge among individuals creating pottery" (McClure 2007:486) as a means of social learning, and this knowledge of manufacture and decoration choices was inherited by other descendant potters in that group. In this context, then, ceramic practices shared or not shared by potters (women in the community) reflect the learning of their craft from other women in a Caddo community, and that "patterns in local pottery styles, both technological and decorative, result from potters making different decisions throughout the production process but using a similar set of tools and techniques available to other potters within an area" (Eckert 2008:2).

Such an approach should help identify the key choices and trends in the character of the production of domestic ceramics from a particular Caddo site or set of sites, including: raw materials; temper; methods of manufacture; production areas; vessel forms and functions; vessel size; and firing. Next, one may examine issues of style and social identity and changes in culinary traditions as possible manifestations of changes in ceramic practice that occurred in a particular site, region, or sub-region. Mortuary ceramics from Caddo sites may illustrate broad continuities in ceramic practice, particularly in terms of vessel decoration and vessel form, but also they can demonstrate patterns in technical choices that are very different than what may be documented in domestic Caddo ceramic assemblages of the same age and made by the same social group of potters. Finally, the disparate and variable ceramic practice data (i.e., decorative, technological, and formal)—from both domestic and mortuary contexts, if possible—may be employed to posit the existence of previously unrecognized or distinctive prehistoric and early historic Caddo ceramic traditions within East Texas or within the larger Caddo archeological area.

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Twisted Serpents and Fierce Birds: Structural Variation in Caddo Engraved Ceramic Bottle Motifs

Eloise Frances Gadus

ABSTRACT

This study builds on recent research that relates motifs on Caddo engraved ceramic vessels to themes evident in historic Caddo stories and rituals as well as iconography expressed though the Mississippian period artistic tradition. Specifically, it explores the structural similarities between the motifs found on Ripley Engraved, Wilder Engraved, and Johns Engraved bottles, and bottles decorated with the canebrake rattlesnake motif. All of these bottles can be associated with the Middle to Late Caddo periods of Northeast Texas. These motifs are then interpreted by comparing their structures to the more representational depictions of iconographic themes found on shell gorgets and cups from the Spiro, Sanders, and Roden mound sites of Texas and Oklahoma. By doing so, this research demonstrates how the rich symbolic tradition of the Caddo found expression on their pottery.

The Caddo bottle is well placed at the apex of the great tradition of Native American pottery technology. These bottles are rightly considered works of art, and that art has been recently revived by the contemporary Caddo potter Jereldine Redcorn (Townsend and Walker 2004:231-245). Caddo bottles from prehistoric contexts also seem to have much to reveal about those who made and used them. Because Caddo bottles, which are the focus of this article, were offerings placed with care within a burial, it is likely that these vessels held special significance to the individual they accompanied in death, as well as to the Caddo society who placed them in the grave. Large bottles in particular may have had ritual or social importance. They might have held ritual drink in a fashion similar to the shell cups so notable from the Spiro site of Oklahoma. Since the Spiro shell cups were decorated with iconographic motifs, it is not a stretch to consider that the motifs on the Caddo bottles may also have ritual or social significance.

To explore the significance of the Caddo bottle, the motif structure and bottle form of the Titus phase ceramic types Ripley Engraved and Wilder Engraved are compared. Added to this mix are Johns Engraved bottles and bottles decorated with the canebrake rattlesnake motif (Walters 2006:1-39). The Johns Engraved vessels may also be considered a Titus phase ceramic type. However, the canebrake rattlesnake motif may be slightly earlier in time and it occurs both in and outside of the Titus phase heartland (Perttula 2005:358). Still, all three ceramic types and the canebrake rattlesnake motif can be associated with the Middle to Late Caddo periods of Northeast Texas, dating from ca. A.D. 1300 to 1600. This comparison demonstrates the close structural similarities between the motifs on these bottles, including the use of the same motif elements in similar ways, and the uniformity of placement of motifs on the bottle form. These similarities suggest that these three ceramic types and the canebrake rattlesnake motif are part of a single ceramic tradition. As such, the Caddo who made these vessels and those who used them would have had an equal understanding of any meaning encoded within these bottle and motif structures.

The second part of this article focuses specifically on motif meaning by demonstrating correspondences between the bottle motifs and the images on shell artifacts from the lower Mississippi valley and Middle South. Once again, structural similarities are important, as the Caddo bottle motifs and the more representational images on selected engraved shell gorgets and cups are compared. The engraved shell gorgets and cups selected for comparison come from the Spiro mound site in Oklahoma and from the Sanders and Roden mound sites, located above the Great Bend of the Red River in Lamar County, Texas, and in McCurtain County, Oklahoma, respectively. The

Spiro site is of special significance, as it appears to be a locus of iconic expression that reached its height ca. A.D. 950-1200, although recent radiocarbon dating indicates that ceremonial activities, which produced a multitude of images, continued to at least A.D. 1400 (Phillips and Brown 1978:14; Brown and Rogers 1999:134-141). These images, which include birds, serpents, and fantastic beings, have also been central to the investigations of the Texas State Mississippian Iconography Conference held at Texas State University-San Marcos and the work and interpretations of this Conference are relied upon here (Lankford et al. 2011; Reilly and Garber 2007; Townsend and Sharp 2004). The Sanders and Roden sites produced only a few engraved shell artifacts, but the presence of these artifacts at these mound sites indicates a Caddo acceptance of a belief system and perhaps participation in the kinds of social agencies that appear so strong at Spiro (Schambach 1993; Bruseth et al. 1995). The similarities between motifs associated with the Ripley, Wilder, and Johns Engraved bottles and the engraved shell artifacts indicate that the Caddo of Northeast Texas retained a version of a Mississippian worldview at least up to the historic period.

The Ripley Engraved and Wilder Engraved bottles used in this study were originally burial offerings from the graves at the Pine Tree Mound site (41HS15) and the Tuck Carpenter (41CP5) cemetery site. The bottles from these sites were selected because I am familiar with the sites and because there is good information on the range of variation within the bottle motifs. Both sites produced similar bottle forms and motifs, but some interesting differences exist concerning the frequency of certain motifs and their associations; that is, in whose grave were certain bottles placed. These differences in association are not a focus of this study, because to do the subject justice would require more depth than this article would allow. However, it is not surprising that these differences should exist since these sites represent important centers in two distinct Titus phase communities (Fields and Gadus 2012:667-677). The Pine Tree Mound site is a village with small family cemeteries (27 identified graves) surrounding a mound complex; it is located in the middle Sabine River drainage in Harrison County, Texas (Fields and Gadus 2012). The Tuck Carpenter site is about 75 km to the northwest of Pine Tree, located in the Big Cypress Creek drainage of Camp County, Texas (Turner 1978). Tuck Carpenter is a large "community" cemetery (44 graves) that is separate from any habitation or other ceremonial structures. Tuck Carpenter and other such large cemeteries are, however, considered to have functioned as centers of ceremonial activity, as did mound sites such as Pine Tree (Perttula et al. 1998:380). Thus, the bottles from these two sites can be considered representative of the range of forms and motifs produced by two different Titus phase communities.

THE STRUCTURE OF BOTTLES AND BOTTLE MOTIFS

To understanding the significance of the Caddo bottles and bottle motifs, it is important to explicate their structure in as systematic a way as possible. The method used here is based on Jernigan's (1986:10–11) definition of style as "a complex unit of design consisting of a configuration or pattern of configurations that retains its identity across a number of vessels and/or design contexts within a particular style repertory." Within this definition "design contexts" are considered here to be the structural levels of the Caddo bottles. These include the bottle form, how the motif is placed on the bottle form, and the structure of the motif itself with its configuration of motif elements. All of these levels are important to understanding the "whole" of the vessel and the iconic themes that the vessels may convey.

Starting with bottle form, it is apparent that the base, body, neck, and rim are similar for bottles associated with the Ripley, Wilder, and Johns Engraved and bottles that display the canebrake rattlesnake motif. How the engraved motifs are configured on these bottles is also similar. At the level of motif structure, the eight Ripley Engraved bottle motifs defined from the Pine Tree Mound assemblage also appear on Ripley bottles from the Tuck Carpenter site (Fields and Gadus 2012:412-439). Examples of bottles with similar motifs from both sites are presented in Figures 1 and 2. In contrast, only one motif has been defined for the Wilder Engraved bottles as well as one motif for Johns Engraved bottles. The similarity of bottle form and motif structure between types, and the limited number of defined motifs for Wilder and Johns Engraved, leads one to suspect that Wilder and Johns Engraved could easily fit into an expanded type definition of Ripley Engraved.

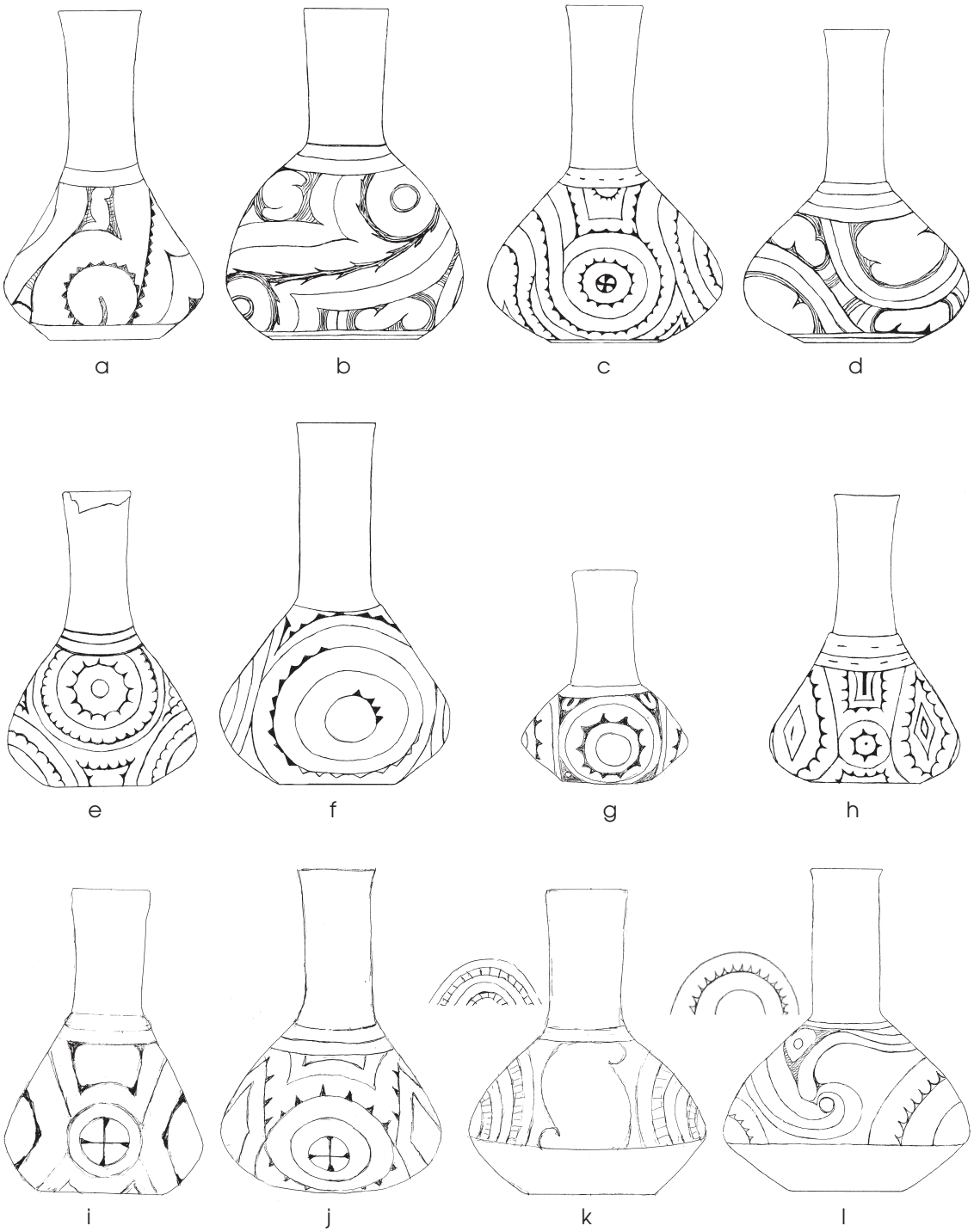


Figure 1. Common Ripley Engraved bottle form and motifs from Pine Tree Mound and the Tuck Carpenter sites: a-b, slanted scroll motif, Pine Tree Mound Vessels 2.2079-12 and 8.1094-1; c, half scroll motif, Pine Tree Mound Vessel 2.2072-11; d-e, medallion motif, Pine Tree Mound Vessels 8.1086-1 and 2.2079-7 ; f, concentric circle motif, Pine Tree Mound Vessel 2.2072-3; g, concentric circle motif, Tuck Carpenter Grave 5 (redrawn from Perttula et al. 2010a:Figure 77); h, circles/diamonds motif, Pine Tree Mound Vessel 2.2072-6; i-j, circles/diamonds motif from Tuck Carpenter Graves 41 and 21; k, band of alternating elements motif from Tuck Carpenter Grave 18 with opened-out half circle; l, band of alternating elements motif, Pine Tree Mound Vessel 2.2078-5 with opened-out half circle. Unless otherwise noted for all figures the Pine Tree bottle drawings are reproduced from Fields and Gadus (2012), and the Tuck Carpenter bottles are redrawn from Turner (1992).

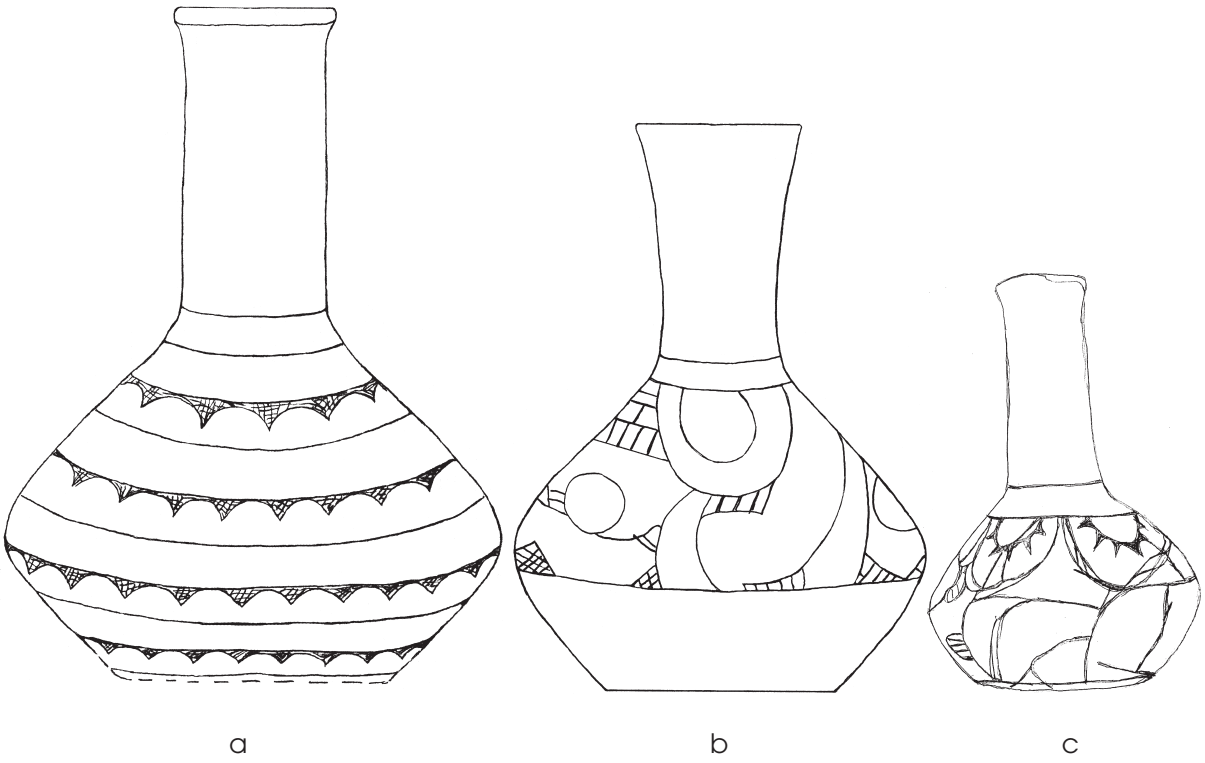


Figure 2. Less common Ripley Engraved bottle motifs: a, concentric bands motif from Pine Tree Mound Vessel 8.1092-6; b, crazy motif from Pine Tree Mound Vessel 8.1088-4; c. crazy motif from Tuck Carpenter Burial 45 (drawn from Perttula et al. 2010a:Figure 237).

Bottle Structure

As noted above, Ripley, Wilder, and Johns Engraved bottles have a similar bottle structure. That structure generally consists of a bell-shaped body with an extended neck, a flaring to straight rim, and a flat base. However, there is some variation of body form within the types. For example, only Ripley Engraved also has a square body, and Wilder bottles can have a more oval body. But whatever the body form, the engraved motif extends from the neck-body juncture to the body carination or below the carination to the base. Two or three horizontal lines that encircle the neck at the neck-body juncture and a single horizontal line around the body carination or base often define this canvas (see Figure 1a-d, k-l). The engraved motif commonly repeats two, three, or four times around the body in this defined space. The four motif repetitions found on some Ripley Engraved bottles—accentuate and are accentuated by—a square body form (Figure 3).

There are also bottles with an extraordinary structure that have been typed as Ripley Engraved or Wilder Engraved or that remain untyped within the Caddo ceramic repertoire. The Ripley Engraved square bottle may be considered one of these; less frequent are the double bottles, bottles with pedestals attached to their base, and bottles with eccentric bodies (Figures 3 and 4). These unique bottles emphasize different aspects of the engraved motif and suggest that the bottle was designed as part of the motif. For instance, observed from the bottle rim down and opened out, the four repetitions of the concentric circles motif on a Ripley Engraved square bottle reinforces the four-part structure of the motif and highlights the central axis of the bottle formed by the extended neck (see Figure 3). In this way, the bottle structure reinforces the idea of a center with a four-part structure surrounding it. This structure is similar to the circle-with-cross element that is often itself part of Ripley Engraved motifs (see Figure 1i-j).

The four-part body structure surrounding a central axis is also repeated on an untyped extraordinary bottle from a grave at the Joe Justiss site (Figure 4a). This bottle has four outer columns (only two columns can be seen in the bottle drawing) fashioned by cutouts made into the central part of the bottle

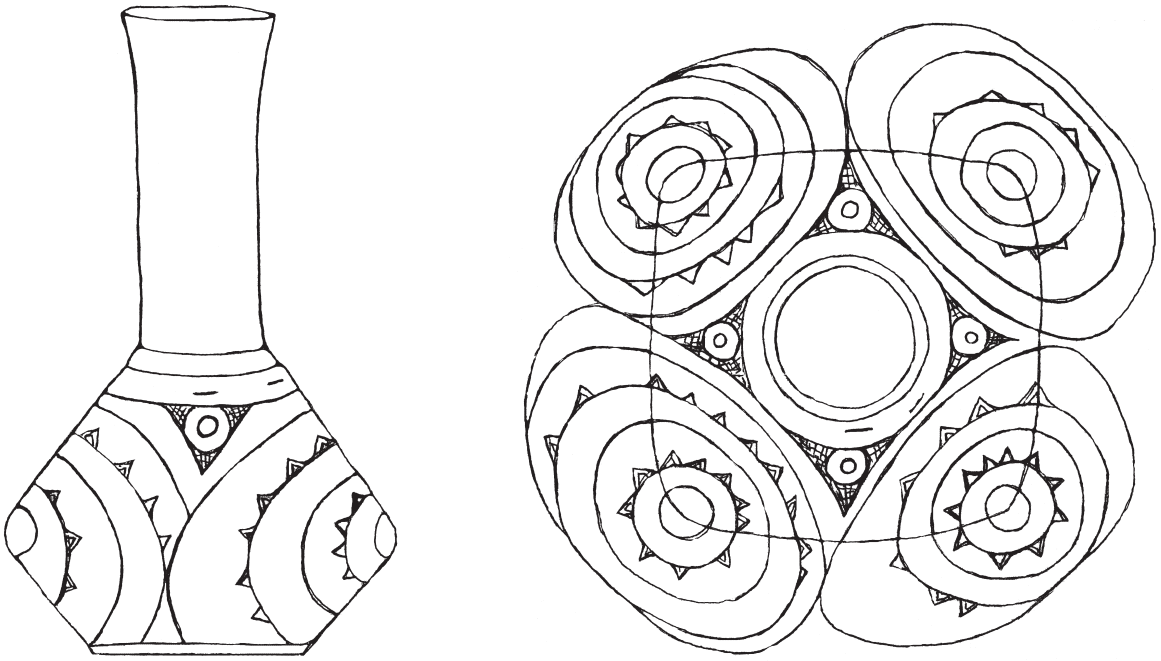


Figure 3. Ripley Engraved square bottle with a concentric circles motif with motif viewed down from the bottle rim, Pine Tree Mound Vessel 2.2072.

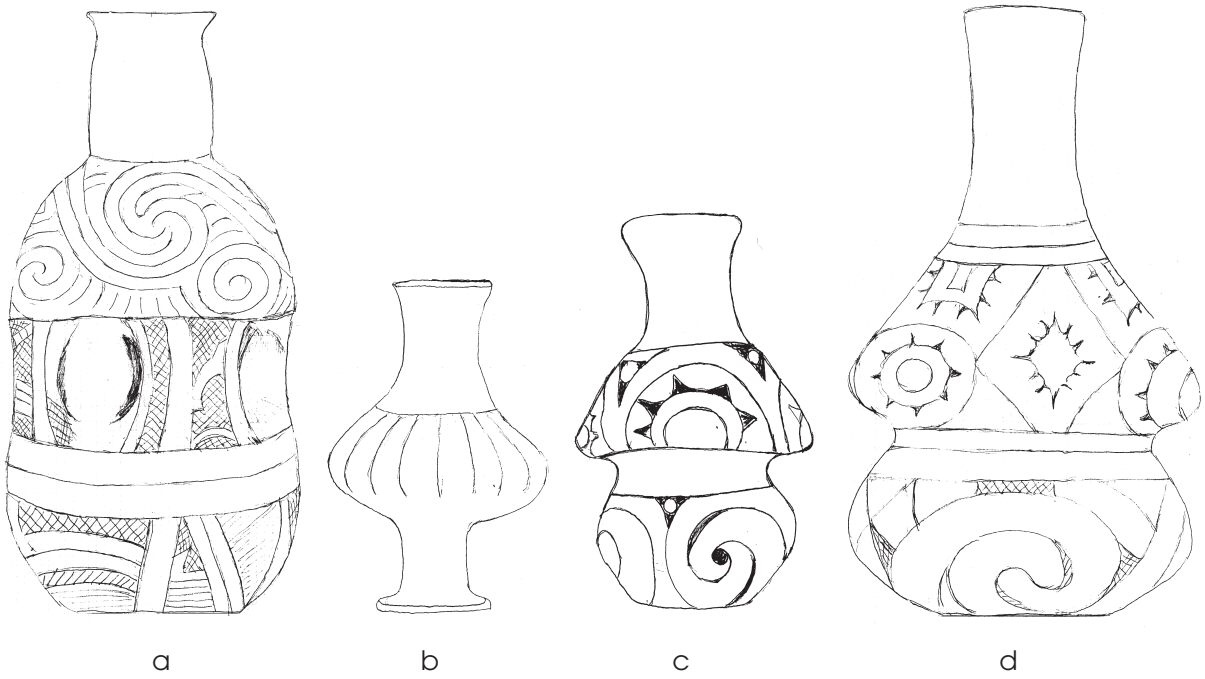


Figure 4. Extraordinary bottles: a, a bottle with an eccentric body from the Joe Justiss site (drawn from the Texas Archeological Research Laboratory, The University of Texas collections); b, pedestal bottle from the Buddy Calvin Jones collection, Upshur County, Texas (drawn from Perttula 2006:Figure 272); c. double bottle from the Tuck Carpenter site, Grave 9 (drawn from Perttula et al. 2010a:Figure 93); d, double bottle from the Johns site (drawn from Perttula et al. 2010b:Figure 112).

body. What remains of the cutout areas form the central shaft of the bottle, which is again accentuated by the extended bottle neck. The columns and shaft appear to unite the upper and lower parts of the bottle body, which are variously engraved. The importance of the central axis of a bottle is also emphasized by the occurrence of pedestal bottles, which have a foot and stem added to the base (Figure 4b). The pedestal in effect extends the bottle axis beyond the base. Although the use of the pedestal on bottles is rare, small pedestal bowls are known from various Titus phase sites, including the Pine Tree Mound and Tuck Carpenter sites (Fields and Gadus 2012:Figure 6.20a; Turner 1978:Figure 34).

The double bottle is another extraordinary bottle often found as a offering in Titus phase cemeteries. The examples presented in Figure 4c and 4d were recovered from the Tuck Carpenter site and the nearby Johns site (41CP12). The double bottle has two bodies superimposed below one common neck, which gives the impression of a single axis extending though two bottles. Each body generally carries a different motif. For the two bottles illustrated, a Ripley Engraved motif is situated above a Wilder Engraved swirl motif. Thus, the double bottle effectively unites two different engraved motifs from two different ceramic types around one center. The positioning of the motifs on these bottles may be of import and is explored further in relation to the iconography of the bottle.

Engraved Motif Structure

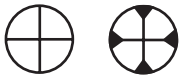
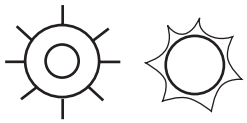
The motif structure of Ripley, Wilder, and Johns Engraved bottles are examined here separately, although all three are composed of similar primary, secondary, and tertiary elements. Primary elements are those prominent in the motif. One such primary element is the circle with cross, which is common to the Ripley scroll motif and the Wilder swirl motif. Figure 5 shows some of the common primary elements identified for the three types. Secondary elements are those that appear to take on a modifying role within the motif structure. Examples of modifying elements are the circles, pendant triangles, and hatching found in the surrounds of certain primary elements (Figure 5). Tertiary elements are here defined as the lines that form the skeleton of the motif and on which the primary and secondary elements are "hung."

Some elements can also change their position within the motif. For example, primary elements, such as the SZ element, can also be used in a secondary position. This interchangeability provides much of the variation of expression seen in the Ripley Engraved vessels. Interchangeable elements may not have affected the overall structure of any particular motif, but likely did alter the meaning conveyed by the potter. Thus, a circle used as a primary element in a scroll motif may convey something different than the circles that appear in the scroll surrounds. One element that does not appear to change positions in this way is the circle with cross, which is always used as a primary element. In addition, some primary elements such as the circle with cross and the SZ element can occur alone on a vessel, suggesting that they have some intrinsic meaning that needs no modification.

RIPLEY ENGRAVED BOTTLE MOTIFS

Ripley Engraved bottles are decorated with a greater variety of engraved motifs and motif elements than Wilder or Johns Engraved. As noted above, eight motifs were defined for Ripley Engraved bottles from the Pine Tree Mound site, and most of these hold for Tuck Carpenter as well. The motifs are the *slanted scroll, half scroll, medallions, concentric circles, circles/diamonds, alternating elements, concentric bands,* and the *crazy motif* (see Figures 1 and 2). Thirteen elements are presented here as associated with these Ripley Engraved motifs. Those most often used as primary elements on bottles are: circle with cross, open circle (a circle within a circle), half circle, rayed circle, curl, SZ (or standing scroll), and diamond. Those most often used as secondary elements include the pendant triangle, circle, bar, SZ, chevron, hatching, and crosshatching (see Figure 5).

The Ripley Engraved motifs defined here combine elements in similar ways, which suggests that different motifs may be variations on only a few themes. For instance, the *slanted scroll* motif (see Figure 1a-1b) consists of a set of lines that connect or run between sets of primary elements. But the *half scroll* (see Figure 1c) cuts those connecting lines in the middle and shows only one primary element per iteration or half of a scroll. Two iterations of the half scroll motif extend downward from the neck of the bottle and two extend upward from the base, effectively connecting the base and rim, as the half scroll repeats four times around

Primary	
Open circle	
Circle with cross	
Rayed circle	
Half circle (open and closed)	
Curl	
SZ	
Diamond	
Hook	
Interlocking ends	
Bird head	

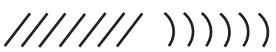
Secondary	
Circle	
Hatching	
Crosshatching	
Bars (orientation varies)	
Pendant triangles	
Chevrons	

Figure 5. Common primary and secondary motif elements found on Ripley Engraved, Wilder Engraved, and Johns Engraved bottles.

the bottle. The *medallions* motif has the same four iterations, with the exception that it does away with the scroll arms. Or rather the scroll arms are configured around the primary element, encircling it except at the connection to the neck and base. The *concentric circles* motif takes this further by completely encircling the primary element such that the connecting lines become the primary element (see Figure 1f and g). For the *concentric bands* motif, the primary element is the central axis of the bottle as what would be the connecting lines of the scroll totally encircle the bottle body. The motif consists of horizontal bands embellished by secondary elements (pendant triangles) separated by and alternating with a plain band, all of which encircle the body. Usually four alternating bands extend from encircling lines at the neck-body juncture to the base. Viewed from the rim of the vessel down, the *concentric bands* motif is identical to the design of the *concentric circles* motif (Figure 6a). And as the primary element for the *concentric bands* motif is the orifice, and by extension the central axis of the bottle, there is for this motif a direct link to the four-part structure seen on some of the extraordinary bottles discussed above.

There are a couple of Ripley Engraved motifs that do not seem to use encircling or connecting lines in the same way as in the motifs discussed above. One such motif is the *circles/diamonds* motif (see Figure 1h-j). Elements of this motif are

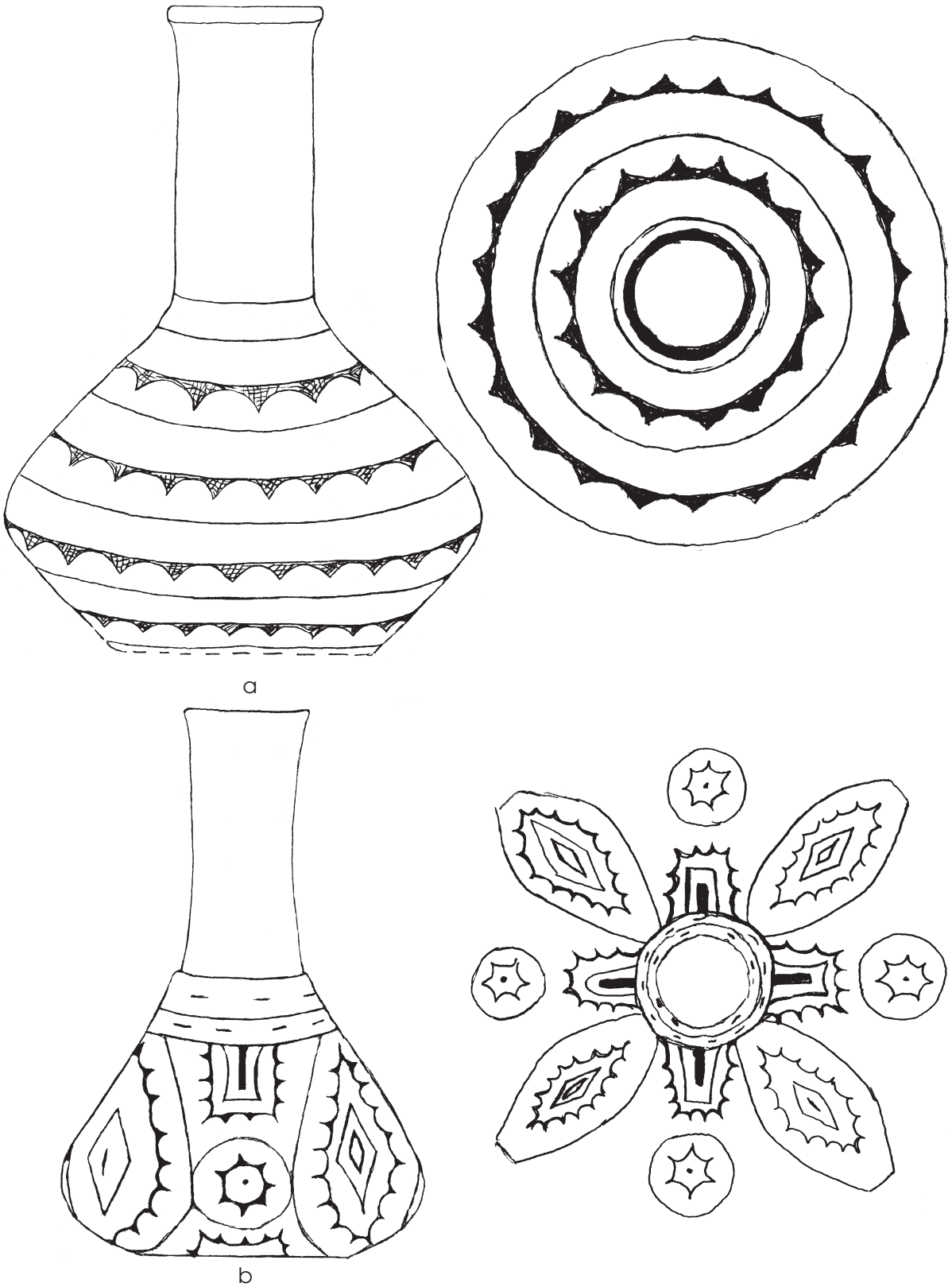


Figure 6. General view and the top-down opened-out view of the structure of Ripley Engraved bottles: a, concentric bands motif; b, circles/diamonds motif. Both bottles are from the Pine Tree Mound site (Fields and Gadus 2012:Figures 6.3 and 6.6).

linked to the bottle body by two or more concentric lines that encircle the neck. However, an opened-out view of the motif from the perspective of the bottle rim or neck once again shows the familiar four-part structure around a center, similar to that of the *concentric circles* motif (see Figure 6b). For the particular bottle pictured in Figure 6b, the top-down view of the opened-out motif is strikingly similar to the circle with cross. Another Ripley Engraved bottle from the Tuck Carpenter site has two large SZ elements alternating with a series of concentric half circles (see Figure 1k). The motif structure of this bottle is similar to the one in Figure 1l from the Pine Tree Mound site. This bottle was original called "untyped with Ripley and Wilder Engraved primary elements" (Fields and Gadus 2012:425-426). However, the structure of both of these bottles is defined here as a *band of alternating elements*, which is a motif recognized for Ripley Engraved bowls at the Pine Tree Mound site (Gadus and Fields 2012:438-444). What makes this motif band-like is the tertiary line at the carination that defines the bottle canvas. It is interesting to note the similarity of the configuration of half circles in the band of alternating elements on both bottles to the *concentric circles* and *concentric bands* motifs. Each half circle, circle, or band is composed of concentric lines alternating with lines embellished with secondary elements such as the pendant triangle or hatching.

A motif first identified for Ripley Engraved bottles during the Pine Tree Mound ceramic analysis is the *crazy* motif (Fields and Gadus 2012:462-430). In this motif, connections between elements appear to be haphazardly structured, but in fact that disconnection or disorder is what is being portrayed (see Figure 2b-c). The motif appears as a band encircling the bottle body with a jumble of connecting lines and primary and secondary elements. This configuration gives a sense that the motif was intentionally deconstructed on the bottle. The *crazy* motif is present on only one bottle each from the Pine Tree Mound (Fields and Gadus 2012:Figure 6.14) and Tuck Carpenter sites (Perttula et al. 2010a:Figure 237). However, a perusal of the Texas Archeological Research Laboratory vessel collection suggests that it may have a wider distribution.

Wilder Engraved Bottle Motifs

As noted above, the shape of Wilder Engraved bottles is similar to that of Ripley Engraved bottles. Wilder bottles generally have a bell-shaped body with an extended neck, a slightly flaring rim, and a flat base (Figure 7). However, Wilder Engraved bottle motifs do not stop at the body carination, as is the case on some Ripley Engraved bottles, but extend all the way from the neck/body junction to the base. Two to three horizontal lines that encircle the neck and one or more horizontal lines at the base define this canvas. Commonly, the Wilder Engraved motif repeats three to four times around the body.

Wilder Engraved bottles are identified by one characteristic motif that is called here the *swirl* motif. This swirl culminates in some variation of a primarily element with interlocking ends. Variations of this primary element include interlocking ends around an oval, a circle, a dot, a circle with cross, or empty space (see Figure 7a-b, d, f-g). Secondary elements associated with the swirl motif are circles or bars in the motif surrounds, hatching, crosshatching, and pendant triangles. Hatching or crosshatching also occurs within the motif surrounds and in some cases is used to thicken interlocking spiral ends. These interlocking ends and hatched surrounds are the defining features of the Wilder Engraved type (Suhm and Jelks 1962:155), setting it apart from other types with spiral designs, such as Taylor Engraved (Suhm and Jelks 1962:149–151). In fact, on some renditions of the Wilder *swirl,* if the hatched elements are considered part of the background, the "positive" arms can be seen as ribbons or bands swirling around a center point that is often a simple circle or nothing at all (see Figure 7d-e).

Another way to view the Wilder Engraved *swirl* motif is to recognize its structural relationship to the canebrake rattlesnake motif as defined by Walters (2006:5-39). This motif is a representational image of snakes with entwined or interlocking tails (Figure 8). It is found on Caddo bottles from 10 sites on the middle and upper reaches of the Big and Little Cypress Creek drainage; it also occurs at three sites on the middle Sabine River drainage; three sites in the Red River drainage; and at a single site on the Angelina River drainage (Hart and Perttula 2010; Perttula et al. 2012:338; Walters 2006:Figure 16). Based on a few radiocarbon dates and associated artifacts, the rattlesnake motif, at least in the Big Cypress Creek area, appears to be associated with both the Middle to Late Caddo periods (Turner and Smith 2003:7-14; Walters 2006:23), and as such may be considered a

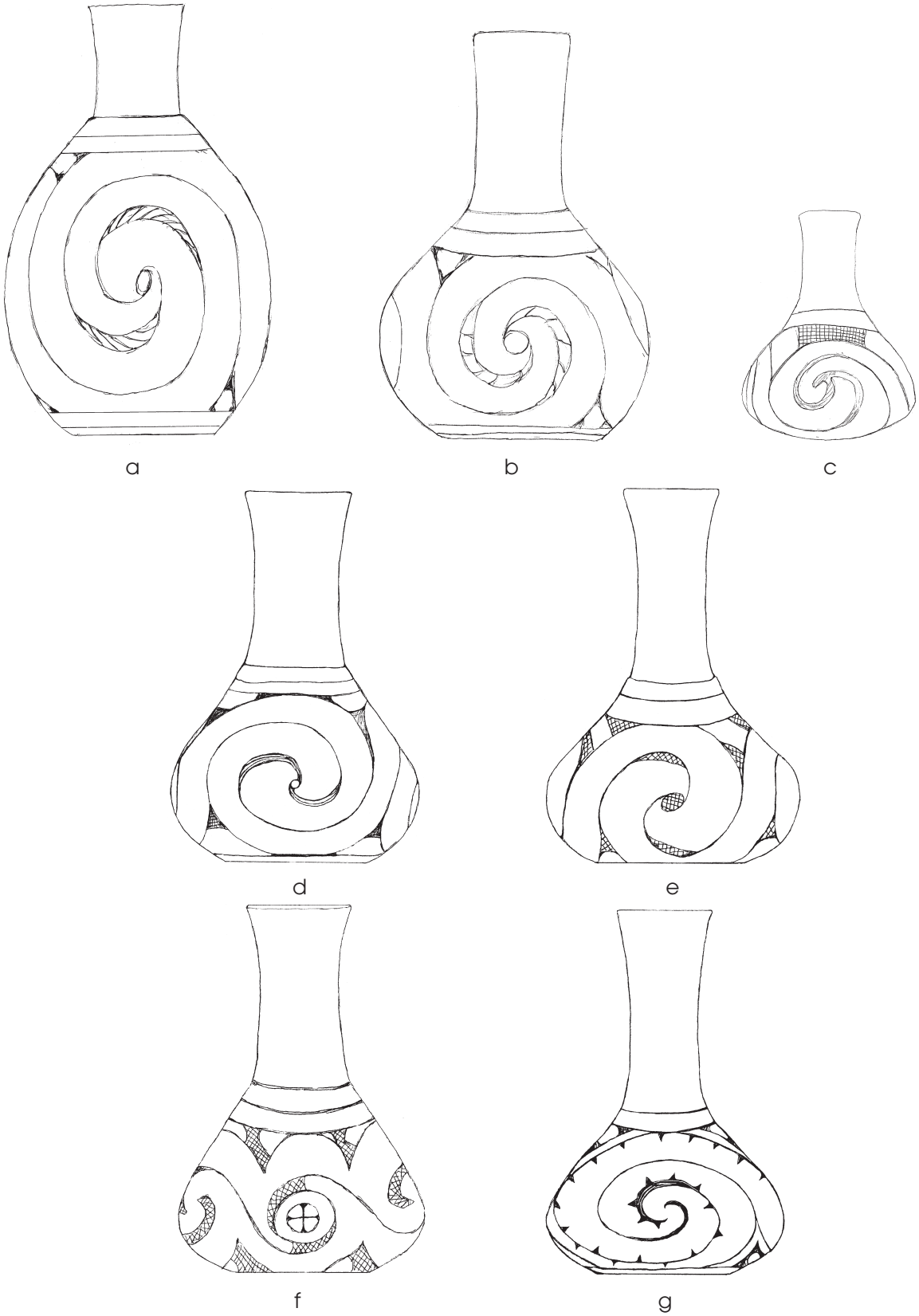


Figure 7. Wilder Engraved Bottles: a-c are from the Tuck Carpenter site (Turner 1992:Figures 4, 31, 37); d-g are from the Pine Tree Mound site (Fields and Gadus 2012:Figures 6.9 and 6.10).

precursor to Wilder Engraved. Several body sherds with the motif were recovered from the Oak Hill Village site, a ca. A.D. 1150-1450 Caddo period village in the middle Sabine River drainage (Perttula 2004:220-222), and a complete bottle with the motif was recovered from the Washington Square Mound site (Corbin and Hart 1998:72). The Washington Square Mound site was likely occupied from ca. A.D. 1250-1450 (Hart and Perttula 2010). Given the range in temporal contexts, it seems that the Wilder Engraved swirl motif, which is very much a Titus phase phenomenon, could have developed from and or alongside the canebrake rattlesnake motif.

A classic example of canebrake rattlesnake motif can be found on a bottle from the Harold Williams site, a habitation and cemetery site in Camp County, Texas (Figure 8). This bottle shows four full-bodied snakes with rattle tails and rounded heads that curl around the bottle body. The bottle form is similar to that of Wilder and Ripley Engraved, and the motif canvas extends from the neck to the bottle base. The snakes are arranged in two sets, with the tails of each set interlocking around a hatched or plain circle. Each snake's head has a forked tongue and is marked by lines and dots that are suggestive of eyes and a nose. The body of the snake is decorated with hachured chevrons that help to identify the figure as a canebrake rattlesnake (Walters 2006:17-19).

The interlocking tails on this representational motif can be considered the primary element. This interpretation is strengthened by a carinated bowl from the Pine Grove site (41HS826) that has only interlocking rattle tails on the vessel body below SZ elements (Walters 2006:Figure 20). Thus, it appears that the tails alone may stand for the entwined snakes. And the interlocking tails are clearly structurally similar to the interlocking ends of the Wilder Engraved swirl motif, as both interlock around a circle or a central point. The examples of Wilder Engraved interlocking ends thickened by hatching are also suggestive of the snake rattles and strengthen this interpretation (see Figure 7b-d, f-g). As such, it is possible to suggest that the Wilder Engraved motif is a nonrepresentational version of what is depicted in the canebrake rattlesnake motif. Both are depictions of snakes or snake elements that rotate around a center or axis, and in that way they are also connected to the interpretation of the Ripley Engraved scroll motif. Based on its structural association with the canebrake rattlesnake motif, it would appear that in the Wilder Engraved swirl motif, the snake is what swirls or twists around the motif axis and the axis formed by the bottle itself. Wilder Engraved bottles may therefore be considered snake bottles.

Although the swirl motif sets Wider Engraved bottles apart from Ripley Engraved bottles, the similarity of bottle structure between the two types, and their common use at the same sites during the same time period, indicate that they are part of the same ceramic tradition. As such, the single motif associated with Wilder Engraved might be seen as complementary by representing an iconic theme that may not be commonly expressed by the Ripley Engraved motifs. Supporting this idea is the fact that Ripley and Wilder bottle motifs sometimes occur on the same bottles. For instance, a Ripley Engraved bottle with a *alternating elements* motif recovered from a grave at the Pine Tree Mound site displays what looks to be a Wilder Engraved swirl motif with interlocking ends and Ripley Engraved concentric half circles embellished with pendant triangles (see Figure 11 below). At the Tuck Carpenter site, these same primary motif elements are joined on a double bottle with the Wilder swirl on the lower bottle and the Ripley half circle with pendant triangles on the upper bottle body (see Figure 4c). A similar double bottle with a Ripley Engrave circles and diamonds motif positioned above a Wilder swirl is also known from the Johns site (see Figure 4d). These double bottles suggest that the same Caddo potters had both Ripley and Wilder motifs in their repertoire.

JOHNS ENGRAVED BOTTLE MOTIFS

Johns Engraved is a ceramic type proposed by Turner (1978:86-88) to account for representational bird images found on some bottles and bowls within Titus phase ceramic collections. The few known Johns Engraved bottles have a variable body shape that in most respects is similar to the bell-shaped body and elongated neck of Ripley Engraved and Wilder Engraved bottles (Figure 9). The location of the representational motif on the body of the bottle is also similar to that of both Ripley and Wilder Engraved, with the motif positioned between the neck/body juncture and extending past the body carination to the base. Comparing the tertiary structures, Johns Engraved

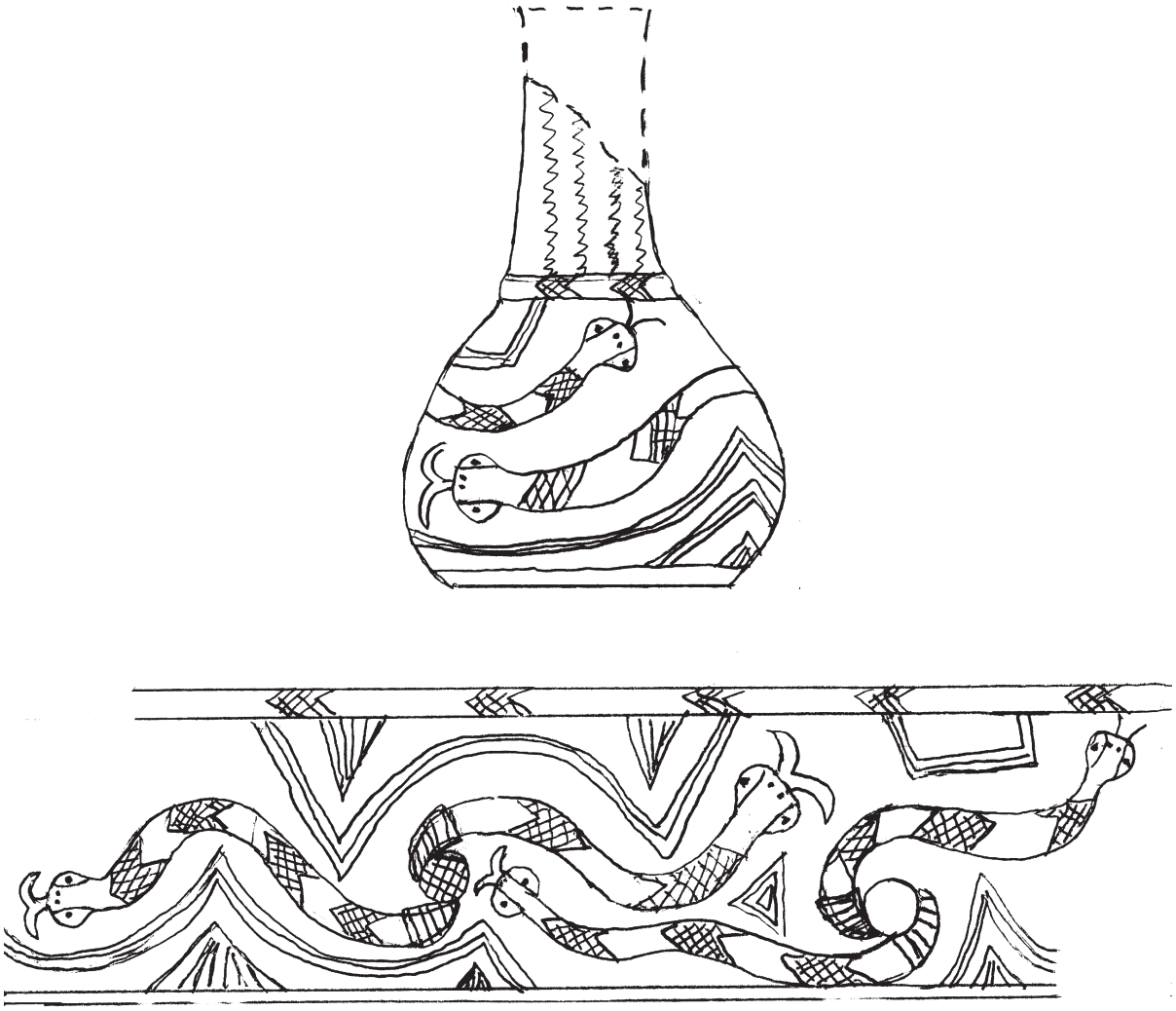


Figure 8. The structure of the canebrake rattlesnake motif from a bottle recovered from the Harold Williams site (41CP10). The canebrake rattlesnake bottle and its opened out design are here redrawn from Turner (1997:15 and Figure 3). Turner (1997:12) also notes that there are four "rocker-like" lines on the neck. (Note that there are a few minor differences between the bottle drawing and the opened-out drawing in relation to the surrounding elements. This redrawing stays faithful to what was illustrated by Turner.)

motifs may be considered similar to the *half scroll* and *medallions* motif associated with Ripley Engraved bottles (see Figure 1c-e) as well as the *swirl* motif of the Wilder Engraved bottles (see Figure 7). The primary elements consist of a bird head that sometimes interlocks with a hook element (Figure 9a-b*)*. Like a medallion or half scroll, the bird head hangs down from the horizontal lines that encircle the neck of the bottle. The head is marked with a circular eye, banded neck, and curving beak. The hooked element curves up from a horizontal line at the bottle base. The hook and bird beak can interlock around an unmarked center, as do some versions of the Wilder Engraved swirl motif. A secondary circle, or open circle element, may appear at the base of the hook or bird head, or there may be a triangular hatch element in this position. The hook itself may be hachured (Figure 9a-b). On the Johns Engraved bottle from the Horton site, the bird head is prominent, extending up or down from the neck and base of the bottle, while the hook element appears de-emphasized (Figure 9c). However, the structure of the bird head is quite similar to that seen on the bottles from the Johns site.

The Johns site produced three bottles and three bowls with the bird imagery, and another bottle is

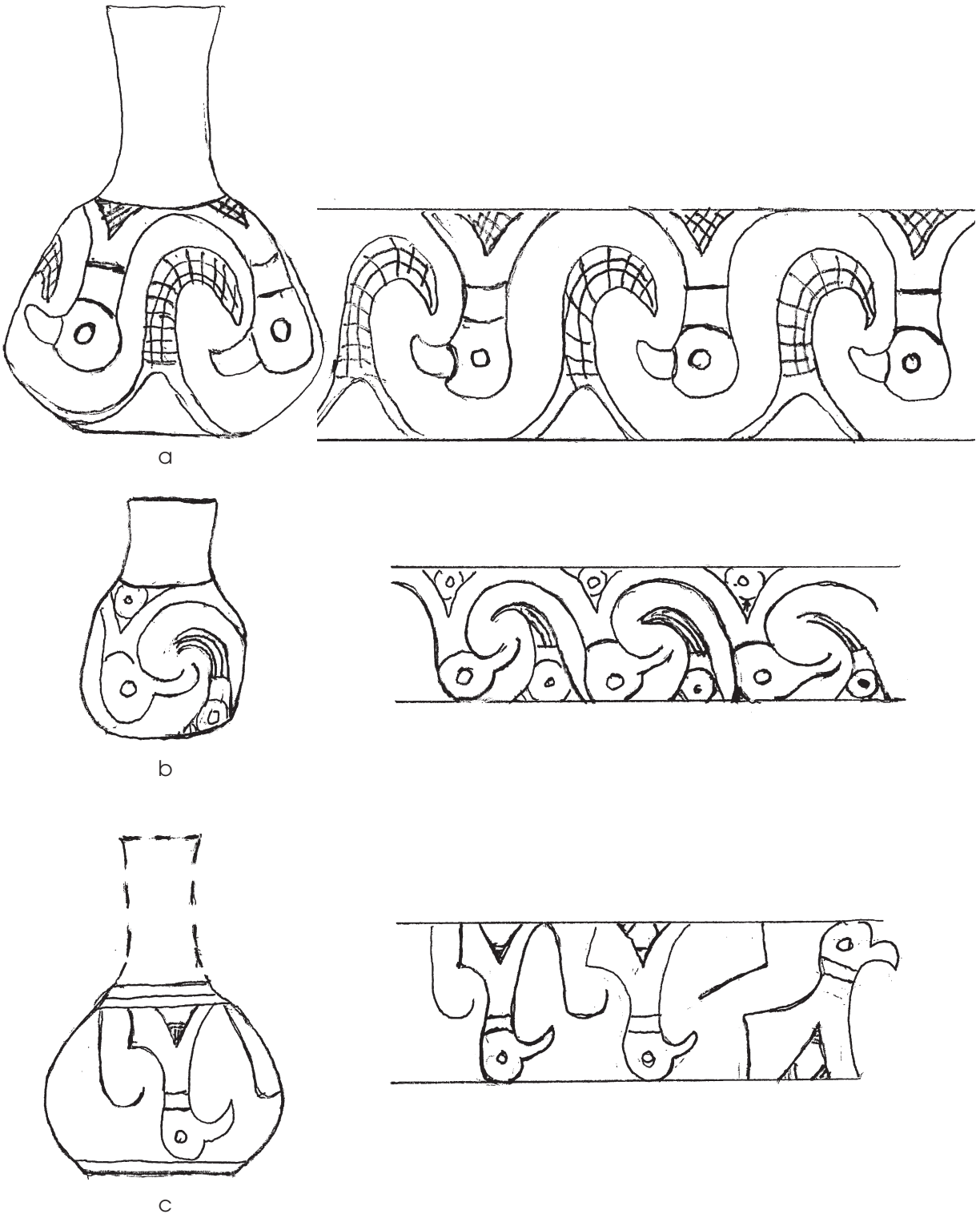


Figure 9. Johns Engraved bottles: a-b, two bottles from the Johns site; c, a bottle from the Horton site (41CP20) in Camp County, Texas. Redrawn from Turner (1978:Figure 30).

known from the Horton site (Turner 1978:86-88). A bottle with hook elements but no bird images is known from the Mockingbird site (Perttula et al. 1998:Figure 57). No Johns Engraved bottles were recovered from either Tuck Carpenter or Pine Tree Mound. However, Tuck Carpenter did produce one Johns Engraved bowl with the bird head motif, as did the Caldwell site in Titus County (Turner 1978:86-88). All of these sites are in the upper reach of the Big Cypress Creek drainage. The tight distribution of these sites suggests that Johns Engraved may have been a local expression of motif themes that were common and also expressed on both Wilder and Ripley Engraved bottles. How the bird imagery associated with the Johns motifs is related to Wilder and Ripley Engraved motifs is explored in the next section.

THE ICONOGRAPHY OF RIPLEY, WILDER, AND JOHNS ENGRAVED BOTTLES

The similarities of motif and vessel structure for the Caddo ceramic bottles described above suggest that the images on these bottles and the bottles themselves reflect a body of beliefs commonly held by the prehistoric Caddo (Fields and Gadus 2012:505-520). That prehistoric Native groups decorated and used ceramic vessels in a symbolic way is supported by David Dye's (2011:99-117) recent overview of the prehistoric ceramic art of the Lower Mississippi Valley. Dye (2011:100-101) contends that those vessels were decorated with "highly charged symbolic and metaphoric images… that reference other world conceptions." It is also true to say that the importance of ceramic vessels as a medium of symbolic expression changed over time and between societies. Jon Muller (1989:17–25) sees ceramic vessels as the main medium of expression in the Mississippian "Post Southern Cult Period," when pottery replaced work done on exotic materials such as shell, stone, and copper. And the use of pottery as a means of symbolic expression appears to accompany increased variation in ritual activity on a regional scale. The "Post Southern Cult Period" starts, according to Muller (1989:17), ca. A.D. 1450, about the same time as the manufacture of Ripley, Wilder, and Johns Engraved vessels. Although there may have been a change in medium of symbolic expression, some of the same themes and images that appear on the shell, stone, and copper artifacts were continued on pottery.

To discern the meaning of the images on the Ripley, Wilder, and Johns Engraved bottles under discussion here, the bottle motifs are compared to shell engravings, which often afford more representational and therefore more interpretable images. One of the largest bodies of engraved images on shell cups and gorgets is from the Spiro site in Oklahoma. These images, which have been analyzed and cataloged by Phillips and Brown (1978, 1984), are thought to express the mythic narrative of the people who made and/or used them (Brown 2007:57-106; Hall 1989:239-278; Strong 1989:211-238). Also compared are selected engraved shell gorgets from the Roden and Sanders mound sites located along the Red River between Texas and Oklahoma (Krieger 1946; Perino 1981). Ongoing work concerning the interpretation of the images on these shell artifacts and their relation to Mississippian iconography is continuing to clarify the linkages between the image structure and mythology. Particular useful to this study is the work of Kent Reilly and George Lankford (Lankford et al. 2011; Reilly and Garber 2007).

It is also important to discern whether Caddo traditional beliefs support an interpretation of Ripley, Wilder, and Johns Engraved bottle motifs based on Mississippian iconography. While much has been lost, Caddo stories and historic accounts of ritual practices provide a background against which interpretations can be fit. In this regard, the work of William Joyce Griffith (1954), Cecile Elkins Carter (1995), and George A. Dorsey (2010) are used here. Dorsey and Carter's work include creation stories of the Caddo based on pre-1923 collections. Griffith and Carter's work summarize the chronicles of the Spanish and French missionaries and traders who interacted with the Hasinai Caddo from the late 1600s through the 18th century. The Hasinai homeland lies within the upper Neches and Angelina River drainages, to the south of the Caddo who made and/or used bottles under discussion here. However, the Hasinai homeland encompasses the Washington Square Mound site, which as noted above, produced a canebrake rattlesnake bottle. The many stories and reminiscences about Caddo life and belief collected by these authors are likely applicable to all Caddo groups.

Four iconographic themes, refined from motif comparisons and Caddo stories, are used here to explicate the images on Ripley, Wilder, and Johns

Engraved bottles. They are the sacred pole, fierce birds, twisted serpents, and the Great Serpent. The theme of the sacred pole relates to a multi-level world order composed of a beneath world, upper world, and lower world. Each world has a four-part structure with the sacred pole as the center passing though all worlds. Implicit in this world order is the necessity of movement (dance) around the center and/or between the world levels as a means to create and renew the world. The themes of the fierce birds and twisted serpents represent powerful beings whose movement or activities can be associated with particular world levels. The theme of the Great Serpent, a powerful being who incorporates characteristics of serpents, birds, and even mammals, figuratively unites all world levels.

The Sacred Pole

The form of the Caddo bottle and its corresponding motif structure can be interpreted using the theme of the sacred pole. As such, the bottle becomes a microcosm of the multi-level world order, a view that was held by many historic Native American cultures (Hudson 1976:122-138). Expressed in myth, legend, and art, the sacred pole stands at the center of a four-part symmetry reflected in the four directions that extend though each world (Lankford 2004:207-217, Reilly 2004:127-129). Each world level also had particular characteristics and denizens. The upper world was considered the day sky that was ruled by the sun and was home to the thunder beings or other winged beings. The middle world was generally considered the everyday world or the plane of human and animal existence. The lower world was an ambiguous realm that was manifest in the night sky and was ruled by the Great Serpent (Reilly 2004:127-129). Movement between world levels was possible because the sacred pole, also known as the world center or *axis mundi*, linked all of the levels.

A historic analog for the world center and the four-part symmetry of each world may be found in the Caddo dance ground and the sacred cedar pole that stood at its center. The prominence of a sacred pole, or dance ground pole, is recounted by William Joyce Griffith (1954:81, 126-127) and Cecile Elkins Carter (1995:90-99), both retelling the stories of the Spanish chronicler Casanas, who lived among the Hasinai tribes. Casanas wrote that a portion of everything the Caddo offer to God was hung on the pole. And in Carter's (1995:92) retelling of the reminiscences of Caddo elder Grace Atkins, the pole and dance ground were quartered symbolically by the color of the pole, which she described as black on the north side and green on the south when set into the center of the dance ground. The orientation of the dance leader completed this quartering, as he stood on the west side of the pole facing east to begin the first song. In addition, Caddo stories that refer to directionality are added evidence that the historic Caddo did accept the idea of a multi-level world.

One story as retold by Carter (1995:73–75) tells of the first man, called Tsah Neesh (Mr. Moon), who brought the Caddo up and out of the "Old Home" in darkness to a world of light. Carter writes: "First an old man climbed up carrying fire and a pipe in one hand and a drum in the other. Next came his wife, bringing corn and pumpkin seeds. All of the people and animals began moving westward coming out of the Old Home in Darkness to another world."

In another part of that same creation story, this time from a collection by Dorsey (2010:Story 1), there appears a passage with a reference to the below world from which the people came, and the directionality of the middle and upper worlds. "Moon told people the name of the place in the ground from which they had come. He told them that the direction to their right-hand side should be called north, or cold side, and the direction to their left-hand side should be called south, or warm side. While Moon was talking the Sun came up out of the east, passed them, and went down in the west."

In another story from the Dorsey collection (2010:Story 17), reference is made to the upper world as well as the sacred pole, or tree, as the narrative tells how the brothers Lighting and Thunder received their powers:

> He [unknown boy] said, my father has given me very dangerous power, and so brother, you must climb up the tree and he will give you power too. The little brother climbed the tree, and he went clear up as far as the other boy had gone. He did not know where he was, and it seemed like a dream to him, and when his bones began to fall he did not know it. The next thing he heard was "lookout brother the arrow is coming right down on you. Get out of the way." He jumped out of the way and saw his brother standing there. The [unknown] boy told his brother to show

> him what kind of power he had, and the little brother began to make a loud noise that sounded like thunder when it rains, and then the [unknown] boy let his tongue out and it looked like a flash of lighting.

Reference to a multi-level world structure may also be found in the structure of the motifs on several prehistoric shell gorgets from the Spiro and Roden sites. Kent Reilly's (2007:39–43) insightful interpretation of a Spiro site shell gorget links this multi-world order once again to the dance ground. In two examples reproduced here, Spiro gorgets show two human figures standing on a ring (the outer edge of the gorget) on either side of a decorated pole (Figure 10a-b). Reilly (2007:40–41) presents a strong case for interpreting these images as depicting a circular path or dance ground around a central pole. The two figures with knees bent appear to be dancing on this path, with the path itself being the outer shell ring of the gorget. The sacred pole stands between the dancers. If these scenes are imagined in 3-D and as viewed from above, then the pole stands at the center of a circular dance ground (Reilly 2007:39-48). The pole on these gorgets is decorated with double diagonal lines or "bars" alternating with "open circle" elements that are common elements in many Ripley Engraved scroll motifs. These open circle elements may recapitulate the pole at the center of a circular path. And a similar configuration of the central axis can be seen on a Caddo long-necked bottle if viewed from the bottle lip down on the bottle body (see Figure 6a).

Another shell gorget depicting human characters on opposite sides of a central pole is known from a shaft burial at the Roden site (see Figure 10d). The Roden gorget with human characters may also be interpreted as dancers standing on an outer shell circle or path. The figures face inward on either side of a pole and appear to have bird tails and to be holding feathered fans or shields. The pole on this gorget is decorated with bars and circular elements similar to that seen on the Spiro gorget mentioned above. At the top of the pole is a large circle with a cross. And of comparative interest is the fact that the poles on both the Spiro and Roden gorgets have four circular elements decorating the pole. All of these elements may refer to the four-part structure of the world through which the pole passes. A shell gorget from the Sanders site and a second gorget from the Roden site go even further to link the four-part structure to the sacred center by depicting a large cross as the focus of the motif as if it represents four poles (Figure 10c, e). On the Sanders gorget the four arms of a cross are decorated with bars and circles as seen on the single pole between the dancers on the Spiro gorget. The cross arms, so decorated, may be another reference of the cross on the central pole as depicted on the Roden gorget. Instead of human dancers around a central pole, a turkey jake dances on the circular path (outer shell ring) in front of this cross representing the four fold structure of the center. On the second Roden gorget the cross arms are not decorated, but four birds are pecking at each arm or pole, and the eye of each of these birds is made similar to the circles that decorate the central poles on the other gorgets. (See the discussion below concerning the identity of these birds.) Thus, both gorgets with a large cross appear to be another way of expressing the sacred pole theme by directly relating it to of the four fold structure of each world level. The Sanders, Roden, and Spiro gorgets described here may be considered microcosms of a multi-leveled world order, in which powerful beings are depicted interacting at a particular world level (Reilly 2004:127-131).

Caddo bottles, like the shell gorgets, may also be considered symbolic representations of a multi-leveled world order. As noted in the discussion above concerning bottle structure, the potter emphasized a bottle's central axis in several different ways, with the elongated neck being the most common. The elongated neck may be considered symbolic of the sacred pole that unites the multi-leveled world, while the four-part structure of bottle bodies and the four-part symmetry of the engraved motifs represent the four-part structure of each world level (see Figure 3). Thus, all Caddo bottles con be considered as a three-dimensional representation of that world structure. Extraordinary bottles, such as those with square bodies, four-column bodies, double bottles, and pedestal bases, are even more explicit analogs in clay of the world structure (see Figures 3 and 4). Square bottles and those with four-column bodies emphasized the four-part structure of each world level. The double bottle may be a reference by the potter to multiple world levels, while the elongated neck of the double bottle again emphasizes the center.

The engraved motifs on bottles also help emphasize these world structural themes. For instance, viewed down from the rim of a bottle and opened out, a Ripley Engraved *circles/diamonds* motif has

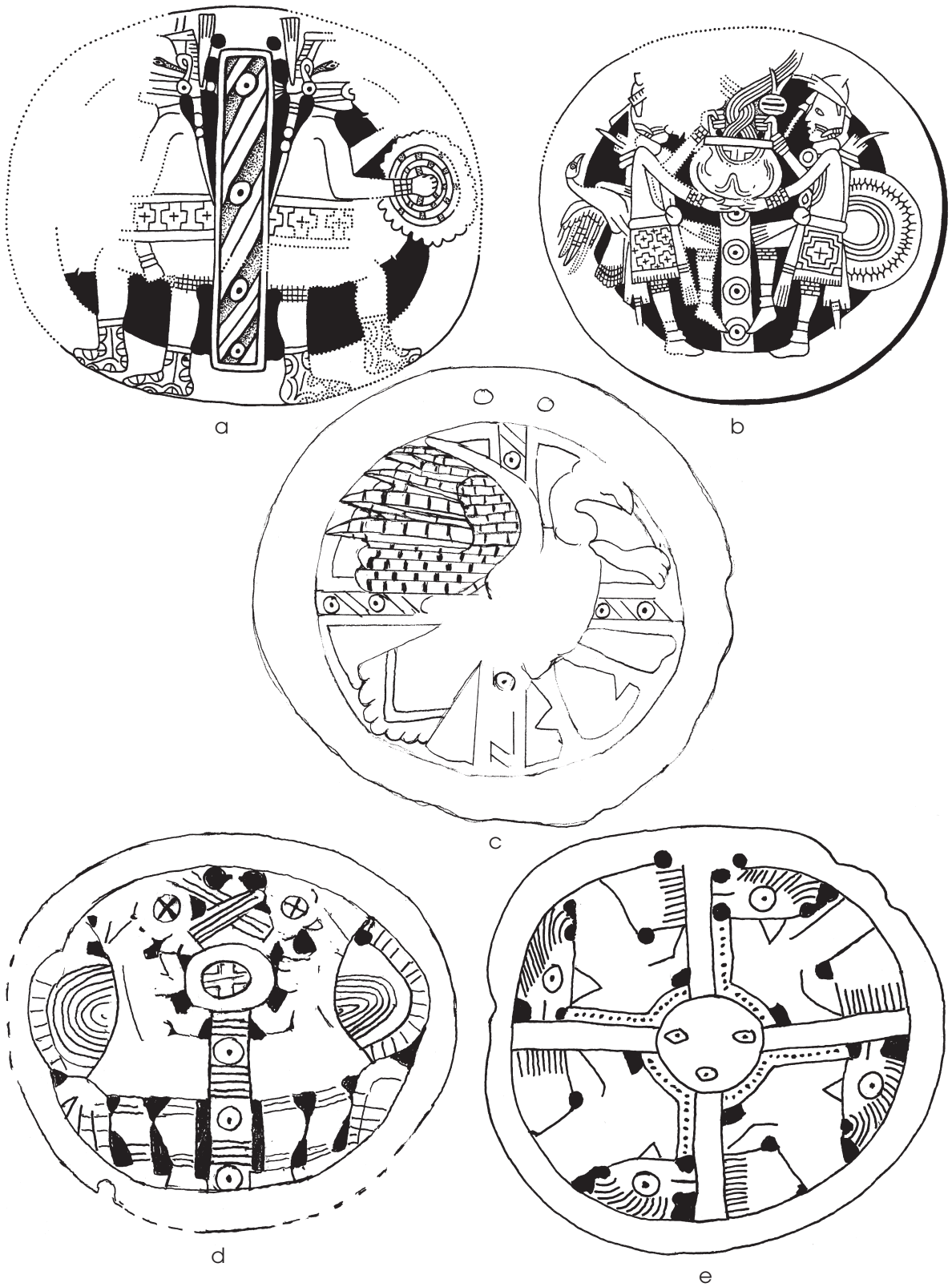


Figure 10. Shell gorgets: a, Spiro gorget (reproduced from Phillips and Brown 1984:Plate 130); b, Spiro gorget (reproduced from Phillips and Brown 1984:Plate 127); c, Sanders gorget (redrawn from Krieger 1946:Plate 19; d, Roden gorget (redrawn from Perino 1981:Figure 4); e, Roden gorget (redrawn from Perino 1981:Figure 3).

a cruciform shape around a circle made by the neck (see Figure 6b). This view of the motif is reminiscent of the cross in circle on top of the pole in the Roden gorget and the cross behind the turkey jake on the Sanders gorget. There are even four circles with central dots or "open circles" on this bottle motif that are again reminiscent of the four circles that decorate the poles on the Roden and Spiro gorgets and decorate the cross on the Sanders gorget (see Figure 10a-d). The importance of the engraved motif found on certain bottles might go further than that of just a recapitulation of world structure. The motifs may provide clues to what world level and powerful being is invoked. Similarly, the accoutrements associated with the dancing figures on the shell gorgets may provide clues to who these actors are or where they are dancing. The elements that comprise the bottle motifs are essential to understanding the significance of the bottle to the society in which it was produced.

Fierce Birds

In the Caddo story "The Girl Who Married a Star," recorded by Dorsey (2010:Story 15), both the upper world and the powerful beings who reside there interact with the human world. The story opens with a beautiful girl receiving her wish to marry a star. She finds herself living with her husband, the old North Star, in the sky world. The marriage was not what she had hoped, and the majority of the story recounts her attempts to find a way home. Since the North Star's home is in the sky or upper world, she fashions a rope to let herself down, but the rope proves to be too short. As the girl dangles between the worlds on her short rope, a powerful bird rescues her and takes her home:

The bird passed under her feet several times and when he passed on the fourth time he told her that he would take her down and carry her home if she would step on his back. She stepped on the bird's back, and he asked her if she was ready, and she said she was; then he told her to let go of the rope. She did so and the bird began to fly downward very easily. The bird asked her if she would let him take her on to her home, and she said she would. The bird then took her to her home and when they came near, the bird let her down and told her that he had to go back to his home; but before leaving her he told her that he was Black Eagle.

Birds and their symbolic representations, that is their feathers, were an important part of Caddo ritual and ceremony. Spanish chroniclers mentioned that feathers or a bird's wing were used by the Caddo to communicate with Ayo-Caddi-Amay, the Creator of all things (Griffith 1954:72, 98, Carter 1995:126). The bird motif known from Johns Engraved bottles (see Figure 9) also demonstrates that birds and their feathers were symbolically important to the prehistoric Caddo of Northeast Texas. And it is proposed here that some of the Ripley and Wilder Engraved motifs also include feathered elements that work to link the motifs to the upper world or to particular winged beings.

Winged beings occur commonly on Spiro shell gorgets and cups. These beings can, for obvious reason, be associated with the upper world or the ability to move between worlds. One such being is the Birdman; he is widely seen on Spiro shell cups and copper plates from Mississippian period sites across the southeastern United States. (Phillips and Brown 1978:124-130). The Birdman is depicted with a human body and outstretched wings, bird tail feathers, and hooked nose or beak (Figure 11a). The hooked beak associates this being with an avian raptor. The stance of this being is often depicted with raised legs, reminiscent of the dancers on shell gorgets discussed above. Brown (2007:56-106) relates the Birdman image to a cultural narrative based on the falcon/warrior/hero who symbolizes rebirth, the defeat of death, and continuation of social continuity.

The way the feathers on the inner wings of the Spiro Birdman are depicted is of interest for the interpretation of Ripley Engraved motifs in particular (Figure 11a). The Birdman's feathers on the upper inside of the wing are shown as a crenate line or a line with low rounded projections. Reilly (2007:43-48) suggests that this crenate line, which he calls a petaloid motif, represents the downy feathers found on the inner wing of a raptor. The motif element "pendant triangles" used extensively in a secondary role on many Ripley Engraved bottles can also be viewed as forming a line of low rounded projections on the bottle motifs (see Figure 1a, c, e-h, j, l). Thus, the crenate line formed by the pendant triangles may symbolically represent feathers and may connect many different Ripley Engraved motifs to the upper world where feathered beings dwell (Fields and Gadus 2012:509). On some Ripley Engraved bottles, a crenate line alone dominates the motif, and these bottles may be considered "feathered bottles" with an exclusive upper-world connection (see Figures

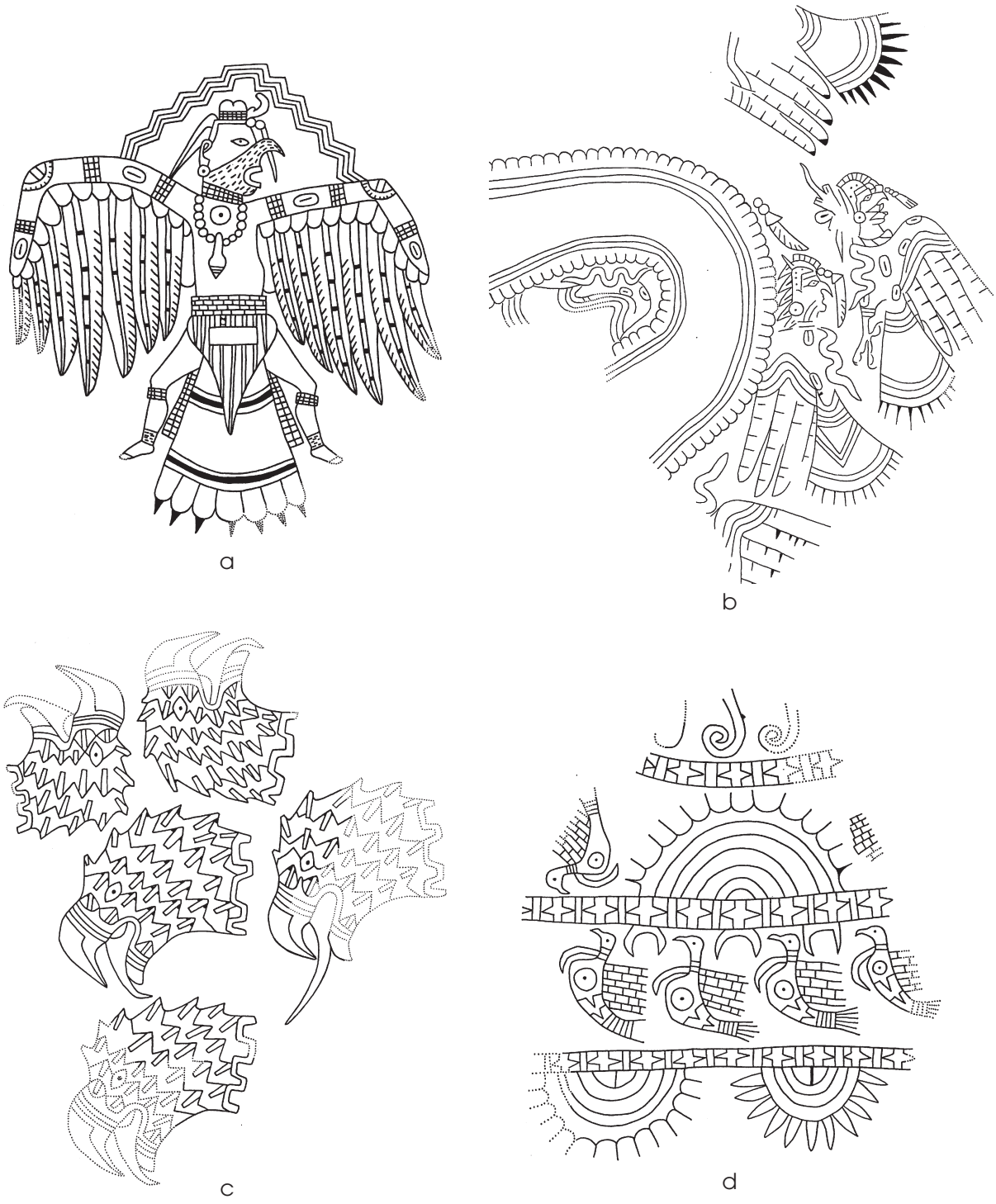


Figure 11. Fierce birds on Spiro shell cups: a, Birdman (reproduced from Phillips and Brown 1984:Plate 203); b, Birdmen flying on a feathered path (reproduced from Phillips and Brown 1984:Plate 165.1); c, jagged crested birds (reproduced from Phillips and Brown 1984:Plate 177); d, turkey jakes flying on a feathered path (reproduced from Phillips and Brown 1978:Plate 87).

3 and 6a). On other Ripley motifs the crenate line is used in combination with different elements, suggesting that what the feathering represents is probably altered by the context. It is interesting to note, however, that crenate lines are rarely seen on Wilder Engraved bottle motifs. Only one Wilder Engraved bottle motif with pendant triangles is known from the Pine Tree Mound site (see Figure 7g). Nor is feathering depicted on Johns Engraved bottles, where apparently the bird images alone makes the necessary symbolic connection.

Ripley Engraved "feathered bottles" generally display a crenate line alternating with a plain line. This alternating structure occurs with *medallion*s, *concentric circles*, and *concentric band* motifs (see Figures 1e-g and 6a). The configuration also occurs on some bottles with *slanted scroll* and *half scroll* motifs as well as in half circle elements (see Figure 1a, c, l). One Spiro shell cup displays this alternating structure as a half circle with four Birdmen arrayed along it (see Figure 11b). Another cup shows a human figure walking on a motif of similar construction. Reilly (2007:47-49) interprets this cenate line alternating with plain lines or bands as a path of downy feathers that represents the "Path of Souls," or the Milky Way, which in many Native American cultures is the path the dead followed to the afterlife. Using Reilly's interpretation, the four Birdmen in Figure 11b may be flying along the path of souls. This structural similarity between the Spiro shell cup "feathered pathway" and Ripley Engraved feathered bottle motifs suggest that these Ripley Engraved motifs may also be depictions of the path of souls in the celestial realm. For a Ripley bottle with a *concentric bands* motif, this feathered pathway clearly proceeds around the sacred center as symbolized by the neck of the bottle (see Figure 6a).

The Thunderers are a group of powerful winged beings that are associated with the four directions, weather, and the stability of the upper world (Lankford 2007:24-27). These beings oppose the powers of imbalance and death in their constant struggle with lower world beings that have snake-like attributes (Lankford 2007:28). On the Spiro shell cups, Thunderers may be depicted as raptors having a curved beak and a jagged head crest (Reilly 2004:127). Lankford (2011:241-243) also links these "birds with jagged crests" to the path of souls, as a guardian or judge along the way. One engraved shell cup from Spiro shows just the heads of five of these fierce birds or "birds with jagged crests" (see Figure 11c). This depiction is mentioned because both the Spiro motif and the Johns Engraved bird depictions focus on the bird head. However, the similarity appears to stop there, as the characteristics of the Johns Engraved bird and the bird with the jagged crest differ dramatically, indicating that they are not the same bird (see Figure 9).

A third winged being, the woodpecker, is also found, although infrequently, on Spiro shell cups, and again with heads only (Phillips and Brown 1984:Plate 182). The woodpecker has been called the "crested bird." It is recognized, in contrast to raptors, by its smoothed crest and a straight bill (Lankford 2011:241). The Roden gorget pictured in Figure 10e may be interpreted as a depiction of four full-bodied woodpeckers each attached to or pecking the sacred pole with wing and tail outstretched. These birds with their smoothed crest and short straight beak are similar in form to the woodpeckers depicted on Hixton-style gorgets from the Tennessee River valley (Lankford 2007:29-32). Lankford (2008:139-162) also links the woodpecker to upper world beings that control thunder and lighting. He makes this connection because both are often depicted with long tongues (Langford 2008:155). Curiously, the ivory-billed woodpecker was noted for the steely "hammer and chisel" effect of its beak and the agility of its "extraordinarily long tongue" that would "flash out" to snare its insect prey (Brinkhead 2012:90-92). The ivory-billed woodpecker is also known for its striking smoothed red crest. The association of the woodpecker, and in particular the ivory-billed woodpecker, to lighting and thunder is certainly a reference to the fierce nature of this bird. The woodpecker's place on the sacred pole also suggests it has a strong association with the multi-level world order. Possibly this association is based on the bird's natural ability to easily move up and down a tree, circling around the trunk in a kind of dance, as it moves from the lower world to the upper world. However, the characteristics of the woodpecker, with its smoothed crest and long strait bill, again do not match the bird depicted in the Johns Engraved motif.

The Johns Engraved bird motif represents a powerful being that is related to a fourth fierce bird: the turkey jake. This bird is also present on the Sanders shell gorget discussed above and on shell gorgets and cups from Spiro (see Figures 10b-c, and 11d). While the Caddo are known for their "turkey dance," which is one of the few

Caddo ceremonial dances that continues to this day (White and Boley 1999), the prominence of the wild turkey in Mississippian iconography is not as widely acknowledged as are the other fierce birds discussed here. Set against Birdmen, raptors, and woodpeckers, the turkey may appear to be a mild creature. Yet, wild turkeys do possess characteristics that would qualify them for the appellation of "fierce bird." Turkey jakes have a reputation as warriors, since they compete for mating dominance with prominent displays and intense sparing (Hutto 1995:230-233). Mature jakes are equipped for this sparing with large leg spurs. These are large birds that make their living on the ground, but they are also strong flyers over short distances and roost in forest trees at night (Sibley 2011). Thus, they may represent a connection between both the upper world and the middle world of everyday life. These birds are also known to confront snakes they find in their territory and they are wary of raptors, both of which can easily kill a young turkey (Hutto 1995:147). These characteristics suggest that wild turkey could easily have fit into a pantheon of winged creatures of special significance.

The characteristics that distinguish turkeys from the other fierce birds as represented on shell gorgets and cups are: a plain head with no crest, a long curved beak, a ringed neck and/or a beard projecting from the neck, barred wing feathers, and leg spurs. All or some combination of these characteristics mark a winged being as a wild turkey jake. Most of these characteristics can be seen on the turkey jake depicted on the Sanders gorget and on the bird attached to the back of the dancer on a Spiro gorget (see Figure 10b-c). Both birds have a long curved beak and no head crest. In nature, the wild turkey has no feathers on its head; rather, the head skin is blue and changes to a bright red on males as a display of dominance (Hutto 1995:230-237). But what marks the Sanders and Spiro birds as turkeys for sure is the jake's beard or tuft of feathers that grows from its breast and its curious barred wing (Figure 10b-c). The jake's beard grows in length continuously, it is never shed, and has been likened by ornithologists to coarse hair (Sibley 2001:233-241). Hudson (1976:130) suggests that these coarse feathers resembled a human scalp and would have added to the jake's reputation as a warrior. On the Spiro gorgets, this beard looks very similar to the sashes worn by the dancers above their raised legs (see Figure 10b). The turkey jake on the Sanders gorget may also be dancing around the four-quartered center pole with raised legs and some wicked looking leg spurs (see Figure 10d). A shell cup from Spiro displays an image of six birds with turkey characteristics (see Figure 11d). Again, the birds have a plain head, a long curved beak, a barred wing, and most importantly a prominent beard projecting from their necks. These birds are also depicted with no legs, which seems odd for a ground bird unless they are in flight. The imagery that surrounds these birds includes three concentric half-circle elements, two of which have plain bands next to a band with a crenate edge indicating the celestial pathway, which appear to be emerging from star-like bands that encircles the cup. The interpretation that the turkeys on this cup are in flight fits with their proximity to the celestial path and places these birds in the same position as the four Birdmen who are also on that path (see Figure 11b, d).

The representational bird imagery seen on the Johns Engraved bottles can also be related to the wild turkey jake (see Figure 9a-c). The Johns Engraved birds have no head crest of any kind indicating that the bird is not a raptor or a woodpecker. The beak is long and curved but not a short sharp curve of a raptor beak. The head has a single eye and is set off by one or two lines at the neck, while the turkey jake's beard may be represented by a wedged-shaped element below the bird's head/neck (see Figure 9a-c). A depiction of this beard may also be represented by the curious hooked elements with hatching opposite of and interlocking with the bird heads on the bottles from the Johns site (see Figure 9a-b). All of these characteristics are similar to those seen on the Sanders and Spiro shell gorgets and help to confirm the identification of the Johns Engraved bird. No other motif elements on the Johns bottles place the birds in any particular world level, so based on the characteristics of the bird itself, the Johns Engraved turkey bottles may refer to action in the middle world of every day life.

As noted above, the structure of the bird images on the Johns Engraved bottles incorporates the structure of both Ripley and Wilder Engraved bottle motifs. These motifs are the Wilder Engraved *swirl* and the Ripley Engraved *medallion*s motifs. These motifs appear as two different ways a Caddo potter could represent movement around the sacred center. By using the structure of these motifs to represent the turkey jake, the potter shows their familiarity with both Ripley and Wilder motifs, and that she is working within the same tradition. As

such, the Johns Engraved representational motif may just be a way to be specific about the actor depicted on the bottle. This bring up the question of whether there is other imagery on bottles that may refer to the turkey, just as the Ripley Engraved pendant triangle element forms a crenate edge that refers to the downy feathers on a raptor wing.

The depiction of feathers on the Sanders and Spiro turkey jake images is different then that of the crenate edge on Ripley Engraved motifs. The inner wing of the turkey tom bears a stylized representation of feathers as overlapping panels or bars. This element is clearly seen on the wings of the turkey on the Sanders gorget and the six birds on the Spiro shell cup (see Figures 10d and 11d). Actual feathers of a turkey do suggest overlapping bars when the jake puffs up his body feathers in display. Although none are known from the Pine Tree Mound or Tuck Carpenter sites, some Caddo bottles display a similar overlapping panels element in a concentric bands motif around the bottle body (Figure 12). When this motif is opened out and viewed from the bottle lip down (Figure 12), it looks strikingly similar to the structure of the shield or fan held by one of the dancers on a Spiro gorget (see Figure 10a). The fan or shield also has a crenate edge, suggesting it is indeed feathered. This juxtaposition of feathering—that is, overlapping panels or bars relating to the turkey adjacent to a crenate edge indicating raptor feathers—suggests that this shield motif may have multiple world associations.

An overlapping panel motif has also been found on possible Ripley Engraved bowls from a grave at 41HS718, a Titus phase habitation site near Pine Tree Mound (Gadus et al. 2006:Figures 4-40 and 4-43). Similar overlapping paneling is a common motif associated with various Caddo ceramic types. A few examples are Washington Square Paneled (Hart 1982:71) and Glassell Engraved (Suhm and Jelks 1962:Plate 27). If this motif interpretation holds, references to turkeys and middle world associations on Caddo ceramic vessels may be considered common. At the very least, Johns Engraved bottles with their representational images confirm the importance of this kind of bird imagery within the iconography of the Caddo living in the Big Cypress Creek drainage of Northeast Texas.

Twisted Serpents

Snake imagery for obvious reasons is associated with the lower world or the synonymous watery realm (Reilly 2004:27-28). In several Caddo stories chronicled by George A. Dorsey (2010:Stories 7, 13, 22, and 39), snakes or serpents are shown to be both dangerous and benevolent. These stories have titles such as Snake-Woman Distributes Seeds; Evening Star and Orphan Star; The Dangerous Water Monster; and The Woman Who Turned into a Snake. In the story of Snake-Woman (Dorsey 2010:Story 7), it was she who gave to the people the seeds of all growing things that the Great Father had given to her. As the plants belonged to Snake-Woman until they were ripe and ready for picking, she admonished the people to take care of the seeds and the plants as they grew, or suffer a poisonous snakebite.

The ambiguity of the serpent's power is also demonstrated in the story of Evening Star and Orphan Star (Dorsey 2010:Story 13). The story tells of boy, abandoned and starving on an island, who is caught in the middle of the struggle between the upper world and lower world powers, even as the lower world power attempts to help the boy:

> The [serpent] monster came straight toward him and said "Boy I have come to save you. I saw the people desert you and I have taken pity on you and come to rescue you. Get on my back and hold to my horns and I will carry you to the mainland." The boy was no longer afraid and climbed upon the animal's back… He [the boy] wanted to reach the other shore so badly that he thought he would keep still and not tell the monster that he saw the star [Evening Star], for he knew that he [the serpent monster] would take him back to the island if he did. He said nothing, and so the monster swam on until they reached shallow water, when the boy saw a great black cloud roll in front of the star. He became frightened and jumped off the animal's back and swam to the shore. Just as he jumped something struck the animal with an awful crash and he [the serpent monster] rolled over dead...

In her article on "Amphibian and Reptilian Imagery in Caddo Art," Elsbeth L. Dowd (2011:88) contends that the Caddo stories concerning serpents are about power and transformation. The transformations take place as the power moves from the lower world to the middle world to the above world, from animal to human agency, from life to death, and back again. It is the skill of the humans that interact with the power that determines the outcome for good or ill. Dowd (2011:82-86) also demonstrates the widespread occurrence of serpent imagery as well as imagery of other ambiguous creatures (ambiguous because they may dwell in

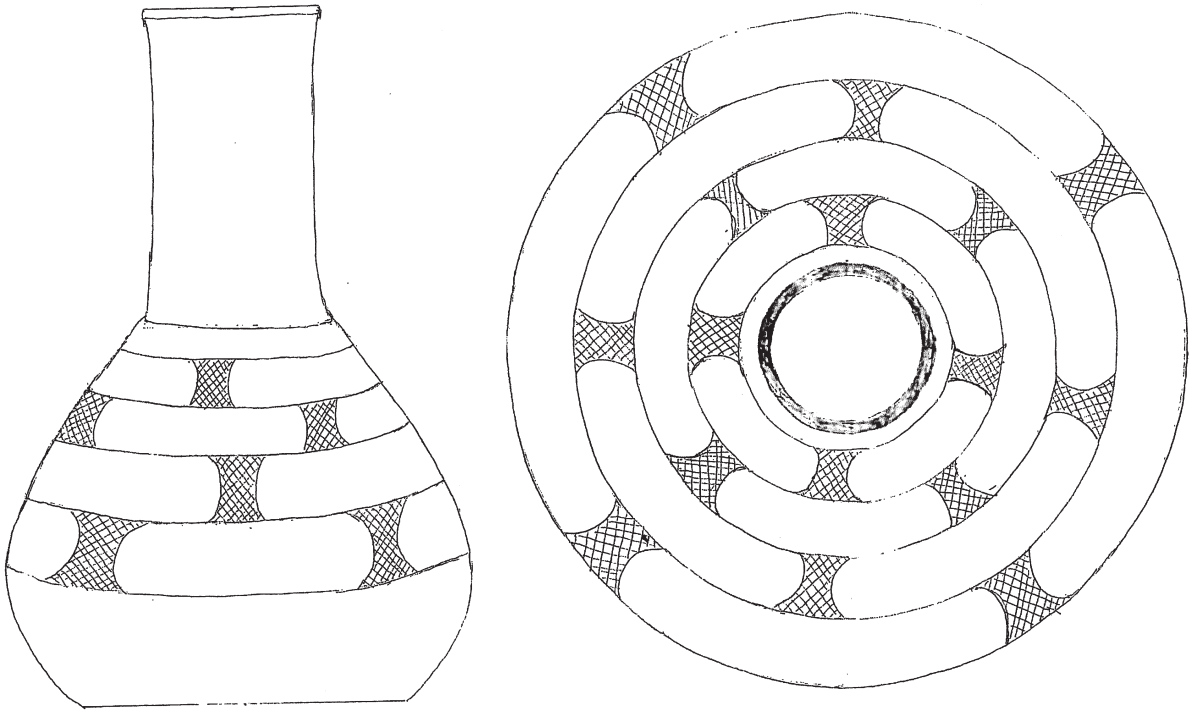


Figure 12. An untyped bottle from 41TT18 cemetery in the Jack Anderson collection showing an overlapping panel motif that may a representation of turkey feathers. Both a general view of the bottle motif and a top-down opened-out view are presented here.

more then one world) within the Caddo ceramic repertoire. The canebrake rattlesnake bottle motif is one such image that attests to the importance of serpent imagery for the Titus phase Caddo and earlier Caddo living in Northeast Texas. This importance is also marked by the less representational images with serpent associations common to Ripley and Wilder Engraved bottle motifs.

Demonstrating what Ripley or Wilder Engraved motifs or motif elements are associated with serpents can be accomplished, like that of the fierce birds, by comparing representational images to the less representational imagery. The representational imagery of the canebrake rattlesnake motif, and the serpents or serpent beings common to Spiro shell cups, display a variety of serpent body markings, with the most common being chevrons, bars, circles, diamonds, and cross-hatching (Figure 13a-b; see also Figure 8). These markings are similar to primary and secondary motif elements that appear on both Ripley and Wilder Engraved bottles (see Figure 5).

As pointed out above, an obvious structural similarity exists between the Wilder Engraved *swirl* motif and the canebrake rattlesnake motif. The bodies of canebrake serpents twist around the bottle, while their tails interlock around a central circle in a configuration that looks identical to the central element associated with the Wilder Engraved swirl motif (see Figures 7-8). The similarity extends to thickened and hachured ends of the canebrake rattlesnake tails, which are reminiscent of the Wilder Engraved "interlocking ends" primary element. The clear connection demonstrated by these structural similarities suggests that the message presented by both is similar. The message or theme concerns snakes, powerful lower world beings, twisting around a common center, be that a bottle axis or the center of a Wilder Engraved *swirl* motif.

The theme of snakes moving or twisting around a common center also appears in the structure of snake motifs found on Spiro shell cups. Brown and Phillips (1978) have titled two of those Spiro motifs as the "intertwined serpent-like beings" (see Figure 13b) and the "intertwined snake-men" (see Figure 13c). The intertwined snake-men in particular reflect well the theme of movement around a center, as the structure of the image can be related back to the dancers on the Spiro and Roden gorgets (see Figure 10a, c). The center on the Spiro and Roden gorgets is represented by the

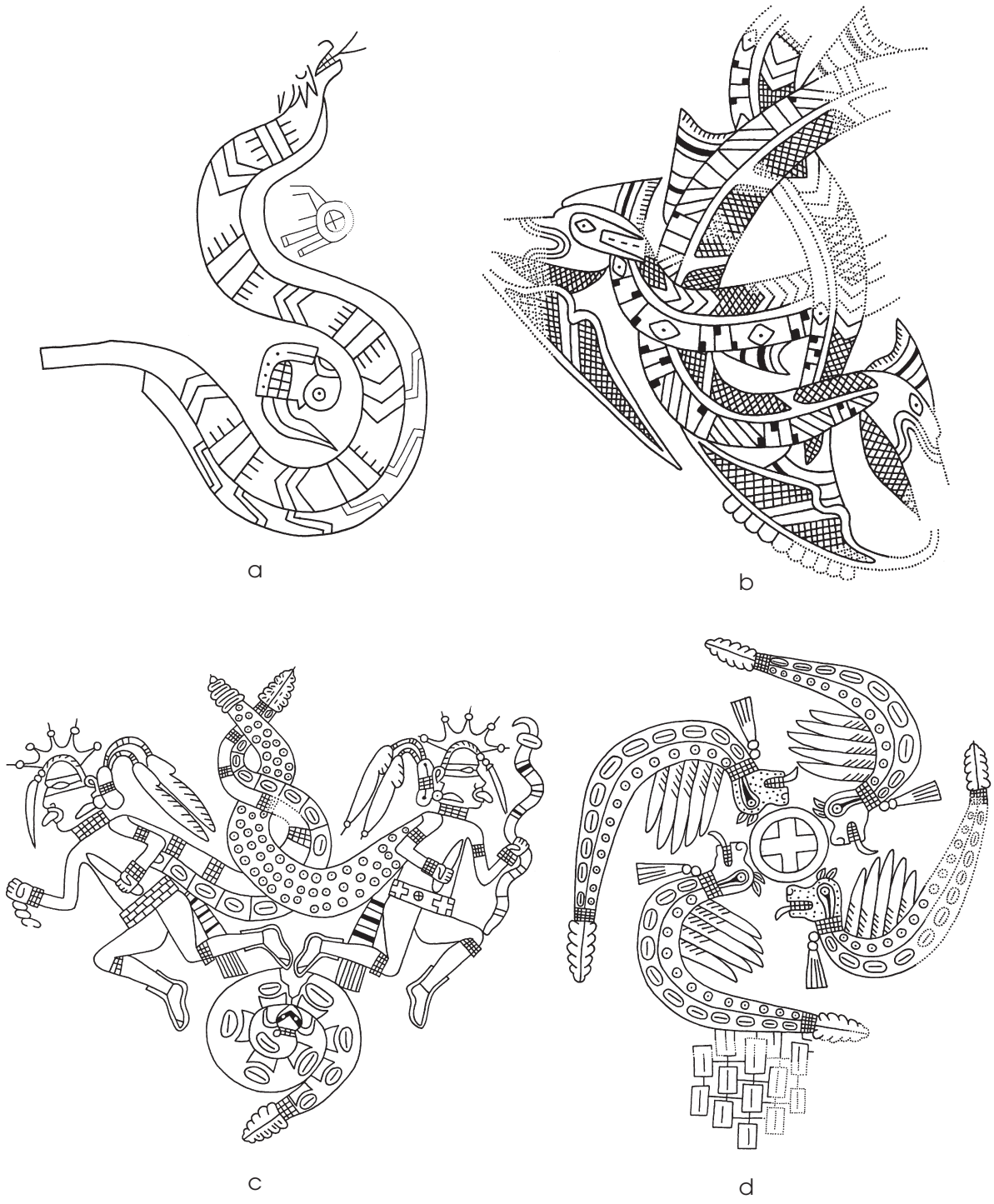


Figure 13. Serpents on Spiro shell cups: a, Horned snake with skull and hand, showing bars and chevrons on the body of the snake and SZ elements or "long step motif" on the belly of the snake (reproduced from Phillips and Brown 1978:Plate 82); b, intertwined snake-like beings with chevrons, bars, and diamond markings (reproduced from Phillips and Brown 1978:Plate 71.1); c, entwined snake-men with circles and cross-hatched bars on the bodies; the snake-men are attached to and seem to be dancing around the entwined snakes instead of a central pole, and their dance ground is around a coiled horned serpent rather than an open circle, suggesting that this dance occurred in the lower world (reproduced from Phillips and Brown 1984:Plate 192); d, serpentine Piasas (reproduced from Phillips and Brown 1984:Plate 229).

sacred pole, around which the two dancers move. However, entwined bodies of the snake-men have replaced the center pole and in an unambiguous way to link the dancers to a center now placed in the lower world (see Figure 13c). At the base of the snake pole is a coiled horned serpent, whose presence leaves little doubt that the dance depicted on this shell cup takes place in the lower world (Lankford 2007:117).

The connection of the Wilder Engraved *swirl* motif and the canebrake rattlesnake motif to powerful serpent beings acting in the lower world seems like a simple association. But sometimes elements within a motif belie something more. For instance, serpent markings, such as chevrons or bars, may be present in the motif along with feathering, as represented by pendant triangles. Elements with serpent and bird associations in the same motif would suggest that a motif could represent action or actors in multiple world levels. For example, a Ripley Engraved bottle from the Pine Tree Mound site displays a half scroll motif decorated with pendant triangles that suggests it is a feathered bottle associated with the upper world (Figure 14). However, a close inspection of the opened-out motif shows a single iteration of the half scroll surrounded with chevrons and hatched areas that are reminiscent of a serpent tail (Figure 14). The Ripley Engraved half scroll with a crenate line alternating with a plain line or band, as discussed above, may indicate the upper world downy-feathered path. The placement of a serpent tail on this path may be a reference to a powerful being that incorporates aspects of all world levels.

The Great Serpent

One being with many aspects is the ostensibly lower world power variously called the Great Serpent, the Horned Serpent, or the Piasa (Lankford 2007:109-111, 132-135). The Great Serpent is the horned serpent seen in a central position on the Spiro "intertwined snake-men" cup (see Figure 13c). And the Great Serpent may be the serpent monster in the Evening Star and Orphan Star story retold above. Lankford (2007:116-119) relates that the power of the Great Serpent is seen as a mixed power that can work for ill or good in relation to humans. When this serpent takes on attributes of other animals it is known as a Piasa (Perino 1960). When wings or feathers are placed on a snake-like creature, this may be indicative of the Piasa or Great Serpent in the night sky; the night sky would be the visible manifestation of the lower world (Lankford 2007:132-134, Reilly 2004:127). When symbols for feathers and serpents are represented within the same bottle motif, this too may be a reference to the Great Serpent and its ambiguous power.

Four Piasas with serpent characteristics and bird wings are depicted on a Spiro shell cup as "flying" around the sacred center marked by a circle with cross element (see Figure 13d). The circle with cross is reminiscent of the same symbol on the top of the pole on the Roden gorget, and is again used here to denote the four-quartered sacred center (see Figure 10c). The circle with cross element is also recapitulated in the overall structure of the four Piasas. The tassel hanging from the necks of these Piasas appears strikingly similar to the position of the turkey jake's beard described above (see Figure 10b-d). As such, this depiction of four Piasas again alludes to the ambiguous power of these beings. That power unites various aspects of the multi-level world order with the wings of a bird marking the upper world, a rattlesnake tail and body of a lower world creature, and the tassel or beard from a middle world bird, while the procession of the Piasas around the sacred center or pole again demonstrates the primacy of that mythic theme. A similar motif structure is found on Ripley Engraved bottles with a *circles/diamonds* motif. This motif opened-out again displays a cruciform image arranged around the neck of the bottle that is symbolic of the sacred center (see Figure 6b). The reference to the Great Serpent is based on the crenated or feathered elements that surround four diamonds. Diamonds, as noted above, are common serpent body markings (see Figure 13b).

A particular Ripley Engraved bottle motif element that may directly refer to a serpent and/or the Great Serpent is the SZ element (see Figure 1a-b, d, k). It is here called the SZ element because it may occur within a motif as an S or a Z, or it may occur sideways and appear scroll-like (see Figure 5). The SZ element may be a very old symbol for the Caddo living in Texas, as Phillips and Brown (1978:150) suggest it is linked to what they call the Davis Rectangle. They give it this appellation because of a similar motif found on Hickory Fine Engraved vessels from the George C. Davis site (Newell and Krieger 1949:Figure 33). That this element embodies serpentine qualities go beyond its obvious sinuous form. It can be found at Spiro on the underbelly of the serpent depicted on a shell

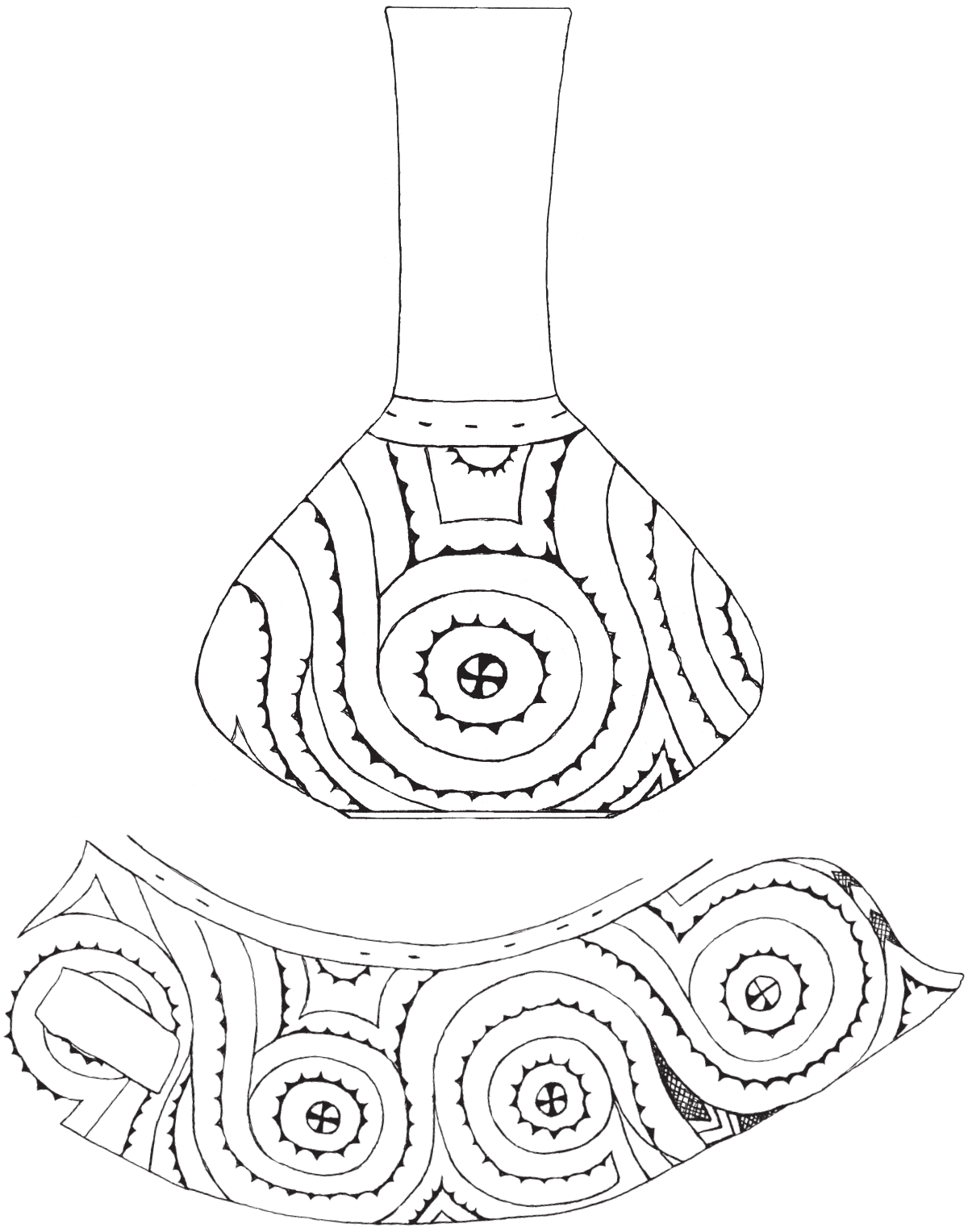


Figure 14. Ripley Engraved bottle with a half-scroll motif that displays feathering (pendant triangle elements) and serpent markings (chevrons and cross-hatched elements). This Vessel 2.2072-11 was recovered from the Pine Tree Mound site (Fields and Gadus 2012:Figure 6.7).

cup (see Figure 13a), and it often occurs in Ripley Engraved motifs with other serpent body markings such as cross-hatching, chevrons, and bars (see Figure 1d). The SZ element can appear as a primary element of a scroll, as a secondary element in the arms of a scroll, it can also occur in a band of elements, or it can occur on its own (see Figure 1d, k). The SZ element can also occur with the element "pendant triangles" that represent a crenate line or feathering, and this suggests that the SZ element, like the Great Serpent, can have multiple world-level associations (see Figure 1a-b).

Two Ripley Engraved bottles, one from the Pine Tree Mound site and the other from the Tuck Carpenter site, may best demonstrate how Caddo potters may have used the SZ element to depicted the Great Serpent moving along the path of souls. The bottle from the Pine Tree Mound site is decorated with a slanted scroll motif that repeats twice around the vessel (Figure 15). The primary element of the scroll is an open circle, which as discussed above, is one way to represent the sacred center. A scroll line is marked on both sides by jagged pendant triangles that connect the primary elements. Although the pendant triangles are jagged, they still work to form a crenate or feathered band that is accompanied by a plain band on the outside of the scroll. This configuration is similar to the structure of the feathered pathway depicted on the Spiro shell cups and on other Ripley Engraved bottles discussed above (see Figures 1c-g and 11b, d). On the outside of the scroll are four SZ elements, which are surrounded by other serpent markings consisting of bars and hatching (Figure 15). The juxtaposition of the feathered pathway and the SZ elements on this bottle suggest that the SZ elements, representing the Great Serpent, are following the pathway in the night sky. The configuration of elements on this bottle is similar to the imagery of the birdmen, who are following the feathered pathway on a Spiro shell cup (see Figure 11b). In this case, however, the Great Serpent, as represented by the SZ element, replaces the birdmen.

On the Ripley Engraved bottle from the Tuck Carpenter site, a large SZ element alternates with two iterations of concentric half circles (see Figure 1k). These half circles are composed of plain bands alternating not with feathered bands but with hatched bands. As hatching is often associated with serpents, these concentric half circles may represent the pathway of the souls as expressed in the lower world. The motif on this Tuck Carpenter bottle motif may be analogous to the motif of the entwined snake-men dancing on the path around the Great Serpent or horned serpent on a Spiro shell cup mentioned above (see Figure 13c). This bottle from the Tuck Carpenter site demonstrates, as do all of the Ripley Engraved bottles used to illustrate this discussion, that less representational motifs incorporated elements and structures that were highly infused with meaning, which was based in a deeply rooted worldview.

Motif Summary

The overall theme used in this study to interpret Caddo bottles and bottle motifs relates both to the structure of the motifs and the form of the bottle. The theme is that of a multi-level world order with the sacred pole, the center, connection to all worlds. These worlds are occupied by various powerful beings that symbolically dance or act in a particular world, and some can take on aspects of or display powerful activity in multiple worlds. References to these beings show up within the motifs engraved on the bottles. The importance of bottle form to the conveyance of this overall theme supports the contention that bottle form itself should be considered a motif. The extraordinary bottle forms described above support this, as they appear to accentuate different aspects of the multi-level world structure (see Figure 4). For instance, the pedestal bottle's extended neck and pedestal base accentuate the center or axis of the bottle, while the four-corned bottle appears to recapitulate the four-fold aspect of each world. Double bottles in particular suggest the superposition of multiple world levels, and the engraved motifs on these bottles do appear to correspond to their appropriate level placement, with lower world imagery below upper world imagery (see Figure 4c-d). Thus, all Caddo bottles, engraved or not, may be considered a microcosm reflecting the multi-level world order.

Lower world imagery marked by serpent elements such as bars, chevrons, diamonds, hatching, and the SZ element is found on Ripley Engraved bottle *slanted scrolls, medallions,* and *alternating elements* motifs (see Figure 1d, i, and k). The canebrake rattlesnake motif, which display representational snakes marked by chevrons and hatching, is likewise considered to have an association with the lower world. The canebrake rattlesnake motif's structural links to the Wilder Engraved

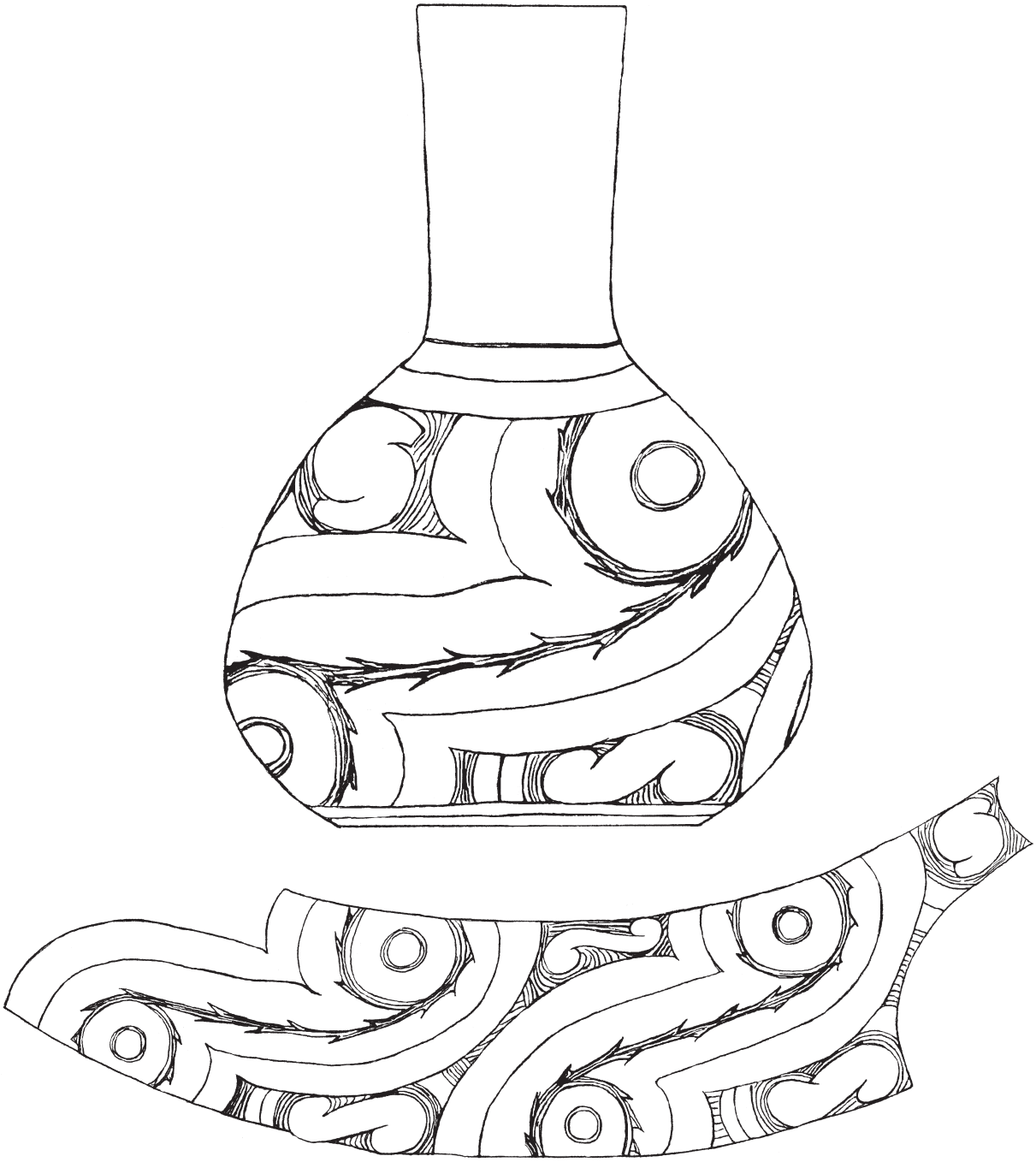


Figure 15. Ripley Engraved bottle with a slanted scroll motif that displays crenate line or feathering (pendant triangles) along with SZ elements surrounded by serpent markings (bars and hatching). This Vessel 8.1094-1 was recovered from the Pine Tree Mound site (Fields and Gadus 2012:Figure 6.4).

swirl motif suggest that both may be expressions of the same iconic theme: that is, serpents twisting around the sacred center within the lower world (see Figures 7a-f and 8). Occasionally incorporated into Wilder Engraved motifs are crenate lines as a representation of feathers (see Figure 7g). The combination of snake and bird elements in the same motif points to the theme of the Great Serpent, who has the ability to take on aspects of all world levels. But generally, the Wilder Engraved *swirl* motif

had strictly serpent associations and as such lower world associations. For middle or upper world associations the many Ripley Engraved motifs and the Johns Engraved motif appear to fill the gaps.

Upper world imagery is marked by the crenate edge or pendant triangle element, representing feathering, on Ripley Engraved bottle motifs such as the *medallions*, *concentric circles*, and *concentric bands* motifs (see Figures 1e-g and 2a). This imagery suggests an association with a particular kind of fierce bird, a raptor, and the feathered pathway in the upper world. However, as noted above, combinations of serpent and feather elements occur within Ripley Engraved motifs indicating a Great Serpent association. This associations appears commonly on Ripley bottles and includes the *slanted scroll*, the *half scroll*, and the *circles/diamonds* motifs (see Figure 1a-c, h and j). Combining not just elements but upper and lower world motifs on a single vessel may represent an all-world association. This is evident on a bottle from the Pine Tree Mound site that combines a Wilder-like swirl motif and a half circle motif with pendant triangles (see Figure 1l). These multi-level motifs demonstrate that the potters making these bottles had both Ripley Engraved and Wilder Engraved motifs in their repertoire.

Middle world imagery is represented by the Johns Engraved bird motif, which I argue represents a turkey jake. The structural similarity of the Johns Engraved bird motif to the Wilder Engraved *swirl* or the Ripley Engraved *medallion*s motif indicates that, like the serpent, these middle world birds also danced or acted at or around the sacred center (see Figure 9). There is also a link for these middle world birds to an overlapping panel motif, which has been interpreted here as bands of turkey feathers around a bottle axis (see Figure 12). Even with the addition of this turkey feather band motif, middle world imagery seems scarce compared to the other world levels and the Great Serpent. This middle world fierce bird motif does not appear on bottles at either Pine Tree or the Tuck Carpenter site, though it does appear on a bowl from Tuck Carpenter (Turner 1978:Figure 30a). It may be that the potters at these two sites found other ways to reference the middle world; one suggestion is that plain bottles, which are frequent within the graves at both Pine Tree and Tuck Carpenter, symbolized the middle world. Still, the presence of the Johns Engraved representational turkey motif demonstrates that some Caddo potters filled a need to be specific about the avian imagery they placed on their bottles.

CONCLUSIONS AND FUTURE DIRECTIONS

The connections highlighted here between the Ripley Engraved, Wilder Engraved, and Johns Engraved bottles and bottle motifs and the imagery on Spiro, Sanders, and Roden site shell artifacts help to broaden our perception of a long and rich Caddo symbolic tradition. The study demonstrates that vessel form and motif structure convey meaning that can be interpreted in relation to iconic themes that are pervasive in Mississippian period art and iconography (Lankford et al. 2011; Reilly and Garber 2007). That the Caddo accepted the themes, such as the sacred pole and the multi-level world, as a way of relating to and understanding their world is supported by historic accounts of their rituals as well as in the retelling of their traditional stories.

This study also demonstrates the close correspondence between some of the classic Titus phase ceramic types. The bottle form and motifs associated with Ripley, Wilder, and Johns Engraved display similarities in structure and content that indicate they all may be considered part of a single ceramic tradition. These similarities, and the meaning they may encode, should cause archeologists to rethink how ceramic types are defined for Northeast Texas. For though it may appear that bottle motifs are derived from limitless possible combinations of elements, this close examination found that potters made consistent choices in how motif elements were combined to derive particular associations. Eight motifs were defined for Ripley Engraved bottles, and these motifs are mainly associated with upper world symbolism or the Great Serpent. In contrast, the single Wilder Engraved *swirl* motif has mainly a lower world association. This association is based on the motif's close structural affinities to the canebrake rattlesnake motif, which may be a precursor to the Wider Engraved *swirl*. Since both Ripley and Wilder Engraved bottles are found in the graves at the Pine Tree Mound and Tuck Carpenter sites, and in some instances single bottles incorporated the motifs of both types, it is possible to conclude that the Wilder Engraved *swirl* motif conveyed a particular meaning not otherwise represented by the Ripley

Engraved motifs. The Johns Engraved turkey jake motif and the overlapping band motif interpreted here as turkey feathers, may have filled another gap in the Ripley Engraved repertoire. Both these turkey related motifs have been interpreting as having a singularly middle world association that is also uncommon on Ripley Engraved bottles.

Explicating meaning by applying an iconographic approach to ceramic analysis can also open new avenues for exploring the social organization and community differences among the people who used these vessels. One such study may be based on the use of these vessels as burial offerings. If it is assumed that the bottles were placed in the grave by the living to ease passage of the deceased to the afterlife, then the vessel offerings should to some degree reflect whom the deceased was in the view of those who did the interring (Parker Pearson 1999:84). Bottle motifs may indicate an individual's attachment to inter- or intra-community associations such as a clan, lineage, or family. This kind of study was attempted for the Pine Tree Mound site burials with some interesting results (Fields and Gadus 2012:371-385). That study showed that most adult burials, both male and female, had imagery on their vessel offerings, suggesting that access to some kinds of imagery was not restricted. However, bottles with Great Serpent imagery occurred only with adult males, although not every adult male had this imagery. The apparent status of an adult male, based on the number and kind of offerings or grave size, did not strictly correspond to which adult males had this imagery in their graves. These patterns suggest that social factors other then status alone affected access to the powerful imagery found on the Pine Tree bottles. Further research is needed to explore what these factors may be, and such research would necessitate comparisons between many Titus phase burial sites.

A comparison of the bottle imagery associated with burials at the Pine Tree Mound and Tuck Carpenter sites suggest that these two sites, representing different Titus phase communities, used imagery in different ways. The Tuck Carpenter bottles appear to be decorated mostly with lower world imagery (n=18, 43 percent), while upper world (n=5, 12 percent) and Great Serpent imagery (n=6, 14 percent) occur in similar frequencies. For the bottles from the Pine Tree Mound graves, there is a more even split between lower world (n=6, 18 percent), upper world (n=8, 23 percent), and the Great Serpent (n=9, 26 percent) imagery. Both sites have 31 to 32 percent undecorated bottles. The iconographic emphasis of the Pine Tree bottles is with the Great Serpent imagery as opposed to the lower world imagery for Tuck Carpenter. This difference in emphasis suggests that iconic association may be another factor archeologists can use in building definitions of prehistoric communities.

This kind of study just scratches the surface of possibilities for the explication of meaning associated with Caddo vessels. Ripley, Wilder, and Johns Engraved bottles were chosen as the focus of this study, but similar vessel constructions and motifs are also found on bottles and bowls associated with other Caddo ceramic types. Motif meaning associated with types such as Taylor Engraved, Natchitoches Engraved, Hodges Engraved, Glassell Engraved, and Poynor Engraved, are beginning to be considered (Early 2010). Interesting similarities in motif structure and meaning between these types may provide an avenue for investigators to address how the transference or retention of information between groups was achieved.

Another important application for this iconographic approach is the exploration of how pottery as a medium of expression continued even as Caddo groups came under the pressures of European settlement (Waselkov and Dumas 2010). Such research would address whether Ripley Engraved, Wilder Engraved, and Johns Engraved vessels continued to be produced with their particular iconic associations into the protohistoric period. Just 10 km south of the Pine Tree Mound site are several sites associated with the historic Kinsloe phase. The burials at these sites contain Hodges or Natchitoches Engraved vessels as offerings along with many artifacts of European origin (Perttula 2007). Ripley Engraved vessels are not in those graves. Motifs associated with Hodges and Natchitoches vessels do have strong similarities to the Ripley Engraved motifs. It is possible that though the pottery may have changed, the message continued. Additional research concerning how that message was used or transformed may provide insight into how communities worked to maintain their identity during times of social disruption.

Clearly the application of an iconographic approach to ceramic vessel studies has great potential to further a variety of research objectives pertinent to Titus phase ceramics from Northeast Texas and Caddo ceramic vessels in general. But before these objectives can be fruitfully pursued, a foundation based in a correspondence of meaning and motif needs to be established. It is hoped that

this study will help to place at least one block in that foundation.

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Native-made Historic Ceramics of Texas

Steve A. Tomka, Timothy Perttula, Tom Middlebrook, and Morris K. Jackson

ABSTRACT

This article provides a regional survey of aboriginal-made historic ceramics in three regions of Texas. For the purposes of this review, the historic period is defined as beginning in the 1580s when the first entradas occurred into the state. The close of the period is assumed to be the 1830s, since it represents the year of secularization of the last mission in Texas, Nuestra Señora del Refugio, and the date beyond which few aboriginal groups remained living in the state. The focus is on the aboriginal ceramic technology of three regions of the state represented by somewhat distinct subsistence practices and social contexts: the nomadic hunter-gatherers of South Texas, the sedentary East Texas Caddo groups, and the Pueblo-affiliated West Texas agriculturalists.

INTRODUCTION

The timing of the adoption of ceramics in Texas is highly variable. For instance, in East Texas, Caddo groups may have adopted ceramics as early as 500-100 B.C. (see Perttula and Miller, this volume) In Southeast and East Central Texas, ceramic manufacture may have been adopted around 50 B.C., if not earlier. In contrast, ceramics appear around A.D. 1000 in North Central Texas, and after A.D. 1250/1300 in Central and southern Texas (Perttula et al. 1995). The contexts within which ceramics appear range from highly mobile hunter-gatherers, to bison-hunting groups, and semi-sedentary agriculturalists. A number of archaeologists have been pursuing research to understand under what circumstances ceramics are adopted and how the technological characteristics of ceramic assemblages vary to accommodate distinct mobility patterns and subsistence practices (Thompson et al. 2012). Research into the sociocultural roles and implications of design motifs also are being pursued (see Gadus, this volume), as is the search for ceramic manufacture localities and exchange networks through instrumental neutron activation analysis (see Creel et al., this volume; Perttula, this volume). This article summarizes the characteristics of the ceramics made by native peoples during historic times in what is now Texas. We describe the characteristics of the ceramics made by native groups after contact, and define what influences, if any, such contact had on native ceramic technology.

THE ABORIGINAL-MADE CERAMICS OF WEST TEXAS

In the Lower Rio Grande valley, the protohistoric period dates from approximately A.D. 1580-1659 (Vierra et al. 1999:25). It is during this period that local hunter-gatherer and incipient agriculturalist populations such as the Mansos and Sumas, were exposed to Europeans, namely the Spanish, through entradas into the region. These entradas began in 1581 with the Rodriguez-Chamuscado and Espejo expedition and continued with Oñate's first visit to the locality that would later become San Elizario. The entrada encountered Mansos groups near El Paso in 1598 (Schroeder 1969; Timmons 1990). Once missions were established in New Mexico during the early seventeenth century, they were provisioned by caravans that traveled up the Rio Grande and passed through the El Paso/San Elizario area on their way to Santa Fe (Scholes 1930) and through the country of the Mansos, Piros, Tewas, and Sumas. To serve in part as way stations on the way to Santa Fe and as centers of religious conversion, the church began establishing missions along the lower and middle Rio Grande. The first such mission was established in 1630 among the Mansos. It was followed by Mission

Nuestra Señora de Guadalupe established in 1659 at Paso del Norte (Figure 1). Two other missions were built during the 1660s for the Sumas at San Francisco and La Soledad (Hughes 1914; Timmons 1990). Spanish activities in the El Paso district centered on the ford of the Rio Grande and focused primarily on trade and transportation. The native tribes that were affected by Spanish activities through this node were the Janos, Julimes, Mansos, and Sumas. Given the geographic proximity, groups living in New Mexico, including the Piros, Tiwas and Tompiros, also were influenced by Spanish colonization.

Following the Pueblo Revolt of 1680, Spanish colonists living in New Mexico, joined by Piros and Tiwa groups, retreated to the El Paso area. The Spanish settlers came to view El Paso as a potential firewall that would stop the revolt from spreading south of the river into northern Mexico. This set into motion a push to establish a base from which the reconquest could be launched and a more permanent and influential Spanish role could be played. The date also marks the start of the Colonial period in West Texas (Perttula et al. 1995:Table 4). Mission San Lorenzo, founded east of El Paso in 1680, was one of the first missions to be established on Texas soil. It was followed by the establishment of the Socorro (Gerald 1990) and Isleta missions by Pueblo Revolt refugees from New Mexico. The Socorro Mission was established by Piro, Tano, and Jemez tribes, while Isleta Mission was established by the Tigua tribe. Other missions and presidios followed throughout the eighteenth century.

Preceding the Colonial period, El Paso district ceramic traditions consisted of the local El Paso Brown ware tradition that seems to end around A.D. 1450, only to be replaced by poorly defined locally-made wares (Perttula et al. 1995:217). The establishment of the Socorro and Isleta missions brought about the new Ysleta and Socorro Brownware tradition (Peterson et al. 1994:209-211), also referred to as "Valle Bajo Brownware" (Marshall 1997:155-198), within the context of a cultural milieu that inseparably connected El Paso to New Mexico as trade and movement of peoples continued between the two regions.

The paste of the wares ranges from bright red to light gray in color dependent on the degree of oxidation during firing. Wall thicknesses range from 5-10 mm (Marshall 1997:Figure 7.1), depending on differences in vessel form. Typically the temper in the sherds recovered from the El Paso district consists of fine to medium-grained sands (Hill 1994:209-211). However, there is also evidence that different vessel forms are tempered with distinct aplastic agents (Miller and O'Leary 1992:154). In the ceramic assemblage derived from Old Socorro, the majority of the sherds are tempered with sand, although a combination of cherts and sand temper also is relatively common (Marshall 1999:Table 6.12). A similar pattern of tempering agents is seen in the San Elizario Phase II sherd assemblage dating to between 1789-1920 (Marshall 1997). In contrast, most of the Ysleta Clinic Valle Bajo Brown wares are tempered with rhyolite, andesite, and felsite, although sand remains a common aplastic additive (Miller and O'Leary 1992).

While petrographic evidence suggests that the bulk of the wares were locally made, petrographic work on Isleta Brown wares (Miller and O'Leary 1992:143) supports the contention that some vessels may have been made elsewhere and brought into the district. Basalt-tempered brown wares have been found in Old Socorro Mission samples but they are more common at the Ysleta Clinic site (Miller and O'Leary 1992), and may have been imported to Socorro.

A large variety of vessel forms are present among the Valle Bajo Brown wares of the El Paso area. Marshall (1999:Table 6.5 and Figures 6.1-6.4) lists a variety of bowls and jars in the Old Socorro Mission sample (41EP1532), and from other tested sites in the vicinity. Bowls alone range from large and small bowls, closed bowls, miniatures, and soup bowls. Among the jars, there are large and deep jars and small jars, and there are bottles and canisters. In general, among the ceramic assemblages from the El Paso area sites studied by Marshall (1999:Table 6.13), bowls are the most common vessel form, followed by jars, and plates and soup bowls are relatively scarce. The only exception to this pattern is provided by the Ysleta Clinic site, where jars are more common than bowls, based on rim sherd profiles (Miller and O'Leary 1992).

Several of these forms are clearly influenced by and modeled after European wares, including soup bowls, candlestick holders, canisters, and bottles. The European vessel forms typically make up 5 percent or less of the ceramic assemblage. Miller and O'Leary note that there is a great degree of standardization in vessel form and size. This standardization may also be in response to Spanish

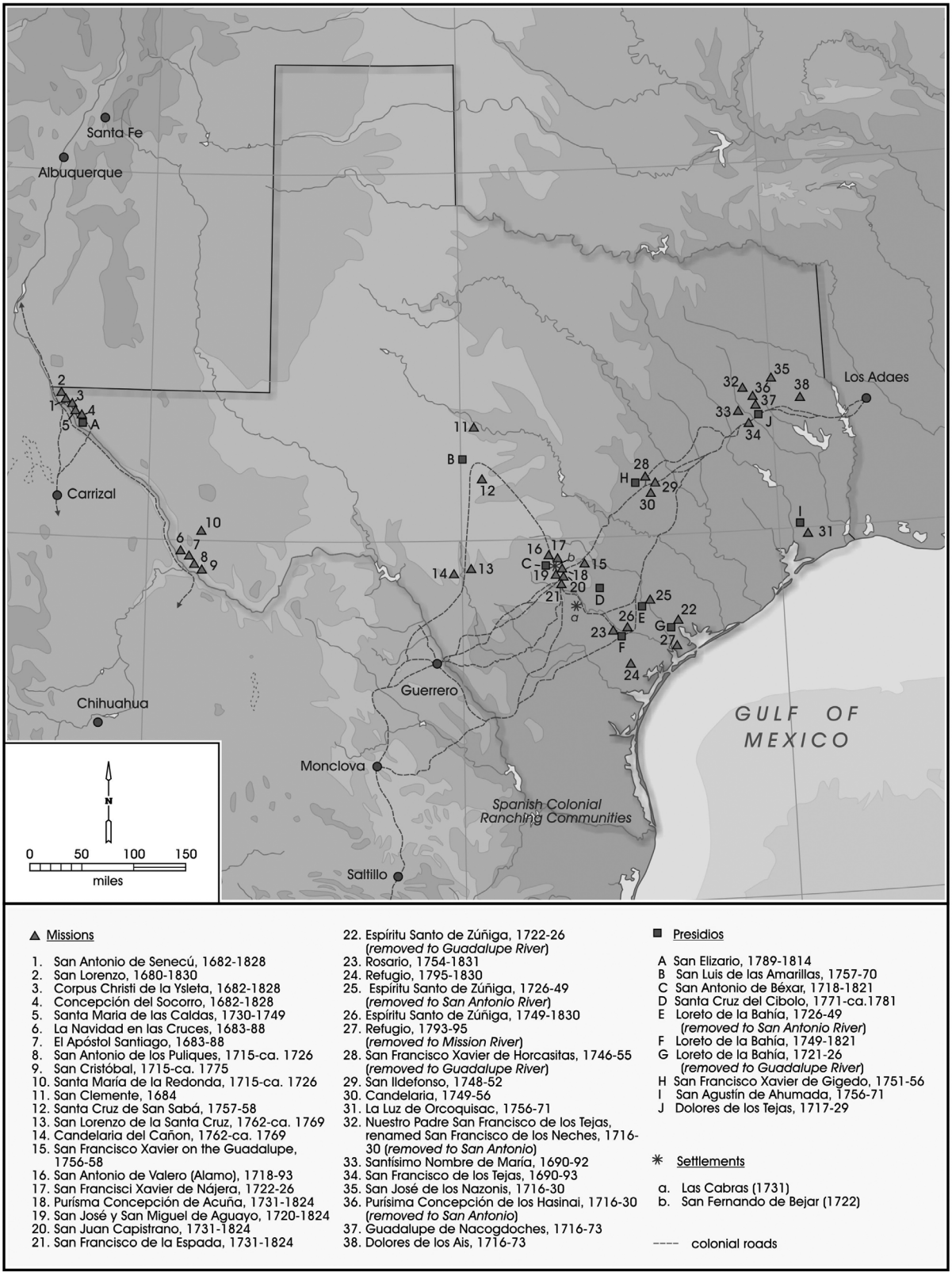

Figure 1. Spanish colonial missions and presidios of Texas.

influences. In contrast, however, the brown ware assemblage from the Ysleta Clinic site shows a significant degree of variability when it comes to firing conditions (Miller and O'Leary 1992:143). This may suggest that pottery manufacture was practiced by a significant proportion of the population rather than within the context of specialized workshops.

Some historic brown wares are decorated, and Leach et al. (1996) distinguish three types within the 41EP5203 and 41EP5204 collections: red-on-brown, red-on-white, and white-on-brown. Decorations tend to be confined to the rims and their immediate vicinity and consist of curvilinear designs (see Leach et al. 1996:Figures 13.1-13.10; Marshall 1997:Figure 7.9). Some of these decorative styles, such as those extending onto the main portion of the body and consisting of flower motifs, may be post-Colonial in age (Leach et al. 1996:200). Smudging, either on the interior or exterior vessel surfaces, is present on some vessel forms (Leach et al. 1996:Figures 13.4-13.13-10; Marshall 1997:Figures 7.5-7.6).

The most common surface finishes consist of a light polish and smoothing of both interior and exterior surfaces (Marshall 1999:Table 6.5). Highly polished surfaces occur on roughly fifteen percent of the vessels from Old Socorro and nearby sites, and smudging occurs on less than ten percent of the vessels. The most common paste color is tan-brown, with between 59.3-67.5 percent of the sherds exhibiting this color. Gray and black sherds are the next most common colors noted in the samples.

The most common rim forms of the Valle Bajo Brown ware bowls from Old Socorro Mission and nearby tested sites are direct rims, with nearly 70 percent of the rims falling in this category. Among the jars, flared rim forms are the most common, followed by the direct flat-edged forms (Marshall 1999:Table 6.5). White slips are present on the exterior surfaces of nearly 70 percent of the sherds, while red slips are present on about twenty percent. Interior surfaces are slipped on only 33 percent of the samples.

Sherds from the Valle Bajo Brown ware collection range in thickness from 2.5-17 mm, with a mean thickness of 6.95 mm. The San Elizario samples of the same type are slightly thicker (mean thickness of 7.13 mm), while the El Paso Brown wares range in thickness from 5.0-5.6 mm (Marshall 1999:94). Vessel orifice diameters derived from 68 rim sherds from the Socorro collection suggest that large bowls were roughly 24.5 cm in diameter while small bowls were 13.0 cm, and large jars were 21 cm in diameter. In contrast, soup bowls ranged from 14-22 cm in diameter (Marshall 1999:94).

The Valle Bajo Brown wares that are so common in the Socorro and El Paso District area began to be manufactured around the late seventeenth century (ca. 1685) and their manufacture extended well into the late nineteenth and early twentieth century (1880-1920). However, by the late 1880s, the manufacture of the wares declined, and after that wheel-thrown commercial ceramic products dominated the wares.

HISTORIC CERAMIC TRADITIONS IN EAST TEXAS

In East Texas, European contact with the Caddo Indian peoples—the principal, if not exclusive, aboriginal group living in this region up through the 1830s—began in the early 1540s with the DeSoto-Moscoso entrada (Chipman and Joseph 2010; Corbin 1989; Perttula 1992) through the region. The effects of the entrada on the Caddo peoples is still being debated, but one possible consequence of the initial contact between the Caddo in East Texas and the Spanish was the production of chalice-shaped ceramic vessels (Turner 1978:98-100; Perttula 1992:27) in Titus phase (ca. A.D. 1430-1680) communities in a restricted area of the Big Cypress and Sabine River basins. These chalice-shaped vessels are known from less than 10 sites (Fields 2008:3).

More permanent and extensive European-Caddo contact in East Texas came only after the mid-1680s, in the form of the establishment of several missions and presidios (Chipman and Joseph 2010:83-147), by the Spanish amongst the Caddo, the Ais, and Adaes groups (see Figure 1), along with ranchos after the 1770s in the Los Adaes and Nacogdoches areas (Jackson et al. 2012; Marceaux and Perttula 2010), as well as the development of civilian settlements and administrative centers, and centers of trade, principally the town of Nacogdoches. There were also several French and Spanish trading posts operating in East Texas (including the post of San Luis de Cadohadacho on the Red River, operating from ca. 1731-1780s, see Gilmore [1986]). In almost every instance, except for the

Plaza Principal excavations in Nacogdoches (see Jackson et al. 2012), sherds from Caddo Indian-produced ceramic vessels (and sometimes ceramic pipes) dominate, or are abundant in, the archeological assemblages at these sites.

To date, only three of the Spanish missions in East Texas have been located, archeologically investigated, and their large ceramic assemblages analyzed: Mission San José de Nasonis (1716-1719, 1721-1730; Perttula et al. 2009), Mission Nuestra Señor de la Purisima Concepción de los Hainais (1716-1719, 1721-1730; Jackson et al. 2012), and Mission Nuestra Señora Dolores de Ais (1716-1719, 1721-1772; Carlson and Corbin 1999; Corbin 2007; Corbin et al. 1980, 1990). The mission and presidio at Los Adaes—now in western Louisiana but once the capitol of Spanish Texas—has also been located, and excavations conducted primarily at the Presidio Nuestra Señora del Pilar de los Adaes (1721-1773) rather than at the associated Mission San Miguel de los Linares de los Adaes (Girard 2007; Gregory 1973; Gregory et al. 2004; Gregory and Avery 2007). It is well to be reminded that the Caddo, or other associated or nearby tribes such as the Ais or Adaes, never settled at any of the missions established in their communities (see Barr 2007; Corbin 1989). Thus, the ceramics found in mission and presidio contexts were made by the Caddo in their local communities and villages, and then provided to the Spanish missionaries, soldiers, and settlers for their use. As such, the ceramic assemblages provide insights into the functional, stylistic, and technological practices and traditions of the Caddo potters in historic times who produced the ceramics, as well as insights into the choices and needs of the European consumers for the kinds of ceramics from nearby Caddo settlements.

At Mission Nasoni (41RK200), more than 8580 Caddo ceramic sherds are in the collection. There are also collections from two contemporaneous and nearby non-mission historic Nasoni sites (41RK191 and 41RK197, n=559 sherds) (Perttula et al. 2009:Table 1). The Nasoni Caddo ceramics, both bone- and grog-tempered, found at the mission—presumably in areas where they were used and discarded by missionaries and soldiers—include plain wares, utility wares, and engraved and slipped fine ware vessels. Brushed and incised vessel sherds, as well as plain sherds from undecorated vessels and from the lower parts of decorated vessels, dominate the ceramic assemblage at the mission. Fine wares comprise only about 3 percent of the sherds. The most recognizable engraved elements on fine ware ceramics at the mission and the Nasoni Caddo sites include ticked horizontal and curvilinear lines from Patton Engraved vessels (see Perttula, this volume), and later forms of Poynor Engraved (*var. Cook* and *var. Blackburn*) also appear to be present in the mission assemblage.

The aboriginal ceramics from the two Nasoni Caddo sites are different from the assemblage of ceramic vessel sherds from the mission. The Nasoni Caddo sites have overall high proportions of decorated sherds, particularly engraved and brushed sherds, as well as more utility ware vessel sherds, especially brushed-punctated, punctated, and incised rim sherds. Conversely, at the mission, there are more plain wares but fewer engraved fine wares. The overall percentage of brushed vessel sherds is at least two times lower at the mission compared to the Nasoni Caddo sites. The predominance of bone-tempered Caddo wares at the mission, as well as the dominance of brushed utility wares and Patton and Poynor Engraved fine wares, indicate that the Nasoni Caddo potters living around the mission between 1716-1730 were part of a spatially broad and temporally long-lasting (beginning ca. A.D. 1250) Caddo ceramic tradition that developed in the Neches, Angelina, Attoyac, and middle reaches of the Sabine river basins.

There is a small assemblage of historic Caddo ceramic sherds (n=358) at Mission Concepción (41NA344) (Jackson et al. 2012:177-181). The ceramics are dominated by brushed sherds from utility ware vessels (90 percent of the decorated utility ware sherds), with a few jars decorated with punctations, incised lines, appliqued elements, grooved lines, and neck bands (Jackson et al. 2012:Figures 3-53 to 3-55). Engraved fine ware vessel sherds (n=45) are primarily from Patton Engraved vessels (64 percent of the fine wares), with a few examples of King Engraved and Mayhew Engraved sherds (Jackson et al. 2012:Figures 3-56 to 3-58) and engraved sherds with indeterminate designs. Jackson et al. (2012:181) conclude that the ceramics from Mission Concepción are:

> consistent with [historic] Allen phase sites in western Nacogdoches County with low numbers of plain sherds, high percentage of brushed sherds…Patton Engraved, and the presence of King Engraved and Lindsey Grooved. It is

assumed that the Spanish at Mission Concepción obtained these ceramics from the surrounding Hainai village.

The aboriginal ceramic assemblage from Mission Dolores de los Ais (41SA25) is dominated by Natchitoches Engraved fine wares, along with Emory Punctated-Incised and Ebarb Incised (usually engraved at this site) vessels, and an unnamed plain ware (Corbin et al. 1980, 1990; Carlson and Corbin 1999). Brushed pottery is absent in the assemblage. These wares are consistent in terms of the paste and primary tempering agent, which is bone (80 percent). Patton Engraved, a diagnostic fine ware type for the historic Hasinai Caddo groups to the west (including at Mission Nasoni and Mission Concepción), is a minor type at Mission Dolores, with either bone or no discernible tempering agent. It is likely that this fine ware is not part of the local ceramic tradition (Corbin 2007:15).

At Presidio de los Adaes (Gregory 1973; Gregory and Avery 2007), the same wares predominate (Natchitoches Engraved, Emory Punctated-Incised, a Constricted Neck Punctated type, Ebarb Incised, and a distinctive plain ware), but the Natchitoches Engraved paste at the presidio is almost always tempered with shell. The other wares at Los Adaes are typically tempered with shell (60 percent) and/or bone (40 percent). The general view is that the different common wares were manufactured by the local Adaes for Spanish use in the presidio. Patton Engraved also occurs at Los Adaes, but not as a resident ware; Womack Engraved, a widely distributed early to mid-eighteenth century Caddo fine ware, occurs in very low numbers such that this ware is also believed to be non-resident. Brushed jars are quite rare at Los Adaes. Corbin (2007:16) considers the ceramic assemblages at both Los Ais and Los Adaes to represent related constituent groups, separated by differences in the paste of the ceramic wares: the Ais made bone-tempered wares and the Adaes predominantly made shell-tempered wares.

One distinctive aspect of the Los Adaes ceramics is the appearance of plain wares with features seen otherwise on European-manufactured ceramic vessels. This includes Colono-ware pitchers with handles, brimmed plates, and vessels with foot rings (Gregory and Avery 2007:72-75). Similar Colono-wares have been recovered in post-1779 archeological deposits in Nacogdoches (see below).

Following the closure of the Zacatecan missions in East Texas in 1772, approximately 300 Adaeseños returned to the area near Mission Guadalupe in 1779 to establish the pueblo of Nacogdoches. Soon Nacogdoches replaced Natchitoches as the key trading center between Europeans and Texas Indians (Burton and Smith 2008). There are currently eight recorded post-1779 to 1830s archeological sites near El Camino Real de los Tejas in downtown Nacogdoches that have aboriginal low-fired coarse earthenwares: Adolphus Sterne (41NA144), Acosta-Durst-Taylor House (41NA182), Guadalupe del Pilar (41NA223), Thomas J. Rusk Fountain (41NA291), Reese Andrews (41NA302), Pocket Park (41NA303), Morris Jackson (41NA304), and Charlie Mann (41NA320).

Reese Andrews, Pocket Park, and Morris Jackson sites are on the west side of the Plaza Principal (see Jackson et al. 2012). Recent excavations at these three sites focused on eight pit features apparently in use and then filled during the late Spanish Colonial period through the Republic of Texas period. The sheet midden surrounding these pits contain very rare Historic Caddo sherds (e.g. Patton Engraved and Natchitoches Engraved). Based on a seriation using the European ceramics found in the pits, the eight Plaza Principal pits can be sorted between those filled prior to the town de-population following the Magee-Gutierrez expedition (1779-1813) and those that date to after Mexican independence (1821 through the mid-1830s). In general, the earliest pits had the highest frequency of aboriginal ceramic sherds relative to European ceramics. In four pits dating prior to 1813, 46-75 percent of all the ceramic sherds were aboriginal, while aboriginal sherds comprised only 25 percent in an 1820s pit, and 14 percent of the sherds in an 1830s pit.

The majority of the aboriginal ceramics found in these late Spanish Colonial pits are plain undecorated sherds (58-76 percent of the sherds in each pit). Large sections of discarded vessels have been reconstructed from the pits, several of which are undecorated (dubbed locally as Pocket Park Plain, see Jackson et al. 2012:Figures 9-222 and 10-245) vessels (Figure 2); these are consistent in form with hemispherical bowls (or "cazuelas") and deep flaring-rim jars illustrated by Jurney and Perttula (1995) from the Coushatta Carl Matthews (41PK2) and Carolina Bluffs (16BO207) sites in Southeast Texas and Northwest Louisiana, respectively. Trade between Spanish merchants and the Coushatta is well known from the late eighteenth century to the 1820s along

Figure 2. Plain bowl from the Plaza Principal excavations in Nacogdoches, Texas.

the Coushatta-Nacogdoches Trace. The plain hemispherical bowls may also be compared to Womack Plain as described from the ca. 1750s Gilbert site in the upper Sabine River basin in East Texas (Story 1967).

One aboriginal vessel found in Feature 2 at the Morris Jackson site suggests possible contact between Nacogdoches settlers and Choctaw traders. This simple bowl has an inverted rim with a Fatherland Incised-like design (cf. Neitzel 1965; Brain 1979) alternating with sections of parallel engraved lines filled with white kaolin pigment (Figure 3; see also Jackson et al. 2012).

A large jar was recovered in Feature 2 at the Reese Andrews site that has a globular body and a constricted, slightly everted rim that is decorated with three rows of punctations on a "swollen" band just below the lip (Jackson et al. 2012:Figure 11-19). This vessel is similar to "Constricted Neck Punctated" jars from Los Adaes (Gregory and Avery 2007), the handless jars with the "Tunica Mode" described by Brain (1979), and perhaps to some Emory Punctated vessels (Story 1967). Several of the early pits also had plain wares with European influences (Colono-ware) in form and function (Jackson et al. 2012:Figure 11-20; see also Gregory and Avery 2007), usually in plate form. Interestingly, none of the reconstructed vessels from the Plaza Principal pits suggest any direct connection to local Historic Hasinai Caddo ceramics.

In the civilian settlement of Nacogdoches, in addition to the extensive collection of aboriginal sherds from the recent Plaza Principal excavations, a small assemblage of Caddo sherds came from contexts at 41NA223 that suggested they may be associated with the site of the 1804 Guadalupe del Pilar mission church (Perttula 2008a). The 41NA223 sherds are from engraved and/or slipped fine ware vessels (bowls and carinated bowls), wet-paste decorated utility ware vessels (jars and simple bowls), and plain wares (bowls and jars). Vessel forms and decorations are consistent with East Texas Hasinai Caddo ceramics, being part of a bone-tempered tradition that has existed since ca. A.D. 1250. The vessels are thin-walled forms tempered primarily with bone, fired principally in a low oxygen or reducing environment, and were either burnished (in the case of the fine wares) or smoothed (in the case of a number of the utility ware sherds) on one or both vessel surfaces. These vessels were probably made from local clays, except for a few shell-tempered vessel sherds among the utility ware and plain ware collections. These shell-tempered vessels may have been obtained from other Caddo groups living in north Louisiana (see Girard 2007; Gregory and Avery 2007).

The Bernardo D'Ortolan ranch and associated land grant, just outside Nacogdoches, was held by the prominent Frenchmen Bernard D'Ortolan, and Spanish colonial military official, from 1796-1813, and then by family associates until the early 1840s (Jackson et al. 2012; Perttula 2008b). During the course of archeological investigations conducted at the site over the last few years, a small sample of aboriginal Caddo ceramic sherds (Plain or brushed sherds) was found on the *rancho* in contexts indicating that Caddo ceramic vessels were in use during the *rancho* occupation. These

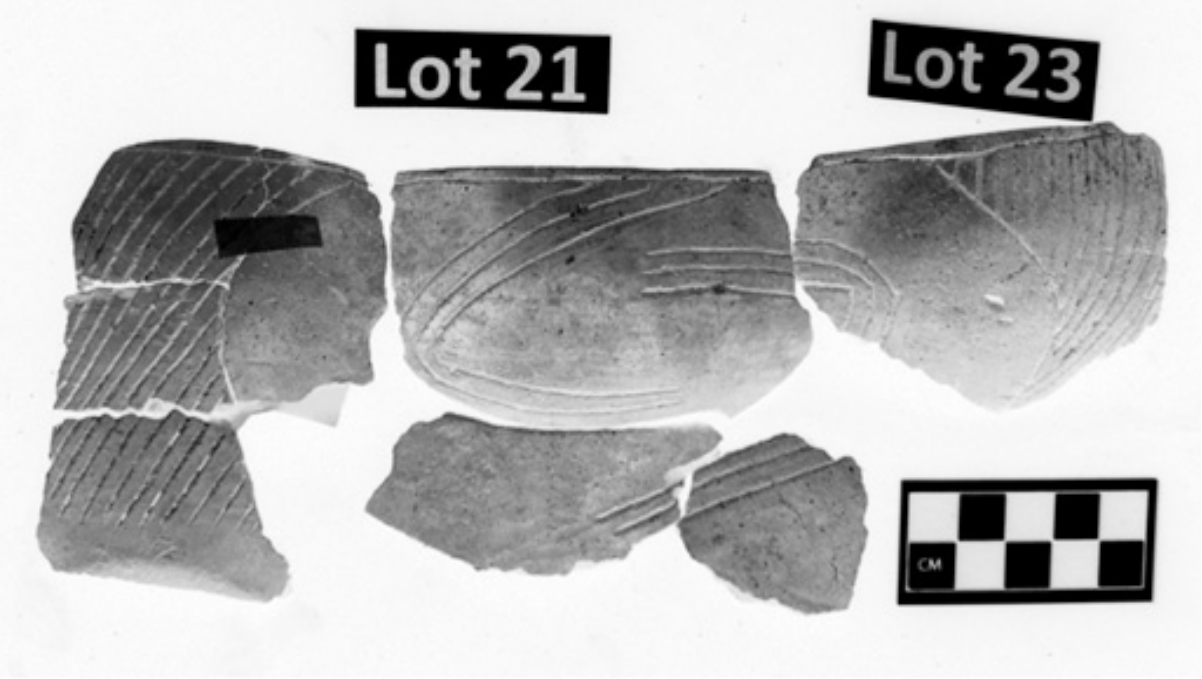

Figure 3. Inverted rim engraved bowl from the Morris Jackson site (41NA304), Plaza Principal in Nacogdoches, Texas.

vessels had to have been obtained by the D'Ortolan *rancho* through purchase or trade from one of the Caddo groups living in the Angelina River valley after the 1790s. The D'Ortolan site investigations indicate that during the last days of the eighteenth century and the first quarter of the nineteenth century, Caddo groups living in the Nacogdoches area made bone-tempered brushed utility ware ceramic vessels as well as vessels (of uncertain decoration) tempered with grog and mussel shell.

ABORIGINAL-MADE HISTORIC CERAMICS OF SOUTH TEXAS

The initial interest of the Spanish crown in the area north of the Rio Bravo was precipitated by rumors that the French also had designs on the area. When in 1687 Alonso de León, then governor of Coahuila, heard from the captive Jean Géry that the French had established a colony in Texas, the Spanish mobilized for action (Chipman 1992:80-81). In 1689 the de León expedition was promptly dispatched in search of the La Salle colony. Upon arrival to the banks of a small creek along the Texas coast, Garcitas Creek, they found that the settlement, known as Fort St. Louis, had already been destroyed by a smallpox epidemic and by hostile Native groups (West 1959:398). Some of the Native groups living inland from Fort St. Louis had expressed interest in maintaining contact with the Spanish, which made the latter believe they would be willing to enter a mission (West 1959:403).

Between 1690 and 1716, the Spanish returned to East Texas to establish several missions amongst Caddo peoples and affiliated tribes (Bannon 1979:102, 111; Burke 1971:70, 118; Habig 1990:153, 156-157). With the threat of French encroachment lessened by 1721, by the end of the decade, Spanish officials were convinced that the East Texas missions were too costly to maintain and their presence was no longer needed. Three of the missions, Concepción de los Hainais, San José de los Nazonis, and Nuestro Padre San Francisco, were moved, first briefly to a location on the Colorado River, and then to the San Antonio River, where each was renamed.

Two missions had already been established in the upper reaches of the San Antonio River even before the three East Texas missions were relocated. The first of these was Mission San Antonio de Valero, established in 1718. It was followed by Mission San José y San Miguel de Aguayo founded in 1721. The three East Texas missions, Concepción, Espada, and San Francisco, were reopened in 1731 (see Figure 1).

The padres in charge of the missions drew their native converts from the aboriginal groups living along the San Antonio, Medina, Nueces, and Frio rivers, the coastal plains, and coastal strip itself. While the material culture of these groups may have been rather distinctive prior to their arrival into the missions, it quickly achieved a surprising level of homogeneity exemplified in the ubiquitous Goliad bone-tempered native-made pottery found in Spanish missions and presidios throughout South Texas.

Goliad Ware

The Goliad ceramic type refers to an undecorated gray ware fired on open-fires and containing moderate to abundant bone temper (Mounger (1959). The type was defined based on a study of a large sample of sherds derived from 1933-1941 work carried out at the third location of Mission Espíritu Santo de Zuñiga (41GD1) on the bank of the San Antonio River (see Figure 1). The definition of a sherd as Goliad ware rests on two criteria: recovery context and the presence of bone as an aplastic tempering agent within the clay fabric. Typically, all native-made pottery containing bone tempering in the clay fabric and recovered from inland and coastal plains mission sites is identified as Goliad ware; therefore, by definition, all Goliad ware post-dates 1720.

Goliad sherds have been recovered from many of the Spanish missions in Central and South Texas and on the coastal plains. The largest collections come from some of the coastal plains missions that have seen the most extensive excavations. For instance, Gilmore's work at Mission Rosario in 1973 and 1974 has recovered over 12,000 sherds. The 1974 sample (n=6,120) has seen preliminary analysis, and the bulk (98 percent) consists of bone-tempered sherds, with only 102 sandy paste plain and asphalt-bearing sherds. Bone-tempered specimens also dominate the smaller sample (n=379) of rim sherds from the site analyzed by Ricklis (2000b:Table 4). Mission Rosario was established in 1754 and abandoned in 1781, only to be re-opened from 1789 until 1806. The principal groups for whom the mission was established were coastal residents including the Cujanes, Copanes, Guapites, and Karankawas.

Three types are commonly recognized within the ware: Goliad Plain, Goliad Red-on-Buff, and Goliad Black-on-Buff (Campbell 1962; Mounger (1959). Goliad Plain sherds, which dominated the 41GD1 collection (21,612 out of 21,785 sherds), have a dark gray paste with varying quantities of bone temper. Typically, both the interior and exterior surfaces of Goliad sherds are smooth and burnished. Vessel forms include shallow bowls, hemispherical bowls, small and large jars, and globular ollas (Campbell 1962). Some hemispherical bowls and globular ollas have thick round loop handles. Wall thicknesses range from 5-13 mm.

Goliad-Red-on-Buff vessels are decorated with designs executed in thin red paint. They typically constitute small proportions of the bone-tempered Goliad wares (less than 0.5 percent of the sherds at 41GD1). The designs consist of horizontal and vertical lines, diagonal and zig-zag designs, and dots. The designs are situated on the outside below the rim, but red painted designs are also known from the interior of vessels (Perttula 2002:238 and Figure 9c-5). Wall thicknesses tend to be less than those of the Goliad Plain type, ranging from 3-6 mm, but sample sizes are small and this may not be representative of the type. Both at 41GD1 and Mission Refugio, the red-on-buff type makes up less than 1 percent of the overall sample of bone-tempered sherds (Perttula 2002:238).

Goliad Black-on-Buff sherds also were recovered from Refugio (Perttula 2002:241). The small number of sherds (n=17) have designs executed with asphaltum and are similar to the Goliad Black-on-Buff identified by Mounger (1959:168) in the 41GD1 collection, where they constitute 45 percent of 173 decorated sherds (Mounger 1959:168). The sherds from Refugio have minimal temper added to the ceramic paste.

Perttula (2002:238) also identifies a small number of bone-tempered sherds (representing at least three vessels) that are decorated with brown or dark brown painted designs in the Refugio collection. The designs consist of bands and squiggly lines, either on the exterior or interior of the vessels. The sherds have bone-tempered pastes or sandy pastes with lesser amounts of bone temper. At least two sherds of this type exhibit vertical brush marks on the exterior of the vessel (Perttula 2002:240-241).

Collections of native-made plain wares from the second and third locations of Mission Espíritu Santo de Zuñiga have yielded the largest sample of Goliad wares to date. The investigations by Mounger (1959:163) have identified over 21,600 bone-tempered specimens at the third location of

the mission, and the work of Walter at the second location produced 12,649 bone-tempered sherds (Lakeman 2001:Table 5). Goliad ware sherds are also common at 41GD112, the early historic Villa de la Bahia site near Presidio de la Bahia (Ricklis 2000a:19). Tomka has also examined samples of native-made ceramics from the Presidio de la Bahia (41GD7), and it is clear that Goliad wares abound in that collection as well.

Goliad sherds also have been recovered from Mission Refugio (41RF1) occupied between 1793-1830. Somewhat surprisingly, some 78 percent (n=2,365) of the sherds larger than 10 mm in maximum dimension are bone-tempered and fit within the Goliad type (Perttula 2002:234).

Finally, while many projects have taken place over the years at the five missions in the upper basin of the San Antonio River (see Figure 1), overall the collections of native-made ceramics are dominated by Goliad Plain ware ceramics. The systematic analyses of these samples are just now taking place, with prior attention having been focused on the majolica sherds that also occur in these collections.

When the ware was first defined, it was assumed (Mounger 1959; Campbell 1962:335) that members of the Aranama ethnic group, who were the primary occupants of the mission at its second and third locations, were responsible for the ceramics. A few historic accounts cited the fact that as late as 1854 the Aranama potters continued to furnished the entire town of Goliad with ceramic wares well into the historic period (Mounger 1959:94). Sherds of Goliad ware were found at all levels in all excavation units at 41GD112, site of Villa de la Bahia, in Goliad (Ricklis 2000a). The ubiquity of this pottery at the site may be accounted for by the historically documented fact that native women in the Spanish Colonial community, most especially those living at the Espíritu Santo mission, manufactured basic utilitarian pottery for distribution to, and use by, the non-native population living in the area. In 1783, Fr. Mariano Cardenas, in an appraisal of the state of the Texas missions, noted that the Native women at Espíritu Santo "…are the ones most dedicated to work and are almost always busy making ollas, bowls and other things of clay, for which they have great skill and with which they trade with the Spaniards of the Presidio of La Bahia" (Cardenas 1783, translation by Robert A. Ricklis).

The Aranama were reported to have occupied an area inland from the Karankawa stretching between the lower Guadalupe and San Antonio rivers (Davenport and Wells 1918; see also Newcomb 1961:Map 1) and, perhaps as far east as the lower Colorado River (Campbell 1996:45). Krieger (cited in Mounger 1959:67), and Newcomb (1961) maintain that the Aranama are the same as the Mariame visited by Cabeza de Vaca in the early 1530s (Bishop 1933). Cabeza de Vaca does not mention that the Mariames were pottery makers, suggesting that they learned pottery making sometime after the early sixteenth century. The Aranama are recorded to have been present in the Bexar County missions in only small numbers (Mission San José n=2 [Solís in 1767; Mounger 1959:68]; Mission Valero n=8 [Campbell 1996]), with most of their members being concentrated at Mission Nuestra Señora del Espíritu Santo de Zuñiga and Mission Nuestra Señora del Refugio (as late as 1817). In addition to the Karankawa, who made pottery on the central coastal strip of Texas (see Ricklis, this volume), only the Aranama are actually reported in the enthnohistoric accounts as having been potters during historic times in the southern part of the State. Ricklis (2000a:19-20) states that "…Goliad ware represents a distinctive native ceramic tradition associated with the inland native peoples, such as the Aranama, who are known to have resided at Espíritu Santo Mission" (e.g., Bolton 1915; Mounger 1959; Walter 1997; Walter and Hester 1998).

Because the origins of the ware are less well understood, defining what constitutes Goliad ware and what bone-tempered sherds are more likely to be affiliated with Toyah phase Leon Plain ceramics is somewhat of a challenge. For instance, Ricklis (2011) identifies the bulk of the native ceramics from the first location of the mission at the former site of Ft. Saint Louis (41VT4), occupied between 1721-1726, as Rockport wares with other ceramic traditions, namely Caddo and Toyah (Leon Plain), also represented but in minor quantities.

The small sample of bone-tempered sherds from 41VT4 consists of ten rim sherds (representing 10 vessels) and five loop-handle fragments that are classified as Leon Plain or Inland Bone-Tempered Plain ware ceramics (Ricklis 2011:26-27). The sherds are made of clay that is either devoid of sand or contains relatively sparse amounts of sand (10-15 percent of the paste). Only two (20 percent) of the sherds represent reduced firings; all others are of light colors (buff or reddish) that indicate oxidizing firing atmospheres. Crushed

bone accounts for between 10 and 40 percent of the paste in the clay bodies, as revealed by microscopic examination of sherd edges.

The ceramic assemblage from the second site of Mission Espíritu Santo de Zuñiga (41VT11) on the Guadalupe River contains over 14,700 native-made sherds with roughly 12,000 of these being bone-tempered (Walter 1997, 1999, 2007:Table 6.1). A Late Prehistoric component underlies the mission deposits and some of the bone-tempered pottery may be associated with this component. However, the bulk of the materials was deposited between 1726 and 1749 and can be securely assigned to the mission occupation.

Goliad sherds also were present at the Presidio La Bahia (41VT8), the second site of the presidio after it was relocated to the Guadalupe River. Over 11,000 bone-tempered sherds were recorded, and they were classified as Goliad wares (Fox and Tomka 2006).

Because of the technological continuity with Late Prehistoric unglazed and bone-tempered Leon Plain ceramics found primarily in Central Texas and on the fringes of South Texas, many archeologists assume that the Goliad ware is a historic descendent of the prehistoric Leon Plain type (Hester 1980, 1989; Ricklis 2000a, 2000b; Walter 1997, 2007). Leon Plain ceramics were manufactured between ca. A.D. 1250 and A.D. 1650/1700, but unfortunately no direct evidence exists linking the manufacturers of Leon Plain wares to Colonial or Mission period sites or contexts. In addition, although some bone-tempered ceramics are found in prehistoric contexts in parts of South Texas (Hester and Hill 1971), it is not clear who made these wares. For instance, Cabeza de Vaca's accounts of the Native groups inhabiting parts of South Texas do not mention any pottery-making groups in the early 1530s in the region (Bishop 1933).

Technological Characteristics

The clay used in the manufacture of Goliad wares is either devoid of sand or has low percentages of it (10-15 percent). One of the collections that is an exception to this statement is the native-made assemblage from Rosario (Ricklis 2000b:104-105). While crushed burnt bone is by far the most common temper in the Native-made sherds from this site, the clay fabric does contain moderate to profuse quantities of sand, and in this aspect, the collection is more reminiscence of the coastal Rockport wares (see Ricklis, this volume). All of the sherds from the third location of Espíritu Santo de Zuñiga contained crushed and burnt bone as tempering. Sparse (less than 5 percent) bone was present in 11 percent of the sample, and moderate amounts (between 5-25 percent) of bone were present in 39 percent of the samples. Therefore, half of the assemblage contained profuse amounts of bone temper (more than 25 percent of the paste). Sand was not common in the clay fabric (Ricklis 2000b:Table 4). An analysis of a small sherd sample (n=183) from the same site (41GD1) showed that sand was present in the fabric of 81 of the specimens (44 percent), while the other 56 percent had no macroscopically discernable quartz grains in the fabric. The 190 rim sherds from 41VT8 (Ulrich 2006:123-130) had three categories of aplastic inclusions: the majority was bone-tempered (n=150, 79 percent), with bone-tempered sandy paste specimens being the second most common (n=38, 20 percent) followed by sandy paste wares (n=9, 5 percent). Of the 150 bone-tempered sherds, 35 (23 percent) had abundant bone, 91 (61 percent) had moderate bone, and 24 (16 percent) had sparse amounts of bone tempering (less than 5 percent). It could not be determined whether the sand in the 38 specimens with a sandy fabric was an aplastic additive or a constituent element of the clay (Ulrich 2006:126). Between 6-11 percent of the bone-tempered pottery from Refugio has abundant bone tempering, with the majority (89-94 percent) of the bone-tempered wares having either sparse or moderate amounts of bone temper (Perttula (2002:23-28).

The large collection of Goliad sherds examined by Mounger (1959) remains the standard for defining the formal variability present within the ware. Her analysis identified large, medium, and small pots with handles, shallow and deep bowls, large and medium jars, and bottles. Figure 4a-b shows the variety of vessel forms defined based on plates shown in Mounger (1959). A smaller collection of 230 rim sherds from 41GD1 examined by Ricklis (2000b:95-96) indicates that bowls were the most common vessel forms (64 percent), followed by everted rim jars and ollas (22 percent) and straight-rimmed jars (12 percent). Inverted neckless jars and ollas constituted a very small percentage of the collection (3 percent). Lip forms were dominated by rounded profiles (87 percent) with flat lips making up the bulk of the rest (11 percent). Vessel forms from the samples from Mission Espíritu

Santo de Zuñiga and Mission Rosario, also dominated by bone-tempered ceramics, include wide mouth everted rim ollas and jars, large serving bowls, straight rim jars and bottles, shallow and deep bowls, and inverted rim ollas (Figure 5, after Ricklis 2000b:93). Goliad wares from 41VT11 consist of small bowls, ollas, and jars (Lakeman 2001:38). The 53 rim sherds that were sufficiently large to identify vessel form in the 41VT8 collection (Ulrich 2006:124-125) indicate that shallow bowls (n=21), and deep bowls (n=17) were the most common, with jars (n=9) and bottles (n=6) occurring less frequently. Samples are too small and sherds too eroded to have a good understanding of the variation in vessel forms of the red-on-buff or brown/dark brown-on-buff types. However, Perttula (2002:23-28) identifies at least one red-on-buff bowl and a brown/dark brown-on-buff bowl in the Refugio assemblage.

Oxidized vessel surfaces and reduced sherd cores were noted in virtually 100 percent of the sherds examined from the third location of Mission Espíritu Santo de Zuñiga. In the small 41VT8 rim sherd collection (Ulrich 2006:127), reduced interior and exterior surfaces are more common (45 and 42 percent, respectively) than sherds with oxidized interior and exterior surfaces (34 and 32 percent, respectively). The bulk of the sample from 41GD1 analyzed by Ulrich (2005:Table 4-4) had reduced cores and either oxidized (45 percent) or reduced (45 percent) exterior surfaces.

The mean sherd thickness of Goliad specimens from the third location of Mission Espíritu Santo de Zuñiga is 5.99 mm, and sherd thickness ranges from 3-10 mm (Ricklis 2000b:101 and Table 4). The majority (79 percent) fall between 5-7 mm in maximum thickness. Vessels with orifice diameters falling between 15-19 cm are the most common within the assemblage derived from the third location of Espíritu Santo de Zuñiga. Wall thicknesses range from 2.8-9.7 mm, with a mean of 5.32 mm, in the sample from the second location of Mission Espíritu Santo de Zuñiga (41VT11; Free and Raschkow 1996). In the sample of 1,242 sherds from the same site examined by Ricklis (2000b:90-105), mean wall thickness is 5.32 mm with a range from 3-10 mm. The thickness of the majority of the specimens falls between 4-6.5 mm (Ricklis 2000b:90-105). A sample of 190 Goliad rim sherds was examined from 41VT8, Presidio Loreto, the second location of Presidio La Bahia (Ulrich 2006:125). The mean thickness of the sherds is 5.6 mm. The thickness of the bone-tempered sherds from Refugio ranges from 3.3-10 mm, with about 60 percent of the sample falling between 5.3-7.6 mm (Perttula 2002:234). The thickness of Goliad Black-on-Buff body sherds from Refugio ranges from 5.6-8.2 mm, with a mean of 7 mm (Perttula (2002:241). Rim sherds are thinner, ranging from 3.3-4.1 mm in thickness (Perttula 2002:241). The thickness of the sherds from a smaller sample analyzed by Ulrich (2005:45-46), range from 4.00-10.54 mm, with the bulk of the sherds falling between 5.5-8.0 mm. Vessel bases are much thicker, with a mean of 9.8 mm, while rim sherds had a mean thickness of 7 mm.

Paste color ranges from grayish-buff to dull orange (Mounger 1959:164), to reddish-brown to dark brown (Ivey and Fox (1982:31), to tan or reddish-brown (Hard et al. 1995). In some collections, paste color is dominated by gray paste but it is not unusual within the same collection to find pieces that are buff, red, or brown in color. In fact, often on the same vessel and larger sherd fragments, coloration shifts from gray to red and black, as the vessel surfaces are affected by variation in heating atmosphere that is typical of open bonfire settings.

Rim profiles vary from straight to very slightly curved (Free and Raschkow 1996:7). Rim edges varied from thin and sharp to thick and rounded and a few with flat-topped edges (Free and Raschkow 1996:7). There were 141 undecorated rim sherds identified from the Refugio collection derived from TxDOT-sponsored investigations at the site. Approximately 25 percent of these bone-tempered rim sherds have everted profiles and may be from jars. The remaining rims are inverted and have flat or rounded lips. They are likely from shallow bowls or ollas (Perttula (2002:235).

Many pieces retain a slight luster, suggesting that they were burnished. None of the rim sherds examined from 41VT8 exhibit highly burnished surfaces (Ulrich 2006:129), and slips and washes were not noted on this sample. In general, slips and washes are relatively rare within the sample from the San Antonio missions. However, the definitive identification of slips and washes can be hindered by oxidizing firing conditions that may turn a very thin outer zone of the clay fabric a reddish color that is difficult to differentiate from a wash without the aid of petrographic analysis.

The large sample of Goliad sherds from 41GD1 provides a greater chance that specimens

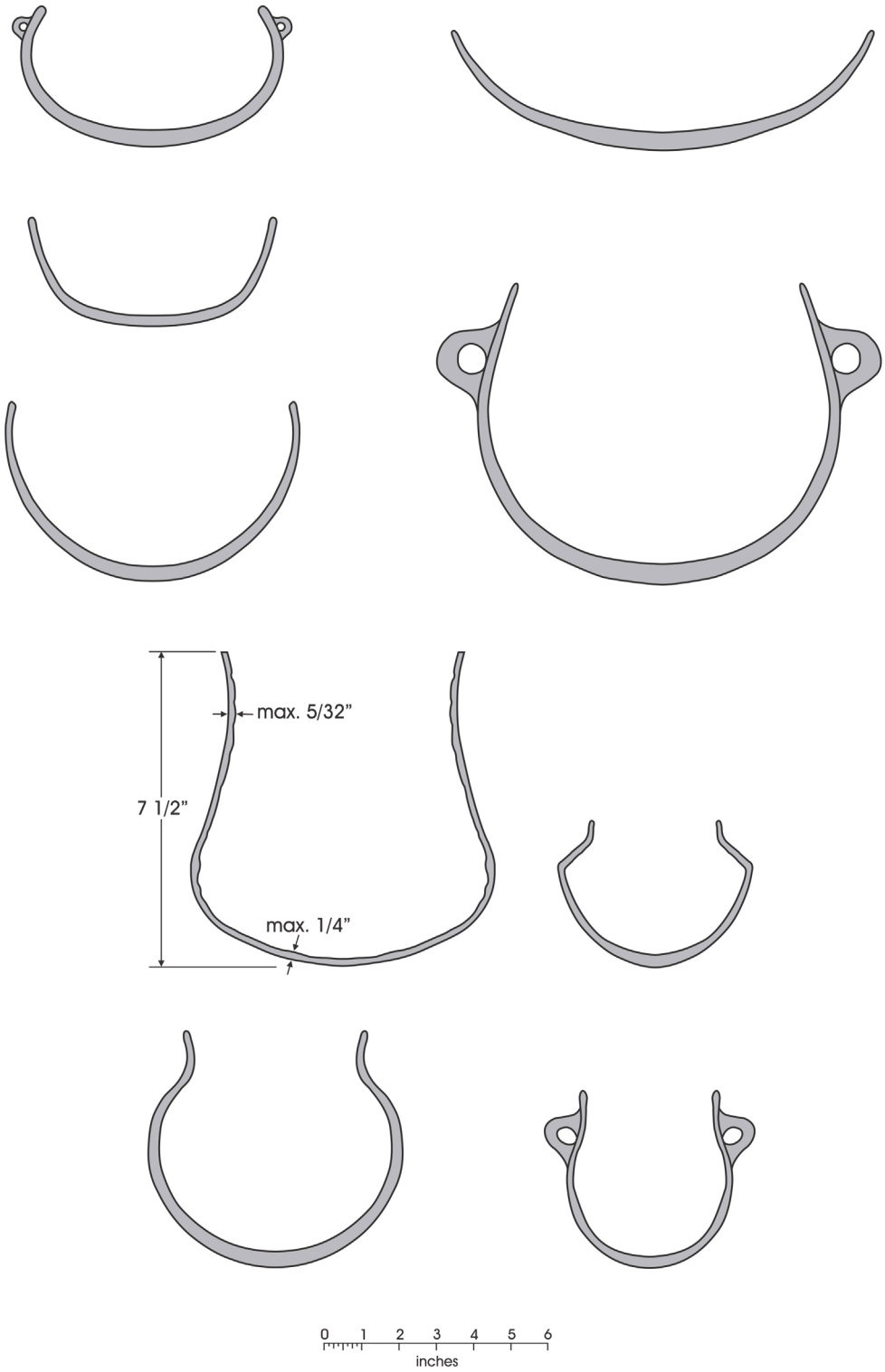

Figure 4a. Goliad vessel forms identified in the 41GD1 collection: a, bowls and jars with and without handles: top row, left to right: bowl with incurved rim and handle, and shallow bowl; second row: deep bowl; third row, left to right: deep bowl and hemispherical pot with handle; fourth row, left to right: medium globular pot and small pot with angular walls; bottom row, left to right: medium globular jar and small pot with handles;

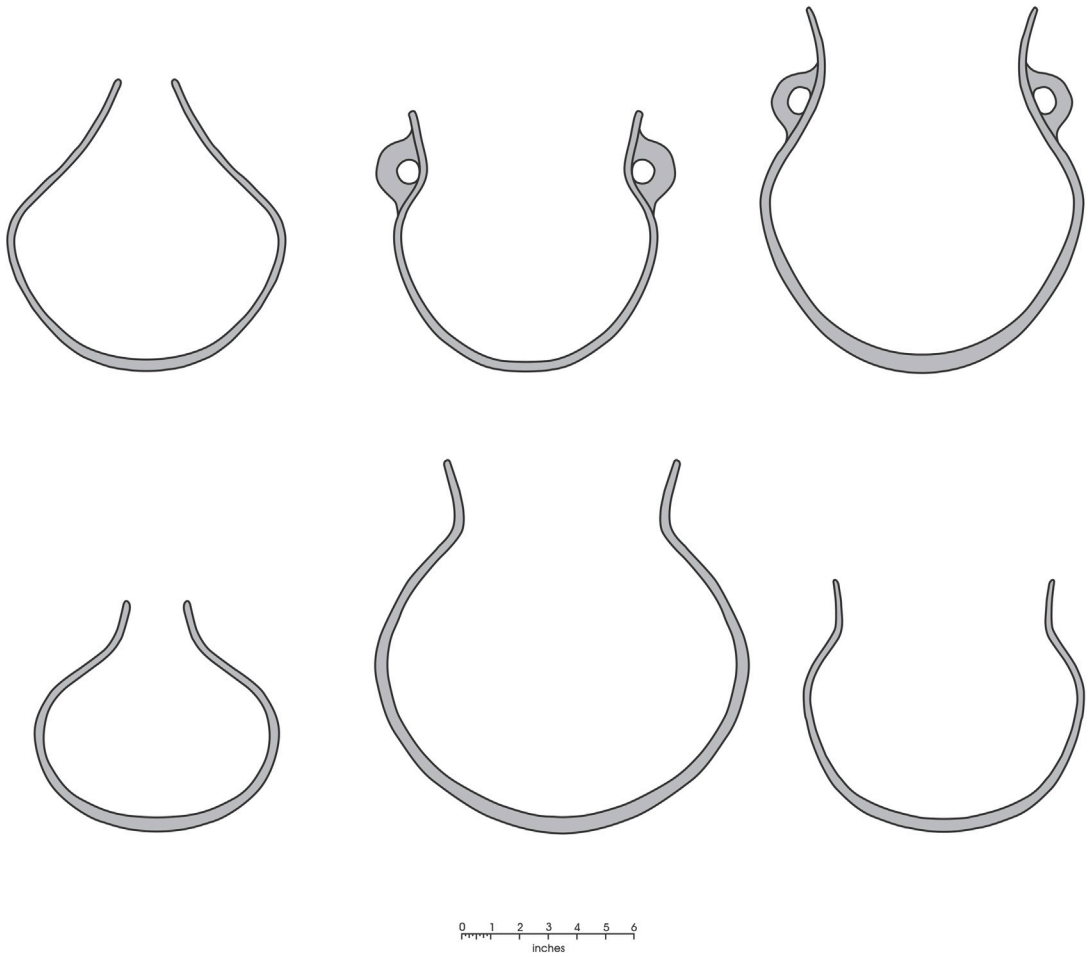

Figure 4b, bottles and jars with and without handles: top row, left to right, medium bottle and two medium and large pots with handles; bottom row, left to right: small bottle; large globular jar; and medium globular jar.

that may show the influence of Spanish-made ceramic forms may also show up in the Native-made wares. Even so, no evidence of flat-bottomed vessels was found among the 22,000 bone-tempered sherds from 41GD1. A single conical pointed foot was identified in the collections (Mounger 1959:Figure 26E) together with a ceramic spoon (Mounger 1959:Figure 37B), at least one candle-holder fragment (Mounger 1959:Figure 37A), three-pronged pottery rests, whistles, and two small bird effigies (Mounger 1959:173-177). Free and Raschkow (1996:12) note the possibility that several flat profiled and curved-edged specimens from 41VT11 may represent plate fragments. Two foot sherds were identified in the Refugio collection (Perttula 2002:234 and Figure 9c-9). The foot sections appear to be typical of the tripod variety, having a conical shape with the larger diameter portion attaching to the vessel base and the rounded and smaller end serving as the purchase for the vessel. The one pictured specimen appears to be 4.2 cm long with a maximum diameter of 25 mm, and a minimum diameter of 12 mm. In her analysis of a sample of native-made ceramics from Mission San Juan, Ulrich (2004:83-84) identified three rim sherds that were lipped, and a base sherd with a foot ring. Finally, among the samples of bone-tempered pottery from Rancho de las Cabras, two flat sherd fragments were identified (Ivey and Fox 1981:31). These sherds are likely fragments of *comales*. Typically they are made of metal and the ceramic versions may signal an attempt by native potters to copy the form for household use given the new food source (corn meal) that became available within the missions.

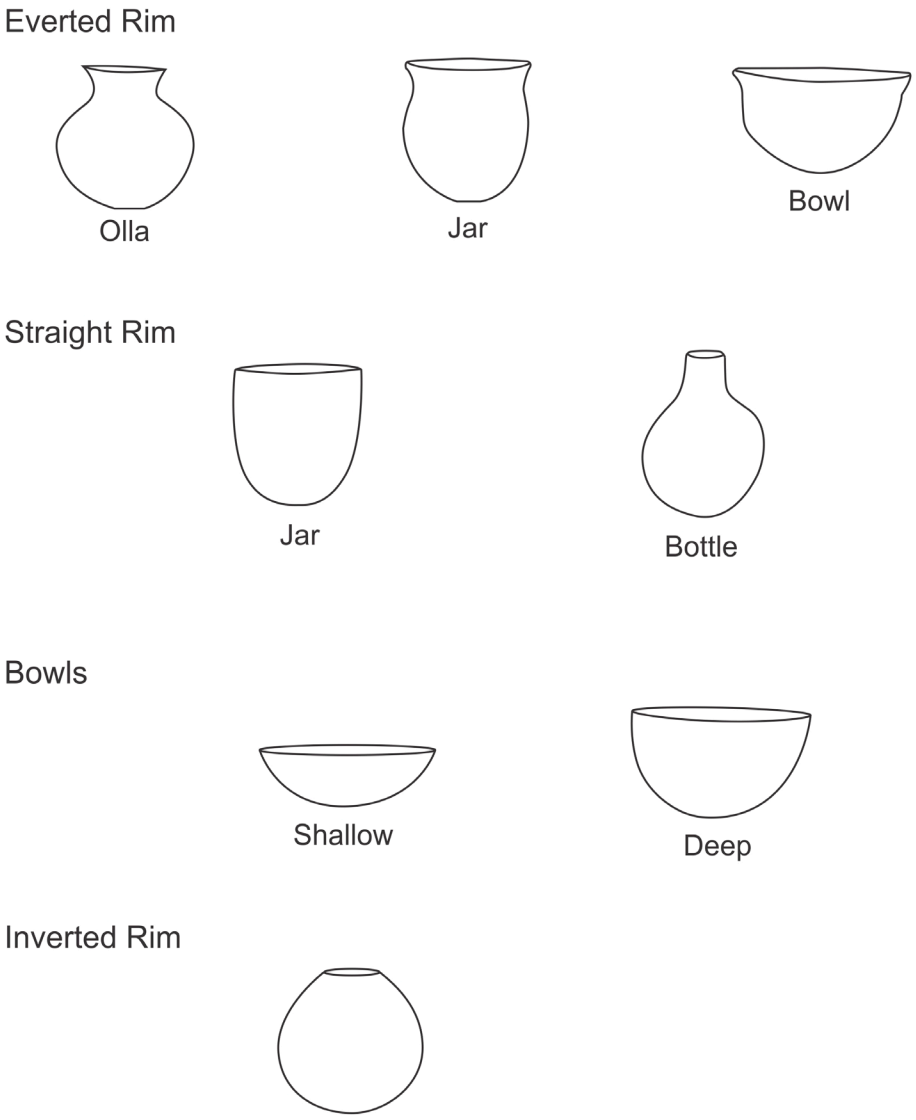

Figure 5. Vessel forms identified in the 41VT11 and Mission Rosario collections (after Ricklis 2000b).

Perspectives from Instrumental Neutron Activation (INAA) and Petrographic Analyses

The Center for Archaeological Research at The University of Texas at San Antonio has recently completed the petrographic analysis of 140 sherds comprised of 35 specimens from each of the four missions under the management of the San Antonio Missions National Historical Park (Concepción, San José, San Juan, and Espada, see Figure 1). In addition to the petrographic analysis, sub-samples of the same sherds were also submitted to the Missouri University Research Reactor for INAA analysis (Tomka and Love 2012).

The petrographic analysis defined nine paste groups based on the presence or absence and percentage of bone within the clay fabric and on the percentage of quartz (sand) noted during the petrographic analysis. Paste groups 1D, 1B, and 1A have low, moderate, and high percentages of bone in the fabric, respectively. Paste group 1C was defined as having bone and shell temper and less than 10 percent quartz. The percentage of bone was 12.9 percent and shell was 14.8 percent. Paste groups 2A and 2B had up to 10 percent (Group 2A) or more (Group 2B) of quartz in the fabric. Paste group 2C was defined as having more than 10 percent quartz and no bone. Quartz ranged from 16.5-18.5 percent of the total point counts. Paste

group 3A was defined as having less than 10 percent quartz and no bone; quartz was 0.98 percent of the total points. Paste group 4A was defined as having less than 10 percent quartz and more than 10 percent andesite. Quartz was 7.6 percent of the total points. Andesite represented 17.8 percent of the total points.

The INAA analysis grouped the majority of the 140 sherds into three likely local groups (groups 21, 22, and 37), one coastal group (group 17) and one group (group 4) with an undefined origin. In addition, several specimens could not be assigned to either of these five INAA groups. Most of the INAA group 21, 22, and 37 sherds are part of paste groups 1A, 1B, 1C, 1D, and 3A. That is, they have low, moderate, or high percentages of bone and less than 8 percent of quartz in the fabric. In contrast, most of the specimens in paste groups 2A and 2B have low to moderate percentages of bone and more than 8 percent of quartz. Two of the INAA group 4 specimens were assigned to paste group 2C, and the single paste group 4A specimen with andesite temper was not classified into an existing chemical group.

The three distinct paste groups differentiated based on the proportion of bone temper (1A, 1B, and 1D) made of locally available clays suggests that these groups represent three technological traditions and potentially distinct populations of craftsmen. On the other hand, the variability seen in the proportion of bone tempering may simply be normal within populations of craftsmen under circumstances when clay fabric preparation is left to the choice of individual potters rather than occurring under strictly regulated conditions such as within the confines of trade groups. At Mission Concepción the three paste groups make up the bulk of the sherds, and only two of the 35 sherds are not part of the three principal paste groups. One of these two sherds is assigned to a local INAA group (group 21) but differs from the rest due to the presence of shell in addition to bone in the fabric. The second sherd had no bone temper and it remains in an unassigned INAA group. Therefore, these five paste groups can be identified as clearly representing distinct technological traditions with at least four of the five derived from the region neighboring the San Antonio River.

The Mission San José sherd sample contains seven paste groups. The bulk of the samples fall within paste groups 1A, 1B, and 1D. However, some sherds fall in paste groups 2A and 2B, with each of these clustering in two INAA groups, the unknown origin clay source (group 4) and the possible coastal clay source (group 17). The single paste group 3A sherd is made of local clay but has bone temper, while the paste group 4A sherd is unassigned in INAA terms. In summary, these patterns are similar to those noted for the Mission Concepción sample: three paste groups representing local manufacture with distinct technological traditions; two paste groups that may represent non-local manufacture traditions; one sample made of local clay but with no temper; and one unassigned sherd.

The Espada sample consists primarily of the three most common paste groups made of locally available clays and three other paste groups that likely represent distinct technological traditions in part because they are made of likely non-local clays. One of these three sherds contains no bone temper.

The San Juan sample is similar to the three previously discussed samples. The bulk of the specimens are in paste groups 1A, 1B, and 1D and are classified in INAA clay groups 21, 22, and 37 (e.g., locally obtained clays). Several sherds are classified in paste groups 2A and 2B, and these are made of INAA group 4 clays, with an unknown origin. These patterns suggest the presence of sherds derived from at least five technological traditions (i.e., paste groups 1A, 1B, 1D, 2A, and 2B).

The bulk of the ceramics from the four San Antonio mission samples are differentiated from other paste group specimens based on their bone temper content, and as such may represent distinct technological traditions. The fact that these bone-tempered specimens are made of apparently local clay sources suggests that they were produced by potters who were familiar with the characteristics of the locally available clays. This could mean that the potters were members of bands that inhabited the San Antonio-Medina River drainage. This conjecture is supported by the fact that it would be expected that the largest proportion of the neophyte population in each mission may have been drawn from the nearby groups; therefore, these groups would also have produced the majority of the ceramics seen in each mission's assemblage. The technological differences between the three paste groups consist primarily of the varying proportion of bone temper added to the clay fabric, and this may be reflective of either differences between broad communities of potters (e.g., ethnic groups,

bands) or perhaps differences between broad groups of potters and their trainees (i.e., technological traditions passed from craftsmen to pupils).

The remaining paste groups contain sherds made of possibly coastal clay sources (INAA clay group 17), group 4 clay sources with an unknown derivation, and specimens that are not assigned to a clay group. With the exception of clay group 4, these other clay sources are not represented by large samples. Even clay group 4 only contains 21 sherds (15 percent of the sample), while clay group 17 has only three sherds (2 percent).

As mentioned before, clay group 17 has been identified as a coastal clay group based on its mineralogical affiliation with ceramics made at the coastal missions such as Mission Refugio and Mission Rosario. It is somewhat surprising that only three sherds are associated with this clay group if indeed clay group 4 is not also of a coastal derivation. This observation comes from the fact that a number of accounts describe the padres in charge of the San Antonio missions going to the coast to gather neophytes, and a number of the named groups were known to have had territories on the coast. Therefore, it is surprising to note that the number of ceramics made on the coast is relatively low. The pattern suggests that the coastal recruits entered the San Antonio missions without vessels made on the coast or that fewer of them entered than appears to be the case from the mission records.

In summary, in the absence of resident potters at the San Antonio missions, it is possible that during the early stages of colonial occupation of the South Texas region the nearest possible ethnic group and mission that could produce ceramics to the numerous missions and presidios in South Texas would have been the Aranama from Mission Espíritu Santo de Zuñiga. On the other hand, if members of other ethnic groups that were brought into the San Antonio missions also were familiar with ceramic manufacture, it would have simplified the provisioning of the missions and their neophytes.

A similar combination of petrographic and INAA analysis was carried out on a sample of bone-tempered sherds from Mission Refugio (Hill 2002). The petrographic analysis defined five paste classes, with all but one of them (Class 0) containing bone-tempered specimens. Four of the five paste groups represent two principal technological traditions. Class 1 sherds contained between 10-40 percent silt-size to fine sand particles and between 1-15 percent bone (Hill 2002:Table G-1). Feldspar was relatively common in the paste. Fifty-seven percent of the sample analyzed fell into this class. Class 2 sherds contained between 1-3 percent quartz sand, and their bone tempering ranged from 10-15 percent. Class 2A contained a single sherd with one percent quartz sand and 20 percent bone tempering. Class 2B sherds contained between 5-15 percent quartz sand and 10 percent or more bone. It constituted seven percent of the sample analyzed. Group 1 sherds represented between 43-75 percent of the samples by analytical unit. The INAA work indicated that many of the sherds that make up the two technological traditions are made of the same locally available clay sources. For instance, 43 of the 61 (71 percent) Class 1 specimens fall within the Refugio Reference group as do 30 of the 36 (83 percent) specimens classified in Class 2. Similarly, 6 of the 8 (75 percent) Class 2B specimens are made of clay that is part of the Refugio Reference group. This pattern indicates that the same clays were used by two distinct traditions, the bone-tempered wares and the sandy paste wares, some of which contain low amounts of bone temper (see also Perttula 2002:247).

SUMMARY

This summary of ceramics manufactured by native groups following contact with Euro-American populations indicates that the impact of the interactions ranged from having little effect on Native technological traditions to dramatically influencing them. For instance, the contact period Valle Bajo Brown ware ceramic tradition of West Texas reflects a considerable amount of vessel form borrowing from Spanish Colonial vessel forms. In contrast, the East Texas historic ceramic traditions exhibit a great deal of continuity with prehistoric traditions. The South Texas and coastal ceramic traditions appear to fall between these two extremes. The Rockport ware appears to have solidly established prehistoric roots and the Goliad ware also has strong technological connections to the prehistoric Leon Plain wares although a direct link between the two wares has not yet been demonstrated. Nonetheless, there are strong technological continuities evident in both wares. Yet, at the same time, and in particular with the Goliad wares, there are signs of Spanish Colonial influence in particular in the vessel forms

that are beginning to be manufactured by Native potters using local clays and traditional pottery manufacture techniques.

The variability noted in the impact of Spanish contact on the ceramic technology of native groups may be best understood in terms of the nature of the inter-relationship between the Spanish Colonial institutions and the socio-cultural and economic fabric of the native groups that were engaged with the colonial forces. In West Texas, there was a lengthy relationship that had been established between native groups and Spanish populations beginning with the occupation of New Mexico and extending approximately 100 years longer than in East Texas. The fabric of Native society had been dramatically altered during this period by a multitude of interactions between native peoples and Spanish settlers and the church. In contrast, at the end of the seventeenth century when the Spanish began interacting with Caddo groups, the Caddo were economically rather self-sufficient and had a strong social and religions foundation that lacked for little that the Spanish could have contributed. Indeed, it was the Spanish church that found itself reliant on the Caddo populations that the padres were trying to "civilize." The power relationships tended to flow from the Caddo populations to the Spanish rather than the other way around (e.g., Barr 2007). Therefore, the Spanish living in East Texas were the recipients of Caddo material culture rather than its manipulators. This reversal of power relations seems to have had little to no influence or impact upon the character of Caddo ceramic technology.

In contrast to this socio-economic interplay, native groups in South Texas, and specifically coastal plains and San Antonio River basin groups, had a more inter-dependent relationship with Spanish Colonial institutions, both the Church and the Presidio. The hundreds of native groups that inhabited the interior coastal plains and the region between the San Antonio River and the Rio Grande were highly mobile hunter-gatherers. These groups appear to have had some basic intra-group social and religious institutions to bind them into effectively functioning entities. However, they do not appear to have had strong inter-group ties that would have bound them into strong independent supra-community entities to effectively fight or resist the impact of encroaching Spanish Colonial influences. These native populations too became suppliers of the missions and presidios with native-made pottery but in this case the power relationships were dramatically off-balance in favor of the Spanish institutions. The native potters manufactured the pottery but primarily for their own use. The few Spanish residents of the mission continued to use the majolica wares imported from Mexico. There was much less dependence of Spanish inhabitants of the mission on the pottery made by native craftsmen, and that dependence may have shown up only late in time as the church was seeking to secularize the missions.

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