Post-Pueblo, Protohistoric, and Early Mission Period Archeology in Western Trans-Pecos Texas and South Central New Mexico, A.D. 1450-1680

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INTRODUCTION

The 230 years between the demise of prehistoric Pueblo settlements at ca. A.D. 1450 and the historic Pueblo Revolt of 1680 is archeologically perhaps the most poorly known period in far west Texas and southern New Mexico. Over the past two decades an impressive amount of archeological research has been completed regarding the nature of prehistoric settlement and adaptation in the region during the several millennia preceding A.D. 1450 (see Abbott et al. 1996; Miller and Kenmotsu 1999). Likewise, several investigations in the lower valley of El Paso and elsewhere have broadened our understanding of Pueblo Revolt and Mission period settlement and material culture between 1680 and 1880 (D. Brown et al. 1994, 1995; R. Brown et al. 1999; Gerald 1990a, 1990b; Martin 1999; Miller and OLeary 1992a; Peterson and Brown 1992a, 1992b; Peterson et al. 1999; Staski 1998; Vierra et al. 1997, 1999). As a result, cultural historical and material culture aspects of the prehistoric and Spanish Colonial periods, as well as interpretations of settlement and adaptive systems during these periods, have undergone significant refinements.

However, with the possible exception of the Early Archaic period, the years between 1450 and 1680 probably remain the most poorly known interval in the entire archeological and historical sequence from the Paleoindian period to recent Historic times. Archeological evidence of post-Pueblo and protohistoric occupation by historically documented Native American groups is almost non-existent. In a comparative sense, even the rather intangible occupations by Apachean groups, or at least evidence of their passing, seem to be much better represented in the archeological record (see Adams and Tagg 1997; Carmichael 1999; Eidenbach 1990; Fulghum 1988; Katz and Katz 1974; Kenmotsu 1992; Laumbach 1992; Sale 1991, 1997; Sale and Laumbach 1989; Southward 1978; Thompson 1979, 1980). The Jornada Mogollon area of far west Texas and south central New Mexico presents a stark contrast to adjacent regions—such as the central Rio Grande valley of New Mexico and the La Junta de Los Rios district of the Presidio Bolson—where numerous Spanish Colonial period Native American and European settlements have been documented, several of which were continuously occupied from Late Prehistoric through historic times (Cloud et al. 1994; Kelley 1953, 1985, 1986; Kenmotsu 1994; Mallouf 1990; Marshall and Walt 1984; Shackelford 1951).

Archival and ethnohistorical research provides conclusive evidence, albeit ambiguous and confusing, of the existence of numerous tribal groups, or *naciones* (nations), described under such names as the Mansos, Gorretas, Tanpachoas, Caguates, Sumas, Janos, and Jocomes in far west Texas, southwestern New Mexico, and northwestern Chihuahua (Bandelier 1890; Benavides 1965; Bolton 1916; DiPeso 1974, Vol. III; Forbes 1957, 1959; Gerald 1973, 1974a, 1990a; Griffen 1969, 1979; Hammond and Rey 1929, 1966; Hackett 1923-1937; Hodge 1907; Hughes 1914; Kenmotsu 1994; Naylor and Polzer 1986; Scholes and Mera 1940). Unfortunately, the archeological record seems to vanish about the point where the archival paper trail begins. Using the limited information available from the historical record, there have been some sporadic efforts to define various archeological expectations for the post-Pueblo and protohistoric periods (Beckett 1985, 1998; Beckett and Corbett 1992; Carmichael 1986; Everitt 1977; Lockhart 1998a, 1998b; Naylor

1969; Sale 1991, 1997). Given the almost complete absence of documented settlements and the extremely limited understanding of material culture for this period, most archeological reviews have been primarily structured in terms of presenting negative evidence and are therefore rather conjectural.

This article provides an updated and critical review of the extant chronometric and material culture evidence for settlements between 1450 and 1680 (Figure 1), a 230 year span between the presumed abandonment of prehistoric El Paso Puebloan settlements and the historically documented Pueblo Revolt of New Mexico when Tiwa, Piro, Tompiro, and other tribal groups loyal to the church and crown were resettled at the Ysleta and Socorro missions established in the El Paso lower valley (Hackett and Shelby 1942). However, the following discussion does not focus on historical accounts and ethnohistorical studies, as these are available in a number of primary and secondary sources. The specific intent is to examine the regional archeological evidence for post-Pueblo and protohistoric occupation, the problems of recognition and verification underlying this evidence, and hopefully to offer some new insights regarding the nature of settlement and material culture for this period. In turn, these discussions are related to the ethnohistoric accounts to assess how well these disparate sources of information correspond with each other.

THE POST-PUEBLO AND PROTOHISTORIC PERIODS: A REVIEW OF THE CHRONOMETRIC EVIDENCE

A comprehensive and unequivocal body of chronometric and archeological information indicates that Pueblo settlements across the Jornada Mogollon region of the western Trans-Pecos and southern New Mexico were abandoned around A.D. 1450 (Miller and Kenmotsu 1999). It is evident that a drastic reduction in the number of radiocarbon-dated features and contexts occurs between A.D. 1400-1500 (Figure 2). Using this as a proxy measure of feature construction and site formation, after A.D. 1450, rates of construction and use of major feature categories such as thermal features, habitation structures, middens, and storage or refuse pits declined to levels equivalent to the Middle Archaic or earlier. Another factor indicating that profound social and demographic changes took place is that the El Paso Brownware ceramic tradition, representing nearly 1200 years of relative technological continuity in manufacturing methods and raw material utilization, disappears from the archeological record after A.D. 1450. These patterns clearly suggest a major decrease in settlement intensity and a substantial decline in regional population occurred during the 15th century.

The demise of El Paso phase pueblo settlements after A.D. 1450 presents an instance, along with Casas Grandes, of abandonment of nucleated settlements by agricultural populations throughout much of the southern Southwest during the 15th century. Although several scenarios have been proposed for the decline of Puebloan occupations in West Texas (e.g., Upham 1984), two are relevant here. Foremost is the view that terminal events in the El Paso phase were a result of environmental change (an extended period of drought), or that such change was coupled with subsistence failure resulting from an over-specialized agricultural economy (O'Laughlin 1980; Upham 1984). A second position is that the fall—as well as the rise—of the Jornada pueblo system was a direct result of the influence of the Casas Grandes regional system (Schaafsma 1979;

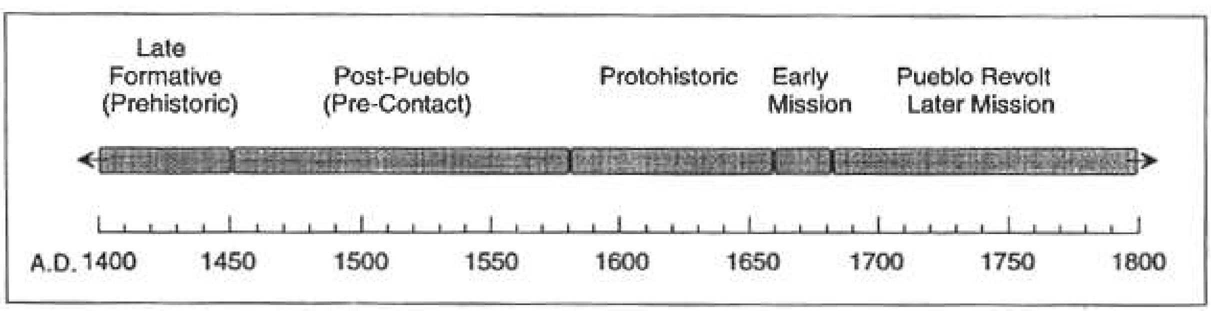


Figure 1. Chronological period designations used in this study.

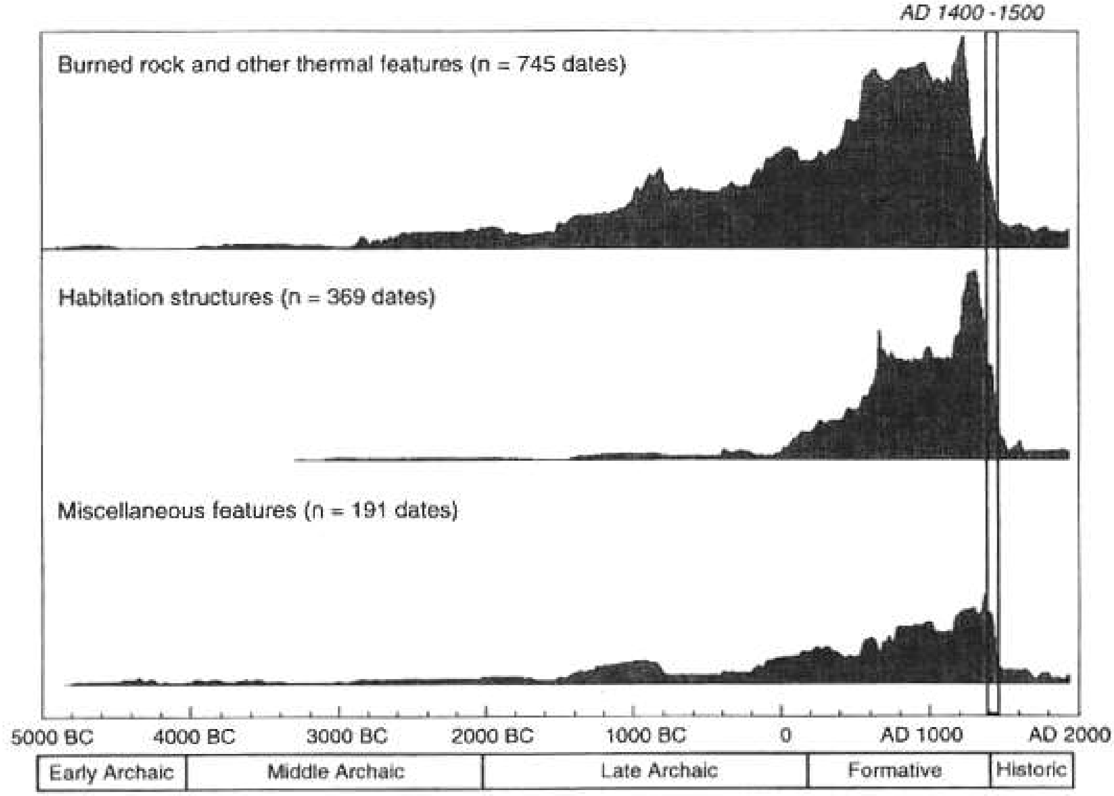


Figure 2. Summed probability histograms for 1305 radiocarbon age estimates from El Paso, Hudspeth, and Culberson counties of West Texas and Dona Ana and Otero Counties of south central New Mexico. Time interval of A.D. 1400 to 1500 is indicated by the vertical bar. Note the sharp decline in radiocarbon dates and dated features during this period.

Wimberly 1979). Kelley (1990; Kelley and Kelley 1991) proposes a similar explanation for developments during the La Junta phase in the eastern Trans-Pecos. Regardless of the nature of the underlying causes, however, the demise of the Pueblo settlement system clearly represents a profound change in social, economic, and subsistence systems in far west Texas.

Archeological and historical evidence indicates that quite a different series of events took place at this time in the eastern Trans-Pecos. Settlements in the La Junta del Los Rios district may not have been abandoned around 1450, and may have been occupied until 1683 when Spanish missions were established in the Presidio Bolson. This period of time has been named the Concepcion phase (Kelley et al. 1940; Kelley 1985), but the dates are tentative. In contrast to the prominence of El Paso Brownware ceramics during the La Junta phase, locally produced ceramics such as Chinati Plain, Capote Red-on-Brown, and Paloma Red-on-Gray dominate Concepcion phase assemblages (Kelley et al. 1940). Intrusive wares from elsewhere, such as New Mexico or northern Chihuahua, are absent (Kelley 1986). More recently, Mallouf (1985, 1990, 1993) has documented a unique archeological manifestation designated the Cielo Complex. One of the more distinctive aspects of Cielo Complex settlements is an architectural style consisting of oval or round house enclosures measuring 2.7 to 3.4 m in diameter that are bounded by stacked stones. Radiocarbon dates indicate occupations dating between ca. A.D. 1330 and 1680 (Mallouf 1990). The particular settlement and adaptive system represented by the complex crosscuts the La Junta and Concepcion phases and offers intriguing support for a continuum of hunter-gatherer adaptations coexistent with agriculturalists in the Presidio Bolson, one that transcended the demise of agriculturally-based settlement systems in the adjacent Jornada Mogollon region.

No such distinctive continuity has been detected in the archeological record in far west Texas and south central New Mexico. Virtually all of the 206 architectural structures dated by radiocarbon and archeomagnetism in the region can be confidently assigned to prehistoric periods prior to A.D. 1450/1500 or date after 1680. The earliest identified historic architectural feature is a collapsed and burned *jacal* structure at the Ysleta WIC site (Miller and O'Leary 1992a), a Pueblo Revolt occupation dating between 1680-1725. Unlike areas to the east and north, no identifiable ceramic tradition such as the Chinati, Capote, and Paloma wares of the La Junta District or the Rio Grande Glazewares of the middle Rio Grande (Rio Abajo) of New Mexico has been identified in far west Texas.

In the absence of a distinct and visible archeological record, the question of what transpired in the two centuries after A.D. 1450 has remained a perplexing one. Wimberley (1979), Beckett (1985), Tainter (1985), and Carmichael (1986) for the Jornada region, and Mallouf (1990) for periods after the end of the La Junta phase in the Big Bend region, take issue with the concept of abandonment, suggesting that populations reverted to a less intensive hunting-gathering subsistence organization similar to that practiced by indigenous groups observed by Spanish explorers during the 16th and early 17th centuries. Such adaptations may have left few visible archeological traces, although the Cielo Complex represents an archeologically distinct entity of this period in the Big Bend region (Mallouf 1985, 1990).

Offering a different perspective, Beckett and Corbett (1992; see also Beckett 1985) suggest that the existence of several radiocarbon and thermoluminescence dates postdating A.D. 1450 provide evidence of continued occupation of Pueblos through the 1500s. They further propose that El Paso phase Puebloan populations were ancestral to indigenous Manso groups described by early Spanish chroniclers. Beckett (1998) has recently extended this argument to include adjacent geographic regions, proposing ancestral connections between various prehistoric cultures in central and southeastern New Mexico and the historically documented Suma and Jumano groups of the Trans-Pecos.

In support of post-Pueblo occupations and settlement continuity, Beckett and Corbett (1992:43-47) provide descriptions of several chronometric age estimates thought to represent occupations of this period. Since this argument, as well as subsequent discussions in the literature (e.g., D. Brown et al. 1994; Lockhart 1998b; Peterson and Brown 1992a), have been phrased primarily in terms of post-A.D. 1450, or late, chronometric dates, it is important to review the accuracy and reliability of this evidence.

A critical appraisal of the extant radiocarbon database for the region indicates that several post-A.D. 1450 radiocarbon age estimates suffer from serious contextual, analytical, or interpretive problems. One such example is Pickup Pueblo in northeast El Paso, Texas. Beckett and Corbett (1992:44, after Gerald 1988:45-46) cite an uncorrected and MASCA-calibrated age estimate of A.D. 1530 $\pm$ 100 (RL-916) from Test Pit 2 situated outside the primary room block. Descriptions of the sample and context provided in the field notes and published report are vague, with some confusion over the composition of the sample, with both corn and charcoal specified in the report, field notes, and sample submission form.

To resolve this problem and clarify the dating of the pueblo, a portion of the original radiocarbon sample was obtained from the Centennial Museum, University of Texas at El Paso, and submitted to Beta Analytic, Inc. The results of the two chronometric studies are provided in Table 1. The measured ^{13}C value of -11.5 ‰ for the replicate sample falls well within the range of C_4 photosynthetic pathway plants of which *Zea mays* is a member. It is reassuring that the measured ^{14}C ages of the original and replicate samples differ by only 20 radiocarbon years. However, correction of the Beta Analytic ^{14}C age results in a conventional age estimate of 700 B.P. Since the sample material used for the original RL-916 date was corn, the age estimate should be corrected by adding 220 years. The calibrated age ranges for the Beta Analytic, Inc. and RL samples fall entirely within the accepted time interval of the El Paso phase. Moreover, two additional dates recently obtained from rooms and exterior activity areas at Pickup Pueblo fall securely within this period.

This illustrates one of the problems that may arise from an incautious use of radiocarbon data to identify Historic period occupations. Several age estimates listed by Beckett and Corbett were not corrected for isotope fractionation, nor calibrated for fluctuations in atmospheric carbon using recent dendrochronological calibration curves. In some cases, calendar dates were calculated by subtracting the radiocarbon age B.P. (often uncorrected) from A.D. 1950. Calibration will have various effects on the dates, in addition

Table 1. Results of Radiocarbon Dating for Replicate Sample from Test Pit 2, Pickup Pueblo.

Laboratory #	Sample	14C Age BP	$\delta^{13}C$	Corrected age BP	Calibrated age
RL 916	Corn/Charcoal?	460 ± 110 BP	None	Not corrected	AD 1330 (1530) 1730[1] AD 1290 (1439) 1660[2]
Beta 84959	Corn	480 ± 60 BP	-11.5	700 ± 60 BP	AD 1220 (1290) 1410[2]
RL 916	Corn	460 ± 110 BP	-11.5*	680 ± 110 BP*	AD 1160 (1294) 1440[2]

* Hypothetical age estimate using assumed isotope value and corrected age based on results of replicate sample Beta 84959
[1] MASCA dendrochronological calibration curve used by Radiocarbon Limited (RL)
[2] Decadal calibration dataset and curve of Stuiver et al. (1998)

to providing a statistical probability distribution (age range) that more realistically represents an interval in which the true age may fall. Several dates mentioned by Beckett and Corbett clearly fall within the El Paso phase when their calibrated age ranges are examined. As seen in the example above, the use of older calibration curves (e.g., Clark 1975; Damon et al. 1974; Klein et al. 1982: Ralph and Michael 1970) will provide different calendar age ranges and intercepts than more recent versions. Calibration curves also impose structure on the age ranges, and it is often useful to examine probability density histograms for particularly important or ambiguous dates.

Corrections for isotopic fractionation (^{13}C) generally have less pronounced effects for wood charcoal samples of plants belonging to the C_3 photosynthetic pathway. However, significant age errors are possible if the particular sample consisted of materials derived from plant species of the C_4 or CAM photosynthetic pathways and the age estimate was not corrected for isotopic fractionation. Figure 3 illustrates the ranges of age corrections documented for samples from the study area. If a particular sample was charred plant material from common C_4 pathway plant species, such as Mormon Tea (*Ephedra* sp.), Dropseed (*Sporobolus* sp.), or Fourwing Saltbush (*Atriplex* sp.), or charred fragments of cacti or succulents of the CAM pathway (*Agave* sp., *Yucca* sp., *Dasylirion* sp.), the reported uncorrected radiocarbon age may be too young by 30 to 230 years. A substantial number of charcoal samples lacking a species identification have ^{13}C values and age corrections ranging far outside the range of C_3 species (see Figure 3), indicating that these sample materials are from C_4 or CAM plants.

The majority of ^{13}C corrections tend to increase the radiocarbon age of a sample. Thus, it is possible that an uncorrected date of apparent historic age will actually be older. Even dates obtained from common C_3 wood species such as mesquite (*Prosopis* sp.), creosote (*Larrea* sp.), and cottonwood (*Populus* sp.) may occasionally require correction factors of up to 80 years. In such cases, apparent post-Pueblo age estimates that fall near the prehistoric/post-Pueblo boundary would be pushed back securely into the prehistoric period if they had been corrected. Conversely, ^{13}C corrections occasionally reduce the age of some C_3 wood charcoal samples, and some borderline prehistoric dates could actually fall within the post-Pueblo period. Such problems underscore the importance of correction factors in eliminating one of several uncertainty factors associated with radiocarbon dating. Unfortunately, in most cases the composition of the sample for uncorrected dates is unknown and this potential source of error cannot be evaluated or reconciled.

Some apparently late dates may have been obtained from samples that incorporated modern or recent materials, including organic material originating from non-cultural events. The current radiocarbon database lists nine samples where radiocarbon measurements were in excess of the modern standard, indicating bomb carbon and thus a post-1950

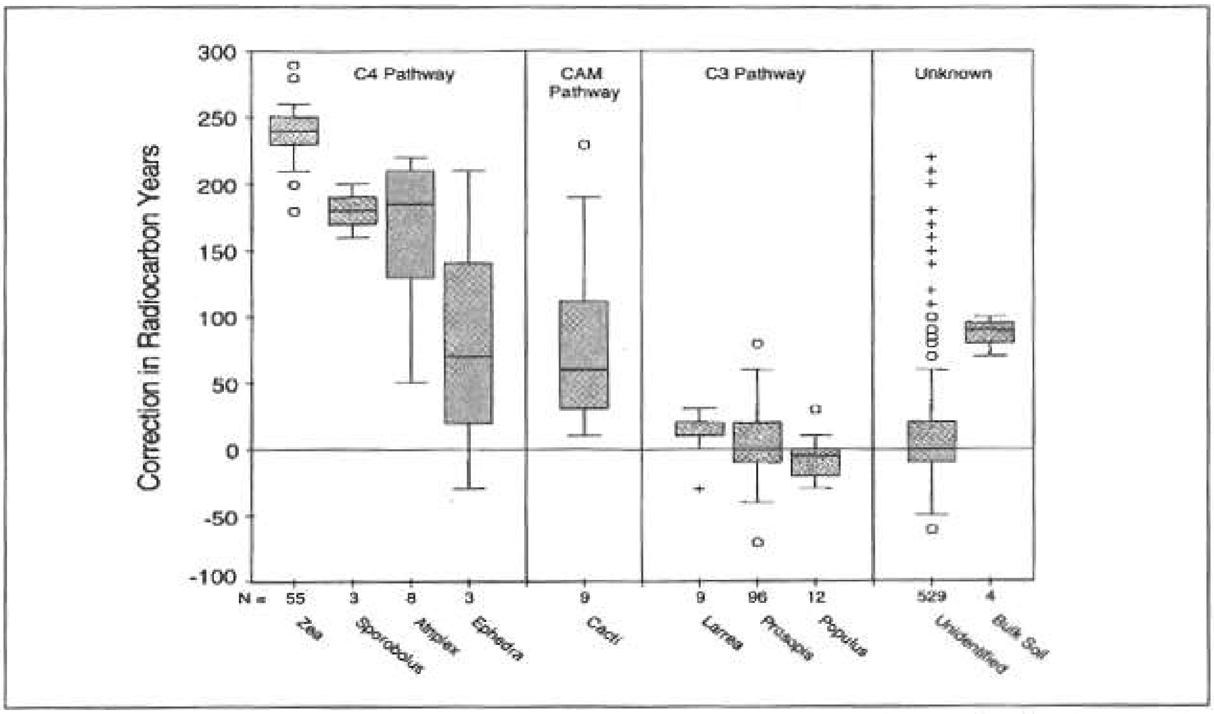


Figure 3. Correction factors in radiocarbon years for plant species common among archeological radiocarbon samples in West Texas and southern New Mexico. Note statistical outliers among series of unidentified samples, indicating the presence of C_4 and CAM plant species.

origin. All of these samples were thought to have been collected from prehistoric or early historic contexts, but the features were either modern or consisted of decomposed roots or other recent organic matter. Mesquite roots tend to decompose into dark brownish-black fragments in semi-arid coppice dune environments, and without close inspection this material can be misidentified as prehistoric or historic charcoal of cultural origin. While such samples will usually provide post-1950 dates, an occasional sample may have older wood of sufficient age to yield a B.P. age estimate[1] that could be mistaken for a late cultural radiocarbon date.

Random laboratory counting errors or contamination during the collection, preparation, or storage of samples may also contribute to errors, although difficult to evaluate in a consistent manner. Heliographic effects may also result in highly anomalous dates, particularly for samples composed of annual plant materials. Such effects may be detected if replicate samples are analyzed or if three to five samples are submitted from the same context. In many cases, it is common for at least one anomalous date to appear among a series of submitted replicate or multiple samples from a specific context (see Camilli et al. 1988; Hard 1983; Mauldin et al. 1998; Miller 1996).

All these factors suggest caution in the interpretation of late radiocarbon dates or, for that matter, any radiocarbon date. Several of these effects can be eliminated or minimized through well-designed chronometric studies, including careful sample selection and documentation procedures. A critical evaluation of documentation for previously submitted samples may help discover the factors underlying the apparent reported ages, but unfortunately, detailed documentation that would provide information on context and sample composition is generally absent for the majority of samples.

With these factors in mind, I return to the issue of late dates. While several of the specific cases mentioned by Beckett and Corbett (1992) are in error or otherwise problematic, not all are without merit, and their premise of the existence of late chronometric dates deserves further consideration. Indeed, several pueblos aside from Pickup Pueblo have a small number of age estimates that extend slightly past A.D. 1450, as do several additional features and other archeological contexts throughout the region.

Chronometric methods utilized in the region include radiocarbon, archeomagnetism, obsidian hydration, and luminescence dating. Twenty-two archeomagnetic dates have been obtained from pueblo rooms, but only one from Firecracker Pueblo has a portion of the age range that exceeds A.D. 1400. Otherwise, the archeomagnetic dates closely and consistently correspond with the series of associated Pueblo radiocarbon dates ranging between A.D. 1275 and 1450 (Miller and Kenmotsu 1999). Beckett and Corbett (1992) reference a ceramic thermoluminescence (TL) date of A.D. 1561 ± 38 (WU-77d1) from pueblo site FB6913 (EPCM 31:106:3:1642) during Whalen's (1980, 1985) chronometric study in the Hueco Bolson. They acknowledge Whalen's (1980) observation that the series of TL dates were too young, a position subsequently verified by additional comparative studies that have confirmed ceramic TL dates are systematically younger than associated radiocarbon dates by 250 to 450 years (Miller 1996). Subtracting this offset factor would bring the TL date from FB6913 in line with the expected time interval for Late Formative pueblos in the region. Moreover, two obsidian hydration studies have been conducted at FB6913. As part of Whalen's (1980) original chronometric study that included the TL dates, several obsidian artifacts were submitted to the Obsidian Hydration Laboratory, University of California at Riverside. Rim measurements ranged from 3.67-6.86 microns. A later unpublished study by Mark Bentley submitted an additional 10 samples to Chris Stevenson at Diffusion Labs. Again, rim measurements ranged between 3.30-10.96 microns. It is noteworthy that neither of these studies had rims measuring between 0.5 and 2.0 microns as provisionally identified at other late sites (see below). Obsidian hydration rim measurements may help substantiate the identification of Historic period contexts, but the current resolution and numerous contextual and methodological problems of the method limit its use to this corroborative role.

The current radiocarbon database for West Texas and southern New Mexico contains information on 1523 age estimates from 1095 individual contexts. Table 2 and Figure 4 review of the most convincing candidates for radiocarbon age determinations that may represent post-A.D. 1450 occupations. As a general rule, most age estimates between 550 and 10 radiocarbon years B.P. were included in the first selection. The second selection of candidates was based on an evaluation of sample context and composition, the precision of the age estimate, and whether it was associated with multiple dates or other chronological information. An additional nine dates extend through the historic period, but did not meet these criteria for inclusion. For example, Chrisman et al. (1996:358) report a corrected date of 350 ± 70 B.P. (UCR-2625) from Zone A at Pendejo Cave. However, the sample consisted of unburned twigs and other organic matter extracted from a packrat midden, and there is no demonstrable association with the limited amount of cultural materials recovered in Zone A. Accordingly, this date was excluded from further consideration. Despite these criteria, the list of 92 dates nevertheless represents a liberal selection: several are uncorrected, a few are from unreliable sample materials (e.g., bulk soil), and some are questionable on the basis of ambiguous archeological contexts or associations.

Table 2 and Figure 4 are divided into three segments according to their association with: (a) Late Formative period Pueblo contexts or other architectural features; (b) miscellaneous thermal features and rockshelter deposits; and (c) known Pueblo Revolt and Mission period contexts in the Rio Grande valley. The uppermost group includes 28 potentially late dates from several El Paso phase pueblos or isolated rooms in the Hueco and Mesilla bolsons, including La Cabrana, Hot Well, Sgt. Doyle, Firecracker, and Embree Pueblos and the DACA Pithouse site. One date was from a charred maize cob collected from the surface of an isolated room at LA72147 in the San Andres Mountains bajada north of El Paso. With the exception of three dates from the DACA pithouse site, the majority are corrected for isotopic fractionation.

The uppermost 13 dates of this group either terminate at A.D. 1450, or only minor portions of their probability distributions extend to A.D. 1500. A cursory inspection of the 2-sigma age ranges for 12 other dates would appear to indicate a significant occupation after A.D. 1450. However, this group of 12 dates represents only 10 percent of the 115 dates from pueblos and isolated rooms, the combined sequence clearly and unambiguously terminating at A.D. 1450 (Miller and Kenmotsu 1999). Virtually all the dates in this group are associated with sites, or in most cases specific contexts, from which two or more older dates have been obtained. Moreover, when probability density areas are examined,

Table 2. Post-A.D. 1450 Radiocarbon Dates from West Texas and Southern New Mexico.

Site	Site or Project Name	Feature	Sample Composition	Lab No.	13C Age (B.P.)	δ[13]C	Corrected age B.P.
Late Formative Pueblos (A.D. 1275-1450)							
LA1671	La Cabrana Pueblo	Room 4[b]	Unid. charcoal	UCR 1525	n/a	n/a	230 ± 80
LA2865	Embree Pueblo	Room N2[a]	*Zea mays*	Beta 72447	280 ± 50	-10.5	520 ± 50
LA72147[c]	San Andres Mtns.	Surface[a]	*Zea mays*	Beta 31616	230 ± 50	-10.2	470 ± 50
LA26788	DACA Pithouse	F.2[a]	Unid. charcoal	Beta 5933	550 ± 50	none	
LA26788	DACA Pithouse	F.1[a]	*Zea mays*	Beta 81919	280 ± 70	-11.2	510 ± 70
LA26788	DACA Pithouse	F.6 Room 1[a]	*Zea mays*	Beta 81922	410 ± 50	-20.3	490 ± 50
LA26788	DACA Pithouse	F.9[a]	*Prosopis* charcoal	Beta 81917	500 ± 50	-24.5	510 ± 50
LA26788	DACA Pithouse	F.3[a]	Unid. charcoal	Beta 6447	530 ± 50	none	
LA26788	DACA Pithouse	F.6 Room 1[a]	*Prosopis* charcoal	Beta 6448	200 ± 110	none	
FB6363	Hot Well Pueblo	A1/Room 2[a]	*Prosopis* charcoal	Beta 58235	490 ± 80	-21.1	550 ± 80
FB6363	Hot Well Pueblo	A1/Room 16	*Prosopis* seeds	Beta 76405	540 ± 60	-24.3	550 ± 60
FB6363	Hot Well Pueblo	A1/Room 15[a]	*Prosopis* charcoal	Beta 58236	430 ± 70	-20.3	510 ± 70
FB6363	Hot Well Pueblo	A1/Pit 2[b]	*Zea mays*	Beta 53355	250 ± 50	-10.9	480 ± 50
FB6363	Hot Well Pueblo	A1/Room 17[a]	*Sporobolus* charcoal	Beta 72428	280 ± 50	-12.7	480 ± 50
FB6363	Hot Well Pueblo	A1/Room 22[a]	*Zea mays*	Beta 53353	240 ± 50	-11.1	470 ± 50
FB6363	Hot Well Pueblo	A1/Room 1[b]	*Zea mays*	Beta 58243	240 ± 60	-11.0	470 ± 60
FB6363	Hot Well Pueblo	A1/Room 17[a]	*D. wheeleri* stalk	Beta 76407	360 ± 70	-18.0	470 ± 70
FB6363	Hot Well Pueblo	A1/Room 17[a]	*Prosopis*/Jun. charcoal	Beta 58242	400 ± 50	-23.3	430 ± 50
FB6363	Hot Well Pueblo	A1/Room 17[a]	*A. lechuguilla* stalk	Beta 72429	180 ± 60	-11.0	410 ± 60
FB6363	Hot Well Pueblo	A1/Room 17[a]	*Populus* charcoal	Beta 76408	410 ± 60	-24.3	420 ± 60
FB6363	Hot Well Pueblo	A1/Room 3[a]	*Prosopis* charcoal	Beta 76410	80 ± 50	-26.1	60 ± 50
FB6874	Sgt. Doyle Pueblo	Room 9[a]	*Populus* charcoal	Beta 76427	430 ± 70	-26.1	410 ± 70
41EP25	Firecracker Pueblo	Room 13[b]	*Phaseolus* sp.	Beta 72423	540 ± 50	-27.1	510 ± 50
41EP25	Firecracker Pueblo	Rm 25/F.140[b]	*Sporobolus* charcoal	Beta 72426	350 ± 90	-15.5	510 ± 90
41EP25	Firecracker Pueblo	Room 13[b]	*Zea mays*	Beta 30831	230 ± 50	-10.1	470 ± 50
41EP25	Firecracker Pueblo	Room 2[b]	*A. lechuguilla* stalk	Beta 72422	280 ± 60	-13.1	470 ± 60
41EP25	Firecracker Pueblo	Rm 14/F.55[b]	*Zea mays*	Beta 72424	180 ± 50	-12.2	390 ± 50
41EP25	Firecracker Pueblo	Room 4[b]	*Y. elata* leaves	Beta 72421	380 ± 50	-23.6	400 ± 50
Spanish Colonial Period Contexts (1680-Late 1800s)							
41EP38	Socorro Mission	F.2	Unid. charcoal	Beta 71826	200 ± 60	-22.8	240 ± 60
41EP40	San Elizario NR Dist	Floor 1	Unid. charcoal	Beta 52736	410 ± 60	none	

Table 2. *(Continued)*

Site	Site or Project Name	Feature	Sample Composition	Lab No.	13C Age (B.P.)	$\delta^{13}C$	Corrected age B.P.
41EP1532	Old Socorro Mission	Trench 15	Unid. charcoal	Tx 7518	270 ± 50	-24.4	280 ± 50
41EP2968	Socorro area	F.1	Peach Pit	Beta 91794	170 ± 40	-22.4	210 ± 40
41EP3010	Socorro area	F.2	Unid. charcoal	Beta 71065	130 ± 70	-17.9	250 ± 70
41EP3011	Socorro area	F.5	Unid. charcoal	Beta 71067	150 ± 80	-27.4	110 ± 80
41EP3797	Old Socorro Mission	Stratum 17 F.2	*Prosopis* charcoal	Beta 91153	100 ± 50	-23.5	120 ± 50
41EP4600	San Elizario-Garcia	Floor 1	Unid. charcoal	Beta 58868	50 ± 60	none	
41EP4600	San Elizario-Garcia	Floor 2	Unid. charcoal	Beta 58869	110 ± 60	none	
41EP4609	San Elizario NR Dist	Stratum 4	*Zea mays*	Beta 91154	Mod ± 50	-8.2	95 ± 50
41EP4623	San Elizario NR Dist	Stratum 5	*Prosopis* charcoal	Beta 91155	90 ± 50	-22.3	130 ± 50
41EP4629	San Elizario NR Dist	Stratum 28 F.5	*Zea mays*	Beta 91156	Mod ± 80	-16.2	50 ± 80
41EP4631	San Elizario NR Dist	Stratum 4 F.1	*Prosopis* charcoal	Beta 91157	Mod ± 50	-22.2	20 ± 50
41EP4633	San Elizario NR Dist	Stratum 7	Peach Pit	Beta 91158	0 ± 50	-20.2	80 ± 50
41EP4634	San Elizario NR Dist	Stratum 5	Peach Pit	Beta 91159	Mod ± 50	-20.8	40 ± 50
41EP5203	Ysleta HUD N	F.7	Peach pit	Beta 84114	150 ± 70	-25.1	150 ± 70
41EP5204	Ysleta HUD S	F.2 Str.1	*Xanthium* charcoal	Beta 84643	130 ± 70	-18.4	230 ± 70
41EP5204	Ysleta HUD S	F.2 Str.1	Unid. seeds	Beta 84644	190 ± 60	-25.5	190 ± 60
LA# n/a	Paraje San Diego	F.1	Unid. charcoal	n/a	n/a		230 ± 50
LA# n/a	Paraje San Diego	F.2	Unid. charcoal	n/a	n/a		380 ± 60
LA# n/a	Paraje San Diego	F.19	Unid. charcoal	n/a	n/a		140 ± 60
Miscellaneous Sites and Features with Post-A.D. 1450 Dates							
LA # n/a	Caballero Canyon	F.1	Unid. charcoal	n/a	325 ± 55	none	
LA # n/a	Altamira #1	None	Unid. charcoal	I-2226	195 ± 100	none	
LA # n/a	Pena Blanca shelter	10N/02W	Unid. charcoal	Beta 6859	520 ± 60	-24.8	530 ± 60
LA # n/a	NAHO - AIII/U3NW	F.4a	Unid. charcoal	Beta 18698	480 ± 100	none	
LA26780	DACA Manso	Hearth 1[a]	Unid. charcoal	Beta 5932	340 ± 70	none	
LA39143	Rhodes Canyon	F.3	Unid. charcoal	DIC 2684	190 ± 50	none	
LA49340c	Navajo-Hopi	F.3	Unid. charcoal	Beta 11239	360 ± 50	none	
LA57070	"A" Mountain Project	F.3[a]	Bulk soil	Beta 71118	510 ± 60	none	
LA64087	GBFEL-TIE	F.2[b]	Unid. charcoal	Beta 23916	n/a	n/a	540 ± 90
LA64087	GBFEL-TIE	F.3[b]	Unid. charcoal	Beta 23925	420 ± 70	-23.9	440 ± 70
LA67716	Cox Ranch	F.2	Unid. charcoal	Beta 34960	130 ± 50	-24.6	130 ± 50
50LA72135	San Andres Mtns.	None	Unid. charcoal	Beta 31615	70 ± 100	-18.8	170 ± 100
LA72138	San Andres Mtns.	F.1	Unid. charcoal	Beta 31621	520 ± 100	-23.7	540 ± 100

Table 2. *(Continued)*

Site	Site or Project Name	Feature	Sample Composition	Lab No.	13C Age (B.P.)	$\delta^{13}C$	Corrected age B.P.
LA72151	San Andres Mtns.	F.1	Unid. charcoal	Beta 31613	210 ± 50	-22.8	240 ± 50
LA72152	San Andres Mtns.	None	Unid. charcoal	Beta 31612	50 ± 60	-22.7	80 ± 60
LA72169	San Andres Mtns.	None	Unid. charcoal	Beta 31619	230 ± 70	-21.3	290 ± 70
LA72860	San Andres Mtns.	None	*Prosopis* charcoal	Beta 31829	310 ± 50	-23.7	330 ± 50
LA107928	Holloman AFB Survey	F.1	*Prosopis* charcoal	Beta 84070	180 ± 40	-23.7	200 ± 40
LA107246	Santa Teresa BP	F.1	*Prosopis* charcoal	Beta 110458	60 ± 50	-26.4	40 ± 50
LA107246	Santa Teresa BP	F.3	*Prosopis* charcoal	Beta 110460	90 ± 50	-25.3	90 ± 50
HAR163	Holloman AFB Survey	F.2	Unid. charcoal	Beta 82099	280 ± 60	-22.7	320 ± 60
HAR163	Holloman AFB Survey	F.2	*Atriplex/Prosopis* charcoal	Beta 87854	130 ± 50	-18.6	240 ± 50
HAR164	Holloman AFB Survey	F.1	Unid. charcoal	Beta 82100	0 ± 110	-11.1	140 ± 110
HAR166	Holloman AFB Survey	F.3[b]	Unid. charcoal	Beta 82104	270 ± 60	-24.8	270 ± 60
HAR166	Holloman AFB Survey	F.3[b]	*Prosopis* charcoal	Beta 87855	280 ± 50	-24.3	290 ± 50
HAR166	Holloman AFB Survey	F.6[b]	Soil organics	Beta 87856	180 ± 60	-15.2	340 ± 60
FB1613	Fillmore Pass	F.8[b]	Unid. charcoal	Beta 26614	370 ± 50	none	
FB1613	Fillmore Pass	F.8[b]	Unid. charcoal	UGa 5910	56 ± 55	-26.7	84 ± 55
FB1613	Fillmore Pass	F.95[b]	Bulk soil	Beta 30354	210 ± 90	none	
FB9369	Pintada Cave	Zone A	*Fallugia* charcoal	Beta 72437	160 ± 60	-24.5	180 ± 60
FB12072	Small Site Project	F.12[b]	Unid. charcoal	Beta 43209	240 ± 70	-22.9	270 ± 70
FB12445	Hueco Mtn. Project	F.44[b]	Unid. charcoal	Beta 58426	520 ± 90	-25.9	510 ± 90
FB13169	91-07 HMAP	F.2[b]	Unid. charcoal	Beta 65368	500 ± 60	-25.2	500 ± 60
FB13169	91-07 HMAP	F.37[b]	Unid. charcoal	Beta 65358	520 ± 70	-25.0	520 ± 70
41EP n/a	Castner 71	F.3[a]	Unid. charcoal	UGa 2288	520 ± 115	none	
41EP493c	Keystone 33	Pit 7[b]	Unid. charcoal	RL 1165	400 ± 110	none	
41EP1590	Vista Hills	F.9[b]	Unid. charcoal	Beta 7910	170 ± 50	none	
41EP2770	Loop 375	F.2[b]	Unid. charcoal	Beta 26043	390 ± 110	-26.0	370 ± 110
41EP2933	Westport	F.1	Unid. charcoal	Beta 79607	500 ± 50	-24.7	510 ± 50
41EP2970	Vista del Sol	F.103	Unid. charcoal	Beta 47109	180 ± 50	-23.0	210 ± 50
41EP2970	Vista del Sol	F.103	Unid. charcoal	Beta 59974	70 ± 80	-24.1	90 ± 80
41CU008	Granado Cave	Burial 1[a]	Unid. wood	Tx 2829	510 ± 60	-25.8	500 ± 60
41HZ504	Samalayuca	F.1	Unid. charcoal	Beta 91843	280 ± 60	-21.3	340 ± 60

a Indicates one or more earlier dates obtained from the same feature or context
b Indicates one or more earlier dates obtained from other features or contexts at the site
c Included in discussion of late dates in Beckett and Corbett (1992:43-47)

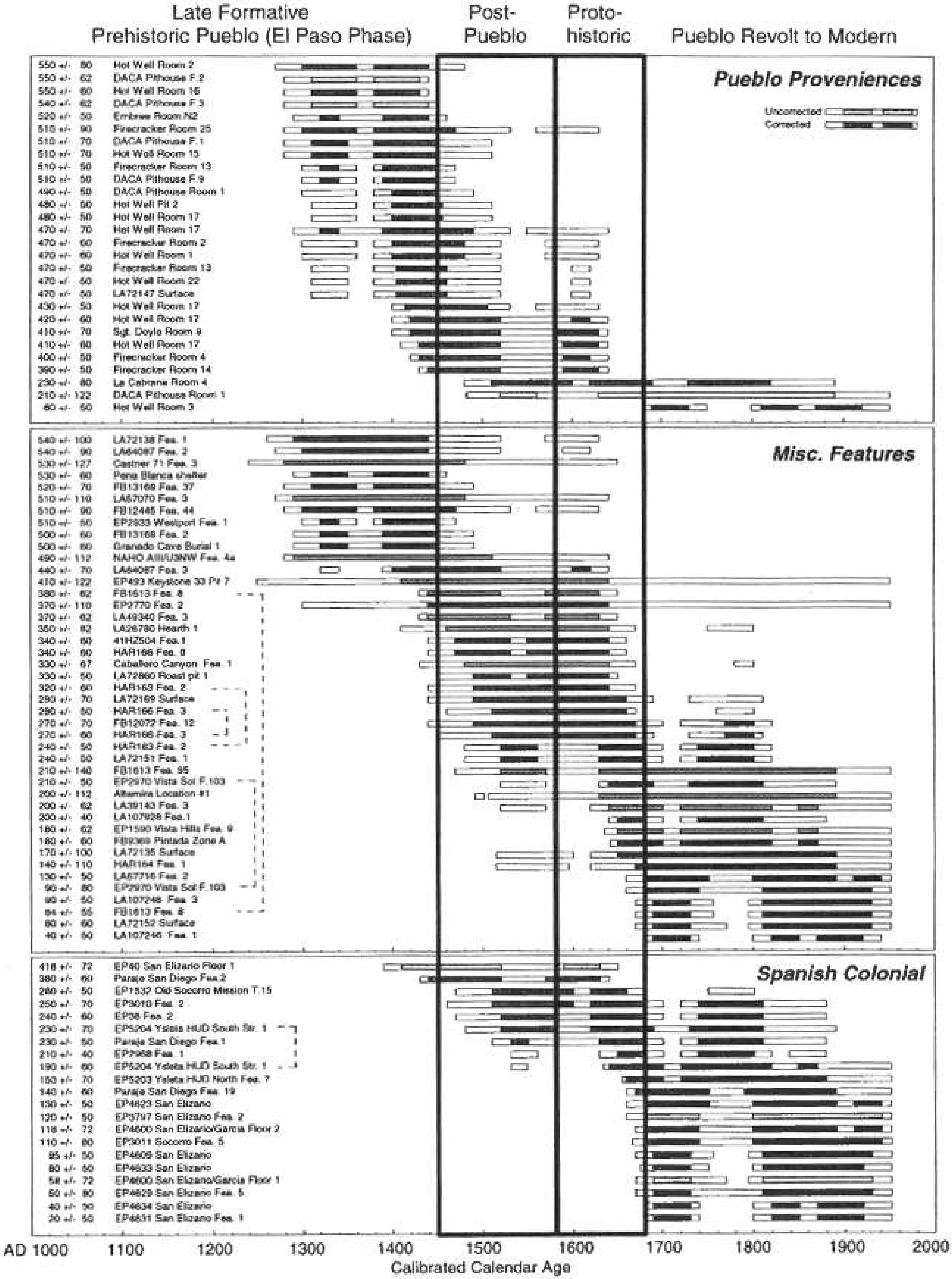


Figure 4. Calibrated 2-sigma age ranges for late radiocarbon dates from West Texas and south central New Mexico. Dates are arranged according to three major contexts: prehistoric pueblos, miscellaneous hearth features or rockshelter deposits, and Spanish Colonial settlements in the El Paso Lower Valley. Vertical bars indicate time intervals of interest for present discussion.

whether individually or as a group, the most statistically likely true ages of the samples range between A.D. 1400 and 1500. Accordingly, the most parsimonious interpretation is that these dates represent the terminal occupation period of pueblos at ca. A.D. 1450, although the possibility that some occupations lasted until A.D. 1500 cannot be discounted.[2]

The three lowermost dates in the pueblo group from La Cabrana, Hot Well, and the DACA Pithouse are different from the remainder in the upper group. The date from La Cabrana is intriguing since this pueblo is situated along the lower terrace of the Rio Grande valley at the northwest limits of El Paso, and lies within the historically documented area and topographic zone inhabited by the Manso *nacion*. However, the date has a calibrated age span nearly 500 years in duration; such poor precision hinders further temporal interpretations. Four additional dates from adjacent rooms at La Cabrana consistently fall within the El Paso phase. Likewise, the date from the uppermost fill of the DACA Pithouse has an exceptionally broad calibrated age span, in addition to being uncorrected. This date is substantially younger than four additional dates obtained from floor and subfloor contexts in the pithouse, and likely represents a natural intrusion within the aeolian dune deposits comprising the upper fill. This interpretation is supported by two mesquite wood charcoal samples from aeolian fills in features adjacent to the pithouse that yielded modern (post-A.D. 1950) dates. The very late date from Hot Well Pueblo does not accord well with chronometric and archeological evidence from adjacent rooms, and this strongly suggests it represents a modern contamination or other source of error.

The lowermost group includes 21 dates from Pueblo Revolt, late Mission, and late Historic period contexts documented during several excavations in the communities of Ysleta, Socorro, and San Elizario in the El Paso lower valley and at the Paraje San Diego locality north of Las Cruces, New Mexico. With the exception of two dates from San Elizario (41EP40) and one from the Garcia Locality (41EP4600), all are corrected for isotopic fractionation. Features investigated and dated include habitation structures, hearths, pits, and various undifferentiated cultural and natural deposits. These contexts are included to illustrate the typical radiocarbon age ranges expected for occupations associated with missions and presidios established after the Pueblo Revolt of 1680. Most are securely cross-dated by the presence of indigenous Valle Bajo Brownware ceramics, glazewares and polychromes from central and northern New Mexico, majolica wares from Mexico, and temporally diagnostic metal and glass artifacts. The majority of radiocarbon age ranges from these contexts clearly fall within the expected time interval beginning at A.D. 1680 and extending through modern times.

Seven dates have 2-sigma age ranges that extend into the protohistoric and post-Pueblo periods, although four of these have calibrated age ranges of nearly 400 years. Only the uppermost three dates depart significantly from the pattern of age estimates for Spanish Colonial period contexts. Other chronological and archeological information does not support the early ranges for three of the seven dates, and in one case the cultural association of the date is questionable. The two dates from 41EP3010 and 41EP38, the present-day location of Socorro Mission, are from contexts clearly associated with Valle Bajo Brownware ceramics and other artifacts of the Pueblo Revolt and Mission periods. The date from the remnant house structure at 41EP5204 is statistically indistinguishable from another younger date obtained from this structure; both dates and the structure are associated with ceramic and metal artifacts post-dating 1750. The date from the Old Socorro Mission (41EP1532) was obtained from a charcoal fragment collected from an undifferentiated soil stratum in a backhoe trench and was not associated with a cultural feature or recognizable artifact-bearing deposit. The age estimate from this sample predates the establishment of the mission at this location by a minimum of 70 to 100 years (Gerald 1990b; Martin 1999).

The three dates from 41EP40 and Paraje San Diego provide the sole evidence of potential earlier occupations. The date from 41EP40 near the San Elizario Chapel was obtained from a clay floor or occupation surface identified in a backhoe trench near the San Elizario Mission. The compacted stratum was situated at 110 cm bs and was associated with scattered pieces of adobe or daub, charcoal, and two brownware sherds (Peterson 1993). No additional cultural deposits were observed in a second backhoe trench placed 5 m south of the feature during subsequent investigations of the locality (Vierra et al. 1997). The wood charcoal date from this context is uncorrected, and therefore the accuracy of the date and cultural context remain ambiguous. Two samples from Features 1 and 2 at Paraje San Diego have relevant age estimates. Paraje San Diego is an historically-documented campsite on the Camino Real, situated at the point where the trail leaves the Rio Grande valley and begins the crossing of the Jornada del Muerto (Staski 1998). Investigations here have documented a long period of use from protohistoric to Modern times. Based on the chronometric and ceramic data, it is likely that the campsite was used during the earliest periods of Spanish exploration. In sum, with the ambiguous exception of 41EP40, none of the archeological investigations in the Rio Grande valley have securely dated a Native American post-Pueblo or protohistoric component.

Returning to the post-Pueblo and protohistoric periods, the central group of 43 dates from miscellaneous features is particularly relevant. Twelve of the dates are not corrected for isotopic fractionation, and information on sample composition is available only for the date from LA26780. On the earlier end of the scale, the uppermost 11 dates have age spans and probability density areas similar to the Pueblo dates. The dated contexts were associated with typical ceramics of the period and it is reasonably certain these represent terminal Formative period features. On the later end of the distribution, about 35 percent of the features, represented by the lower 15 dates, have calibrated age ranges similar to those from Spanish Colonial contexts in the lower valley. While some may represent misidentified natural organic materials or modern features (e.g., Features 1 and 3 at LA107246 as documented by Sale and Gibbs [1998]), sample contamination, or heliographic effects, it is also quite likely several date indigenous occupations during the Pueblo Revolt and Mission periods. Although settlements during the Pueblo Revolt and Mission periods were centered in the Rio Grande valley floodplain, episodic use of the valley margins and interior basins is documented historically and archeologically (Gerald 1974b). The limited occupation at the Vista del Sol site (Miller et al. 1993) may represent such a location. Several features may be from Apache occupations at FB1613 (Carmichael, 1998 personal communication), LA39143 (Eidenbach 1983), several sites in the San Andres Mountains north of El Paso (Sale 1991), and possibly at Pintada Cave (MacNeish 1998).[3]

CHARACTERISTICS OF COMPONENTS WITH POST-A.D. 1450 AGE ESTIMATES

Of primary interest for the present study are 17 age estimates from 15 features that fall primarily within the A.D. 1450-1680 interval. Characteristics of the 15 features and their associated site contexts are reviewed below. Eleven age estimates have sufficient precision that nearly the entire 2-sigma probability distribution falls within this interval. Two cases, LA49340 and Keystone 33 (41EP493), are among the late dates cited by Beckett and Corbett (1992).

41EP493 (Keystone Dam 33 North)

O'Laughlin's (1980) investigations at Keystone Dam 33 North identified stratified Archaic and Formative period components. Work in Zone Two exposed a Formative component with several clusters of burned rock hearths and roasting pits; small pits were occasionally present in association with the burned rock features. Pits 5, 6, and 7 were in a relatively discrete cluster of several burned rock thermal features located in the north central portion of the site. Wood charcoal recovered from either Pit 5 or 7 yielded an uncorrected radiocarbon date of 400 ± 110 B.P.

There is some confusion about the provenience of this date. The text description of the cluster of pit features notes Pit 5 as having the late date (O'Laughlin 1980:131), while Table 2 and Figure 14 in the report indicate Pit 7 had the late date. O'Laughlin interprets the features as hearth pits cleaned after use, and suggests that Pits 5-7 are contemporaneous based on their proximity.

The majority of ceramics were El Paso Brownwares and other common prehistoric types. However, several unidentified sand-tempered sherds were present from Keystone Dam 33 North. Additionally, Rio Grande Glaze F (n=2) and Glaze A (n=1) sherds were found on the surface. Snow (1982) dates the production period of Glaze F from 1625-1680. It is unknown whether these sherds were found in proximity to Pits 5, 6, and 7. Several projectile points were collected, but all appear to be

Archaic and Early Formative forms; no small triangular forms typical of the Late Formative and Historic periods were present. An obsidian sample from the fill of Pit 7 had no measurable hydration rim, an observation that could indicate either poor preparation of the sample for microscopic study or a recent origin for the flaked surface of the artifact.

41EP2770

41EP2770 is situated in the central Hueco Bolson (O'Laughlin et al. 1988). The site covered 1147 m^2 among several coppice dunes and deflated surfaces, and three features were investigated. Feature 1 was an eroded and disturbed hut structure. There was a small sample of lithic artifacts, a piece of red ochre and another mineral, and five El Paso Brownware sherds from the fill of the structure. A radiocarbon age of 125 ± 110 B.P. was obtained from a sample of wood charcoal from the structure fill. The other two features were basin-shaped pits (Features 2 and 3). An unidentified wood charcoal sample retrieved from Feature 2 yielded a corrected radiocarbon age of 370 ± 110 B.P., but it had no distinctive materials. Feature 2 was less than 5 m from Feature 1. It is difficult to interpret the age discrepancy between these spatially associated features, but the possibility that Feature 2 represents a minor protohistoric component cannot be ruled out.

FB1613 (Fillmore Pass)

Fillmore Pass is a dense, multi-component site situated along an alluvial ridge at Anthony Gap north of the El Paso city limits (Carmichael and Meyer n.d.). It has extensive Paleoindian and Archaic components, with several partial Folsom points and substantial numbers of channel flakes and Paleoindian tools. Other data also indicate a long history of occupation, including radiocarbon dates that range from 1890 B.C. through historic times, and over 300 obsidian samples, including several of the thinnest and thickest obsidian hydration rims on record in the region. The presence of an historic component is suggested by three late radiocarbon dates, several exceptionally thin hydration rims, and a small scatter of unusual brownwares. Several of the brownware sherds appear to be from a vessel with a conical base, and these may be of Apache affiliation (David Carmichael, 1998 personal communication).

Interpretation of the three late dates is hindered by several problems with sample composition and that the wood charcoal sample from Feature 8 was split and submitted to two laboratories. Beta Analytic, Inc. (Beta) reported an uncorrected age of 370 ± 50 B.P. for this sample, while the University of Georgia Radiocarbon Laboratory (UGa) reported a corrected age of 84 ± 55 B.P. Applying the ^{13}C value of -26.7 ‰ for the UGa sample to the Beta date would correct it to 400 B.P., and thus the absence of a correction factor for the Beta date cannot account for the age discrepancy. A third uncorrected date of 210 ± 90 B.P. was obtained from a bulk soil sample retrieved from Feature 95. Based on ^{13}C values and correction factors from other bulk soil samples in the region (see Figure 3), an additional 100 years could be added to this age estimate, thus bringing it into line with the Beta date from Feature 8.

FB12072

FB12072 is located in the central Hueco Bolson (Mauldin et al. 1998). It is an areally extensive site (ca. 23,000 m^2), with 23 features, including burned caliche and limestone thermal features, one large stain, and several smaller hearth stains. Mauldin et al. (1998) report 13 radiocarbon dates from five features. Wood charcoal from Feature 12, a small burned caliche hearth, has a corrected age estimate of 270 ± 70 B.P. Multiple dates obtained from the other four features are internally consistent and range from 2040 ± 80 to 1640 ± 50 B.P. One obsidian artifact was submitted for hydration dating. The rim measurement of 2.59 microns for this sample is borderline for historic components, and the obsidian artifact was recovered over 10 m from Feature 12. Despite the size of the site, only 75 artifacts were recovered during surface collections and excavations, mostly chipped stone and a small number of groundstone artifacts. A single sherd of undifferentiated El Paso Brownware was also collected.

41HZ504

Site 41HZ504 and nearby site 41HZ505 are known as the Padre Canyon Paleoindian locality (Mauldin and Leach 1997a). The site is situated on the floor of the Hueco Bolson, approximately 1 mile west of the Hueco Mountains. Feature 1 was a small (20 cm diameter) area of stained soil and charcoal on or near the surface. Several burned limestone pieces were scattered in the vicinity of the feature, but no artifacts were recovered from it. A small fragment of wood charcoal yielded a corrected AMS age estimate of 340 ± 60 B.P. (Mauldin and Leach 1997b). Aside from the radiocarbon age estimate, no other materials diagnostic of Formative or Historic occupations were recovered from Feature 1. Instead, formal tools, tool fragments, and other aspects of the lithic assemblage represent a substantial Paleoindian occupation.

LA26780

LA26780 is located at the Dona Ana County Airport just west of the El Paso city limits (Batcho 1987; Batcho et al. 1985; Duran and Batcho 1983). Chronometric data and several unusual aspects of the artifact assemblages indicate that LA26780 may represent one of the few substantial protohistoric Native American settlements in the region. A detailed examination of this site is provided below.

LA49340

LA49340 was recorded during the survey of the Navajo-Hopi Land Exchange on the west mesa of the Rio Grande valley near the western limits of El Paso (Ravesloot 1988), and it has one of the late dates discussed in Beckett and Corbett (1992). An uncorrected age of 360 ± 50 B.P. was obtained from Feature 3, a small hearth stain associated with a scatter of burned rock. Aside from the radiocarbon date, the only other diagnostic item was a projectile point typical of Late Archaic forms.

LA64087

LA64087 was excavated as part of the GBFEL-TIE project near Orogrande, New Mexico, 45 miles north of El Paso (Swift et al. 1991). The site was a low density, multi-component hearth/artifact scatter distributed over 3600 m^2. Three widely spaced burned rock features were present. Feature 3 was a 1.2 m diameter charcoal-stained area, and mesquite wood charcoal from it yielded a corrected radiocarbon age of 440 ± 70 B.P. A corrected AMS date of 540 ± 90 B.P. was obtained from Feature 2. A third date of 1310 ± 100 B.P. from Feature 1 falls within the Formative period. Sixty-seven lithic artifacts and a small number of fauna were recovered during the excavations, but no ceramics or other distinctive items.

LA72860, LA72169, and LA72151

Surveys conducted on White Sands Missile Range property in the San Andres Mountains north of El Paso have documented several potential post-Pueblo or protohistoric sites, as well as several camps and rock art sites conclusively affiliated with Apache occupations of later historic times (Human Systems Research 1991; Sale 1991; Sale and Laumbach 1989).

The Horrendous Hearth site (LA72860) is situated near Hembrillo Canyon in the northern San Andres Mountains (Sale 1991; Sale and Laumbach 1989). It is dominated by a large burned rock feature (10 x 15 m) about 1 m in height. A corrected radiocarbon age of 330 ± 50 B.P. was obtained from a sample of wood charcoal collected from the periphery of the feature. The remainder of the site is a low density lithic scatter. Several micaceous brownware sherds were reportedly observed during the initial reconnaissance of the site, but could not be relocated during subsequent visits. Other notable artifacts include a projectile point typical of Archaic forms and one White Mountain Redware sherd.

Site LA72169 is situated on a canyon floor (Human Systems Research 1991; Sale 1991). It has a 13 m diameter burned rock feature associated with a low-density scatter of lithic and ceramic artifacts. A wood charcoal sample collected from a rock scatter at the feature margin yielded a corrected age of 290 ± 70 BP. The majority of the lithic assemblage consists of fine-grained materials. Other items include a single Chupadero Black-on-white sherd, a brownware rim sherd, and projectile point; the latter two artifacts are not described. A worn horseshoe was also present near the feature.

LA72151 is on a series of ridges bordering San Andrecito Canyon (Sale 1991), with two springs at its eastern margin. Occupation areas consist of approximately 10 burned rock features and several ash stains associated with a dense artifact scatter. Late Archaic projectile forms, El Paso Brown rim forms, and Lincoln Black-on-Red ceramics indicate a long period of intermittent occupations from the Late Archaic through Late Formative periods at this favorable settlement location. Evidence of a post-A.D. 1450 occupation is provided by a wood charcoal sample from Feature 1 that yielded a corrected age estimate of 240 ± 50 B.P. Six obsidian flakes were submitted for hydration dating, and hydration rims range from 2.04 to 6.58 microns. Three specimens have rims of 2.04, 2.59, and 2.69 microns, which may represent relatively thin rims considering the higher altitude of the site. It is also notable that one of the obsidian flakes represents the only regional occurrence of the recently identified Jug Canyon obsidian source. The Jug Canyon source is located across the Rio Grande valley near the foothills of the Mimbres Mountains (Church et al. 1996).

HAR 163 and HAR 166

Comprehensive inventory surveys of lands under the jurisdiction of Holloman Air Force Base near Alamogordo, New Mexico, 90 miles north of El Paso, have identified several potential historic components (Lowry and Gibbs 1999). Site HAR 163 has two small hearth features associated with a very low-density artifact scatter dispersed over approximately 41,000 m^2 (Sale 1997; Sale et al. 1996a). Feature 2 was the best-preserved of the hearths and the only feature containing burned rock. Wood charcoal from the feature provided a corrected age estimate of 320 ± 60 B.P. In order to verify the dating of the feature, additional excavations were conducted and a second sample from the feature has a corrected age of 240 ± 50 B.P. (Sale et al. 1996b). A scatter of undifferentiated El Paso Brownware ceramics was present near the feature. The remainder of the site contained less than 400 lithic artifacts, a few groundstone fragments, and a small number of El Paso Polychrome sherds. Three projectile points typical of Late Archaic or Early Formative forms were collected.

Site HAR 166 is a large (ca. 1 km^2) multicomponent site with evidence of Paleoindian, Archaic, Formative, and post-1880 occupations (Sale 1997; Sale et al. 1996b). Several hearths were recorded but few artifacts were noted in association with them. Four features were tested, and three small ash stains yielded radiocarbon age estimates falling securely within the Late Formative period (A.D. 1200-1450). However, Feature 3 consisted of a very-well preserved burned rock hearth with substantial amounts of charcoal. It is noteworthy that, as with Feature 2 at HAR163, Feature 3 at HAR166 was the only hearth containing any substantial quantity of rock. A corrected radiocarbon age of 270 ± 60 B.P. was obtained from a sample of mesquite wood charcoal in the feature. As with HAR 163, a second investigation obtained additional dates, including a corroborative date of 290 ± 50 B.P. from Feature 3. In addition, a date of 340 ± 60 B.P. was obtained from mesquite wood charcoal in Feature 6. Projectile points representative of Paleoindian and Archaic forms were recovered from the site. Ceramics included typical Formative period wares, including six El Paso Brownware, four Lincoln Black-on-Red, and two Chupadero Black-on-White sherds, although a fragmentary vessel of possible historic affiliation was observed in the northern portion of the site. Sherds from this vessel had a reddish-orange surface color and a fine sand temper.

Caballero Canyon

Southward (1978) reports the results of investigations at a small site in Caballero Canyon, leading from the escarpment of the Sacramento Mountains. Artifacts include a glass trade bead and retouched and edge-damaged glass fragments associated with a burned rock feature with an uncorrected date of 325 ± 55 B.P. The artifact assemblage is characteristic of later historic Apache burned rock midden occupations in the Sacramento Mountains (Carmichael 1999), and thus it is possible that the true age of the sample, which was not corrected for isotopic fractionation, is younger than the measured radiocarbon age.

THE POST-PUEBLO AND PROTOHISTORIC PERIODS: CONTINUITY, ABANDONMENT, OR DEPOPULATION?

Table 3 provides a summary of these 14 sites and 15 dated features along with two features at Paraje San Diego and one at 41EP40 described earlier. The extent to which sampling or dating errors and other interpretive problems exist among these features is unknown, and it is uncertain whether they all represent late occupations. Corroborative samples have been submitted from only three features. In two cases involving Feature 2 at

Table 3. Summary Description of Features and Sites with Late Radiocarbon Dates.

Site	Feature	Ceramics on Site	Ceramics in Features	Projectile Points	Additional Chronometric Data	Other Materials
41EP40	Structure or stratum?	2 Valle Bajo Brownware	Same	None	None	Scattered daub
41EP493	Small pit	EP Wares, Mogollon brownwares, 3 Rio Grande glazeware sherds	Indeterminate	Several Archaic and Formative styles	2.59 micron hydration rim from pit	None
41EP2770	Small ash stain	EP Brownware	None	None	2 Formative Period radiocarbon dates	None
41HZ504	Ash stain with FCR	None	None	Folsom fragment	Diagnostic Paleoindian tools	None
FB1613	Small ash stain	Brownware (undescribed)	Indeterminate	Several Paleo-indian and Archaic forms	Radiocarbon 1890 BC-AD 1950, 300 hydration rims	None
FB12072	FCR hearth	EP Brownware	None	None	Multiple Late Archaic dates	None
HAR163	FCR hearth	EP Polychrome	EP UB	3 Archaic forms	None	None
HAR166	1 FCR hearth 1 Ash stain	Lincoln B/Red,Chup B/W, brownware (possibly historic)	Indeterminate	None	3 Formative Period radiocarbon dates, Paleo-indian formal tools	.56 caliber minnie ball
LA26780	FCR hearth	EP UB, Ramos Polychrome, Protohistoric brownware	None	Archaic and Late forms	1 Archaic radiocarbon date, very thin hydration rims	Spur rowel
LA49340	Small ash stain	EP UB	None	1 Archaic form	None	None
LA64087	FCR hearth	None	None	None	2 earlier radiocarbon dates	None
LA72151	FCR hearth	EP Brown, Lincoln B/R	Indeterminate	All Late Archaic forms	6 hydration measures, 3 between 2.0 and 2.6 microns	Rare occurrence of Jug Canyon obsidian
LA72169	Large FCR	Chupadero B/W sherd, brownware (undescribed)	Same	1 form undescribed	None	Horseshoe
LA72860	Large FCR	White Mountain Redware, Micaceous brownware	Same	Archaic forms	None	Fine-grained lithics
Caballero	Ash stain w/ FCR	None	None	None	None	Glass beads, flaked glass tools
Paraje San Diego	2 Ash stains	Multiple New Mexican and Mexican historic types	Historic ceramics in Feature 1	None	None	Historic artifacts

HAR163 and Feature 3 at HAR166, the second age estimate fell within statistical limits of the original date, and therefore it can be assumed that at least these features do represent late occupations (Sale et al. 1996b). In the third case, two dates obtained from Hearth 1 at LA26780 differed by 2850 radiocarbon years. For the sake of discussion, however, if it is assumed that the majority of cases described above do constitute components or site areas occupied by post-Pueblo and protohistoric groups, they have several attributes in common.

First, and foremost, is the near universal multicomponent nature of the sites with possible post-Pueblo or protohistoric components. Thirteen of the 14 sites have Formative period ceramics, radiocarbon dates, or both, while eight sites have Archaic projectile point forms or radiocarbon dates; three have Paleoindian components. However, artifacts characteristic of these prehistoric periods are seldom associated with the specific feature or site area assigned to the post-Pueblo/protohistoric period on the basis on late radiocarbon dates.

Overall, chronologically diagnostic materials not specifically attributable to prehistoric time periods are rare. Historic glass or metal items are limited to the horseshoe at LA72169, a spur rowel at LA26780, and several glass beads and flaked glass tools at the Caballero Canyon site. The chronometric data provide the sole means of detecting potential late components at these sites. While these patterns are not unexpected given that multi-component prehistoric sites—often lacking chronologically sensitive artifacts—are the rule rather than the exception throughout the region, it does suggest the need for more thorough field documentation, artifact description, and chronometric analysis of small sites.

A second characteristic is that the majority of features or components with late dates represent low intensity occupations with small, isolated thermal features associated with few artifacts, particularly on those in interior basin landforms. An exception includes a few settlements located in mountain areas, where large and exceptionally well-preserved burned rock features may indicate late use. About 63 percent of the thermal features have rock heating or construction elements, a relatively high proportion compared to features from the Formative and Pueblo Revolt/Mission periods. In fact, these attributes are similar to small sites of the Archaic and early Formative periods, and suggest that general parallels may be drawn between settlement systems of these chronologically distant periods.

It has been proposed that post-Pueblo populations reverted to a less intensive hunting and gathering subsistence organization having general similarities with the Archaic period (Beckett 1985; Carmichael 1986; Tainter 1985; Wimberley 1979). Unfortunately, the small assortment of scattered features and ambiguous artifact associations contribute little substantive information, and subsistence data are neglible. Faunal remains are scanty and, with the exception of a charred monocot stem possibly representing an *Agave* species recovered from the large burned rock feature at LA72860, virtually no macrobotanical data are available.

Despite these shortcomings, characteristics of features and settlement locations do offer insights into the changing nature of Post-Pueblo and protohistoric adaptations. Figure 5 illustrates patterns of feature classes and settlement locations among major prehistoric and historic time periods. The relative proportions of general feature classes and settlement locations of the Post-Pueblo and protohistoric interval most closely matches that of the Archaic period in general, specifically the Middle Archaic period. For clarity, as well as to provide sufficient sample sizes during each time interval, features have been grouped according to three general classes: thermal features with rock (limestone, granite, rhyolite, or burned caliche), thermal features lacking rock, and residential features. The latter include features characteristic of settlements of greater occupational intensity or duration, such as habitation structures, trash middens, and storage or trash pits.

The proportion of thermal features with rock heating elements decreases markedly during the Late Formative period (cf. Miller and Kenmotsu 1999), and is also low during the Mission/Historic period, suggesting an inverse relationship between residential features and thermal features that incorporated rock as heating or construction elements. In contrast, this feature class is substantially more common during the intervening Post-Pueblo/protohistoric period, and is also common in Archaic and Formative time intervals prior to the Late Formative Pueblo period. Residential features are common throughout the Formative period and peak during the Late Formative and Mission/Historic periods, but are relatively rare during the Archaic and Post-Pueblo/protohistoric periods (see Figure 5).

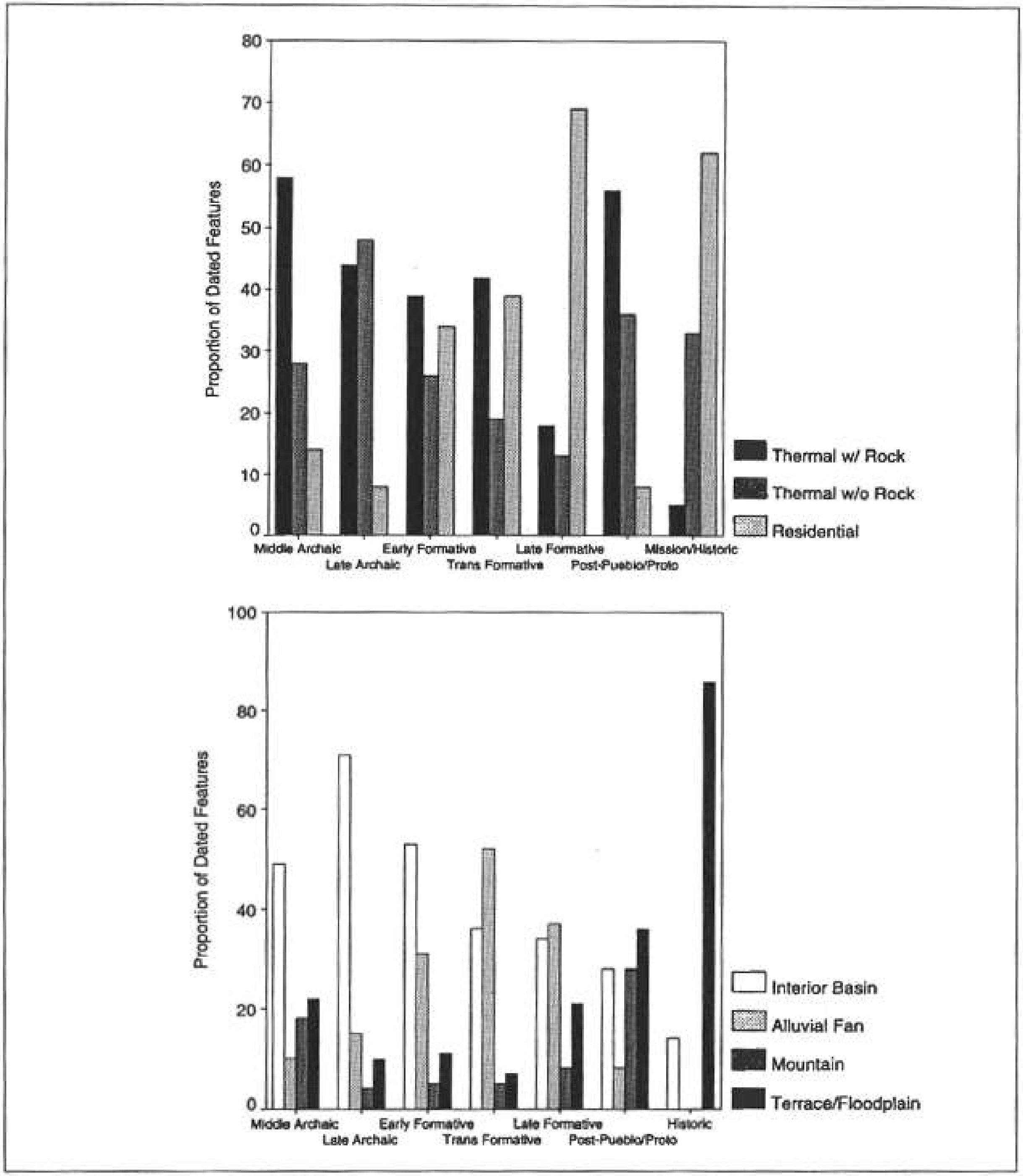


Figure 5. Relative proportions of major feature classes and settlement locations among prehistoric and historic time intervals in West Texas and south central New Mexico.

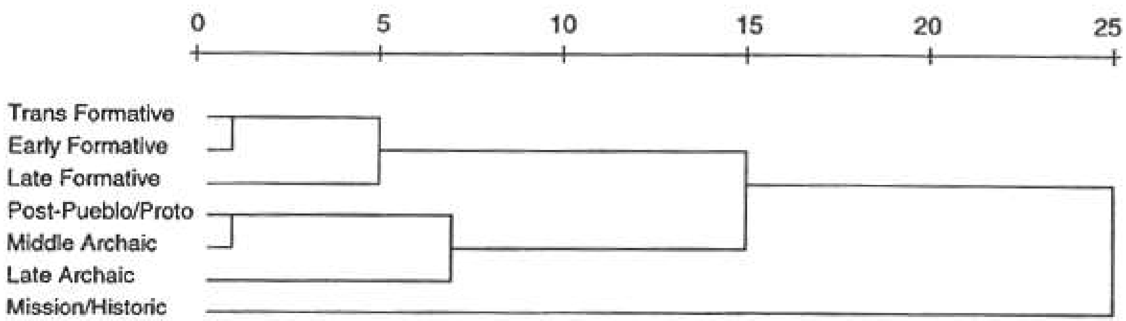
The lower graph in Figure 5 illustrates the distributions of dated features among four major environmental or topographic zones. Again, the profile of the Post-Pueblo/protohistoric features most closely resembles the Middle Archaic, particularly in the lower proportions of settlements situated along alluvial fans, the more frequent occurrence of occupations in mountain landforms, and the more evenly distributed and areally extensive occupation of different landforms. In contrast, settlements during the three Formative period intervals tend to have a greater focus on alluvial fans. Pueblo Revolt and Mission/Historic period settlements, tethered as they were to missions and presidios in the Rio Grande valley, are largely centered in the Rio Grande floodplain and the adjacent valley terraces.

To further explore these patterns, the proportional values of various feature classes and landforms are examined through two statistical classification and data reduction procedures: hierarchical cluster analysis and principal components analysis (Figure 6). The cluster dendrogram defines the Mission/Historic period as a distinctive cluster; the three Formative intervals form a separate cluster; while a third cluster comprises the Late Archaic, Middle Archaic, and Post-Pueblo/protohistoric features and landform distributions. Principal components analysis offers a more robust alternative due to the fact that several of the variables are intercorrelated, but the results are consistent with the cluster analysis in having three distinct groups, one consisting of the protohistoric and two Archaic intervals, a second group including the three Formative period intervals, and an isolated group consisting of the Mission/Historic period features and landform distributions (see Figure 6).

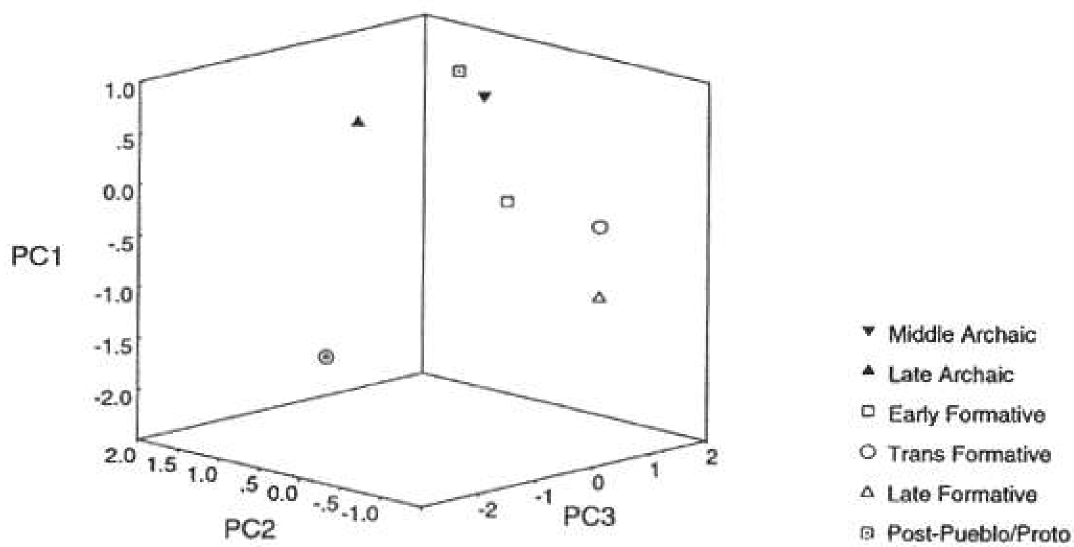
One attribute of Post-Pueblo/protohistoric thermal features with rock construction or heating elements can be examined in more detail. Figure 7 provides a series of median boxplots with the distributions of burned rock weights by temporal interval among 119 radiocarbon-dated thermal features in the Hueco, Tularosa, and Mesilla bolsons. Rock weight data for the probable protohistoric component at LA26780 are shown separately. Although sample numbers are small for three of the six time intervals, the feature data suggests burned rock weights for protohistoric features are more similar to the low weights typical of Archaic features.

While these patterns are intriguing, the comparisons do not provide definitive statements regarding post-Pueblo/protohistoric settlement and subsistence systems, nor can they be used to infer that adaptations of this period were identical to that of the Middle or Late Archaic periods. The data are invariably biased by several factors. First, the apparent rarity of structures, middens, pits, or other features from more sedentary or intensive occupations during the post-Pueblo and protohistoric period is undoubtedly influenced by preservation and visibility factors. Many settlements at this time were apparently located in the Rio Grande valley and have been obliterated by several decades of agricultural and urban developments. Second, the low proportion of Archaic settlements on alluvial fans is conditioned to an unknown degree by site burial and limited archeological visibility. Third, the median value for protohistoric rock weights is biased because the calculations exclude two large rock features at LA72169 and LA72860 in the San Andres Mountains since such information was not obtained in limited surface reconnaissance. Finally, some features, such as the hearths at Paraje San Diego along the Camino Real, may not reflect aspects of a particular settlement or subsistence system in the conventional hunter-gatherer perspective, but rather functioned within realms such as transportation and economics (see Staski 1998). Despite the obvious biases and shortcomings, however, the preliminary evidence from features and landform distributions suggests that the post-Pueblo/protohistoric period represents a substantial change from the preceding Formative period, and may more closely approximate regional Archaic period settlement models.

In the absence of any form of unambiguous diagnostic artifact, architectural form, or unique feature that can be associated with the post-Pueblo/protohistoric period, chronometric evidence provides the only consistent and reliable empirical evidence to sustain arguments for post-Pueblo and protohistoric components at sites. Does other evidence exist regarding post-Pueblo settlement? There is as yet no recognizable ceramic tradition in the region until the 1680 Pueblo Revolt when the production of Valle Bajo Brownware became widespread. This does not mean that no ceramic production occurred between 1450-1680, as there is limited evidence for brownwares in the El Paso/Ciudad Juarez area (Gerald 1974a) and conclusive evidence of production in adjacent regions, such as the La Junta district and northern Chihuahua (Kelley et al. 1940; DiPeso 1974). However, technological attributes of the potential brownware collections at LA26780 (discussed below) and Mission Guadalupe have similarities to Spanish-influenced *corriente* wares common throughout the Spanish Colonial Southwest, and thus it is likely that they postdate A.D. 1581 as well as perhaps the establishment of the first missions in the area in 1659.



Cluster analysis dendrogram using average linkage method with squared Euclidean distance measure



Principal Component	Eigenvalue	% of Variance	Cumulative %
1	3.32448	47.5	47.5
2	1.90186	27.2	74.7
3	1.13471	16.2	90.9

Component Loadings*	PC 1	PC 2	PC 3
Thermal w/ Rock	.95082		.23382
Residential	-.93746	-.28718	
Terrace/Floodplain	-.70036	.68928	
Interior Basin	.65027	-.35341	-.55300
Alluvial Fan		-.87385	
Thermal w/o Rock	.52676	.58229	-.49506
Mountain	.58738	.34163	.71355

* PC loadings less than 1.0 have been removed

Plot of principal components 1, 2, and 3

Figure 6. Statistical classification and data reduction procedures comparing distributions of feature types and settlement landforms among prehistoric and historic time intervals.

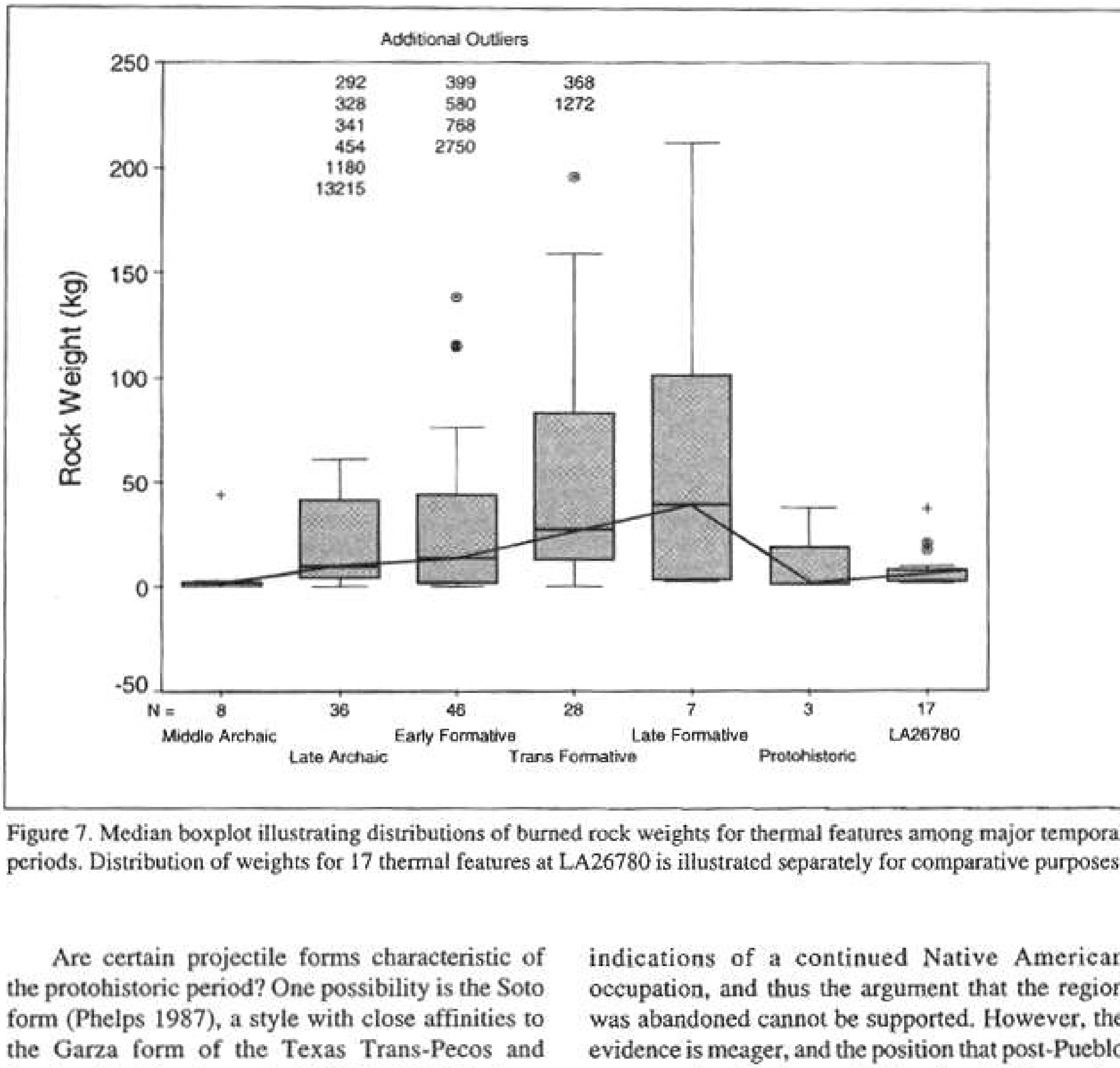


Figure 7. Median boxplot illustrating distributions of burned rock weights for thermal features among major temporal periods. Distribution of weights for 17 thermal features at LA26780 is illustrated separately for comparative purposes.

Are certain projectile forms characteristic of the protohistoric period? One possibility is the Soto form (Phelps 1987), a style with close affinities to the Garza form of the Texas Trans-Pecos and Panhandle. Boyd et al. (1997:427-429) have synthesized the chronometric data for Garza specimens recovered from secure contexts at sites in the Panhandle, demonstrating that its primary age range is between ca. A.D. 1450-1650. Numerous Soto/Garza points have been collected at the Soto Ranch site in northern Chihuahua (Krone 1978), although associations between the projectile points and specific components there are unclear. It is also possible that several additional sites in northern Chihuahua with Soto points (Phelps 1968, 1987) may represent protohistoric occupations. However, projectile point collections from Fort Bliss and elsewhere in the Jornada region north of the U.S.–Mexico border have few examples of this form.

Summarizing the chronometric evidence for a post-Pueblo occupation of the region, there are indications of a continued Native American occupation, and thus the argument that the region was abandoned cannot be supported. However, the evidence is meager, and the position that post-Pueblo groups maintained a continuity after the Formative period in settlement, subsistence, and demographics also cannot be supported. There is ample chronometric evidence from secure associations that the primary period of Late Formative Puebloan occupations ended between ca. A.D. 1450 and ca. A.D. 1500. If it is assumed that the 18 features and 20 age estimates in Table 3 that fall within the A.D. 1450-1680 interval are valid, these few instances comprise just slightly over one percent of the total chronometric database (n=1523 dates). This percentage estimate may be biased by the fact that many prehistoric features have multiple dates, but late contexts are equally rare if counts of dated features rather than counts of dates are examined. Of the 718 hearth and stain thermal features, 206 architectural features, 55 rockshelter strata or features, and 116 miscellaneous deposits, strata, pits, or burials dated in this region, only 17 thermal features and one habitation structure may date between A.D. 1450-1680 (2.4 percent of thermal features or 1.6 percent of all features). Only the Paleoindian and Early Archaic periods are more poorly represented in the radiocarbon record of the region, and the six to eight millennia of erosional and depositional processes that partially explain the rarity of Paleoindian and Early Archaic chronometric dates cannot account for the absence of post-Pueblo and protohistoric features and habitation structures.

The available archeological information support a model of regional depopulation, along with concurrent and substantial changes in regional settlement patterns, subsistence economies, and technology. There is evidence of a consistent pattern in the late occupations in settlement locations, feature types, limited artifact inventories, and a generally low-intensity occupation, to support the idea that post-Pueblo groups had a less intensive and mobile adaptation, one which had closer affinities with distant Archaic period groups than they did with Formative period groups.

It is difficult to envision how a region having an archeological record spanning the Paleoindian to Historic periods would be completely devoid of settlement for a period of 200 years, particularly when Spanish accounts of the late 1500s and 1600s provide ample evidence that several groups inhabited the region. Yet, when the present evidence is examined, some event or process, or a combination of events and processes, essentially served to depopulate the region and forced a fundamental reorganization of demographic patterns, settlement, and adaptive strategies on a scale unprecedented during the previous millennium. How was such a change manifested in the archeological record, and how does the archeological record reflect the testimony of the ethnohistoric record?

MANSO AND SUMA

Turning now to the historical record, the sparse chronometric and material culture evidence does not accord well with historic accounts of several groups inhabiting the area during the late 16th through the 17th centuries. It is at this point that the archeological and ethnohistoric records diverge.

Commencing in 1565, several *entradas* by Spanish explorers passed through portions of the western Trans-Pecos and northern Chihuahua. Among the more important and well-documented early expeditions are the 1565 journey of Ibarra, the Rodriguez-Chamuscado and Espejo expeditions of 1581 and 1582-1583, Don Juan de Oñate's journey of 1598, the Salmeron and Mendoza accounts of 1626 and 1683, and Fray Benavides' detailed account of his passage through the region in 1630 and 1634. Several accounts by Spanish settlers and missionaries from the late 1600s through the early 1700s are also available. Each of these accounts describe various tribes that lived in the Rio Grande valley and adjoining regions. However, since these records span nearly 200 years, the various documentary sources provide an inconsistent and often confusing series of names to the tribal groups of the region. Additional sources of confusion include the lack of a standard orthography among Spanish chroniclers and their tendency to assign names to tribal groups based on aspects of their physical appearance, names of tribal leaders, terms of greeting, or prominent local geographic landmarks (Gerald 1974a; Naylor 1969; see Kenmotsu [1994] for a useful discussion regarding the identities of various groups). Only occasionally does it appear that the actual names were recorded that were used by the natives themselves. The most commonly accepted name for groups in the vicinity of El Paso and northern Chihuahua, using terms assigned during the late 1600s and early 1700s, are the Manso and Suma, although these differ from such names as Tanpachoas, Gorretas, and Caguates assigned by the earlier accounts of the late 1500s and early 1600s.

Little is known of these groups beyond the series of sometimes contradictory, often biased, and always brief accounts provided by Spanish chroniclers (Benavides 1965; Griffen 1979; Hammond and Rey 1929, 1966; Hughes 1914; Kenmotsu 1994; Mecham 1927). Fray Alonso de Benavides (1965) and Perez de Luxan (Hammond and Rey 1929, 1966) provide the most thorough accounts of the encounters between the Spanish and indigenous Manso and Suma groups in the Jornada Mogollon region. These accounts describe Manso groups living along the Rio Grande in communities, or rancherías, composed of straw or brush structures, and subsisting primarily on hunted and gathered foods. The Suma occupied areas along the Rio Grande southeast of El Paso, as well as portions of northern Chihuahua.

Archeological evidence of Manso and Suma occupations in the Jornada region remains elusive (e.g., Gerald 1973, 1974a). Aside from the known location of the Nuestra Señora de Guadalupe de los Mansos mission, no unequivocal settlement of this period has been identified despite extensive archeological survey coverage throughout the Trans-Pecos and south central New Mexico. Aside from the Guadalupe Mission locality, only two archeological sites have been specifically claimed to represent Manso or Suma occupations. As such, the archeological identification of Manso or Suma occupations has been comparable to the search for Apache sites, in the sense that both pursuits are fraught with chronometric and contextual ambiguities that make it difficult to securely identify them. Artifact affiliations are ambiguous since there are few, and often no, chronologically or culturally sensitive ceramics or projectile points that date solely to the 1450-1680 period or are otherwise not easily confused with other traditions. Aside from the intriguing possibility that the distinctive Soto/Garza points represent protohistoric use, typical projectile point forms are similar to those of the Late Formative period: small, triangular, side-notched or basally-notched forms. Similar forms have also been recovered from later Pueblo Revolt and Mission period contexts. Ceramic wares are infrequent.

Spanish accounts note that settlements were frequently encountered along the Rio Grande valley. The apparent absence of such sites may be due to limited archeological visibility and geomorphic factors. The latter is particularly salient if such settlements were situated in the floodplain of the Rio Grande, since Spanish Colonial archeological deposits throughout the El Paso lower valley are generally buried by more than 1 m of flood sediments. In addition, the terraces of the floodplain have been subject to several decades of intensive agricultural and urban developments that probably has left few traces of the small, ephemeral campsites characteristic of Manso and Suma settlements.

A few rumors, hints, and allegations of suspected Manso or Suma sites have surfaced over the years. It is possible that several of the post-Pueblo and protohistoric radiocarbon dates reviewed earlier may represent Manso or Suma occupations, although it is equally likely that many of the features in the Tularosa Basin and San Andres Mountains represent Apache occupations (Sale 1991, 1997; Southward 1978). In the absence of any signature material culture, it is very difficult to link most of these components with a specific historically-documented group, a problem that reflects the larger issue of determining ethnicity from the archeological record.

Nuestra Señora De Guadalupe De Los Mansos Mission, Ciudad Juarez

Gerald (1974a, 1990a) briefly reviews the results of unsystematic collections made in the vicinity of the present-day location of the cathedral in downtown Ciudad Juarez that overlays the original site of the Guadalupe Mission. He concluded that Manso and other mission settlers were producing brownware ceramics, although the mixing of materials from the earliest years of the mission with later materials from the Tiwa, Suma, and other groups precluded any specific association of ceramic materials with any ethnic group. More recently, streetscape improvement projects on the north side of the cathedral encountered part of the Camposanto of the original mission. Several burials were recovered by archeologists from the Instituto Nacional de Antropologia e Historia, including some intentionally covered with a coating of caliche lime powder; one burial may have had filed teeth, although confirmation is awaiting the report from the physical anthropologist. A small collection of brownware ceramics was recovered from undifferentiated deposits along the trenches, and I examined these during a 1997 visit to the excavation site.

Mesilla Valley Site

Bentley (1991) attributes a Manso occupation to a small, unnamed site in the Mesilla segment of the Rio Grande valley north of El Paso. Situated on a terrace, the site reportedly consists of several lithic scatters in association with historic red-on-brown ceramics. The identification of a Manso occupation is predicated on the historic brownwares, its lower terrace location on the Rio Grande, and the absence of hearth features. The latter two criteria involve rather tenuous linkages between ethnohistoric accounts and archeological surface observations, such as the absence of evidence for hearth features reflecting Benavides' (1965) account of the tendency for the Manso to eat meat without cooking. Accordingly, the sole distinguishing characteristic is two ceramic sherds classified as Casitas Red-on-Brown, using type descriptions for historic brownwares adopted for the Estancia Basin of northern New Mexico (see Marshall 1984). Notwithstanding the inappropriate ceramic terminology derived from the distant Estancia basin, historic red-on-brown ceramics date after the middle or late 1700s in the El Paso area. While it is possible that the site represents an historic Native American encampment, without excavation data there is no means of confirming the age or affiliation of the site nor attributing a specific ethnic or cultural affiliation to the limited surface materials.

Soto Ranch Site and Other Localities, Northern Chihuahua

Soto Ranch is located southeast of El Paso across the Texas/Chihuahua border from Fabens, Texas, and is one of the more interesting sites in the region for the present study. Unfortunately, because of its difficult access in Mexico, the site has received no professional attention. Krone (1978) provides some basic descriptive information on the site and material culture, while Phelps (1987) has reviewed the projectile point collections that form the basis for his definition of the Soto point form. The Soto site has several distinct areas with features and artifacts along a major drainage leading from several mountain ranges, and this favorable settlement location has evidence of occupation from Paleoindian through Historic times, including a ca. 1850 ranch site and possible military encampment with standing adobe structures.

Two areas have distinctive evidence for occupation during the protohistoric or Mission periods. Several unique artifacts, including a quantity of lead beads made from melted musket projectiles, a copper ring, and a blue glass bead, were collected from two distinct loci situated some distance from the unrelated ca. 1850 or prehistoric settlements. Over 50 Soto/Garza points were recovered near these artifacts, although additional points were occasionally observed among the prehistoric and ca. 1850 components. Other materials observed at these two locations include burned rock, Harrell and Toyah points, groundstone and lithic artifacts, shell jewelry, and several undescribed ceramic sherds. It is likely that these loci represent occupations by Suma or later Apache groups, but detailed archeological investigations must be done to resolve their age and affiliation.

La Hacha y Los Moscos

Further afield in the bootheel region of southern New Mexico near the Chihuahuan border, Sechrist (1994) describes a site with late dates and several unusual assemblage characteristics. The site has six burned rock features and charcoal stains associated with a dense scatter of lithic and groundstone artifacts. Four mesquite wood charcoal dates from burned rock features range from 280 ± 50 B.P. to 470 ± 50 B.P. No ceramics were observed, but a large sample of projectile points was collected, principally a stemless form lacking notches with flat or concave bases. While associated with late dates, the La Hacha y Los Moscos specimens have close similarities with the Cortaro form, a type generally associated with Middle to Late Archaic occupations in Arizona. A moderate quantity of obsidian artifacts was also present. Geochemical sourcing indicated the obsidian materials were obtained from the Mule Creek source 220 km to the north and the Antelope Wells source 40 km to the south (Sechrist 1993). The chronometric and material culture evidence from this site is ambiguous, but there is a possibility that the site represents a protohistoric settlement, perhaps associated with the historically-documented Jocome.

LA26779 and LA26780, Dona County Airport Project

The most promising and thoroughly investigated sites that may be provisionally attributed to Manso or Suma occupations are LA26799 and LA26780 at the Dona Ana County Airport (DACA), just west of the El Paso city limits (Batcho 1987; Batcho et al. 1985; Duran and Batcho 1983). The two sites were originally recorded by the Office of Contract Archeology, University of New Mexico, during survey of the proposed airport facility and assigned field site numbers FA15 and FA16 (Moore and Bailey 1980). Subsequent data recovery investigations conducted in 1983 by the Cultural Resources Management Division (CRMD) of New Mexico State University assigned site numbers NMSU 1385 and 1380, respectively. The two sites are considered a single entity separated by several aeolian coppice dunes, and will hereafter be referred

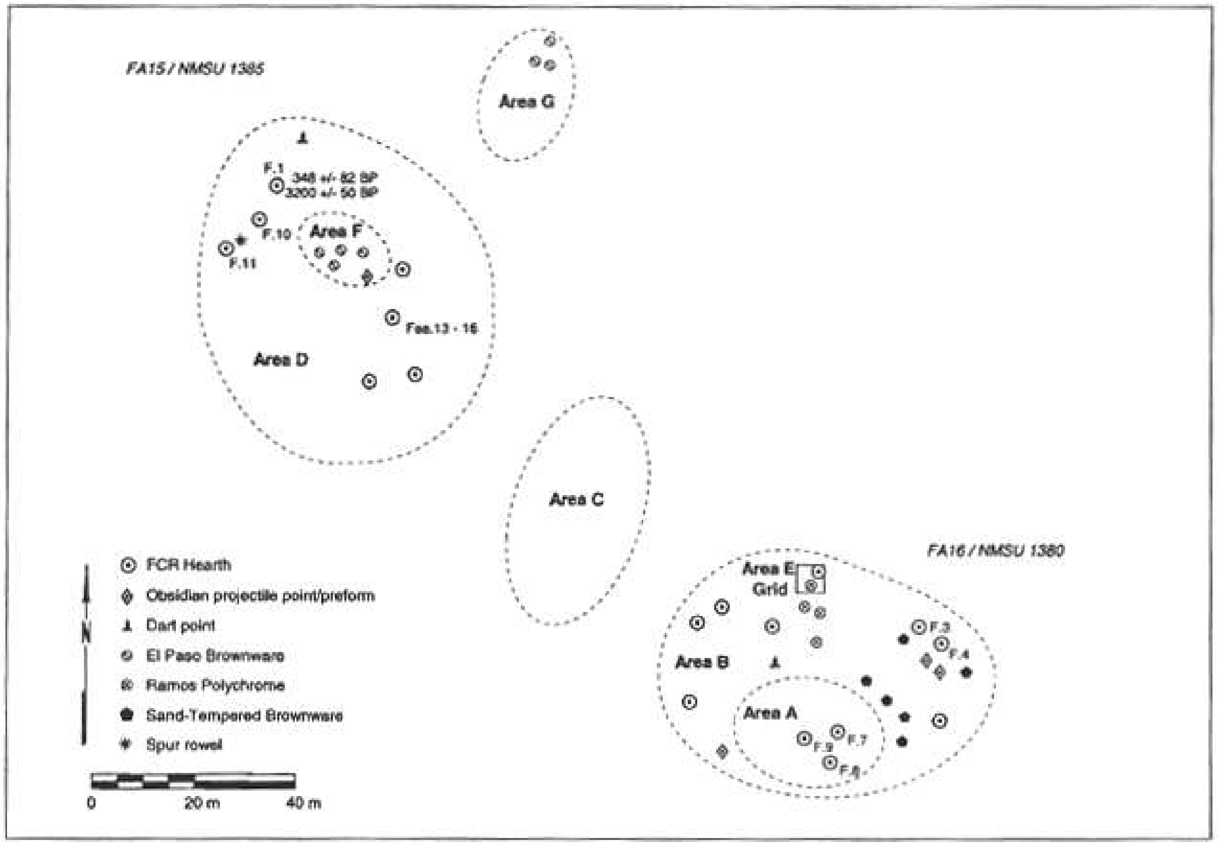


Figure 8. Schematic reconstruction of LA26779 and LA26780, located in Dona Ana County, New Mexico, a few miles west of El Paso, Texas. Locations of hearth features 13-16 at NMSU1385 and unnumbered features at NMSU1380 are estimated.

to as LA26780 using the formal Museum of New Mexico Laboratory of Anthropology site number.

Surface collections and limited excavations conducted at these two conjoining sites recorded several clusters of hearths and artifacts distributed within two 60 x 50 m areas along the upper terrace of the Rio Grande. Despite several efforts, the site map cannot be found in the files and curation facility at the University Museum of New Mexico State University. Figure 8 represents a reconstruction based on information obtained from the interim data recovery report produced by CRMD (Batcho et al. 1985), a very preliminary and incomplete draft report of investigations (CRMD 1985), as well as an assortment of field notes, specimen logs, and provenience information present on artifact bags. It shows the general layout of the site, but precise locations of some features, collection areas and units, and select artifacts should be not considered entirely accurate.

Data recovery efforts were restricted to surface collections and hand excavations of limited areas around five hearth features.[4] Upon completion of the hand excavations, shallow surface deposits of unconsolidated aeolian sands were removed with a backhoe. A formal grid system was not used during the surface collection. Ceramics, tools, and other noteworthy items were point provenienced in reference to a baseline and series of datum stakes established across the site. Otherwise, primary artifact collections centered on 5 x 5 m grid units placed around 17 hearth features. In addition, artifacts received a second provenience designation according to their location within one of seven areas, of which two represented particularly dense artifact concentrations.

Generally, the site consisted of two major occupation areas corresponding to the original boundary definitions for NMSU 1380 and 1385. The southeastern cluster (NMSU 1380) included Areas A, B, and E. Area A was a 10 x 10 m cluster of three hearths associated with a relatively sparse scatter of artifacts. Area B represented the larger (3500 m^2) artifact scatter and seven additional hearths surrounding Area A. Area E was a dense concentration of obsidian and other chipped stone artifacts collected within a 5 x 5 m grid unit.

The northwestern cluster (NMSU 1385) consisted of Areas D and F, both with slightly higher artifact densities than Areas A, B, and E. Area D was the 5700 m^2 artifact scatter that comprised NMSU 1385. Field notes and specimen logs mention that seven hearth features were present in Area D. Area F was a relatively dense 200 m^2 concentration of obsidian chipped stone artifacts, ceramics, and groundstone artifacts situated within Area D.

Two additional artifact areas were present adjacent to these primary clusters. Area C had a small number of artifacts and a bifacial tool fragment distributed over 1125 m^2 of coppice dunes and deflated surfaces between Areas B and D. Area G was another small (200 m^2) artifact scatter located northeast of Area D.

Burned rock and caliche hearths were the only identified features, although whether ephemeral habitation structures were present is unresolved since subsurface excavations were limited to hearth features and surface grading; no charcoal stained-features were observed during surface grading. Seventeen hearths were present in three of the major provenience areas: seven features (Features 1, 10, 11, and 13-16) in Area D (a statement in the preliminary data recovery report [Batcho et al. 1985:40] incorrectly places Hearth 2 in this area); Features 2-6, 12, and 17 in Area B; and Features 7-9 in Area A.

Five of the better-preserved features were selected for excavation, while burned rock weights were obtained for the remainder (Table 4). Feature 1 was a deflated, basin-shaped burned rock hearth with a fire-reddened and hardened perimeter. The fill was relatively well-preserved and contained 8 g of mesquite wood charcoal. Feature 2 contained 37.5 kg of burned rock and caliche, but was severely deflated and little subsurface rock or fill deposits remained intact. Features 7-9 had dispersed burned rock and caliche, and only Feature 8 retained remnant fill deposits. Burned rock weights for the features ranged from 2.3-37.5 kg, with a mean weight of 8.7 kg. In comparison with similar prehistoric features throughout the region, the rock weights at LA26780 fall within the lower tail of the distribution and do not suggest intensive feature use.

As is typical for open-air sites in the El Paso area, macrobotanical analysis of four flotation samples collected from Features 1, 7, and 8 yielded meager results. Wetterstrom (1983) identified a small, charred *Zea mays* kernel fragment among the 7.1 g of light fraction material retrieved in two samples from Feature 1. A single unidentifiable charred seed fragment was observed in Feature 8, while no charred materials were recovered from Feature 7. The presence of corn is intriguing, but as discussed below, there is some doubt concerning the accuracy of this identification.

The artifact assemblage from LA26780 is quite diverse compared to similar open-air hearth sites in the region. Artifacts include ground and chipped stone, ceramics, and a single metal artifact. Perhaps the most notable item was a spur *estrella* or star-shaped spur rowel identified as 16th century Spanish in form and origin (Duran and Batcho 1983:6; CRMD 1985), found on the surface adjacent to Feature 11 in Area D. Unfortunately, while further study of this item could help verify the site's age and affiliation, the artifact was removed from the collection by an unknown member of the field crew and has not been relocated (David Batcho, 1993 personal communication).

The collection of 17 ceramic sherds includes both prehistoric decorated and plain brownwares as well as a distinctive group that resembles Historic sand-tempered brownwares (Figure 9). Eleven sherds are assigned to types common to several Late Formative period (A.D. 1275/1300-1450) settlements in the DACA project area, including four Ramos Polychrome sherds recovered from Areas B and E and seven El Paso Polychrome sherds (three from Area G and four from Area F).

Six distinctive brownware sherds were recovered from Area B in the southeastern portion of the site. These sherds have some affinities with Spanish Colonial brownwares described from the El Paso lower valley, but are different. They are not like prehistoric El Paso, Mogollon, and Convento series brownwares. The brownwares from LA26780 are coarsely finished and poorly fired. The sherds are friable, crazing is present on some interior surfaces, and exteriors have a distinctive mottled orange surface color (see Figure 9). Temper consists of rounded volcanic sands. The degree of surface finish in the form of slips, smoothing, or polishing characteristic of Valle Bajo Brownware (Marshall 1997; Miller and O'Leary 1992b) is absent in the LA26780 collection.

Table 4. Burned rock weights and other information for hearth features at LA26780.

CRMD Site No.	Feature No.	FCR Weight (kg)	Excavated	Macrofloral
1380	2	37.50	Yes	
	3	7.30		
	4	5.90		
	5	17.80		
	6	8.20		
	7	21.00	Yes	None
	8	8.00	Yes	Unidentified seed fragment
	9	2.50	Yes	
	12	3.90		
	17	9.80		
		Mean Weight= 12.2 ± 10.6 kg		
1385	1	7.10	Yes	*Zea mays* (?) kernel fragment
	10	1.80		
	11	6.20		
	13	2.30		
	14	2.70		
	15	2.50		
	16	3.20		
		Mean Weight= 3.7 ± 2.1 kg		
		Mean Weight for Overall Site= 8.7 ± 9.2 kg		

Batcho and others (1985:41) cite a personal communication with Rex Gerald, who commented on the similarity of these sherds with brownware varieties common to mission contexts in the El Paso lower valley and Ciudad Juarez. My inspection of these sherds confirms this impression, and the LA26780 brownwares have close affinities with a small collection of sherds recovered during the recent excavations in the camposanto of Nuestra Señora de Guadalupe de los Mansos at Paso del Norte. One specimen from LA26780 has been submitted for neutron activation analysis to compare its chemical profile against several brownware groups in West Texas, south central New Mexico, and northern Chihuahua, but the results were not available for inclusion in this article.

Surface collections and the limited excavations recovered 230 chipped stone artifacts. Several aspects of the lithic assemblage are unusual when contrasted with assemblages documented at other historic and prehistoric sites in West Texas and south central New Mexico. Nearly 64 percent of the lithic assemblage is obsidian, an extremely high proportion in a region where this material rarely exceeds 10 percent in any known historic or prehistoric lithic assemblage (see Miller 1996:965), including sites situated directly adjacent to obsidian-bearing gravel deposits in the Rio Grande valley. The lithic assemblage consists predominantly of fine-grained materials such as obsidian, chert, and chalcedony.

Cortical flakes, small exhausted cores and core fragments, several bipolar-flaked obsidian and chert nodules, and non-diagnostic shatter are the most common artifacts; numerous bifacial thinning flakes are also present. Tools include informal flake tools, bifaces, unifaces, and a relatively large number of

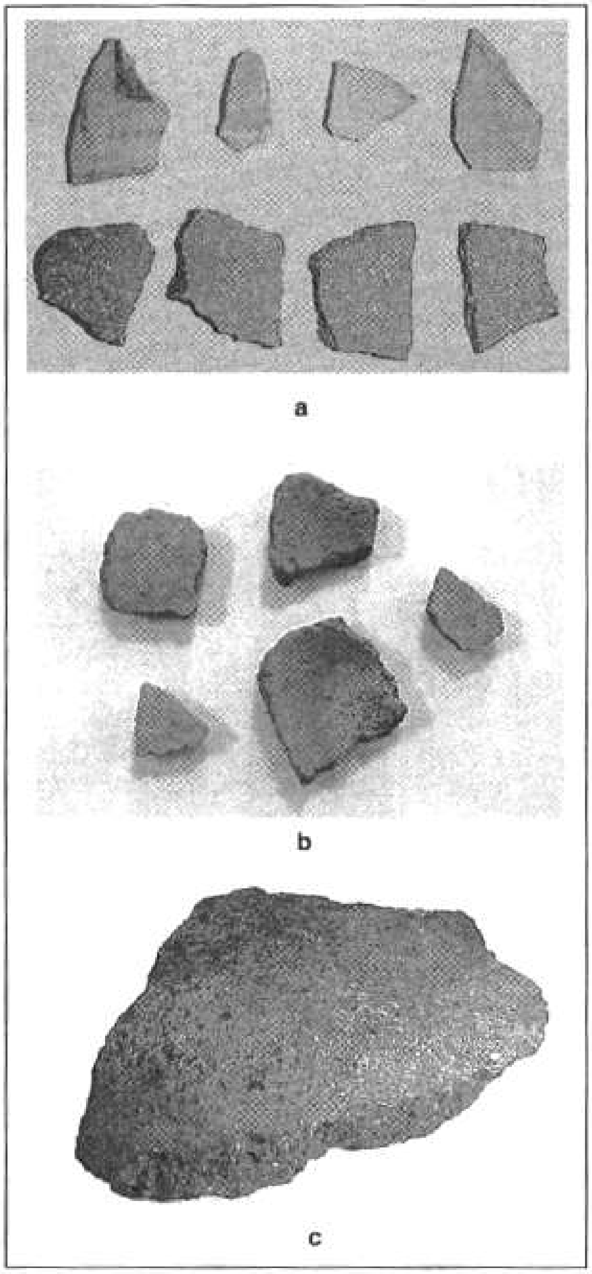


Figure 9. Ceramic assemblage from LA26780. All sherds are illustrated with the exception of three El Paso Brownwares from area G: a, Formative period Ramos Polychrome and El Paso Brownware sherds; b, possible protohistoric sand tempered brownwares; c, close-up view of exterior surface of possible protohistoric brownware.

hammerstones and battered cobbles. Four projectile points and one small preform were also collected from the surface (Figure 10).

Groundstone artifacts include six metate and three mano fragments. Raw materials used for groundstone included quartz monzonite, limestone, and sandstone, all of which were locally available in secondary gravel deposits of the Rio Grande valley.

As noted previously, nearly two-thirds of the lithic artifacts were obsidian. The obsidian used in the manufacture of tools at LA26780 was obtained entirely from sources located in northern Chihuahua. Batcho (1987) had originally submitted a stratified random 25 percent sample of the obsidian from areas B, D, E, and F to MOHLAB for chemical characterization and hydration rim measurement. Of the 36 samples, 33 were assigned to the newly defined Rio Grande Gravels (RGG) Group III and IV compositional groups based on percentage weight values of five major oxides measured by atomic absorption spectroscopy (Michels 1984a, 1984b). Two samples were assigned to RGG Group V, while the remaining specimen had an unknown chemical profile.

Recently, it has been confirmed that Rio Grande Gravel Groups III and IV, and possibly RGG Group V, do not derive from primary sources in northern New Mexico (and redeposited as Pliocene and Pleistocene-aged secondary gravel deposits in the Rio Grande valley) but are from northern Chihuahua sources (Miller and Shackley 1998). In 1996, several of the original samples characterized by MOHLAB to first define RGG Groups III and IV, along with several previously unanalyzed specimens, were submitted to Dr. Richard Hughes (Geochemical Research Laboratory) for X-ray fluorescence analysis. Several samples were also submitted to Chris Stevenson (Diffusion Laboratories) for measurement of specific density and determination of intrinsic water content for hydration dating. Hughes' analysis of chemical profiles determined that the RGG Group III and IV samples did not match any known obsidian source in the United States. In fact, the RGG IV specimens have one of the most distinctive chemical profiles of all North American obsidian sources. RGG III and IV Group obsidian also have specific density and intrinsic water content values that differ markedly from other Southwestern obsidian sources.

Instead, the chemical profiles for RGG III and IV Groups match several newly characterized sources in north central Chihuahua. Of the 46 obsidian samples submitted for geochemical characterization or intrinsic water content measurement, 42 have been assigned to two obsidian geochemical compositional groups deriving from the Sierra Fresnal source in northern Chihuahua and a second as yet unidentified source,

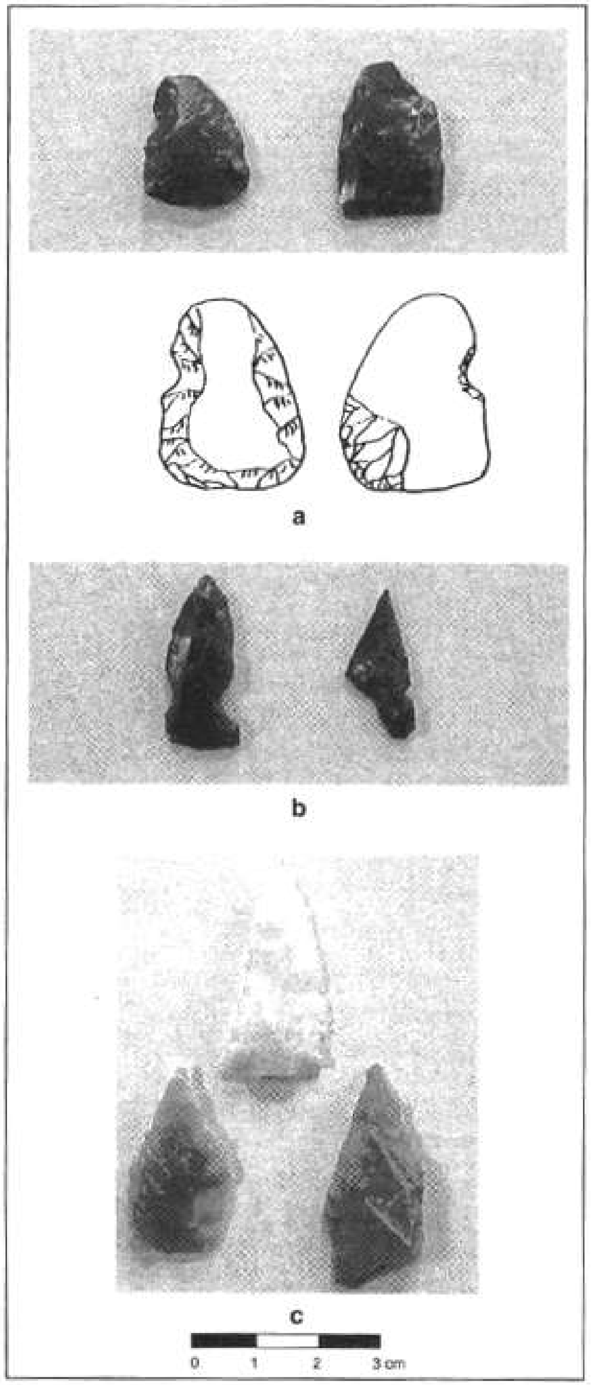


Figure 10. Selection of formal tools from LA26780: a, obsidian preform (with drawing) and uniface; b, obsidian projectile points; c, Archaic dart point, extensively reworked projectile point, and unifacial tool.

Chihuahua B, from the same region (Miller and Shackley 1998). In addition, an 1985 but unpublished analysis of an obsidian sample conducted by Chris Stevenson provided a partial chemical profile for another specimen originally assigned to the RGG IV Group by MOHLAB. Although the use of inductively-coupled plasma spectrometry failed to provide some crucial element measures for this sample, a comparison of the existing element measures indicates that it probably originated from the recently identified Lago Barreal source located southwest of El Paso. Two of the three remaining samples are from an unknown source that may also be located in Chihuahua. The final specimen is from the Antelope Wells source in southwestern New Mexico. Table 5 provides a comprehensive summary of sourcing studies conducted on obsidian from LA26780 and other sites in the DACA project area.

Equally important is the finding that none of the 46 samples represent a source present in local secondary gravel deposits of the Rio Grande valley, despite the location of the site near the edge of the upper Rio Grande terrace. The obsidian assemblage from LA26780 is distinct from several nearby Late Formative components that were also investigated during the DACA Project (Table 6). Obsidian at two El Paso phase pithouse sites (LA26784 and LA26785) consists entirely of sources commonly found in the local Rio Grande gravels, such as Obsidian Ridge, East Grants Ridge, and Polvadera. A substantial number and variety of Medio period ceramic wares was recovered from LA26784 and LA26785, including Ramos, Carretas, Villa Ahumada, and Escondido Polychromes, Playas Red, and several textured and plain brownwares of the Convento series, which makes the absence of obsidian from northern Chihuahua significant considering the preponderance of ceramic wares from this region.

The assemblage of obsidian artifacts provides important insights into raw material use and tool production by the inhabitants of LA26780. Unfortunately, the majority of these obsidian artifacts could not be further analyzed because they had been destroyed during previous studies through the combined processes of conversion into powder for AAS geochemical analysis and cutting to obtain slide samples for optical measurement of hydration rims (see Table 5). The lithics that remain intact include split nodules and bipolar nodular cores, cortical and non-cortical flakes, shatter, and bifacial thinning flakes, as well as several unifacial flake tools, a preform, and two projectile points. The entire reduction trajectory is represented in the

Table 5. Summary of Obsidian Chemical Sourcing Studies for the DACA Project Area Sites.

				Geologic Source Determinations			
Specimen/ MOHLAB #	Diffusion Lab #	Provenience	Artifact Type	1983/1984 AAS	1980s ICP/XRF	1995 XRF	1995 Density
LA26779/LA26780							
182–1380–5	–	Area B	specimen missing	RGG IV	–	–	–
182–1380–5–1	–	Area B	specimen missing	RGG III	–	–	–
182–1380–6	–	Area B, F. 5	specimen destroyed	RGG III	–	–	–
182–1380–8	–	Area B	specimen destroyed	RGG III	–	–	–
182–1380–8–1	–	Area B	specimen destroyed	RGG III	–	–	–
182–1380–10–1	–	Area B, F. 3	specimen destroyed	RGG IV	–	–	–
182–1380–10–2	–	Area B, F. 3	specimen destroyed	RGG IV	–	–	–
182–1380–10–3	–	Area B, F. 3	bifacial thinning flake	RGG IV	–	–	–
182–1380–10–4	DL–95–187	Area B, F. 3	biface preform	RGG IV	RGG IV	Chih A	Chih A
182–1380–10–5	–	Area B, F. 3	specimen destroyed	RGG III	–	–	–
0–3	DL–95–186	Area B, F. 3	bifacial thinning flake	–	–	–	Chih A
182–1380–24–1	–	Area E in B	specimen destroyed	RGG III	–	–	–
182–1380–24–2	–	Area E in B	specimen destroyed	RGG III	–	–	–
182–1380–24–3	–	Area E in B	specimen destroyed	RGG III	–	–	–
182–1380–24–4	–	Area E in B	specimen destroyed	RGG III	–	–	–
182–1380–24–5	–	Area E in B	specimen destroyed	RGG III	–	–	–
182–1380–24–6	–	Area E in B	specimen destroyed	RGG III	–	–	–
0–1	DL–95–184	Area E in B	flake tool	–	–	–	Chih B
0–2	DL–95–185	Area E in B	bipolar nodule	–	–	–	Chih B
1380–12–1	DL–95–420	Area C	cortical flake	–	–	–	Chih B
FA15–125–7	–	Area D, F. 1	specimen missing	RGG IV	RGG IV	Lago Barreal?	–
182–1385–13	–	Area D	specimen destroyed	RGG V	–	–	–
182–1385–13–1	–	Area D	specimen destroyed	RGG IV	–	–	–
182–1385–13–2	–	Area D	specimen destroyed	RGG IV	–	–	–
182–1385–13–3	–	Area D	specimen destroyed	RGG IV	–	–	–
182–1385–13–4	–	Area D	specimen destroyed	RGG V	–	–	–
182–1385–21–1	–	Area D	cortical flake	RGG III	–	Chih B	–
182–1385–21–2	–	Area D	specimen missing	RGG IV	–	–	–
182–1385–21–3	DL–95–189	Area D	cortical flake	RGG III	RGG III	Chih B	Chih B
182–1385–21–4	DL–95–190	Area D	cortical flake	RGG IV	RGG IV	Chih A	Chih A

Table 5. *(Continued)*

Specimen/ MOHLAB #	Diffusion Lab #	Provenience	Artifact Type	Geologic Source Determinations: 1983/1984 AAS	1980s ICP/XRF	1995 XRF	1995 Density
182–1385–21–5	–	Area D	specimen destroyed	RGG III	–	–	–
182–1385–21–6	–	Area D	specimen destroyed	RGG III	–	–	–
1385–21–7	DL–95–188	Area D	cortical flake	–	–	–	Chih B
182–1385–23	–	Area D	bifacial thinning flake	RGG IV	–	Chih A	–
182–1385–25–1	–	Area F in D	specimen destroyed	RGG IV	–	–	–
182–1385–25–2	DL–95–194	Area F in D	cortical flake	RGG III	–	Chih B	Chih B
182–1385–25–3	–	Area F in D	insufficient remnant	RGG III	–	–	–
182–1385–25–4	–	Area F in D	specimen destroyed	RGG III	–	–	–
182–1385–25–5	–	Area F in D	specimen destroyed	RGG III	–	–	–
182–1385–25–6	DL–95–195	Area F in D	bifacial thinning flake	RGG III	RGG III	Chih B	Chih B
182–1385–25–7	–	Area F in D	cortical flake	RGG III	–	Chih B	–
1385–25–8	DL–95–193	Area F in D	cortical flake	–	–	–	Chih B
1385–25–9	DL–95–192	Area F in D	cortical flake	–	–	–	Chih B
1385–25–10	DL–95–191	Area F in D	cortical flake	Unknown	–	Antelope Wells	–
FA15–125–11	–	Area F in D	specimen missing	RGG III	RGG III	–	–
FA15–125–12	–	Area F in D	specimen missing	RGG III	–	–	–
LA26775, Formative Period							
182–1383–178	–	08N/18W	specimen destroyed	Not Obsidian	–	–	–
182–1383–75	DL–95–200	12S/40E	bipolar nodule	RGG I	–	RGG I	–
182–1383–79–2	–	Periphery	cortical flake	RGG I	–	RGG I	–
182–1383–115–2	DL–95–198	04N/20W	flake tool	RGG II	–	Cerro del Medio	–
182–1383–163	–	00N/36E	insufficient remnant	RGG II	–	–	–
182–1383–181	–	12S/22W	insufficient remnant	RGG II	–	–	–
182–1383–49	–	04S/40E	specimen missing	RGG II	–	–	–
182–1383–8	–	04S/08W	insufficient remnant	RGG II	–	–	–
182–1383–88	–	00N/28E	insufficient remnant	RGG II	–	–	–
182–1383–99	–	00N/12E	insufficient remnant	RGG II	–	–	–
182–1383–115–1	–	04N/20W	specimen destroyed	RGG VI	–	–	–
182–1383–184a	–	06N/18W	specimen destroyed	RGG VI	–	–	–
182–1383–184b	–	06N/18W	cortical flake	RGG VI	–	RGG VI	–

Table 5. *(Continued)*

Specimen/ MOHLAB #	Diffusion Lab #	Provenience	Artifact Type	Geologic Source Determinations 1983/1984 AAS	1980s ICP/XRF	1995 XRF	1995 Density
LA26784/26788, Formative Period							
FA20–125–13	–	04N/24W	specimen destroyed	RGG II	–	–	–
182–1386–101	–	F. 2	insufficient remnant	RGG II	–	–	–
FA24–125–16	DL–95–182	04N/64E	cortical flake	RGG I	–	RGG I	–
FA24–125–15	–	04N/66E	specimen destroyed	RGG II	–	–	–
FA24–125–8	–	04S/20E	specimen missing	RGG II	–	–	–
182–24–136	–	Area A	insufficient remnant	RGG II	–	–	–
182–24–143	–	Area C	insufficient remnant	RGG II	–	–	–
182–24–144	–	Area D	specimen destroyed	RGG II	–	–	–
182–24–144–1	DL–95–181	Area D	insufficient remnant	RGG II	–	–	–
182–24–144–2	–	Area D	insufficient remnant	RGG II	–	–	–
182–24–94	DL–95–180	08N/67E	insufficient remnant	RGG II	–	RGG II	–
LA26778							
FA14–125–14	–	surface	cortical flake	RGG I	–	RGG I	–
182–1388–200–1	–	surface	specimen destroyed	RGG II	–	–	–
LA26769							
182–1379–1	–	surface	specimen destroyed	Unknown	–	–	–
LA26772							
182–1381–8	–	periphery	specimen destroyed	RGG II	–	–	–

RGG I=East Grants Ridge, central New Mexico, locally present in Rio Grande gravels; RGG II=Obsidian Ridge, central New Mexico, locally present in Rio Grande gravels; RGG III=Chihuahua B, northern Chihuahua; RGG IV=Sierra Fresnal, northern Chihuahua; RGG V=unknown, not a Rio Grande source, may be a vitrophyre; RGG VI= Polvadera Peak, central New Mexico, locally present in Rio Grande gravels

Table 6. Summary of Geochemical Source Assignments for Obsidian Samples recovered from Protohistoric and Prehistoric Sites within the Dona Ana County Airport project area near El Paso, Texas.

		Obsidian Sources								
		Northern Chihuahua			SW New Mexico		Rio Grande Gravels (local secondary source)			
Site	Area	Sierra Fresnal (RGG IV)	Chihuahua B (RGG III)	Lago Barreal	Antelope Wells	Obsidian Ridge	Grants Ridge	Polvadera	Cerro del Medio	Unknown
					Protohistoric Component					
LA 26799/ 26780	B	6	5	–	–	–	–	–	–	–
	E	–	8	–	–	–	–	–	–	–
	D	6	5	1?	–	–	–	–	–	–
	F	1	10	–	1	–	–	–	–	–
	C	–	1	–	–	–	–	–	–	–
	Total	13	29	1?	1	0	0	0	0	0
					Prehistoric El Paso Phase Components					
LA 26784	All	–	–	–	–	10	1	–	–	–
LA 26775	All	–	–	–	–	6	2	3	1	–
Others	All	–	–	–	–	2	1	–	–	1
	Total	0	0	0	0	18	4	3	1	1

obsidian assemblage, indicating that obsidian nodules were transported from distant sources and reduced into tools at the site.

Having reviewed the site layout, features, and the material culture at LA26780, the fundamental issue now concerns the chronological and chronometric evidence. Relative chronological indicators include ceramics, projectile points, and the spur rowel. Eleven of the 17 ceramic sherds recovered from LA26780 are common Late Formative types, while the remaining six sherds probably represent protohistoric or Historic brownwares. One of the projectile points is a small, triangular form with side and basal notching that could be classified as a Toyah or Harrell, inasmuch as most triangular, notched forms in the region have been traditionally classified—correctly or incorrectly—under these terms. The specimen conforms most closely with the Toyah form, having more pronounced shaping along the basal margins and lower placement of notches. However, it is a unifacially worked flake blank, with the ventral surface of the original flake unmodified except for the tip of the blade and the margin of the base. The second projectile point, also a flake blank on which minimal pressure flaking was used to create side notches and modify the shape of the blade, lacks a basal notch.

Figure 11 compares these specimens with similar forms recovered from Late Formative and Pueblo Revolt/Mission period contexts in the El Paso area. Four of the six projectiles from LA26780 and the Ysleta WIC site were manufactured from flake blanks, although this pattern has also been detected among point collections from Formative period sites in the region and does not constitute a particularly diagnostic attribute of one period or another. Otherwise, it is evident that this general projectile form is associated with occupations ranging in age from ca. A.D. 1150-1750, and is not a particularly refined chronological marker.

A third point from LA26780 has similarities to the Datil style (Dick 1965) of central New Mexico and to the recently defined Pendejo form (MacNeish 1993; Sanchez 1989) of northern Chihuahua; these generally date to the latter part of the Middle Archaic or early part of the Late Archaic. The fourth point appears to be Archaic, but has been extensively reworked to such an extent that it is difficult to identify the original form. Attributes of the base and lower haft element of this specimen resemble Early Archaic Jay and Bajada forms. The reworked blade edges have distinctive abrasions and micro-flake wear patterns indicating its use as a tool rather than as a projectile, and it is possible that this tool was scavenged, recycled, and discarded at the site by later occupants.

The spur rowel represents a critical piece of evidence for determination of age and affiliation.[6] A description in the draft report of investigations (CRMD 1985) noted that the item was a hand-wrought iron spur rowel typical of Spanish forms manufactured during the 16th century (See Simmons and Turley 1980:Plate 20). Figure 12 provides a reproduction of this plate. While this six-pointed rowel style was supplanted by different styles during the late 16th and early 17th centuries, Simmons and Turley (1980) note that early examples of spurs and other durable aspects of horse gear continued to be used and maintained in the northern frontier of New Spain for long periods, and were often inherited over several generations. Therefore, it would be inappropriate to use the style of this particular artifact to specifically assign a 16th century occupation date to LA26780.

A confusing impression of age and affiliation emerges upon consideration of the temporally diagnostic artifacts from LA26780. The various projectile point and ceramic types represent the Middle/Late Archaic, Late Formative, and protohistoric periods. Moreover, there is no consistent contextual patterning of these artifacts, in the sense that artifacts representative of particular time intervals were spatially segregated from those of other periods. El Paso Brownware sherds, an Archaic projectile point, a late projectile point, and the spur rowel were recovered from Areas D and F, while Ramos Polychrome sherds, sand-tempered brownwares, and late projectile points were present in Area B. Obsidian artifacts from Chihuahuan sources were present in generally equal proportions across each of the major provenience areas. If confirmed as such, the presence of a metal artifact of Spanish origin would impose a *terminus post quem* argument that at least one occupational component post-dates 1565 or 1581, the dates of the earliest of the Spanish *entradas* in northern Chihuahua and the El Paso area.

Mesquite wood charcoal from Feature 1 in Area D (Batcho 1987; Batcho et al. 1985:39) has a radiocarbon age of 340 ± 70 B.P. (Beta 5932). A ^{13}C correction was not obtained since the sample was submitted prior to the widespread use or

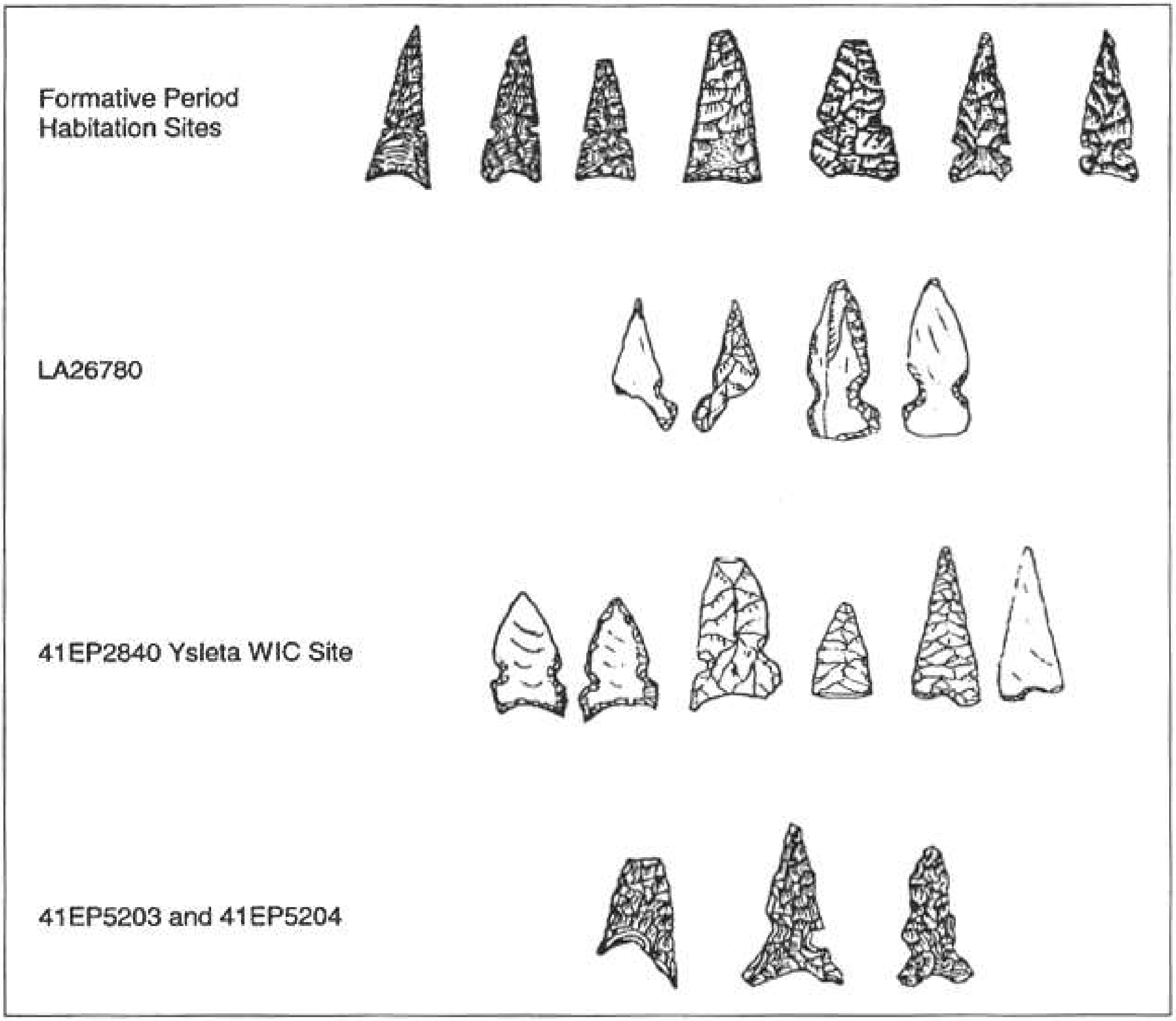


Figure 11. Typical projectile point forms for the Late Formative and Spanish Colonial periods in far west Texas and south central New Mexico contrasted with two specimens from LA26780. Upper row: typical forms recovered from Late Formative period pueblo and pithouse settlements. Second row: projectile points from LA26780. Third and fourth rows: examples from excavations in the El Paso Lower Valley municipality of Ysleta. The four specimens in the third row are from Pueblo Revolt period (A.D. 1680-1725) contexts at the Ysleta WIC site (O'Leary and Miller 1992); the three examples in the lower row are from the late 18th through mid-19th century contexts at 41EP5203 and 41EP5204 (Melton and Harrison 1996). Note unifacially worked or edge retouched flake blanks characteristic of points from LA26780 and 41EP2840.

availability of isotopic measurements provided by commercial laboratories. To compensate for this deficiency, the radiocarbon age has been corrected using an estimated ^{13}C value of -24.7‰ that represents a mean value for mesquite wood charcoal calculated from over 100 mesquite charcoal samples documented in this region of West Texas and south central New Mexico (Miller 1996). The estimated isotope correction results in an age estimate of 348 ± 82 B.P.

Figure 13 provides the dendrochronological calibrations for this age estimate using both the bidecadal dataset of Stuiver and Pearson (1993) and the comprehensive decadal dataset of Stuiver et al. (1998). At the two-sigma (95 percent) confidence interval, the calibrated calendar age (rounded to the nearest decade) is AD 1420 to 1950, with intercepts centered around AD 1515, 1590, and 1620 (rounded to nearest five year interval). However, as illustrated in Figure 13, the densest area

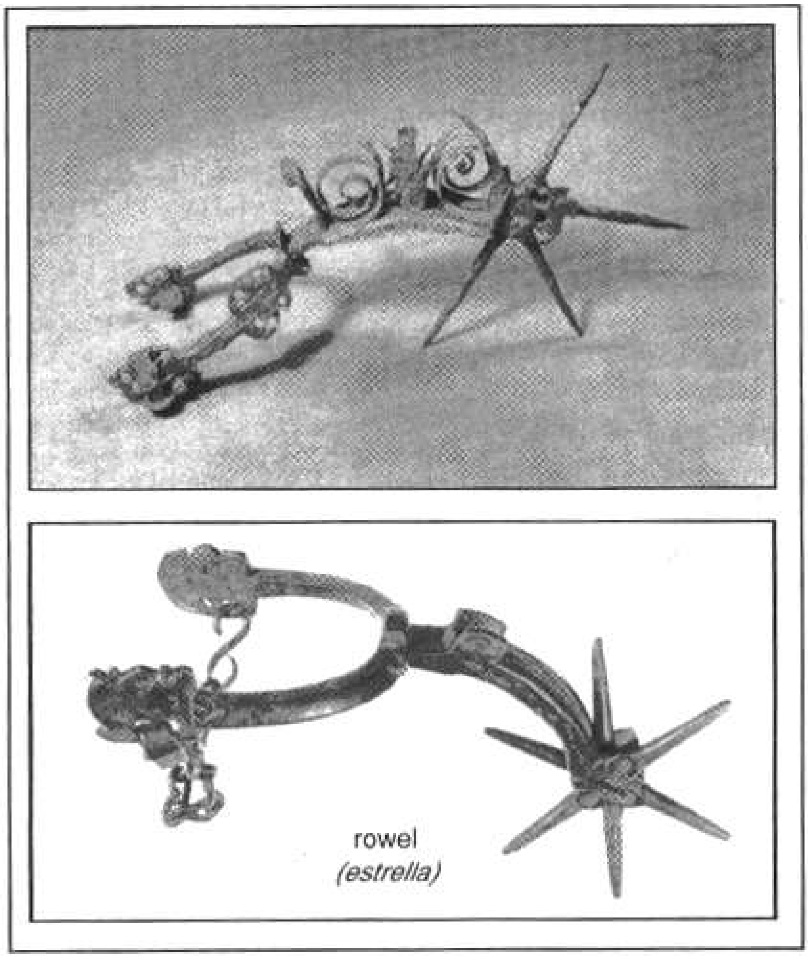


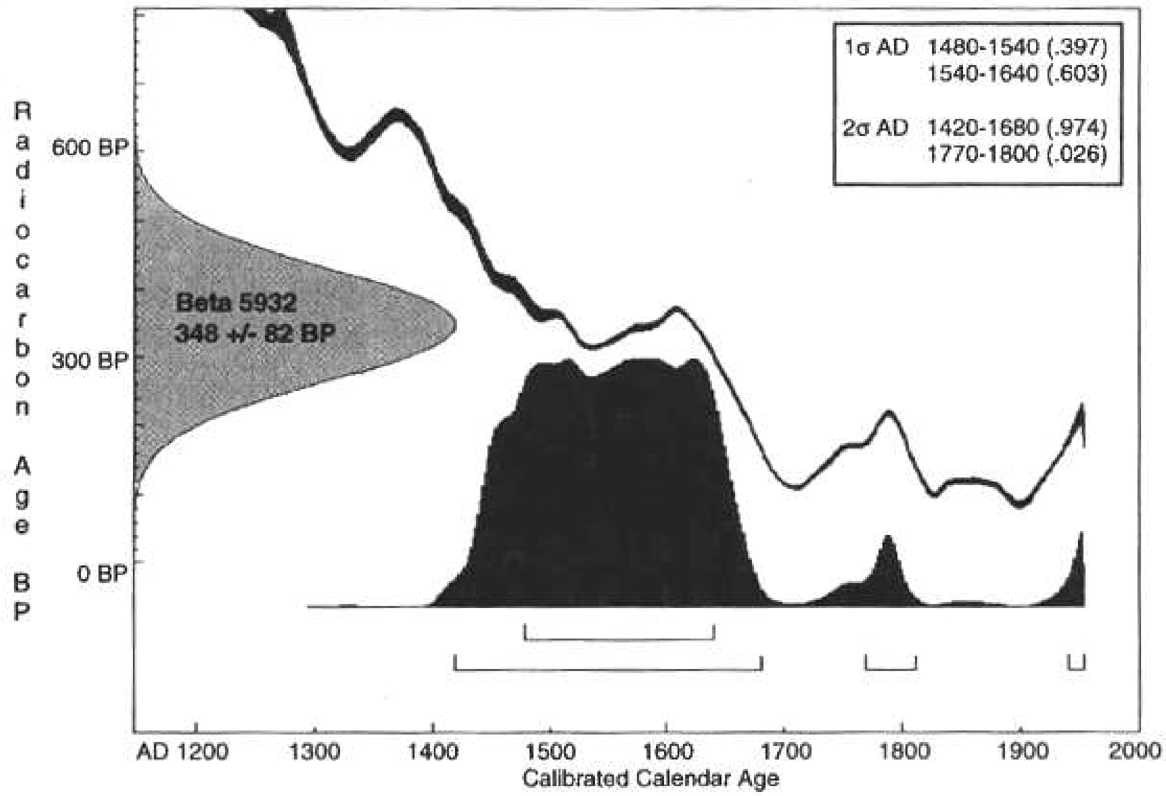
Figure 12. Examples of wrought-iron Spanish spurs of the 16th century (adapted from Simmons and Turley 1980:Plates 20 and 21). The *estrella* (or rowel) of these forms is similar to the specimen recovered near Feature 11 at LA26780.

under the probability curve falls within a much more restricted time interval. Using this approach, the most appropriate age estimate for the sample ranges from AD 1420 to 1680 (0.96 or 0.97 probability depending on the calibration dataset), while the one-sigma (65 percent) probability area affords a slightly narrower time span of AD 1480-1640. In summary, the radiocarbon age estimate provides a relatively secure age assessment for Feature 1 that falls comfortably within the protohistoric era.

However, not content to leave well enough alone, I submitted in 1995 a second sample thought to be from Feature 1 to further corroborate the original date. The sample consisted of a very small macrobotanical fragment collected from a flotation sample and identified as *Zea mays* (Wetterstrom 1983). However, the measured ^{13}C value of -24.0 ‰ indicates that the species identification of this very small specimen was in error. The sample yielded a corrected AMS radiocarbon age (Beta 81908/ETH 14334) of 3200 ± 50 B.P., placing it in the early part of the Late Archaic period.

The discrepancy of 2850 radiocarbon years between these two age estimates, thought to be from the same feature, is difficult to reconcile. The remnant of the original sample (Beta 5932) was examined by Tom O'Laughlin and I, and determined to consist of mesquite wood charcoal and not recently decomposed roots or other organic matter. On the other hand, the misidentification of a partial maize kernel fragment used for the second dating study is somewhat surprising, and thus there is some issue regarding the provenience of the sample. The sample was miniscule (less than 1 mm in diameter), and it is possible that some provenience or handling error occurred during the preceding 12 years, and that this actually represents the unidentified seed fragment recovered in the flotation sample from Feature 8 in Area A. However, providing additibnal support for the premise that the species identification was in error is the fact that three small macrobotanical samples identified as corn cupule fragments from nearby Formative period pithouse site LA26784 were submitted for AMS dating. The measured ^{13}C values for these specimens were -18.3‰, -20.3‰, and -21.0‰, suggesting that Wetterstrom's identifications of minute macrobotanical samples were occasionally inaccurate.

It should be noted that of 202 archeological contexts in the region for which two or more radiocarbon ages have been obtained, in only 12 cases have the earliest and latest age estimates differed by more than 500 years. The largest recorded difference is a single case of a 1400 year offset for two dates obtained from a hearth.



Laboratory #:	Beta 5932
Sample composition:	Mesquite wood charcoal (8 grams)
Uncorrected radiocarbon age:	340 +/- 70 BP
Estimated correction factor:	-24.7 with added variance
Estimated corrected age:	348 +/- 82 BP

Calibration Datasets

Age Estimates	*Stuiver and Pearson 1993* (bidecadal dataset)	*Stuiver et al. 1998* (decadal dataset)
Curve Intercepts	AD 1517, 1588, 1622	AD 1516, 1598, 1617
1 sigma age ranges	AD 1444 - 1652	AD 1444 - 1646
2 sigma age ranges	AD 1424 - 1677 AD 1774 - 1800 AD 1941 - 1954	AD 1419 - 1672 AD 1778 - 1799 AD 1943 - 1945
1 sigma age probabilites	AD 1481 - 1637 (1.00)	AD 1476 - 1536 (.397) AD 1537 - 1635 (.603)
2 sigma age probabilites	AD 1421 - 1678 (.960) AD 1771 - 1802 (.030) AD 1940 - 1955 (.010)	AD 1415 - 1675 (.974) AD 1772 - 1801 (.026)

Figure 13. Calibration results for radiocarbon age estimate from Hearth 1 at LA26780.

Therefore, the potential for laboratory error or contamination factors can be taken into account. It is possible that the sample was contaminated by 15 years of storage in a gelatin capsule, although this is not a high probability (Darden Hood, 1999 personal communication). Barring handling mistakes, laboratory errors, or contamination, a conservative interpretation is that radiocarbon evidence suggests Feature 1 represents either a protohistoric or Late Archaic occupation at LA26780.

Additional chronometric refinement has been attempted through the use of obsidian hydration dating. In 1983, 39 samples were submitted to MOHLAB for hydration rim measurement (Michels 1983). All of the hydration rims were relatively thin. Based on intrinsic hydration rate constants calculated for Rio Grande Gravel Groups III and IV, and using a weather station temperature model to estimate ambient effective hydration temperatures, Batcho (1987) calculated a series of dates ranging between A.D. 1440-1558, with a mean age of A.D. 1518 ± 26.

However, MOHLAB laboratory procedures, and the reliability of the dates, has been seriously questioned (Miller 1996; Scheetz and Stevenson 1988; Stevenson et al. 1989, 1990), and subsequently in 1995 an additional 13 samples were submitted to Chris Stevenson of Diffusion Labs (Table 7). Hydration rates were determined using the intrinsic water content method, with water content determined through a regression analysis of the relationship between specific density and water content (Stevenson and Ambrose 1995). In addition, thermal cells were implanted at the site in 1995 and measured after a period of one year to determine ambient temperature and relative humidity factors needed to accurately determine local hydration rates. None of these refined approaches provided a satisfactory suite of calendar age estimates for LA26780, nor for the Ysleta WIC site and other components in the region (see Table 7). While obsidian hydration dating has proven extremely troublesome and unreliable as a chronometric method, Miller (1996) suggests that the presence of unusually thin hydration rims may satisfactorily serve as a *relative* dating method for the identification of post-A.D. 1450 components when used in corroboration with other chronometric or chronological data. Compared to the 1529 hydration rims measured on prehistoric obsidian artifacts in the region, hydration rims measured on Chihuahua B obsidian from LA26780 are relatively thin, while those measured on a small number of Sierra Fresnal obsidian samples are all less than one micron in thickness. It is noteworthy that in the entire dataset of 1529 specimens, only one other obsidian specimen, a sample of East Grants Ridge source debitage from the Fillmore Pass site, has a rim measurement less than one micron.

Figure 14 is a series of boxplots with median values and interquartile ranges for hydration rim measurements from Archaic, Formative, and Historic components. Several geologic sources are represented among the obsidian assemblages, each of which potentially hydrates at a different rate, and accordingly the boxplots are arranged by specific sources common among all time periods. To provide a comparison with hydration rim values that may be expected from a Historic component, the boxplot furthest to the right provides rim measures obtained from the Ysleta WIC site, a Pueblo Revolt settlement conclusively dated to 1680-1725 (Miller and O'Leary 1992a). The Ysleta WIC samples were not chemically characterized, although it is likely that these specimens are Obsidian Ridge based on the prevalence of this source in the Rio Grande gravels. Macroscopically, the samples lack the rhyolitic phenocrysts and coarse texture characteristic of the East Grants Ridge source or banded ash inclusions of the Polvadera Peak source. Furthermore, the specific density and intrinsic water content values for these samples are not consistent with those measured among the Chihuahuan sources or Polvadera Peak. However, whether compared against the trend of rim measurements for the Obsidian Ridge or unsourced materials, the Ysleta WIC site clearly has very thin hydration rims compared to other periods.

Having demonstrated that historic components have markedly thinner hydration rims, consider the rim measurements obtained on Sierra Fresnal and Chihuahua B samples from LA26780. The median value for Sierra Fresnal hydration rims (0.88 microns) is significantly smaller (see Figure 14) than the median values of 3.51 and 1.70 microns for samples of this obsidian group from Archaic/Early Formative and Late Formative components, respectively (Mann-Whitney U test for independent samples, p =.024). The difference is not as pronounced for Chihuahua B rims, where the LA26780 median is 2.78 microns versus 3.35 microns for Archaic/Early Formative samples, although the Mann-Whitney U test is still significant (p = 0.50).

Table 7. Obsidian Hydration Dating at LA26799/LA26780 compared to other sites of similar age or location.

Site	Rim Width MOHLAB (Microns)	DL (Microns)	Source	IWC Model 1	IWC Model 2	Standard Model 1	Standard Model 2	Regression Model
Ysleta		1.95	Unknown*	1336	1488	1779	1704	1406
41EP2840		2.10	Unknown*	1257	1428	1752	1664	1356
A.D. 1680–1750 (ceramic dating)		2.18	Unknown*	1204	1388	1737	1642	1329
DACA Manso	1.87	0.82	Chihuahua A	1803	1785	–	–	–
LA26799/26780	1.85	0.86	Chihuahua A	1794	1775	–	–	–
A.D. 1581–1680?		0.96	Chihuahua A	1757	1733	–	–	–
		1.92	Chihuahua B	1446	1386	1750	1711	1416
		2.00	Chihuahua B	1428	1366	1733	1691	1389
	2.68	2.39	Chihuahua B	1152	1056	1640	1580	1258
	2.68	2.65	Chihuahua B	973	856	1569	1495	1168
	2.66	2.78	Chihuahua B	908	784	1531	1449	1122
		2.98	Chihuahua B	753	610	1468	1375	1051
		3.18	Chihuahua B	594	432	1401	1295	978
		3.49	Chihuahua B	286	87	1289	1161	865
		4.35	Chihuahua B	-470	-758	923	724	539
		2.04	Antelope Wells	1321	1246	–	–	–
DACA Pithouse		3.29	Obsidian Ridge	538	370	1362	1249	938
A.D. 1250-1450	1.81	7.04	Obsidian Ridge	-1398	-803	-740	-1260	-558
(^{14}C and ceramics)	1.82	7.29	Obsidian Ridge	386	214	-856	-1398	-622

*Probably Obsidian Ridge

All ages are expressed in calendar ages; negative numbers denote B.C. dates

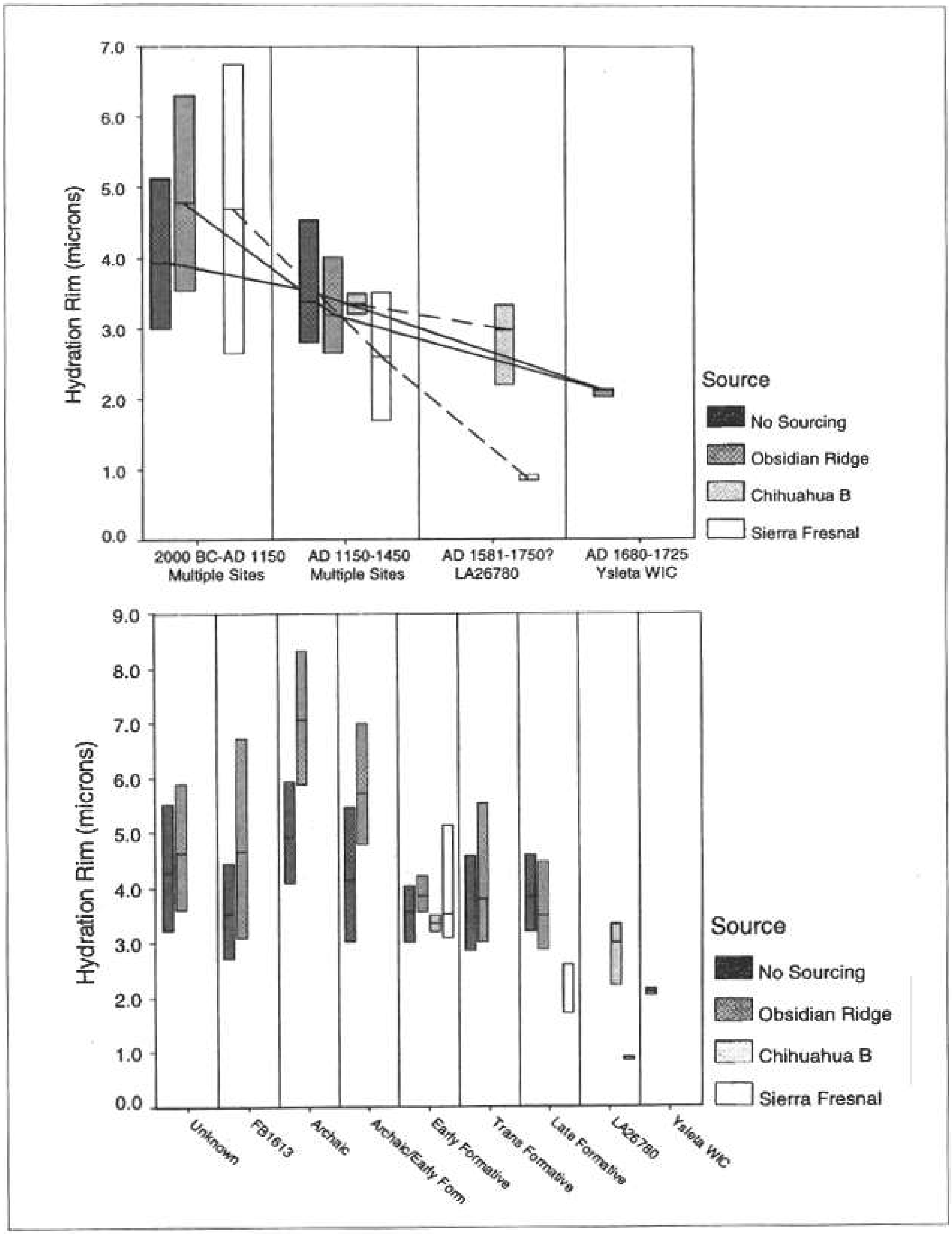


Figure 14. Boxplots comparing median obsidian hydration rim measurements among prehistoric and historic period components. Upper graph illustrates trend of rim measurements through major time intervals and among different geological source groups. Lower graph illustrates all rim measurements for selected components.

The comparison of hydration rims indicates, in relative terms, that flaked obsidian artifacts recovered from LA26780 and the demonstrably historic Ysleta WIC site are comparatively recent.

While comparisons of basic hydration rim measurements are intriguing and potentially useful, it is equally important to examine the derivation of actual calendar age estimates provided by the method since different ambient temperatures and other local factors affect hydration rates. Figure 15 compares the distributions of obsidian hydration and radiocarbon dates for 13 components dating

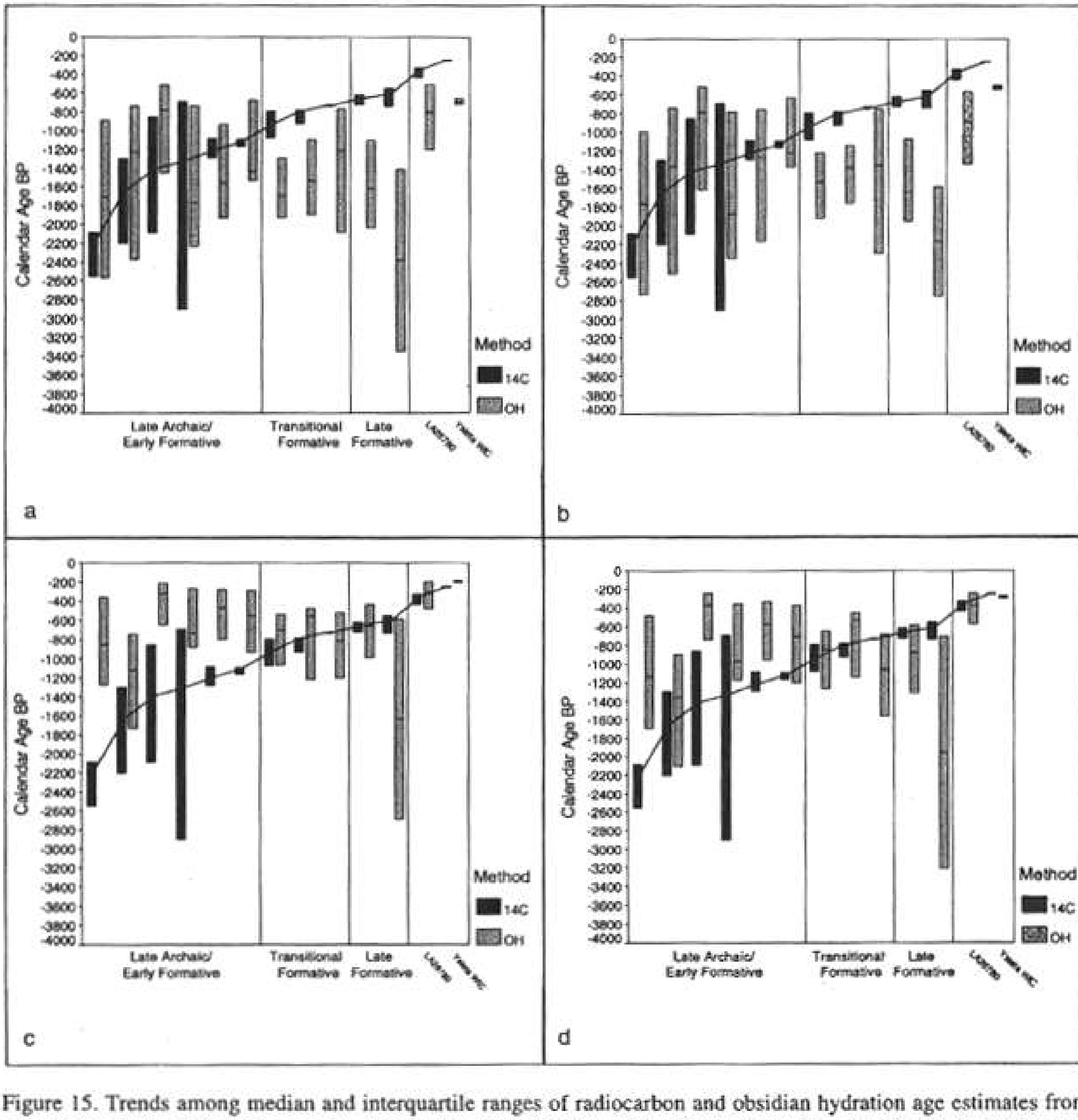


Figure 15. Trends among median and interquartile ranges of radiocarbon and obsidian hydration age estimates from components dating from 300 B.P. (ca. AD 1680) to 2200 B.P. (ca. 250 BC). Obsidian dates for historic components at LA26780 and the Ysleta WIC site are shown on the far right side of each graph. Obsidian hydration dates calculated using four hydration rate determination models: (a) intrinsic water content with direct measurement of effective hydration temperature (EHT); (b) intrinsic water content with measured EHT assumed at a depth of 10 cm; (c) standard Obsidian Ridge hydration rate with direct measurement of EHT; (d) dates calculated using empirical regression model of Mauldin et al. (1998).

between ca. 250 B.C. and A.D. 1680, and incorporates four models used to calculate calendar dates. The upper two models use intrinsic water content values to determine artifact-specific, rather than source-specific, hydration rates. The first of these has provenience-specific effective hydration temperatures based on thermal cell temperatures recorded at the depths from which artifacts were recovered. The second applies a regression-based temperature value for a uniform soil depth of 10 cm. The third model employs the same temperature model, but incorporates a source-specific induced hydration rate for Obsidian Ridge materials developed by Chris Stevenson (1985). The final model uses an empirical regression model (Mauldin et al. 1998). Technically, the standard Obsidian Ridge and regression models are inappropriate for the obsidian samples from LA26780 since they are specifically designed for the Obsidian Ridge source. They are included here to illustrate that a consistent trend exists among obsidian hydration age estimates despite the method or model utilized to estimate hydration rates.

The distribution of median obsidian hydration values along the trend of increasing radiocarbon age is non-linear, but does have a general sinusoidal trend. Previous analyses have detected this pattern and found it extends even further into the past, and there is an indication that paleoclimatic factors (paleotemperature fluctuations) may have some influence (Miller 1996). A fundamental problem is that this sinusoidal pattern creates a situation where a particular interval during the Late Archaic/Early Formative period has similar obsidian calendar age estimates to Historic components. However, this particular interval is much later than the 3200 B.P. radiocarbon date from LA26780, and thus the obsidian data appears to more closely corroborate the most recent of the two radiocarbon dates from the site.

In summary, while obsidian hydration analysis does not provide consistently reliable absolute chronometric dates, a consideration of the obsidian data as a relative dating method suggests that hydration rims at LA26780 formed relatively recently compared to prehistoric sites in the region. Furthermore, the hydration data do not support the presence of a Formative period occupation, although the non-linear relationship between hydration rims (actually hydration rates) and age does not entirely rule out an Archaic occupation.

The fundamental question is how many components are present at LA26780, and to which component or components do the majority of artifacts belong? Of the possibilities, the evidence for a Formative period occupation is clearly the weakest. There is no chronometric evidence for a Formative occupation (Figure 16). While the majority of the small number of ceramics are typical Formative period types, only 11 such sherds were found. This is a much lower count than any of the nearby Formative period sites within the DACA project area: NMSU 1393 (n=2891 sherds), NMSU 1383 (n=1226), NMSU 1386 (n=877), and NMSU 1389 (n=674) (Batcho et al. 1985). The other

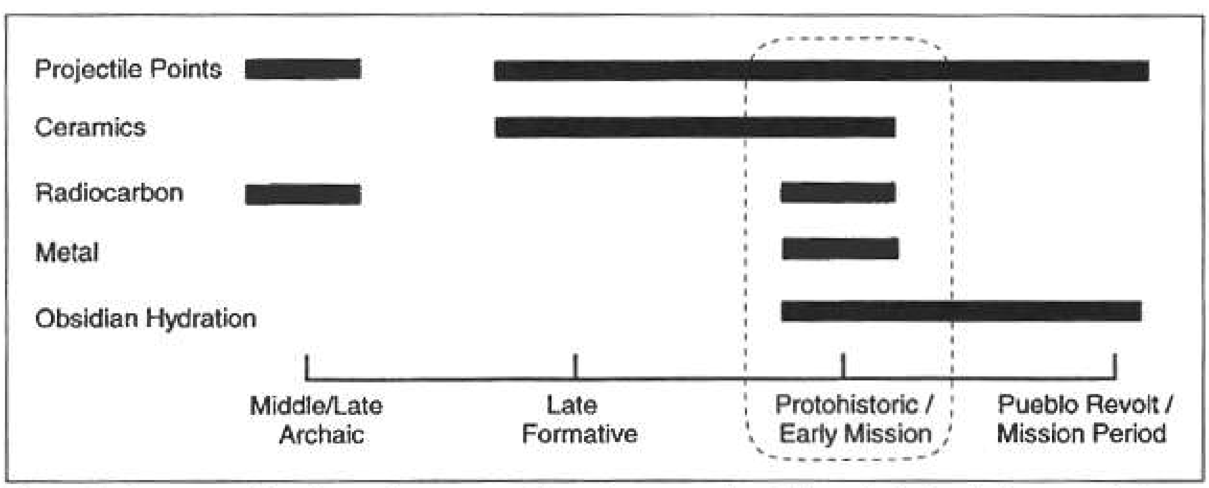


Figure 16. Summary of time intervals represented by various categories of chronological and chronometric data at LA26780.

chronological indicator is the two projectile points, both characteristic of later Historic forms. The Archaic period is represented by a problematic radiocarbon date and two projectile points, one of which was intensively reworked. Obsidian hydration rim measurements and calendar age estimates do not strongly support the presence of an Archaic occupation.

The strongest case is for a post-A.D. 1450 occupation. The original radiocarbon age is secure in terms of sample composition, provenience, and laboratory analysis, although unresolved is the second extremely discordant date obtained from Feature 1. Obsidian hydration data, although always suspect, corroborate the relative dating of LA26780 as a late occupation. It is reasonable to assume that the majority of the lithic assemblage is associated with this occupation, inasmuch as it consists predominantly of non-local obsidian transported to the site and subsequently reduced into several informal and formal tools. The presence of the Spanish spur rowel further substantiates the late age of the site, and may serve to narrow the proposed occupation period by imposing a *terminus post quem* later than 1565/1581. Overall, there is sufficient chronological evidence to support the hypothesis that the primary occupation of LA26780 occurred between 1565 and 1680.

ARCHEOLOGY AND ETHNOHISTORY AT LA26780

In a review of archeological and ethnohistorical research pertaining to the protohistoric period, Lockhart (1998b) expresses the need for multi-disciplinary efforts to identify and study Manso and Suma settlements. Here, the integration of archeological and ethnohistorical methods, chronometric studies (i.e., radiocarbon, obsidian hydration, and relative artifact dating), geochemical analysis and sourcing of obsidian and ceramic artifacts, and macrobotanical studies, have been brought to bear on defining the age and affiliation of LA26780. Yet, the summary results are ambiguous even in the most favorable light. If considered individually, none of the material culture attributes are particularly convincing, and the potential multi-component nature of the site, including the evidence for a Middle/Late Archaic occupation and the presence of a small number of Late Formative period ceramics, poses interpretive problems.

At the present time, however, LA26780, and perhaps the Soto Ranch site, are the most auspicious candidates for Manso or Suma settlements in West Texas, south central New Mexico, and northern Chihuahua. To further explore the nature of Manso or Suma settlement in the region, I assume that the principal occupation at LA26780 was affiliated with one or another of these groups, and compared to the collection of isolated features and components having late chronometric dates reviewed earlier, it is certainly the most substantial and thoroughly investigated settlement of this period. Working from this premise, I compare several aspects of the site and its artifact assemblage to historically documented characteristics of Manso and Suma settlement.

A limited amount of ethnohistoric and ethnographic information is available for the Manso and Suma, but they provide important and intriguing insights into the settlement and subsistence adaptations and material culture of these groups. The discussion centers on four aspects of the Manso and Suma ethnohistoric record—geographic location (i.e., mobility/territorial ranges), built environment, subsistence, and technology—for which archeological parallels may be drawn and subsequently used to derive archeological expectations concerning the nature of 1450-1680 settlements and material culture. Personal appearance, dress and adornment, social organization, characteristics of later Mission period settlement, and the history of assimilation among other ethnic groups are not considered here, nor is the debate regarding the linguistic affiliation of these groups (see Beckett and Corbett 1992; Forbes 1957; Griffen 1979; Kenmotsu 1994; Miller 1983; Scholes and Mera 1940).

The geographic location of the Manso *nacion* is relatively well-established through historical accounts, and included the Rio Grande valley in the area of El Paso and extending north past Las Cruces, New Mexico. The Espejo expedition of 1582 first encountered a group called the Tanpachoas in the vicinity of the El Paso lower valley (Hammond and Rey 1929). Most sources identify the Tanpachoas as an early encounter with the same group later identified as the Manso during Oñate's journey in 1599 (Beckett and Corbett 1992; Hammond and Rey 1953; Kenmotsu 1994). Benavides (1965) observed several rancherías occupied by Manso groups for a distance of 30 leagues along the Rio Grande. During later years, in 1692 a large Manso ranchería was observed along the Rio Grande valley near present-day La Union, New Mexico, just north of El Paso (Beckett and Corbett 1992), and near Dona Ana, north of Las Cruces (Espinosa 1942). The La Union ranchería would lie within a distance of five miles from LA26780.

Evidence of settlement beyond the Rio Grande valley is sketchy, but accounts do indicate that the Manso may have ranged beyond the confines of the river valley. Forbes (1959) describes a 1667 account of a Manso ranchería near the Florida Mountains, 100 km west of the Rio Grande. Documentary sources also mention the Manso as using salt salines, although the location is not specified (Kenmotsu 1994). The salines may be Coe Lake and Lake Lucero in the Tularosa Basin (north of El Paso) where later Spanish settlers established the San Andres Salt Trail; one of several lakebeds in northern Chihuahua; or perhaps the Salt Flat Basin near the Guadalupe Mountains.

Documentary evidence suggests the Suma inhabited a wide territory from the Rio Grande valley south of El Paso and extending across north central Chihuahua to Casas Grandes and perhaps westward into Sonora. The western Suma may have been the group encountered by Ibarra in 1565 (Griffen 1979). Kenmotsu (1994) reviews the account of Juan Domingo Mendoza, who traveled the Rio Grande valley from El Paso to Presidio in 1683. During seven days of travel down the valley from El Paso, Mendoza and his party observed several Suma rancherías near elevated landforms with access to the river valley. Suma groups were present at El Paso area missions by the mid-1600s (Griffen 1979). Other accounts reviewed by Griffen (1979) note widespread encounters with Suma groups throughout north central and northeastern Chihuahua, eastern Sonora, and the Rio Grande valley. Perhaps most informative is Benavides' (1965) statement "...thus moving from one set of mountains to another," suggesting a highly mobile settlement pattern in addition to the fact that mountain landforms were frequently occupied by the Suma.

Both Manso and Suma groups are documented across wide areas, particularly during periods of revolt in the late 1600s when members of several tribes joined in opposing the Spanish and raiding mission settlements. Conclusive statements that these groups—particularly the Manso—had much wider territorial ranges than indicated by the historical record must be tempered by the fact that ethnic affiliations may have occasionally been confounded by the Spanish; widespread mobility of the Suma is indicated, however. The Manso may have had more circumscribed settlements within the Rio Grande valley.

Spanish descriptions of the built environment of the Manso and Suma mention informal habitation structures consisting of straw, brush, or poles. Benavides (1965) described the Mansos "as a people which has no houses, but only huts of branches," while Luxan's account of settlements along the Rio Grande valley north of El Paso noted the common occurrence of ranchería settlements with "straw houses" (Hammond and Rey 1966). Groups encountered in the vicinity of Casas Grandes by the Ibarra expedition in 1565, who likely were Sumas, were reported living in brush structures or *jacales* (Mecham 1927).

A number of primary and secondary literature sources have used the term *jacal* to characterize these structures, but it is not clear whether they more closely resembled hut structures or wikiups instead of the more formal pole, thatch, and adobe plaster construction typical of *jacales*. In contrast to the usual descriptions of structures, the Mendizabal testimony of 1663 (Hackett 1923-1937, Vol. III) seems to make specific reference to the absence of houses of any form among the Manso encountered in the El Paso area: "...although the country is very cold, they have no houses in which to dwell, but live under the trees..."[8] Likewise, Griffen (1979; see also DiPeso 1974, Vol. III; Naylor and Polzer 1986) provides several Spanish accounts of abandoned settlements encountered by them during the late 1600s. One such camp had beds of grass interspersed among approximately 40 small hearth features; another description of a camp in the Sierra Enmedio, northwest of Janos, Chihuahua, noted several *petates* of beargrass. It is not known whether some of these features represented the collapsed remnants of brush structures. Seldom considered in the review of the historical accounts is that these camps and their constituent features may have been atypical, given that they may have represented brief settlements by groups attempting to avoid Spanish military patrols during an active period of revolts by the Suma, Jano, Manso, and other allied tribes between 1684 and 1700. In one of the few descriptions of thermal features, Griffen (1979) notes the discovery of *tatemes*, or fire pits, at an abandoned Suma camp.

These facilities were questionably identified as places where meat was roasted, but it is also likely that they were rock-lined thermal facilities for processing cacti and other plant materials.

Spanish accounts of subsistence practices suggest a predominantly foraging economy based on gathering, hunting, and fishing. The sole reference to the use of cultigens among the Manso is found in Luxan's account of the Tanpachoas (Hammond and Rey 1966). Otherwise, evidence for Manso and Suma agriculture has often been based on Spanish accounts of the Otomoacos encountered along the Rio Grande during the Chamuscado-Rodriguez expedition (Hammond and Rey 1966). Schroeder (1969) identified the Otomoacos as Suma, while Beckett and Corbett (1992) consider them to be Manso. A more detailed and reasoned examination by Kenmotsu (1994) places the Otomoacos in the La Junta and Conchos regions and finds no relation between this group and either the Suma or Manso. Otherwise, more specific accounts of Manso and Suma subsistence do not include descriptions of cultigens. Benavides (1965) observed that the Manso did not practice agriculture, "nor do they sow." The Mendizabal testimony includes the statement "not even knowing how to till the land for their food" (Hackett 1923-1937, Vol. III), while Posadas notes in his memoir: "These people neither sow nor reap and are few in number" (Kenmotsu 1994).

The historic accounts provide few descriptions of specific food items utilized by the Manso. Benavides notes the consumption of rats and fish, and both fish and mesquite are mentioned in several accounts. However, a much wider variety of food items was undoubtedly consumed by the Manso as suggested by Luxan's statement (Hammond and Rey 1966): "They brought also other samples of their food, in such great quantity that most of it was wasted because of the amounts they gave us."

Luxan's observation also accords well with the variety of food items observed to have been utilized by the Suma, including mesquite beans, *tunas* (Prickly Pear), mescal or maguey (Agave), *datiles* (Yucca), other cacti fruits, and various unspecified roots and seeds, several of which were ground for use in drinks and flours for baking (Griffen 1979). Bolton (1916) notes that the Suma living southeast of El Paso subsisted primarily on mescal that was baked while wrapped in the palms or leaves of the plant, while Mendoza's account (Kenmotsu 1994) describes them as a "poor people who only sustain themselves with mescal." While no information is provided on animal exploitation by the Suma, Naylor (1969) proposes that rabbits were an important food resource and also mentions historic accounts where jerky was prepared from horses and mules stolen from the Spanish.

The Suma were also described participating in ceremonies or communal gatherings involving intoxication or "drunkeness." The form of intoxicant is not specified, and whether it involved some form of fermented beverage is unclear; Gerald (1974a) cites a documentary source that mentions the use of peyote. All accounts generally agree that the Suma did not practice agriculture, with the occasional exception of some bands that had been reduced at mission settlements. Benavides (1965) describes the Suma as a people who "wander...without houses, and without crops; they live from what they hunt, which is all species of animals."

Descriptions of Manso and Suma material culture and technology are extremely meager. Benavides (1965) notes the use of "knives of flint" to cut meat, while Luxan's account of the Tanpachoas notes the use of bows and arrows, bludgeons made of *tornillo* (screwbean mesquite) wood, and fishing nets (Hammond and Rey 1966). Several accounts mention the use of body paint, indicating that minerals and tools needed to produce pigments would have been used. In regards to the Suma, Griffen (1979) discusses several archival references to clubs and bows and arrows. The Suma were also observed with lances, swords, pikes, and shields, although such weapons and armor were obtained through contact with the Spanish. A 1695 Spanish account reports the use of saddles, halters, and other items of horse culture adopted from the Spanish (Griffen 1979). Of particular interest is a 1751 document stating that Apache arrows were distinctive from those of the Suma and other groups, but the document does not further specify in what manner they differed (Griffen 1979), nor whether the distinguishing characteristics referred to the arrow shaft, fletching, projectile tip, or a combination of these components.

I turn now to the archeological information available from LA26780, and other potential post-Pueblo and protohistoric components in the region, to compare the archeological record against historically documented aspects of Suma and Manso settlement and technology.

Artifacts of Spanish Origin

The presence of a metal artifact of Spanish origin does not help resolve the issue of ethnicity as far as Native American groups are concerned, but does introduce the question of whether LA26780 represents a Spanish occupation. Ahlborn (1992) has commented on the pitfalls of using metal artifacts to determine the ethnic or cultural affiliation of protohistoric and early Historic sites. However, Spanish settlements generally tend to have larger numbers of metal artifacts (Vierra 1989), as well as higher quantities of ceramics and relatively few chipped stone artifacts. Lithic artifacts have been recovered at Spanish mission and presidio settlements throughout the El Paso area, but unlike LA26780, they are present in very small numbers. It appears that chipped stone technologies at many Spanish missions, presidios, and domestic settlements were oriented towards the production of gunflints (Moore 1992; Shenk and Teague 1975; Vierra 1989, 1997). No gunflints were identified in the lithic assemblage from LA26780.

Common metal items recovered from Native American and Spanish settlements of the protohistoric and Mission periods include nails, hinges, and other domestic hardware, fragments of armor and weaponry, horseshoes, cooking items, and tools. Spurs and spur rowels are not among the more commonplace European metal artifacts found at sites of this period, although they have been documented at 16th and 17th century Native American Pueblos and Spanish settlements. Vierra (1989:137) compiled information on the metal artifacts recovered from 14 Native American Pueblo and Spanish settlements in the middle Rio Grande valley of New Mexico. Spurs and spur rowels occur at two of the sites, Mission San Gregorio de Abo (Toulouse 1949) and Quarai Pueblo. Simmons and Turley (1980) also mention an intact spur from Pecos Pueblo.

Aside from the potential use of the spur rowel for relative dating, the presence of this item clearly indicates that the occupants of LA26780 had some contact with the Spanish and adopted certain technological items associated with horse culture (see Griffen 1979). Whether the occupants of LA26780 actually possessed horses obtained or stolen from Spanish settlements, or were using miscellaneous items associated with horse culture for some obscure purpose, is unknown.

Obsidian Sourcing Evidence for Territorial Ranges and Mobility, Ethnicity, or Mutualistic Relationships

Obsidian sourcing studies of the LA26780 lithic assemblage and other potential protohistoric components provides a key piece of evidence of the mobility ranges or extra-regional contacts of protohistoric groups in the region. Figure 17 displays the locations of obsidian sources identified at LA26780, and the territories inhabited by various tribal groups or *naciones* suggested by Spanish accounts of the late 16th through late 18th centuries. Distances between LA26780 and obsidian sources at Lago Barreal, Sierra Fresnal, and Antelope Wells are approximately 90, 120, and 190 km, respectively. The locations of obsidian sources correspond more closely to regions inhabited by Suma and Jano groups than the Manso, whose settlements were centered along the Rio Grande valley between El Paso and some distance north of Las Cruces, New Mexico.

Obsidian from distant sources is also documented at other protohistoric components. The sole occurrence of the Jug Canyon obsidian source in the Jornada region is at LA72151 in the San Andres Mountains. Sechrist's (1993) finding of Mule Creek obsidian at La Hacha y los Moscos indicates similar distances of obsidian movement. Even more distant transport is indicated by a specimen of Cow Canyon obsidian from southeastern Arizona among the chipped stone artifacts sourced at the Fillmore Pass site (FB1613), although unfortunately it cannot be determined whether this specimen is associated with the Paleoindian, Archaic, or Historic component.

The presence of obsidian materials from distant sources appears to be a significant aspect of protohistoric occupations in West Texas and southern New Mexico. Similarly, an analysis of over 1300 obsidian source assignments from the region has determined that distant obsidian sources are much more common among Archaic period artifact assemblages than those associated with more sedentary Formative period occupations, and Chihuahuan sources are almost exclusively represented among either Archaic or protohistoric assemblages in the region (Miller and Shackley 1998). With the dramatic decline in population levels that may have taken place during the post-Pueblo and protohistoric periods, it it possible that protohistoric groups reverted to the broad-scale territorial ranges characteristic of the Archaic period.

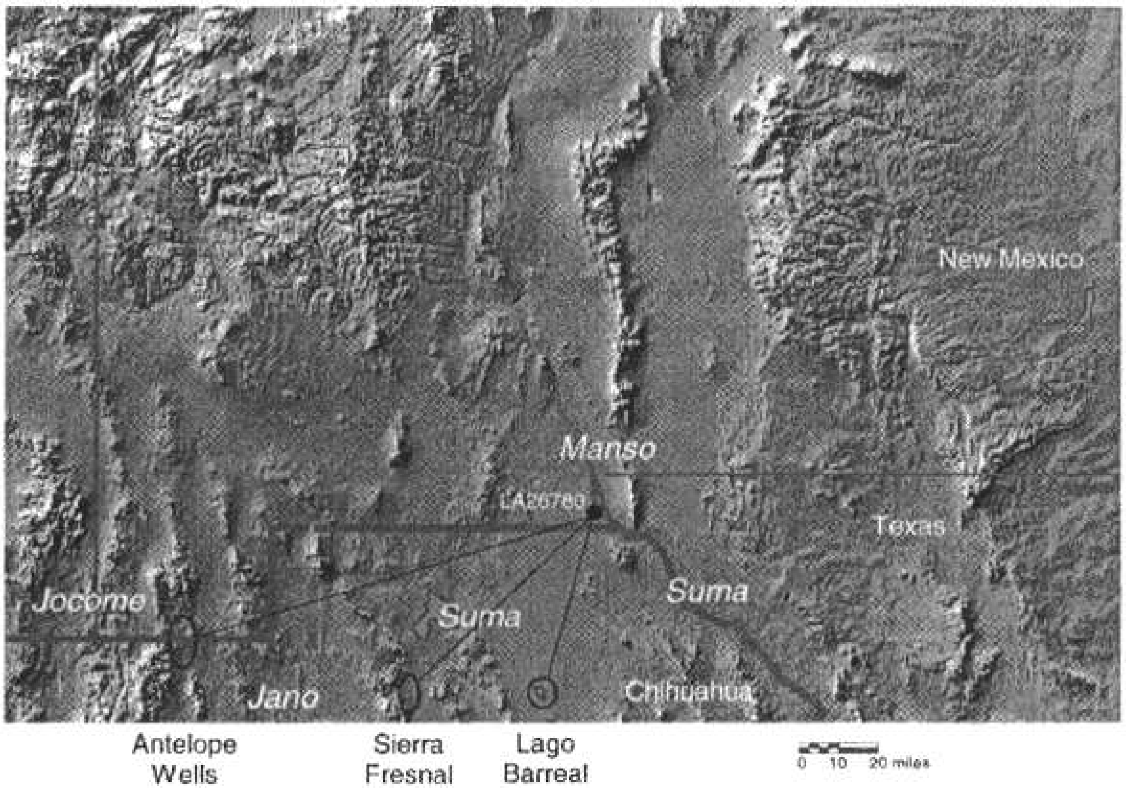


Figure 17. Locations of obsidian sources in northern Chihuahua and southwestern New Mexico identified at LA26780 compared against ethohistorically documented territorial ranges of protohistoric and historic *naciones* in the region.

If the presence of distant obsidian sources is considered as one indication of group movement, the nature of the obsidian assemblage at LA26780 suggests that Manso groups had a greater territorial range and degree of mobility than that documented in the historical record (assuming, of course, that LA26780 is a Manso settlement). The majority of Spanish accounts of the El Paso area mention the presence of the Manso to the exclusion of other groups, although at least one testimony mentions a Manso ranchería in the Florida Mountains (Forbes 1959), 100 km west of LA26780.

The presence of non-local obsidian may not solely reflect group movements, but may also be viewed in terms of regional exchange relationships. From this perspective, equally plausible is that the obsidian sources at LA26780 reflect broad-scale mutualistic relationships between the Manso, Suma, and Jano, as well as other groups, similar to those documented by Kenmotsu (1994) for the La Junta de los Rios and other areas of Trans-Pecos Texas. Sufficient archeological information is not available to resolve which of these alternatives hold true, and, as noted by Swagerty (1991), even with the availability of historical documents, the study of regional exchange systems during the protohistoric is a difficult undertaking. Additional obsidian sourcing studies in Northern Chihuahua may help clarify the nature of group movement and relationships among tribes and *naciones* of the post-Pueblo and protohistoric periods.

Other Indicators of Settlement and Mobility

Other aspects of the lithic assemblage at LA26780 offer additional insights into mobility and settlement during the protohistoric period. As discussed earlier, the lithic assemblage at LA26780 is dominated by fine-grained materials, including a uniquely high and unsurpassed proportion of obsidian. The majority of the obsidian artifacts consist of materials procured in northern Chihuahua, with a minor amount of obsidian from southwestern New Mexico that were transported for distances of between 100 and 200 km. The entire reduction and tool production sequence, including bipolar cores, debitage, utilized flakes, unifacial tools, thinning flakes, preforms, and projectile points, is represented among the Chihuahuan obsidian materials, suggesting the transport of raw materials to the site and subsequent reduction into formal and informal tools.

Obsidian raw materials were procured at distant, widely separated locations or from other groups inhabiting those locations, transported to the settlement at LA26780, and subsequently reduced into tools. This distinctive pattern of selection for particular high-quality raw material and transport over wide areas more closely resembles lithic assemblages associated with Archaic and Paleoindian groups in the region. If current conceptions regarding the relationships between raw material procurement and transport, tool manufacture, and settlement mobility hold true (e.g., Bamforth 1985, 1986, 1991; Kelly and Todd 1988; Kuhn 1991), the attributes of the chipped stone assemblage at LA26780 strongly indicate a high degree of mobility by the inhabitants, and perhaps the exploitation of an extensive area subsuming the bolson regions of north central Chihuahua, far west Texas, and south central New Mexico.

Built Environment, Settlement Structure, and Subsistence

Aspects of the built environment, settlement structure, and subsistence economies of protohistoric settlements, as suggested by the historical record, prove to be among the more difficult issues to examine with the current body of archeological information. Excavation data are lacking for nearly all potential sites of this period, and for the single thoroughly investigated case at LA26780, there is no site map illustrating the actual locations and relationships of features.

Historical accounts frequently describe the occupation of ranchería settlements as groups of informally constructed brush structures. The presence or absence of structures is an important but unresolved issue at LA26780 and other potential protohistoric components. Absence of evidence for structures does not imply evidence of absence, and it is likely that had ephemeral brush structures been present at LA26780 and/or associated with any of the late hearth features, little or no evidence would have survived in the aeolian environment.

It does seem that a majority of potential late occupations consist of small hearth features and meager artifact assemblages. This may be misleading, however, since the extent to which other artifacts and spatial clusters from protohistoric occupations within multi-component sites is difficult to assess because of the absence of any consistent or common diagnostic traits. If more intensive investigation of such sites does reveal that many such sites consist of isolated hearth features with minimal artifact inventories, this would suggest the existence of additional components of the ranchería settlements (i.e., logistical camps) beyond those in the Spanish accounts that focused on river valley settlements.

The absence of macro-botanical data from the small number of investigated features at LA26780 and other possible protohistoric components precludes comparisons with the historical record. This means that the intriguing historic accounts of Manso and Suma subsistence practices as ones that provide clear hints of a hunter-gatherer foraging economy similar to that of the Archaic period cannot be evaluated or confirmed at the present time. A crucial issue is whether horticulture or agriculture was practiced by the Manso and Suma since the historic record is ambiguous in this regard. The identification of maize at LA26780 is doubtful, based as it is on a minute sample that subsequent stable carbon isotope analysis indicates derived from a C_3 photosynthetic plant rather than a C_4 plant such as maize. Despite the absence of direct macrobotanical evidence, inferences based on settlement and material culture attributes of the few known protohistoric sites suggest high levels of mobility and broad territorial ranges that are more consistent with foragers than agriculturalists. In this, I tend to agree with Kenmotsu's (1994) conclusions that the Manso and Suma were predominantly, if not exclusively, foragers.

As a final consideration, it should be kept in mind that the Suma participated in several rebellions against Spanish authority during the late 1600s. They were often joined in these revolts by members of other *naciones*, including the Manso, Jocome, and Jano. Griffen (1979), DiPeso (1974), and Naylor and Polzer (1986) provide several Spanish accounts of widespread searches for, and pitched battles against, rebel Suma bands, as well as descriptions of abandoned Suma settlements at numerous locations in north central Chihuahua and northeastern Sonora. Several of these events occurred near what is now the U.S.-Mexico border, and it is conceivable that the remains at LA26780 reflect a temporary camp occupied by participants in one of the revolts.

SUMMARY

The post-Pueblo, protohistoric, and early Mission periods comprise an important link between the long trajectory of prehistoric settlement and adaptation in the region and later developments during the Mission and Historic periods. They also provide an important contrastive database for considerations of the effects of Spanish contact and missionization or *reduccion* programs on Native groups in the region. The majority of information on this important period has been obtained through archival and historical research and, unfortunately, archeological studies that could offer important corroborative information have lagged behind. Yet, with the limited available archeological information, it is rather interesting that there appears to be little concordance between several of the expectations regarding settlement, mobility, and geographic location derived from the historical record and inferences derived from the archeological record, although both sources of information are often sketchy and ambiguous. The archeological record seems to differ substantially in some regards from the historical record, suggesting new avenues of inquiry for both research domains.

Another important aspect of this period involves its similarities with the Archaic period in terms of settlement location, mobility and territoriality, and technology. Although the data are admittedly meager, there is a noteworthy cluster of traits shared between the two periods. A more concise understanding of the post-Pueblo and protohistoric periods of the Jornada Mogollon region may offer important insights into patterns of regional reorganization and adaptive changes resulting from the collapse of sedentary or semi-sedentary agriculturally-based settlement systems.

However, all of these potential research pursuits first require more consistent archeological identification and documentation efforts. For example, work by Sale (1991, 1997) in the San Andres Mountains and Tularosa Basin identified several late components, suggesting that exceptionally well-preserved burned rock features found on the surface among otherwise non-descript and dispersed artifact scatters and other burned rock features may be indicative of late occupations. A closer inspection of sites and patterns of material culture patterns that deviate from the archeological record on small sites typically encountered in the region, the application of refined relative and chronometric dating applications, and the use of various archeometric sourcing techniques may result in the identification of additional post-Pueblo and protohistoric occupations. More thorough investigation and documentation of such components will help diminish the gap between archeology and ethnohistory in western Trans-Pecos Texas and south central New Mexico, and illuminate the reasons underlying the apparent disparities between them. Such a process will ultimately lead to a more refined and comprehensive understanding of this important and intriguing period that bridges the prehistory and history of the region.

NOTES

1. In a recent study of potential old wood effects among modern mesquite wood samples in the Hueco Bolson, radiocarbon dating of 10 unburned samples collected in the Small Site project area at Fort Bliss yielded several B.P. dates (Mauldin et al. 1998).

2. The series of dates from Firecracker is most notable in this regard in that six of eight dates range slightly later than most Pueblo components. The excavator, Tom O'Laughlin (1995 personal comunication) does not agree, as virtually no post-A.D. 1450 ceramics were recovered during the extensive excavations within the roomblock or exterior pithouse and extramural activity areas.

3. MacNeish and Wilner (1998:165) state that this and one other of the five radiocarbon age estimates from Pintada Cave should be rejected since they do not accord with the proposed Archaic occupation of the shelter. However, the stratigraphic sequence identified in talus slope deposits outside the shallow shelter is probably more complex than presented in the report. Projectile point forms and other evidence from shelter and talus excavations indicate that earlier and later occupations are represented in the archeological deposits.

4. It must be noted that the DACA project was inherited in 1983 by David Batcho and Steadman Upham from a previous administration at the CRMD. The previous project manager had seriously underbudgeted the data recovery project, and an underlying factor in the budget calculations was that all

sites were low density and surficial hearth/artifact scatters. Credit is due David Batcho and the CRMD field crew who, through the novel use (in 1983) of backhoes, magnetometers, and other investigative methods, discovered pithouses, hearths, trash and storage pits with impressive macrobotanical contents, and other features buried below acolian coppice dunes at several sites in the project area. Additionally, several innovative chronometric and archeometric studies were conducted; despite the budget limitations, the pithouse component at LA26784 remained the most thoroughly dated El Paso phase component in the region until 1996. Other archeometric analyses established the framework for the present study, and lacking such preliminary work, it is possible that the potential protohistoric component at LA26780 may have continued to exist only as a rumor in the CRM literature.

5. Obsidian data for LA26780 presented in Miller (1996:Table III.14) are erroneous. The total lithic count in this table includes groundstone artifacts, while the count of obsidian artifacts (n=67) was based on the number of specimens remaining in the collection of chronometric samples rather than the total number of obsidian artifacts (n=147) noted in Batcho (1987).

6. The metal artifact is not listed in the specimen logs, although this does not discount its presence because all artifacts within each 5 x 5 m unit placed around a hearth were bagged together and assigned a single specimen number. The spur rowel is mentioned in Duran and Batcho (1983:6), and the preliminary CRMD (1985) report of investigation describes its provenience. However, the item is not mentioned in the interim data recovery report prepared for BLM (Batcho et al. 1985) or in an unpublished draft MS reviewing chronometric studies at the DACA sites (Batcho 1987). For the record, the presence of the spur rowel is accounted for through my personal communications over the past several years with three individuals affiliated with the project: David Batcho, Meliha Duran, and Steadman Upham.

7. This excludes 728 hydration rims measured by MOHLAB. These rim measurements are not considered reliable because of several MOHLAB laboratory procedures that are inconsistent and not comparable with those used by other laboratories (see Miller [1996] for a review of this problem).

8. It is likely that this impression, or the perceived absence of houses, has more to do with the restrictive and formal meaning of the Spanish term *casa*. As implied by the passage in Benavides' Memorial, it appears that a distinction was maintained between formally constructed and relatively permanent domiciles (*casas*) and informally constructed and impermanent brush structures called *ranchos*. Therefore, the Mendizabal testimony may not necessarily imply a complete absence of house structures, and it is possible that the description of the Manso as "living under trees" may refer to brush structures.

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