

Investigation of Early Spanish Exploration Encampment Sites at El Morro National Monument

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Introduction

On October 22-24, 2007, NPS-Heritage Partnerships Program archeologist Charles M. Haecker conducted a sample metal detection survey of approximately 29 acres within the El Morro National Monument. Assisting him were El Morro National Monument archeologist Steve Baumann; USFS-Gila Forest archaeologists Chris Adams and Kristen Bowen; Coronado Institute archaeologist Dr. Clay Mathers; and English Heritage-Battlefields Trust archeologist Dr. Glenn Foard. The survey resulted in the discovery of 78 metallic artifacts, reflective of over 350 years of Euro-American activity at this natural landmark. Of special note, the collection includes a spatial cluster of three so-called *horseshoe* or *caret-headed nails* considered diagnostic of pre1550 Spanish sites in the New World - artifacts that suggest strongly a visit to El Morro by the 1540-1542 Vázquez de Coronado expedition. The report outlines the types of historic period features and associated artifacts that may exist within El Morro National Monument; field methods applied during this survey; descriptions of the artifacts discovered; analytical models of camp activity and patterning, as well as research conclusions and recommendations for future work.

Historic Expeditions through the El Morro Valley

In the late summer of 1540, Capitan General Francisco Vázquez de Coronado ordered Hernando de Alvarado to head east from the expedition's base at the Zuni pueblo of Hawikku, investigate what other pueblos lay before them, and visit the lands to the east. With a small force of mounted men and Indian guides Alvarado set out on what became a three month-long reconnaissance. The first leg of Alvarado's journey followed one of the trails that ran from Zuni to the pueblos of the middle Rio Grande valley (Flint 2008). By following this trail the expedition reached the pueblo of Ácoma via El Morro and the Malpais. Rather than returning to Zuni, in September 1540 Alvarado instead wrote from one of the pueblos along the Rio Grande to Vázquez de Coronado at Hawikku, advising him that the expedition should establish winter quarters in the Tiguex area (Flint and Flint 2005: 303-305, 661 – n. 22-25). Accordingly, Vázquez de Coronado led a 30-man vanguard eastward from Zuni along a trail that is likely to have been different from the one chosen earlier by Alvarado; i.e., adopting a southern route that skirted the difficult lava flows in the Malpais area to the north and striking the main stem of the Rio Grande at its confluence with the Rio Puerco (Flint and Flint 2005:400, 676 – n. 227). After a journey of eight days, Vázquez de Coronado arrived at a Tiguex pueblo (presently unknown) in the Rio Grande valley. A few weeks later or days earlier camp master Garcia López de Cárdenas led much of the advance guard (Flint and Flint 2005:400) down the Zuni trail toward the Rio Grande and Tiguex. The remainder of the expedition, led by Tristán de Luna y Arellano, made the trek from Zuni to the Rio Grande in a snowstorm early in December 1540 (Flint and Flint 2005:401-02). Richard Flint suggests that the route followed by Luna y Arellano was probably similar to that taken earlier by Alvarado and López de Cárdenas east towards the Middle Rio Grande valley (following Riley and Manson 1983). The total of the four parties (Alvarado, López de Cárdenas, Vázquez de Coronado, and Luna y Arellano) was some 2,000 *indios amigos* (Flint 2009:73, 115) and 800 others (Europeans and Africans – Flint, 2009: 56-57), including equipage, food supplies, and some 7,000 head of livestock. They assembled at the Tiguex pueblo of Alcanfor (Coofor), a site suggested by some

to be Santiago Pueblo/LA 326 (e.g., Vierra and Hordes 1997:257). Although the definitive location of Alcanfor has remained elusive, documentary sources suggest this pueblo became the expedition's new base of operations (Hammond and Rey 1940:326-347; Riley and Manson 1983:351; Riley 1997:8). It is probable that the Vázquez de Coronado expedition stopped at El Morro, both during its 1540 *entrada* into New Mexico and its 1542 *salida* to Mexico. Richard Flint (pers. comm., August 2009), for example, suggests that the entire expedition was likely to have been present at El Morro briefly on their return trip to México in April 1542, and that small parties, including messengers, probably also passed by and stopped enroute to and from San Gerónimo in the Sonora Valley. When at full capacity the natural tank at Inscription Rock would have held water in quantities sufficient to quench the thirsts of many, if not all, expedition members. Water supplies for the large number of livestock, horses and mules associated with this expedition, may have been available via one of the large, ephemeral playas located in the El Morro area and described by Landgraf (1954:16). None of the Spanish inscriptions found at El Morro are attributable currently to the 1540-1542 expedition, to the subsequent entradas of Francisco Sánchez Chamuscado and Fray Agustín Rodríguez in 1581-1582, or to the expedition of Antonio de Espejo in 1582-1583.

Documents relating to the latter two expeditions indicate that while both the Sánchez Chamuscado-Rodríguez and Espejo parties remained in the Rio Grande valley for the majority of their stay, both groups eventually traveled west past the Pueblo of Ácoma and into the Cíbola/Zuni area visited by the Vázquez de Coronado expedition (Bancroft 1889:74-91; Barrett 1997, 2002; Bolton 1916:135-195; Hammond and Rey 1966:6-28, 67-242; Sánchez 1994; Riley and Manson 2001). Despite the detailed accounts left by members of the Sánchez Chamuscado-Rodríguez expedition – including the *Relación* of Hernán Gallegos and associated documents (1581-1582), and Francisco Domínguez's thorough *List of Pueblos* - later transcribed by Martín de Pedrosa in 1600 (Hammond and Rey 1966:67-138) – there appear to be no specific references in these texts linking this entrada with site of El Morro. Nevertheless, the general line of travel of this expedition (from Ácoma to Zuni, and vice versa), the historic popularity of a route through the El Morro area, and the presence of a significant water source in the form of a large tinaja there, all suggest that the Sánchez Chamuscado-Rodríguez expedition could well have camped at or around this site.

Evidence for a visit to El Morro by the expedition of Antonio de Espejo in 1583 is, however, more compelling. The narrative account of Diego Pérez de Luxán (Hammond and Rey 1930 [1967]:35, 88), a member of the Espejo party, suggests it is very probable that this group did camp in the El Morro area. Traveling from the Pueblo of Ácoma to the Zuni area in March of 1583, Pérez de Luxán indicates:

We set out from this place [El Elado] on the eleventh of the month and marched three leagues and stopped at a waterhole at the foot of a rock. This place we named El Estanque del Peñol. (Hammond and Rey 1930 [1967]:88)

The modern Spanish definitions of *estanque* (i.e., pool, pond, reservoir, basin and dam – Gáma (ed.) 1973:1202) and *peñol* (i.e., crag, steep rugged hill of rock - Gáma (ed.) 1973:1414), suggest

that El Morro and its *tinaja* were indeed a probable stopping point for the Espejo party (Hammond and Rey 1966:23-24).

The Espejo expedition reached the Zuni pueblos three days after their stay at *El Estanque del Peñol*, on 14 March 1583 (Obregón 1928:326; Hammond and Rey 1930 [1967]:189). There Zuni inhabitants of the Pueblo of Mazaque (*Malaque*) - most probably Mats'a:kya - informed Espejo of previous visits to the area by both the Vázquez de Coronado and Sánchez Chamuscado-Rodríguez expeditions (Hammond and Rey 1930 [1967]:196:89). (The diminutive size of the Espejo and Sánchez Chamuscado-Rodríguez expeditions – i.e., approximately 21 and 31 individuals, respectively – should be borne in mind when comparing them to the far larger Vázquez de Coronado entrada numbering some 2800 people; see Figure 5, below).

The first definitive evidence of later Spanish expeditions that traveled the Zuni Trail and stayed at El Morro takes the form of inscribed mementos of their visits to this locale. An inscription signed by Juan de Oñate, the first governor of New Mexico, concludes with '1605', the earliest year noted on Inscription Rock. His inscription reads:

Pasó por aquí el Adelantado don Juan de Oñate del descubrimiento de la mar del sur a 16 de abril año 1605.

Through here passed the Adelantado Don Juan de Oñate from the discovery of the South Sea on the 16th day of April, year 1605. (Encinias et al. 1992:xl)

Oñate's journal, which indicates he also led an expedition to Zuni in the fall of 1598, includes entries stating the expedition camped at *Agua de la Peña* (El Morro) in October and December during this journey (Hammond and Rey 1953:327, 394-395, 397; Simmons 1991:132-133). In addition, Oñate's *Account of the Journey to the Salines, the Xumanas, and the Sea, 1599*, indicates that Captain Gaspar Pérez de Villagrà was rescued by Oñate's soldiers at the *Agua de la Peña* in November 1598. Villagrà had narrowly escaped death when he and his horse fell in a brush-covered trap near Ácoma (Bolton 1916:236; Encinias et al. (eds.) 1992: Canto XIX, 175182; Espínosa 1962:Canto Nineteen, 172-176).

Beginning in the late sixteenth-century and continuing well into the nineteenth century, El Morro figured as an important place of encampment for many groups and individuals travelling the Zuni Trail through the El Morro Valley. The 1778 map of the Zuni area produced by Spanish cartographer Bernardo Miera y Pacheco, who had accompanied Francisco Domínguez and Vélez de Escalante on their expedition of 1775-1776, for example, depicts the site of El Morro, together with other prominent landmarks and settlements in the Zuni area (Ferguson and Hart 1985:32-33). El Morro became a waypoint for some of the first European colonists in the Southwest, and later as an attractive stopping point for a wide range of American settlers and military expeditions, for example: the U.S. Army's Camel Corps. After Oñate's visit, members of various later Spanish expeditions that traveled the Zuni Trail left written mementos of their visits to this locale (Lesley 1929 [2006]:85; Simmons 1991:132-133; Sitgreaves 1853 [1962]:35). While El Morro was initially viewed by Euro-Americans as an attractive locale for potable water and grazing animals, by the early twentieth century it had become an curiosity and stopping point for tourists as well.

Camp Components and Differentiation

Given the many Native Americans and Euro-Americans, as well as Mexican natives, Africans and others who visited El Morro over the centuries, it is probable that physical indications of their presence continue to be preserved in the archaeological record. Non-random clusterings of artifacts - in spatial association with hearths, dugouts, fire cracked rock clusters, patterned stonefree clearings and other features associated with ephemeral occupations - are all manifestations that may signify the presence of their encampments and associated activities.

Although historic-period encampments have seldom been the focus of formal modeling exercises by archaeologists or historians (however see Orr et al (eds.) 2006; Railey 2007), important variables such as the spatial organization, ethnicity, social status and approximate chronology of a given encampment can be identified via a range of variables, such as:

- **cellular repetition of the size, number and spatial configuration of cultural features** (e.g., *identifying recurrent patterns produced by tents, shelters, dugouts, hearths and refuse areas using a range of geophysical and geochemical techniques*);
 - **artifact analysis** (e.g., *evaluating qualitative and quantitative access to different artifact classes, raw material types, and levels of elaboration/ornamentation*);
 - **differential food selection, preparation, use and discard patterns** (e.g., *intra- and inter-site analyses such as Toll 1989, 1992; Railey 2007:18-19, 43-50; Hoag 2009:16-17*);
 - **archaeomagnetic dating of thermal features** (e.g., *establishing the temporal variation between clusters of camp features amenable to this type of analysis*);
 - **seasonality of occupation** (e.g., *using carbonized botanical remains, pollen, phytoliths, macro food remains and refuse, orientation of shelters and shelter entrances, etc.*)
- **size and architectural elaboration of individual tents/shelters/dugouts - as well as the size and elaboration of such structures in their immediate vicinity; and**
- **morphological attributes that are characteristic of certain habitation features** (e.g., *the size, shape, and orientation of individual camp components such as the*

dimensions of shelters, the placement of their entrances, and disposition of internal-external features such as hearths and support posts).

The importance of trying to formalize a model of camp structure and organization is that it can provide a series of heuristic devices with which to predict, test and revise ideas about different periods of activity at El Morro and other sites. The lack of such formal models has made it difficult to begin the process of distinguishing the different historic period expeditions known to have traversed the landscapes of New Mexico and the Greater Southwest. At sites such as El Morro and Pecos Pueblo the need for such analytical frames of reference is particularly acute since these sites have attracted such a wide range of ethnic, social and functional groups throughout the historical period (Bandelier 1881: 35-135; Kidder 1924: 4-35, 1931 [2003]; Slater 1961; Bezy and Sánchez 1988; Pecos National Historical Park 1995: 8-9, 85-98; Boyer et al. 2002; Scheick (ed.) 2006; Bradford 2007). The complex palimpsest of activities represented at these and other historic sites in the Southwest requires that we develop a set of methodological and theoretical approaches to camp structure and organization that are commensurate with this complexity. While the aim of this report is not to provide a fully developed schema for addressing and analyzing these important variables, we recognize making a contribution towards that goal is both valuable and imperative.

Because of our particular interest in the expedition of Capitan General Francisco Vázquez de Coronado, and the special significance of this entrada for the El Morro National Monument, much of the discussion that follows is focused on the initial Contact Period and the camps associated with it. Nevertheless, we hope that the general approach and some of the specific components of the models offered here may be of value to our colleagues working on sites of similar, as well as different, periods elsewhere.

Spatial Organization. Until recently, our knowledge of the earliest European expeditions and their associated camps in the American Southwest has been limited to a sporadic set of sites, materials and documentary references (Ellis 1987; Flint and Flint eds. 1997; Flint and Flint 2005; Hordes 1992; Vierra 1989, 1992, Vierra and Hordes 1997). As a result of discoveries by both archaeologists and historians in the last several years, however, our knowledge of early contact period camps, including their location, contents and organization, is changing dramatically (Brasher 2007, 2009; Blakeslee and Blaine 2003; Schmader et al. 2007; Railey 2007; Haecker 2008; Mathers et al. 2008; Flint 2009). Not only do we now have more sites and assemblages with which to model historic sixteenth-century European camps in the Southwest (e.g., Brasher 2007, 2009), but indications are that the general approaches to this task is changing as investigations have become more empirically based, analytical and comparative (e.g., Railey 2007).

Some of the research that is likely to have the most impact on camp-related research in the near future has come from recent documentary investigations by historians Richard Flint and Shirley Cushing Flint. Their research concerning the size, composition and organization of the Vázquez de Coronado expedition provides key insights and valuable details for interpreting the expedition's activities (Flint and Flint 2005; Flint 2008; 2009). Richard Flint's recent publication on the role of the *indios amigos* in this entrada is particularly relevant to our discussion of camps, and to any attempt to model and discriminate encampments associated with this expedition. First, Flint (2009:73, 115) indicates that documents relating to the review (or *visita*) of Viceroy Antonio de

Mendoza following the return of the Vázquez de Coronado expedition to Mexico, point to the participation of a much larger number of native Indian allies than has hitherto been suspected. His research now suggests that approximately 2000 *indios amigos* accompanied the Vázquez de Coronado expedition. This is a number that significantly expands earlier estimates of 1300 allies (Flint 2008:58). In addition, Flint's research indicates native Indian allies from various regions of Mexico were regularly assigned to specific Spaniards or Europeans, rather than being isolated in homogeneous groups composed only of natives (Flint 2009:74-75). Finally, Flint (2009:74, 83, 86, 92, 94) highlights the Indian allies' significant casualty rate, which may have varied from 20 to 31 percent based on native testimonies connected with Tello de Sandoval's 1543-1546 review of Antonio de Mendoza's conduct as Viceroy (see Figure 1, below).

All of these new data and observations are extremely important for understanding the spatial organization of sixteenth-century camps associated with the entrada of Francisco Vázquez de Coronado. First, our notions of the scale of Vázquez de Coronado encampments needs to be reevaluated in light of the new figures postulated by Richard Flint. Camps of this type are currently known at the following sites: Kuykendall in southeast Arizona (Brasher 2007, 2009); LA 54147 near Bernalillo, New Mexico (Vierra 1989; Railey 2007); and the Jimmy Owens site in the Texas Panhandle (Blakeslee and Blaine 2003). We believe evidence of a spatially extensive camp will eventually be discovered at El Morro National Monument.

In evaluating these sites, and our models of early Contact Period camps, it is important to consider how remains on the ground relate to:

- the overall size of an expedition;
 - individual components (or subsets) of it that may have camped in a particular location;
- assessments of ethnic, status and spatial variability; and
- military deployment, especially in areas where there was significant conflict or potential for it to develop, such as the Tiguex Province, in the present day Albuquerque-Bernalillo area.

One of the best known and most systematically investigated camps sites associated with the Vázquez de Coronado expedition is LA 54147 near Bernalillo, NM (Vierra 1989:25-70; Railey 2007). This site appears to be a camp largely composed of *indios amigos*, occupied between late 1540 and spring 1542. At present, LA 54147 is represented by sixteen excavated dugouts, and possibly ten unexcavated depressions believed to be additional dugouts - the latter identified during fieldwork in 1986. Railey (2007:45) suggests that dugout dimensions (the largest measuring 4.4 x 3.8 m and occupying an area of approximately 16 m²) would have offered living space for no more than two individuals. Assuming this figure is correct, and that the overall size of the Vázquez de Coronado expedition was very roughly 2800 individuals – including European/African servants and slaves (i.e., approximately 2000 allies and some 800 others) - the

currently exposed area of the camp identified as LA 54147 would represent just under two percent of the overall number of individuals associated with this entrada. That is:

$$\frac{\text{individuals per unit }]}{\text{expedition as a whole}} \times 100 = 1.9\% \quad \frac{[26 \text{ dugouts}] \times [2 \text{ individuals for the}]}{2800}$$

The general issue of scale raised by Richard Flint's new findings, therefore, refocuses attention on a host of other interesting and important research issues at LA 54147 and other possible Vázquez de Coronado camps, such as: What portion of the expedition does this camp represent? What was the time period of occupancy? What is the areal extent of the camp? What purpose(s) did the camp serve? And, what does intra-site variability within the camp signify? While there are different implications at each site, new findings concerning the expedition's expanded size raise relevant questions at El Morro and at other Vázquez de Coronado's encampments about appropriate research questions, as well as the scales and units of analysis suitable for addressing them.

The second important implication of Richard Flint's new research is the light that it sheds on the relationship between individual Spaniards and groupings of native allies. Flint (2009:74-75) indicates that the testimony of a senior native member of the expedition, Juan Tlecanen, during the *visita* of Tello del Sandoval in 1546 is telling in this regard:

Tlecanen's testimony strongly suggests that many of the indios amigos were assigned to specific Spanish individuals on the expedition and may have traveled with those individuals, rather than as a segregated, all-Indian unit that would have included individuals assigned to multiple Spaniards. This arrangement probably applied especially to tamemes [load bearers] and men given the chore of tending the private livestock of individual conquistadores. There may, nevertheless, have been others, especially those who served a primarily warrior function and those who served the force as a whole, who were not as a rule mixed with the European expeditionaries. The Tello de Sandoval records provide the first documentary evidence available on this matter. (Flint 2009: 74-75)

In addition, in describing the 1537-1538 siege of the Peñol de Cerquin in Honduras by forces under the command of Francisco de Montejo and Alonso de Cáceres, Chamberlin (1953:83) indicates:

In constant attack and counterattack, the Spaniards tried to advance their lines, the Indians to drive them off entirely. Cáceres, who had to guard eight places of access to the peñol, had to make the most careful disposition of his men, posting them in more or less equal detachments before each point. Bodies of auxiliaries were posted with each Spanish squad.

These findings suggest a model of camp organization that emphasizes absolute spatial segregation by class and ethnicity may be both simplistic and inaccurate (see Figure 1A). A more nuanced version of this model, which incorporates the idea of integrated social and ethnic groups, at least on some levels and in some areas of the camp, seems appropriate (see Figure 1B). Other approaches to the issue of social and ethnic differentiation within camps will be addressed below.

Figure 1A: Idealized Central Place Model of Camp Organization: Social Status and Ethnic Segregation

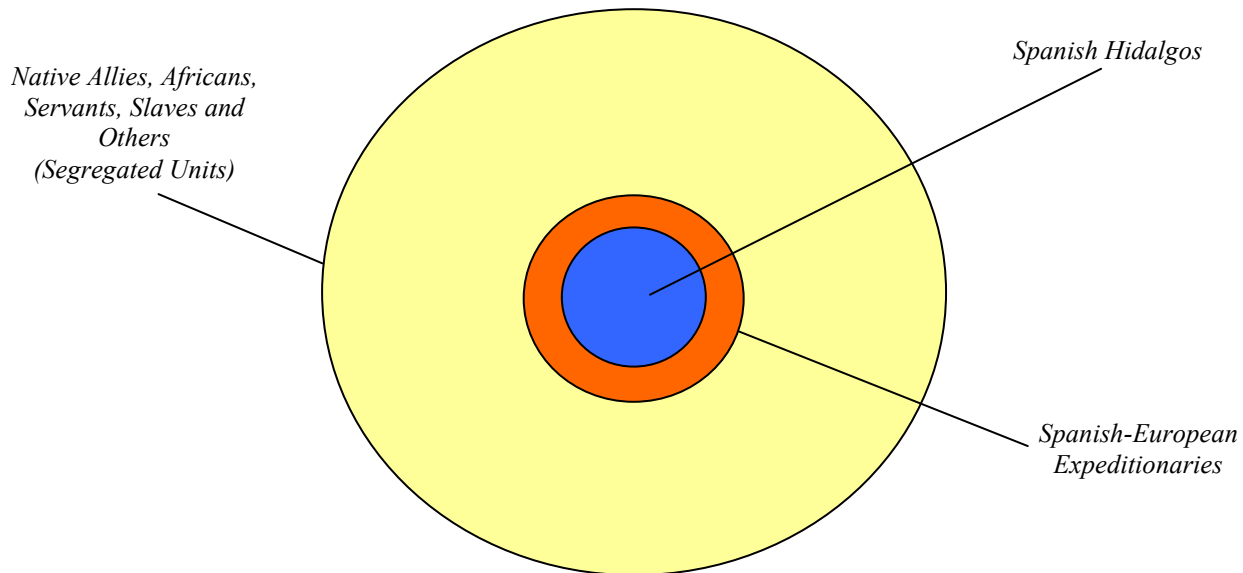
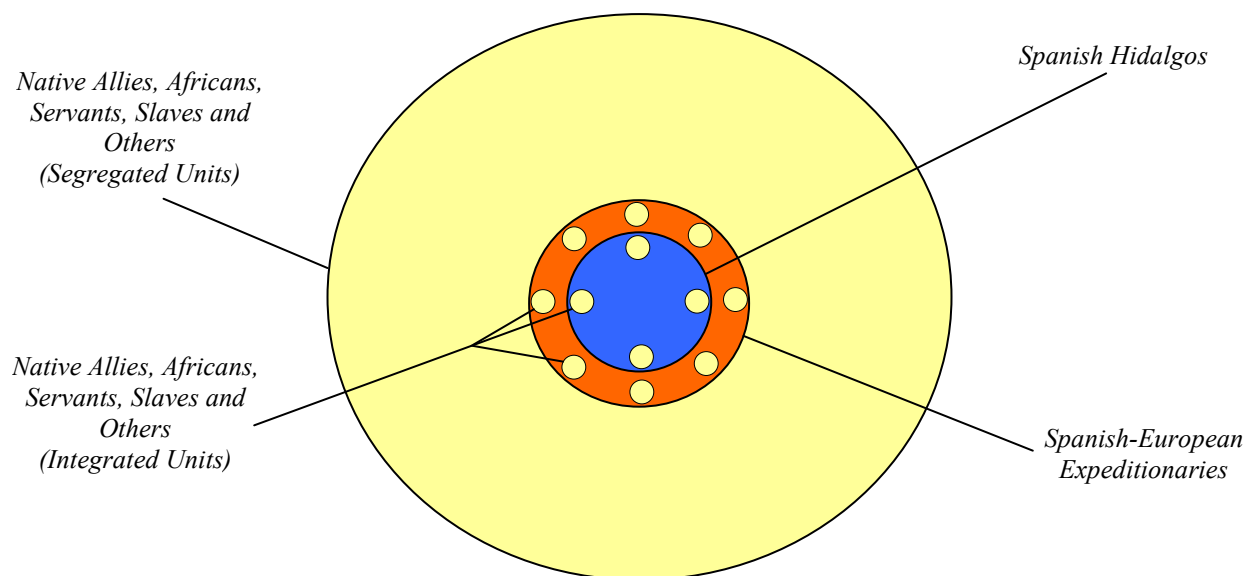


Figure 1B: Idealized Central Place Model of Camp Organization (Modified): Social Status and Ethnic Integration

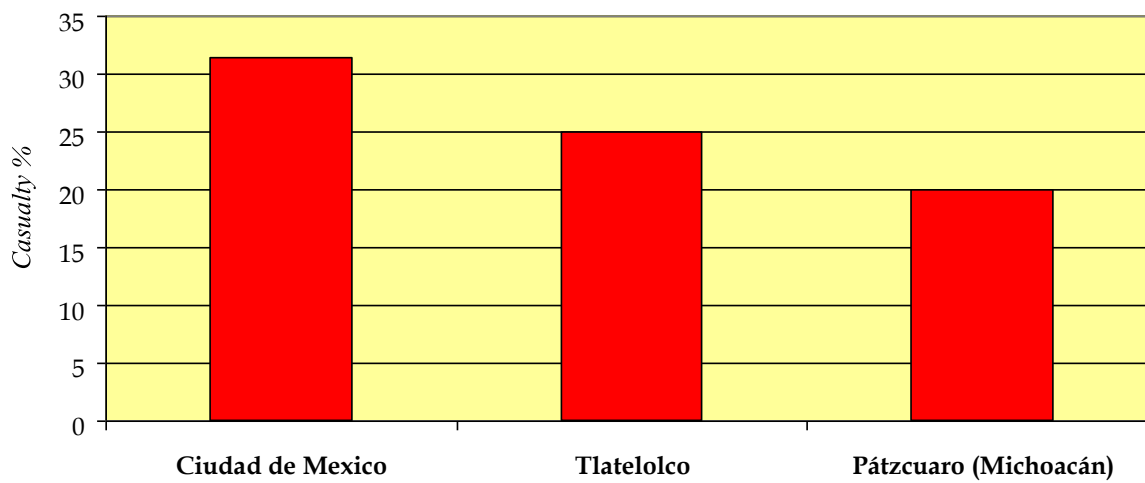


When translated into a formal spatial model, some of these observations may have significant predictive value, at least as a heuristic device for developing new ideas and hypotheses concerning camp organization and structure.

The third significant aspect of Flint's documentary work for our discussion of camps is the high rate of casualties that are reported for the native allies accompanying the Vázquez de Coronado entrada. The documentary testimonies of surviving native members of the expedition suggest that the average casualty rate amongst the *indios amigos* was considerable, that is, approximately 25 percent (see Figure 2, below). If these figures are indicative of the expedition as a whole, then the overall number of casualties amongst the expedition's native allies could have been in excess of 500 individuals.

While the reason for this high level of casualties is not clear, and could have been due to a wide variety of factors (including disease, exposure, food shortages and military action), repeated references to war and conflict in the Tello de Sandoval *visita* testimonies of the *indios amigos* suggest that a significant number of fatalities may have been due to injuries suffered in combat. If military conflict did contribute to the deaths of any appreciable number of Indian allies, it might suggest that some of them were used as shock troops in battle, as a protective screen for camps, and as an expendable force during the course of the expedition (e.g., being deployed as pickets, for reconnaissance and foraging parties, unprotected shepherds on the fringes of expedition camps, and as a first line of defense (or attack) in hostile encounters with Native American communities).

Figure 2: Casualty Percentage for Three Groups of Native Allies Associated with the Vázquez de Coronado Expedition (Source: Flint (2009: 74, 83, 86, 92, 94))



Ethnicity and Social Status. Although there are clear signs that sixteenth century Spanish communities in both Iberia and Mexico were socially and ethnically divided (e.g., Deagan and Cruxent 2002; Harvey 2005; Lockhart 1992), the distinctions between individuals on campaign and on the frontiers of empire may have been more relaxed. Adequate treatment of this complex and wide-ranging subject is beyond the scope of this report. Nonetheless, there are documented examples where differences in rank, privilege and materials between Spaniards and their native allies are less pronounced than might be expected. Because these distinctions may have had material correlates and been manifest in the archaeological record, they are particularly important to assessments of camps and their associated material remains.

The privileges of rank and the hierarchical nature of early Spanish society in the Americas clearly had its origins in medieval Iberia and the *Reconquista*. Evidence of the priority given to the upper nobility, as well as the emergent nationalism and jingoism of Christian Spain, is manifest in various aspects of Castilian and Iberian society in the late fifteenth and early sixteenth centuries: from land ownership (Vassberg 1984:99), taxation (Domínguez Ortiz 1971:108-119) and urban planning (Pike 1967), to religious practice (O’Callaghan 1975:668674) and the administration of justice (Harvey 2005:45-78). The importance of these developments for our understanding of sixteenth century camps at El Morro is that they emphasize some of the pronounced ethnic and class differences in Spanish social relations at the time and highlight the possibility of spatially discrete groups based on status and ethnicity. For example, at the late-fifteenth century site of Christopher Columbus’s failed colony of La Isabella (1492-1498) in Hispaniola, Deagan and Cruxent (2002:107) indicate that:

Public, military and domestic spaces were separate and distinct from each other, and the residential domestic areas were apparently segregated according to the status of their occupants – hidalgos and caballeros versus commoners. As in most Spanish towns

of the period, high status residences were located closer to the center of town as defined by the church, plaza and public buildings.

Further signs of spatial and social segregation at La Isabella are indicated in the archaeological evidence, such as the close control of horses and horse equipage by Christopher Columbus and other elites. Deagan and Cruxent (2002: 168) indicate that horses were a potent symbol of social status and political authority in late fifteenth-century Hispaniola, as they had been in the medieval period. They further note that:

By the end of the fifteenth century, however, service on horseback was no longer restricted exclusively to those of high social class (Deagan and Cruxent 2002: 172)

In addition, writing about the early Post-Conquest period in central Mexico, Lockhart (1992: 94) indicates:

Sixteenth-century Spaniards found in central Mexico a society remarkably like their own. Both the Spanish and the indigenous system divided the entire population between the two basic hereditary categories of noble and commoner. Furthermore, in both cases gradations and various types of special status made for a social continuum rather than two sharply separated blocks.

The social continuum alluded to by Lockhart apparently included a wide range of unlikely social and ethnic groups within Spanish controlled territory in the sixteenth-century. Evidence of these groups comes from a number of geographic areas and social contexts such as the granting of:

- freedom, land grants and honorific titles to fugitive slaves or *cimmarones* following the successful outcome of the Barauco War on Hispaniola in 1533 (Deagan and Cruxent 2002: 209-210);
- privileges to eat from European dishes, go to special schools to learn European languages, engage in European transactions, and even buy and sell property, as was afforded to Inca curacas [local chiefs] in post-conquest Peru (Silverblatt 1988:183); and
- permissions to wear Spanish clothing, carry a sword, or ride a horse, which was extended by the viceregal government to Tlaxcalan nobleman, and encomienda privileges given to the metizo descendants of Pedro de Alvarado by the Crown in sixteenth century southern Mexico (Gibson 1952:163-164).

The inclusion of some natives and others in the Spanish social hierarchy in a number of contexts is also confirmed by documentary, archaeological and pictorial data, such as: the evidence of horse riding by native allies on the Vázquez de Coronado expedition (Flint 2009:75; AGI, Justicia, 264, pieza 3, Probanza de Mendoza, Antequera, 1547); the use of metal by native allies at the site of LA 54147 (Vierra 1989: 131-144); and the depiction of many natives with metal swords, as well

as a mounted native leader with a metal-tipped lance, all of whom accompanied Hernán Cortés during the Conquest of Mexico (Lienzo de Tlaxcala). Richard Flint (pers. comm., August 2009) indicates: “A number of historians have suggested that, especially in the early Spanish colonial period, class often trumped ethnicity, so that European and American native elites often recognized and reciprocally acknowledged their similar social status; this explains in part the ease with which elite interethnic marriages were condoned by the Church. Also, there are numerous cases of hidalgo status being granted to elite Native Americans and the class honorific “don” being applied to central Mexican native leaders.” Examples of such rights and titles were commonplace during the *Reconquista*, and continued to be employed by the Crown and its representatives as Spaniards began their domination of the Canary Islands in the late fifteenth century, and moved westward to the Caribbean Islands and the mainland of the Americas in the early sixteenth century (Gibson 1952:162-169; Deagan and Cruxent 2002: 209).

Finally, there is evidence from regions such as Oaxaca, that by the middle of the sixteenth century, that there were distinct departures from the marked patterns of social differentiation that prevailed in the earlier sixteenth century. According to Chance (1978:64) in early sixteenth century Oaxaca: “Social strata were defined in ethnic terms, and the cleavages separating the three categories were clear-cut and virtually absolute”. By mid-century, however, Oaxacan towns such as Antequera began to see major changes:

Growth in the number and kinds of occupations generated by population increase and the dyeing and weaving industries provided a basis for a greater range of variation in socioeconomic status than had previously been the case. At the same time, the social boundaries that had made three distinct groups of the Spaniards, Indians, and Negroes were becoming blurred with the appearance of more and more castas, the progeny by and large of extramarital relations between Spanish men and Indian or Negro women and between Negro men and Indian women. As the number of these castas grew, it became increasingly difficult to accommodate them within the three groups, and the racial factor came to be an important criterion of social status, supplementing those of language, culture, religion, and the possession (or lack of it) of a noble title. (Chance 1978:94)

At El Morro and other Vázquez de Coronado camps, we may be able to detect evidence of these changing social, political and economic currents in the material record of artifacts and other cultural features. Since many components of the Spanish colonial enterprise were in flux, particularly during the first decades following the defeat of the Aztec empire, it would not be surprising to find some of these macro changes being reflected in micro (localized) contexts. One such social and analytical context may be entrada camps on the frontier of empire. Large, variegated social and ethnic groupings of the type that existed within the Vázquez de Coronado expedition may have provided ample opportunities for experimentation and change in existing social relations between Spaniards-Europeans and others. Important factors that influenced these evolving social interactions include the autonomy of expedition leaders, the close and prolonged contact between Europeans and other ethnic groups, and the critical interdependence between these groups for their collective survival. In this respect, we may be glimpsing signs of changes that began to be manifest in social life, as well as in other contexts, as the interaction between

Spaniards and New World natives/ environments developed in the course of the sixteenth century particularly at lower social strata. As Deagan and Cruxent (2002: 178) note in writing about late fifteenth-century settlement at La Isabella:

As the supplies brought with the expedition were depleted or became worn out, most of the material items used for personal protection, symbols of power, and public defense were either made or repaired at La Isabella. Blacksmiths, farriers, metal founders, and soldiers maintained the weapons, armor, ammunition, and horse equipment needed for both protection and honor. Like the other craftsmen and artisans in the town, they often made do with whatever resources they could find in the isolated and dramatically un-European environment and economy of Hispaniola. It was in this material production that we see the first American alterations to the late medieval Spanish ideal represented by Columbus, and it was brought about in the non-elite working sector of the community.

In any case, significant changes in rank, privilege, and ethnic identity seem to have developed in many rural and urban areas of settled Spanish territory by the latter half of the sixteenth century (Chevalier 1966; Chance 1978; Lockhart 1992). In central Mexico, however, the pace of social change appears to have been more focused on the lower tiers of native society rather than on *caciques* and *principales* (Gibson 1964:155). In other areas, such as central Peru, changes in social relations and social mobility were both much less pronounced than in Mexico (Lockhart 1968:223-234), suggesting that patterns of status and class differentiation in sixteenth-century Spanish society were by no means uniform.

Several pragmatic model predictions can be generated from the wide-ranging evidence reviewed above. First, it appears that while broad ethnic and social divisions in Spanish society are likely to have been preserved by the time the Vázquez de Coronado expedition entered New Mexico, and camped at El Morro, it is likely that there were many shades of status, privilege and access within these social classes. Furthermore, distinctions between major social and ethnic groups may have been less apparent than they had been during the initial phase of Spanish colonization and conquest. For example, nobles and other leaders from within the cadre of *indios amigos* may have received access to some of the materials and privileges that were traditionally the exclusive domain of Europeans. Consequently, we should not be surprised to find evidence of some features such as metal weapons, horse gear, relatively large shelters, domesticated animals, ornaments (such as copper bells or Nueva Cádiz beads), or exotic raw materials, in the possession of at least some of the native allies. The presence of sheep bone, metal objects, and fine Pachuca obsidian in some of the dugouts at LA 54147, therefore, may be reflective of these dynamic social changes. Another interesting possibility is that these social transformations may have been initiated on (or at least been given a major stimulus by) frontier campaigns in the 1540s to 1560s in Tierra Nueva and La Florida (Priestley 1928; Lyon 1990; Milanich and Hudson 1993; Clayton et al. (eds.) 1993; Young and Hoffman (eds.) 1993; Hudson 1990,1994, 1997; Galloway (ed.) 1997; Flint and Flint 2005; Flint 2008, 2009).

Another prediction is that sixteenth century camps reflected social and ethnic distinctions via the spatial differentiation of small-scale groups and encampment areas. While the idealized models

in Figure 1A and 1B, above, suggest differentiation at a macro-level, for an overall camp, the models illustrated in Figures 3A and 3B, below, suggest distinctions at a more personal, individualized scale. The latter models emphasize intra-group (rather than *inter-group*) differentiation. Figures 3A and 3B present an idealized social distance model, which suggests class and ethnic distinctions within the expedition could have been translated into spatial segregated areas, with perhaps a different constellation of camp features separating them from others (such as large intervening areas for cooking and corralling horses). Individuals of higher status within groups, therefore, may have been afforded a greater amount of social space or privacy than others in their immediate vicinity. Furthermore, the degree of spatial separation may have been correlated with the social standing of a particular individual, so that Spanish elites may have had a larger *buffer area* around them than nobles among the indios amigos. Within the main camp it might be presumed that high status hidalgos and their respective entourages placed their tents and campfires some distance from the lower status Europeans: e.g., men-at-arms, farriers, and fabricator/repairers of leather and metal objects, whose relative closeness to the hidalgos' camps may have been tolerated for the sake of company maintenance and efficiency. Another significant factor here is that companies were often recruited or even sponsored by their captains (Flint 2009:52). As Flint suggests, one result is that members of companies often had preexisting relations with their captains, i.e., as retainers, servants, or even family members. Other possible physical groupings within camps may be related to the task-specific functions of some expedition members, such as mineral prospection and mining. In describing Pedro de Alvarado's expedition from Guatemala to Honduras in February 1536, for example, Chamberlin (1953:55) indicates:

They also took 'cuadrillas', or teams of Indian and negro slaves, each headed by an experienced miner, to search for and exploit deposits of precious minerals. These cuadrillas were owned by officials and citizens of Guatemala and San Salvador, among them Alvarado and the treasurer Castellanos.

Nevertheless, the space allotted to different social classes may be detectable at different levels within camp areas by:

- the density of individual shelters/tents/dugouts in a given space;
- the qualitative and quantitative differences in the objects and raw materials in that area; as well as
- the degree of distinctiveness with respect to the types and configuration of camp features.

Figure 3A: Idealized Social Distance Model of Camp Organization: Class and Ethnic Distinctions = Socially Segregated Space for High Ranking vs. Lower Ranking Individuals

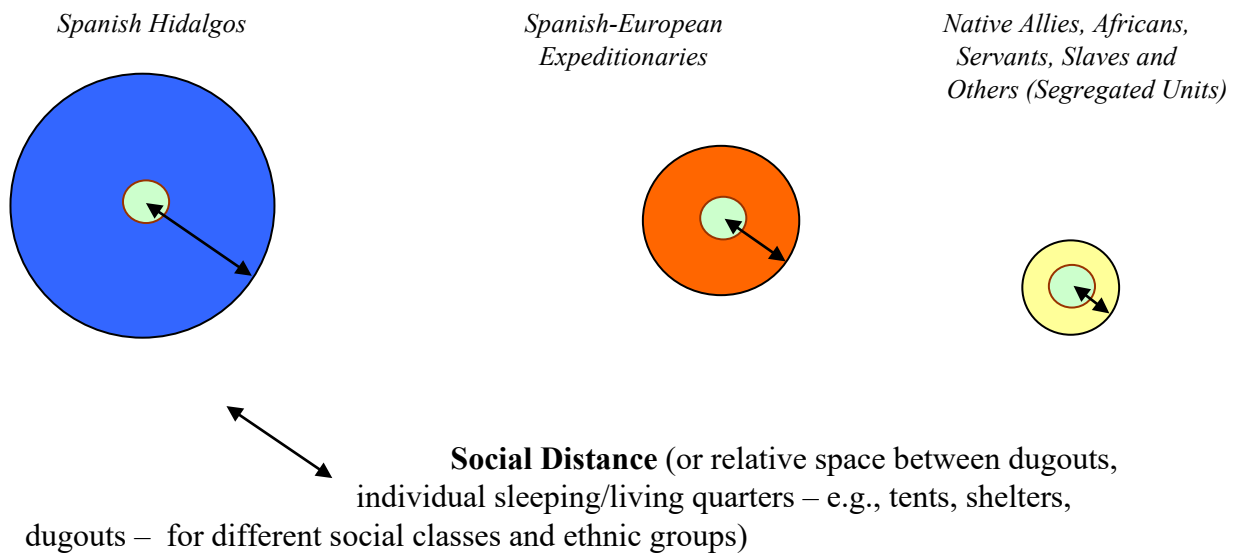
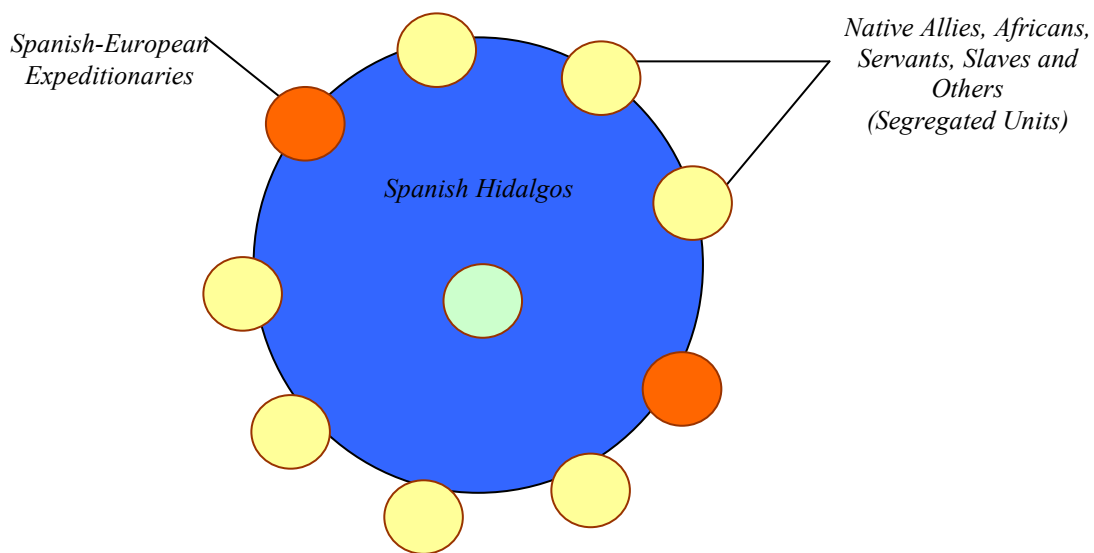


Figure 3B: Idealized (Modified) Social Distance Model of Camp Organization: Class and Ethnic Distinctions = Socially Segregated Space for High Ranking vs. Lower Ranking Individuals + Greater Personal Security and Administrative Efficiency



As Figure 3B suggests, however, social and ethnic distinctions within camps, and within groups, may not have always equated with spatial segregation and large, distinctive areas of private space. Our colleague, Richard Flint (pers. comm., August 2009) suggests that “the large “real” or extensive tented area was the ideal of many elites on campaign, including royals; bragging rights often went with how many persons one customarily fed at one’s table; households were typically much, much larger than nuclear families, including servants, slaves, and retainers. Furthermore Flint suggests the possibility that “these “households or *casas*” had some form of spatial expression even in a quasi-military setting”. In some contexts, a more dense clustering of individual tents or shelters, may have been encouraged by the need for greater personal security for high ranking individuals, greater administrative efficiency with respect to expedition logistics and planning (i.e., having subordinates close at hand for meetings and discussions), or simply greater ease of access with respect to services provided by artisans, cooks, personal stewards and others. Nevertheless, these distances may have varied in a regular and hierarchical way (e.g., by social class), so that the spatial area occupied by the sleeping/living quarters of individual Spanish hidalgos is consistently greater than that of other social or ethnic groups. If that assumption is correct, then there may be a variety of opportunities to detect social distinctions within many sixteenth-century camp areas in the Southwest. Indeed, there are indications that some of these patterns of social differentiation may already be visible in the archaeological record using extant evidence.

It is widely believed that LA 54147 near Bernalillo, NM forms part of camp area occupied by *indios amigos* associated with the Vázquez de Coronado expedition. This site is composed of clusters of dugouts that may reflect patterned social groupings. Pioneering work by Vierra (1989) and his colleagues, as well as recent innovative research by Railey (2007), suggest social distinctions exist within excavated dugouts at this site. Although the number of these shelters that have been investigated to date is small (n = 16), two discrete clusters of dugouts can be identified (see Figure 4, below).

These clusters consist of one group to the southwest (composed of eight dugouts: nos. 1-4, 12, 13, 14A and 14B) and another to the northeast (including six dugouts: nos. 5-10). Another possible cluster may exist to the southeast where there are ten unexcavated depressions that appear to represent a spatially separate grouping of dugouts. Other excavated dugouts currently represent outliers with respect to main concentration of dugouts, i.e., No. 11, excavated by Vierra (1989:66-69) and Feature 2004-1, recently investigated by Railey (2007), located to the northeast and west, respectively. The latter may be indicative of other, larger clusters yet to be identified. Alternatively, they may represent peripheral shelters for pickets or observers keeping watch at the edge of a camp located in hostile territory.

Railey’s (2007) analysis of these sixteen dugouts and their contents suggests there are a number of possible social and ethnic distinctions visible between them. Using three main variables, Railey tried to identify distinctions between these dugouts that might provide insight into the social and ethnic identity of their inhabitants. These variables included:

1. **Ceramic frequencies** (i.e., < 200 sherds and $\geq$ 200 sherds);
2. **Presence or absence of metal artifacts;** and
3. **Faunal remains.**

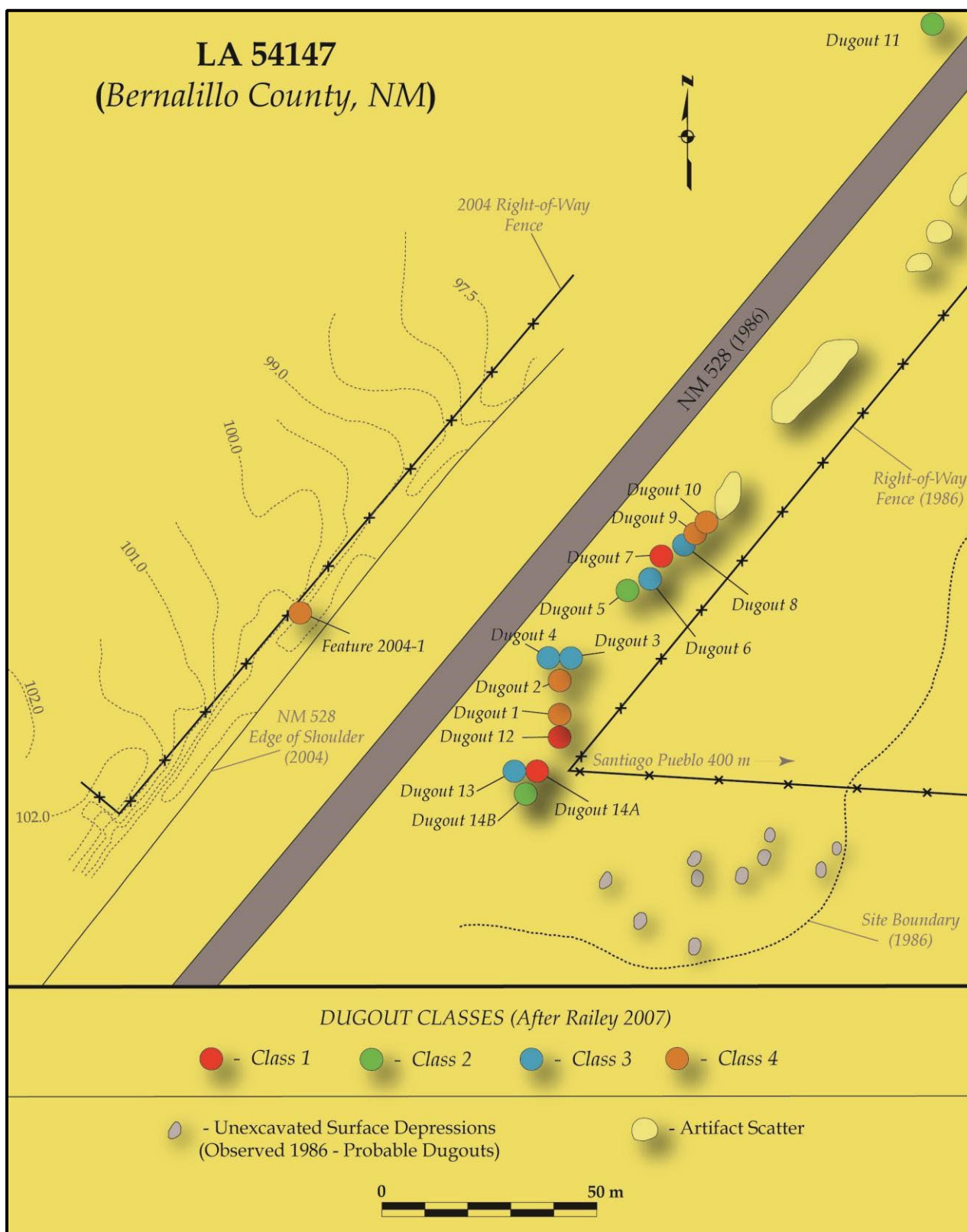
Using these criteria, Railey identified four major classes of dugouts with varying degrees of each of these elements.

While there are a variety of refinements that could be made to this analysis and classification (such as statistical determination of class boundaries and addition of other variables – such as dugout size), this approach is a valuable and innovative one that could stimulate significant advances in the future.

Whether or not future analyses confirm the existence of four classes of dugouts as suggested by Railey's analysis, some of the relative and absolute differences he points out are interesting and important. Using the dugout classes created by Railey, together with information on the relative size of dugouts (i.e., the square meter area occupied by each shelter), it appears that there are some consistent patterns when comparing Cluster 1 (to the South) and Cluster 2 (to the North). Both have large Class 1 dugouts in the approximate center of their overall distribution, as well as a mixture of other dugout types belonging to classes 1-3 arrayed on their periphery. In addition, both clusters have a Class 2 dugout marking their southern terminus (No. 14B in Cluster 1 and No. 5 in Cluster 2) and a Class 3 dugout immediately adjacent to it in a northerly direction (i.e., No. 13 in Cluster 1 and No. 6 in Cluster 2). Furthermore, the northern portions of both of these dugout clusters are composed of Class 3 and 4 dugouts. While it is impossible at the present time to evaluate accurately the significance of two outlying dugouts (No. 11 and Feature 2004-1) and their class attribution, further investigation in the vicinity of these dugouts may provide a valuable test of some of the ideas developed by Railey. Additional work on Dugouts 11 and Feature 2004-1 may also provide some insight into the possible patterning in Clusters 1 and 2.

Figure 4: Spatial Distribution of Known Dugouts at LA 54147, near Bernalillo, NM (after Vierra 1989:26, Figure 11, and Railey 2007:49, Figure 9.1).

LA 54147
(Bernalillo County, NM)



In any event, modeling the development of camps associated with the Vázquez de Coronado entrada, and any other large sixteenth-century expeditions in the Southwest, will no doubt require

an understanding of the complex myriad of activities that are likely to be represented at any one site. At LA 54147, Piedras Marcadas and elsewhere in the Tiguex region generally, the nature of camps will have been particularly complex. Encampments in this area were long-lived and likely served a number of widely varying purposes including herding animals, collecting food, trading with native communities (or obtaining goods through force), reconnaissance, defense against attack, as well as many others. The tight clustering of dugouts at LA 54147 should also be understood with respect to its proximity to Santiago Pueblo, which lies some 400 m to the east. As Mathers et al. (2008) have proposed, a distance of 400 meters would have put this camp outside the range of arrows launched from Santiago, and thus provided a useful *standoff distance* for positioning a camp. The dense clustering of dugouts in this area, therefore, may represent the need to maintain a small defensive perimeter, and perhaps to reduce the visibility of the camp area in an effort to disguise its true size, its presence, or both.

By contrast, encampments at El Morro by the Vázquez de Coronado party, *en masse* or in sequential waves, require a very different approach. Models of camp activity at sites such as El Morro, Jimmy Owens and Kuykendall will, by necessity, involve a different set of parameters and evaluation criteria since the complexity and duration of activities conducted at these locales were on the order of days, rather than months or years. In order to accommodate a traveling microcosm of Spanish society, an encampment complex may have required several square kilometers of living space, thus complicating the issue of how to evaluate spatially limited investigations. Accordingly, the archaeological record of this complex may appear as widely spaced and perhaps spatially discontinuous assemblages, resulting in further interpretive difficulties. The challenge at sites such as El Morro and Pecos Pueblo will be to disentangle their many intertwined historic-period expeditions and occupations. As more information emerges from El Morro and other camp sites, more robust spatial models of camps are likely to develop in tandem.

Chronology. The final component of camp-based modeling to be explored in this discussion relates to the chronological discrimination of artifacts and features. This aspect of camp models is particularly significant for evaluating the archaeological record at El Morro, in both a macro- and micro-historical sense. At a broad scale of analysis, the ability to discriminate between different types and periods of occupation is clearly important at a site that was visited so frequently in the historic period. At a slightly finer level of temporal resolution, distinguishing between early and later sixteenth-century entradas is also a major advantage to, and priority for, research and interpretation at this site. Finally, another aspect of complexity at sites like El Morro, is whether camp-related features and artifacts are connected with the incoming entrada of Vázquez de Coronado in November 1540 or the outgoing salida, the latter camp probably occurring at El Morro during the spring of 1542. Chronological determinations at all of these different levels are necessary to ensure an accurate understanding of the material record at this important location.

One particularly significant aspect of the material record of camps at El Morro and elsewhere is the types of tents, dugouts, and other types of shelters in use at different periods. Because of their ubiquitous presence these features, together with the structural components and artifacts associated with them, offer helpful information about both the date and nature of occupations associated with them.

Configurations of European tents manufactured during the sixteenth and seventeenth centuries typically enclosed rectilinear, circular, ovoid or lozenge-shaped floor space (Wylie <http://www.geocities.com/historyoftents.html>). In contrast, nineteenth century American-manufactured A-frame and wall tents enclosed a rectilinear floor space; Civil War-era Sibley tents occupied a circular space. Accordingly, areas leveled and cleared of rocks to accommodate the placement of a tent may reflect its configuration and may also provide opportunities for these cleared areas to be detected using geophysical techniques such as ground penetrating radar and electrical resistance.

Archaeological investigations of nineteenth century US Army bivouacs suggest a more-or-less ordered layout of campfire hearths, with each hearth signifying a group (mess) of four to six men who prepared and cooked their rations together. These hearths, in turn, cluster in ordered groups that reflect larger tactical units such as companies. Artifacts characteristic of period US military encampments typically occur in spatial association with various encampment features (e.g., areas prepared for the placement of tents; hearths, corrals, wagon parks, trench sinks, and picket posts (Orr et al. 2006; Haecker 1998; King and Haecker 2008).

Of course, the US Army did not invent the concept of a well-ordered encampment. This aspect of military discipline was codified by the Republic of Rome over 2,000 years ago (Pollard 2006). Documentary evidence indicates the Vázquez de Coronado expedition functioned as a quasimilitary force, yet it is possible its military footing was not reflected in the layout of its camps. Of the approximately 370 Europeans that are named on the expedition rolls, for example, only one, Juan Troyano, possessed extensive military experience. Troyano, a professional artilleryman and veteran of Charles V's wars in Italy, captained the expedition's six light field pieces (falconets), as well as advising Vázquez de Coronado on military matters (Flint 2002:161-162).

Although military manuals were relatively rare in late fifteenth-early sixteenth-century Europe (Eltis 1995; Taylor 1921 [2006]:156-179), by the beginning of the Italian Wars (c. 1494), condottieri and other military-minded authors began to record their thoughts and advice about military best practice: from siege tactics and training, to formations and weapons deployment. While there is a dearth of literature regarding the specific conduct of Spanish entradas in the New World and the arrangement of camps during these campaigns, at least until the end of the sixteenth century (e.g., Vargas Machuca 1599 [2008]), it is reasonable to presume that quasimilitary units on campaign during this period adhered to some degree of encampment order so as to address basic needs, provide security, maintain order, and reinforce its command structure. In fact, Renaissance-influenced military leaders explicitly adopted, with some modifications, certain aspects of an ancient Roman model of army encampment. A 1565 illustration of an idealized mid-sixteenth-century military encampment (Arnold 2001:17) highlights a number of important features of camp organization, including: guard posts (pickets) stationed at regular intervals around a clearly demarcated camp perimeter; guards controlling places of entry/exit; the commander's tent positioned at the approximate center of the camp to better oversee the camp; supplies protected from the elements and thievery, and centralized for easy access; companies arrayed along a grid system of streets; placement of tents within each company's grid block reflecting the duties, responsibilities and benefits of rank for common soldiers and officers; and the camp physically

demarcating different branches of military service (infantry, cavalry, artillery). Usually a camp for civilian followers, if present, was placed some distance away from the military camp.

On the other hand, sixteenth-century praxis may have departed significantly from models of camp behavior as prescribed by military manuals of the period. As Richard Flint suggests, for example (pers. comm., August 2009), the writings of the Spanish Captain “Vargas Machuca, reveal that actual field practice was extremely variable in his day – most active in the 1580s – and much of it ill considered and disorderly, in his opinion”. If the situation described by Vargas Machuca applied equally to the earlier 1500s, the archaeological signatures of sixteenth-century encampments in the Southwest might be quite variable as a consequence - both with respect to the attributes of individual sites, and to variations in internal ordering and composition between camps. The nature and degree of this variability remains to be seen and investigated. Nevertheless, it is probable that the actual layout of any military encampment, regardless of the time period and nationality of its occupants, will diverge to some degree from the ideal. Some of the variables determining camp layout include: levels of military experience and morale possessed by officers and enlisted men; the ethnic composition of expedition members; number and types of livestock, supplies, equipage, and rolling stock such as wagons and caissons; terrain; availability of water, fuel, and pre-existing shelter; proximity to hostile forces and/or populated areas; and number of days a military unit occupied its encampment. It is likely that expedition leaders significantly modified idealized encampment layouts suggested by sixteenth-century military writers and their manuals, based on these leaders’ personal preferences and experiences. Similar deviations from the idealized plans for Spanish colonies and towns, for example, are noted by Van Ness (1991:7-10, 27) and Simmons (1969). These deviations occurred, however, despite the fact that the Crown dictated and codified urban plans in some detail (Recopilación de Leyes 1681).

Ten, semi-autonomous companies comprised the Vázquez de Coronado expedition, with each company having its own particular rate of marching speed. Sometimes as much as a day’s march separated these companies (Richard Flint, pers. comm., 2008). It is conceivable that, after a lead company abandoned its camp location for another day’s march, a succeeding company would encamp in much the same spot hours later. The succeeding company may have configured its camp in a fashion that was significantly different from that of the previous group. From an archaeological standpoint this palimpsest of chronologically separate camping events might obscure or even erase temporally distinct events and their associated patterns. Multiple, intersecting encampments of different periods might also suggest the presence of a single camping event that lacks order with respect to the patterning of cultural features and objects.

Each company encampment would have exploited natural resources and favorable terrain aspects based on its own internal ordering of social status, ethnic groups represented, trade skills, and unskilled duties. Over three-quarters of the members of the Vázquez de Coronado expedition were *indios amigos*, an unknown number of them being professional warriors who probably camped as distinct units, perhaps with their own identifiable patterns of food preparation/consumption, waste disposal, and techniques of constructing shelters. Others were lower-status/unskilled tenders of livestock, wood gatherers, cooks, and so forth. As indicated above, internal ordering of a company camp probably followed some culturally defined separations between social classes and trades.

Until recently, the numbers, roles and significance of native allies in sixteenth-century Spanish entradas in La Tierra Nueva and La Florida has largely been either ignored, poorly understood, or glimpsed from afar through more detailed accounts of their contributions elsewhere in the Americas (e.g., Ballentine 1969; Restall 1977; Matthew and Oudijk (eds.) 2007). Over the last ten years or so, work by Richard Flint and Shirley Cushing Flint on documents relating to the Vázquez de Coronado expedition has revealed important aspects of the material culture associated with this entrada's native allies (Flint 1997), as well as some insights into how these groups were integrated into expedition as a whole (Flint and Flint 2005; Flint 2009).

As a consequence, it is clear that while some of the *indios amigos*' camp sites are likely situated some distance away from the main camp occupied by Europeans, camp areas associated with other natives would have been integrated more closely with European members of the expedition. These findings are important to keep in mind in order to avoid simplistic associations, that is, camping areas with metal reflect only Europeans, and lithic materials such as Pachuca obsidian associated solely with the native allies. Natives and perhaps other members of the expedition had access to European goods and weapons, and vice versa (Flint 1997; Pohl and Robinson 2005). As a result, we need to ensure that our models are sufficiently flexible and sensitive to detect some of the more subtle crossovers in material culture and cultural exchange that may have taken place at El Morro and elsewhere. It is reasonable to assume, however, that assemblages generated by the *indios amigos* are likely to be associated with fewer metallic artifacts relative to the total found within largely European-occupied camp areas. Metal and other objects related to encampments of the expedition's native allies may also show regular signs of reuse. Objects broken and discarded by Europeans may have been modified and used by the *indios amigos* for a purpose distinct from the one they were designed for originally.

Artifacts considered diagnostic of the Vázquez de Coronado expedition include: copper crossbow bolt heads; horseshoe nails having a bi-faceted/inverted V-shaped head (also termed *caret-head nails*); Nueva Cádiz glass beads; green-tinged Pachuca obsidian, which derives from Sierra Las Navajas in the central highlands of Mexico; and fragments of thin, tabular sandstone *comales* (griddles) of native Mexican manufacture (Blakeslee and Blaine 2003:211; Damp 2005; Mathers *et al.* 2008; Vierra 1989; Vierra and Hordes 1997:259-260). More than 1,100 horsesmules were included in the Vázquez de Coronado expedition (Flint 2008:63). Since eight nails were used per shoe, thus 32 nails per animal, one can presume that around 32,000 caret-head nails would have touched the ground on a day's journey. Given its ubiquity, caret-head nail counts within camp sites should be high relative to other Vázquez de Coronado-related artifact types. Concentrations of caret-head nails may reflect farrier work areas, as well as locations where horses and mules were corralled in camp or concentrated in outlying grazing areas.

Undoubtedly the Vázquez de Coronado expedition was the largest and most complex expedition that has ever camped in the vicinity of El Morro (see Figure 5, below). Later Spanish and American groups that visited this site were comparatively simple affairs. Both of Governor Oñate's expeditions of 1598 and 1605 numbered around 100 members (Simmons 1991:126), while retinues of later Spanish officials who traveled the Zuni Trail were comprised of comparable or lesser numbers. Travelers in the El Morro region up until the 1880s consisted of American military units on campaign, official explorations, and emigrants to California. According to Slater

(1961:27), nineteenth century travelers favored an east-west trail located between two and three miles north of El Morro. Thus, it is possible that a majority of those individuals who commemorated their visit to Inscription Rock with inscribed initials and names actually had encamped miles away from the promontory.

Some artifact types broadly diagnostic of Spanish sites dating from 1500 to 1650 include: whole and fragmented chain mail links; jack and brigandine plates (i.e., plates of lamellar-type armor) made of iron or copper-alloy; copper-alloy clothing lace tips (aglets); ornate ball-type metal buttons; buckles made of copper-alloy and iron that have an oval, round, or “figure-eight” double-frame; and the late medieval period horseshoe with its characteristically broad branches. Spanish Colonial sites of later periods contain artifacts derived from European stylistic changes, particularly with respect to clothing fasteners and personal ornamentation. For example, post-1700 Spanish buckles reflect French influence in frame shape and decoration (Deagan 2002:183). Varieties of other artifact types also are found on Spanish Colonial sites but are not temporally or culturally diagnostic of a specific period or nationality. As examples, lead round shot and wrought iron rose-head nails may be found on both Spanish Colonial and American Territorial sites in the Southwest, and have very similar morphologies.

A few of the more common artifacts diagnostic of the American Territorial (1846-1912) and New Mexico Statehood (1912-present) periods include: round lead shot, cartridge cases and conical bullets, the latter dating after circa 1864; roller buckles (post-1850); whole and fragmented food cans and beverage bottles; machine-cut nails and wire nails, the latter dating after circa 1885; factory-made horseshoes; baling wire, barbed wire, and wagon hardware. Hispanic sheep herders settled in El Morro valley around 1866, and the Ramah Navajo returned to this area after their incarceration at Bosque Redondo ended in 1868. By the end of the nineteenth century El Morro Valley also was home for Anglo homesteaders and cattlemen. Fifty-nine historic sites are recorded within the Monument, and most of these sites are attributed to farming and ranching activities (Bradford 2007). Isolated historic artifacts and sites that date to the twentieth century are related to NPS staff and visitors to the Monument.

Figure 5: Comparative Statistics for Sixteenth Century Expeditions in the American Southwest

DATE	EXPEDITION	ESTIMATED SIZE OF PARTY	Free Men (European)	Servants-Slaves (European-African- Native)	Native Allies (Non- Local/Mexican)	Native Allies (Local/Southwestern)	Women-Children	Priests	Others	Domestic Livestock	Horses-Mules	References
1535	Álvar Núñez Cabeza de Vaca	6	3	1	0	0	0	0	0	0	0	Purpo-Walker (1993: xvi-xxv); Adorno and Padua (1999: 212-251); Adorno and Padua (2003: 143-153)
1539	Fray Marcos de Niza	58 ?	54 ¹	1	? ²	0	2	1 ³	0	0	0	Hallenbeck (1987: 62); Diffen and Hartmann (1997: 209-211); Rodack (1990: 72); Rodack (1997: 103-115); Hartmann (1997: 77); Flint (2008: 32)
1539	Melchior Díaz and Juan de Zaldivar	17 ?	17 ⁴	0	? ⁵	0	0	0	0	0	17 ⁶	Diffen and Hartmann (1997: 209) Flint (2008: 40)
1539-1542	Francisco Vázquez de Coronado	2744	367 ^{7, 8}	368 ⁹	2000 ¹⁰	0	4 ¹¹	5 ¹²	0	5500 ¹³	1100 ¹⁴	Flint (2008: 10, 51, 56-57, 63)
1581-1582	Francisco Sánchez Chamuscado and Fray Augustin Rodriguez	31	9 ¹⁵	19 ¹⁶	0	0	0	3 ¹⁷	0	600 ¹⁸	90 ¹⁹	Bolton (1916: 138); Hammond and Rey (1966: 8)
1582-1583	António de Espejo	21	15 ²⁰	2 ²¹	0	0	0	2 ²²	2 ²³	0	115 ²⁴	Bolton (1916: 163-164) Hammond and Rey (1966: 18)
1590-1591	Gaspar Castaño de Sosa	170	168 ²⁵	0	2 ²⁶	0	0	0	0	10 ²⁷	0	Hammond and Rey (1966: xi) Schroder and Matson (1965: 11)
1591	Juan Morlete	42	41 ²⁸	0	0	0	0	1 ²⁹	0	0	0	Hammond and Rey (1966: 43)
1593	Francisco Leyva de Bonilla and António Gutiérrez de Humaña	4	3 ³⁰	1 ³¹	0	0	0	0	0	0	0	Hammond and Rey (1966: 49-50)
1598	Juan de Oñate	544	260 ³²	2 ³³	2 ³⁴	0	0	10 ³⁵	270 ³⁶	5113 ³⁷	238 ³⁸	Bancroft (1889: 124-125) Bolton (1916: 124-125) Hammond and Rey (1963: 14, 44-45) Simmons (1991: 87)

Footnotes for Figure 5

- ¹ Hallenbeck (1987:62) indicates that the number of people associated with Estevan's party at Zuni numbered 60 individuals; "What probably happened is that immediately after the killing of the Moor, three of the swiftest runners were dispatched to carry the news back to him. The rest of the company of some sixty (not "more than three hundred men" and "many women" as Marcos wrote) followed the runners at a more leisurely pace." The figure here assumes 54 people for Estevan's party; plus Estevan (1 Servant-Slave); plus some non-local native allies (3 related to Estevan's party and 2 related to Fray Marcos' party); women related to Estevan's party (2 - the actual number is unspecified), plus Fray Marcos himself (1 priest). Bandelier quotes the figure of 300 people for Estevan's party (Rodack 1990:87) - citing the *Relación* of Fray Marcos de Niza, p. 277, as the source.
- ² Hartmann (1997:77), mentions that Estevan was killed at Zuni along with "some of the native guides from Chichilticale.". Rodack (1997:104) indicates that a member of Estevan's party returning from Cibola, indicated that Estevan had been killed at Zuni, along with "many others". The figure of three individuals = at least three allies killed at Zuni (Rodack 1990:72 mentions three runners from Estevan's party reaching Marcos de Niza with the news of the attack on Estevan and his party) and at least two native allies accompanying the Marcos de Niza party. Total = 5. Richard Flint (pers. comm., August 2009) suggests that Fray Marcos de Niza may have been accompanied by a significant number of native allies, from dozens to perhaps hundreds. Consequently, the number of allies and the overall size of this expedition is very difficult to assess accurately.
- ³ Flint (2008:32) indicates that there were at least two priests in the Marcos de Niza party: i.e. Fray Marcos and a second Franciscan priest named Onorato. However, Bandelier notes that shortly after leaving Culicán in March 1539, Brother Onorato fell ill and was left behind (Rodack 1990:72).
- ⁴ The figure of 17 is implied by Flint (2008: 40), who indicates: "Although Mendoza would not hear from them for many months, Melchoir Díaz and Juan de Zaldívar, along with some 15 horsemen and an unknown number of indios amigos, dutifully left Culiacán on November 17, 1539, bound for Cibola."
- ⁵ Richard Flint (pers. comm., August 2009) suggests that Díaz-Zaldívar expedition may also have been accompanied by a significant number of native allies, from dozens to perhaps hundreds. Consequently, the number of allies and the overall size of this expedition is very difficult to assess accurately.
- ⁶ The figure of 17 horses is based on the reference in Flint (2008:40) in reference to the composition of the expedition - i.e., including Melchoir Díaz, Juan de Zaldívar, along with some

15 horsemen. Duffen and Hartmann (1997:209) note that expedition consisted of "Melchoir Díaz and his fifteen horsemen".

- ⁷ The figure of 80 men-at-arms is mentioned by Flint (2008:51).
- ⁸ The figure of 287 *hombres libres* is mentioned by Flint (2008:51).
- ⁹ The figure of approximately 368 is suggested by Flint (2008:56-57).
- ¹⁰ The figure of approximately 2000 indios amigos at the beginning of the entrada is offered by Flint (2009:73, 115).
- ¹¹ The figure of 4 wives is offered by Flint (2008:56-57), though he notes that the real number is likely to be much higher.
- ¹² The figure of 5 friars is mentioned by Flint (2008:55-56). The 3 friars were listed as Fray Marcos de Niza, Fray Luis de Úbeda, Fray Juan de Padilla, and Fray Antonio de Castilblanco, and Fray Daniel.
- ¹³ The figure of 500 cattle and 5,000 sheep is mentioned by Flint (2008:63), though he notes that this tally was taken halfway through the entrada.
- ¹⁴ The figure of 600 pack horses and mules, and 550-odd saddle horses of the men-at-arms is mentioned by Flint (2008:63).
- ¹⁵ The figure of 9 soldiers is mentioned by Bolton (1916:138) and Hammond and Rey (1966:8).
- ¹⁶ The figure of some 16 Indian servants is mentioned by Bolton (1916:138), but Hammond and Rey (1966:8) suggest there were 19 Indian servants.
- ¹⁷ The figure of 3 friars is mentioned by Bolton (1916:138) and Hammond and Rey (1966:8). The 3 friars were listed as Fray Agustín Rodríguez, Fray Francisco López, and Fray Juan de Santa María.
- ¹⁸ The figure of 600 head of stock is mentioned by Hammond and Rey (1966:8).
- ¹⁹ The figure of 90 horses is mentioned by Hammond and Rey (1966:8).
- ²⁰ The figure of 14-15 soldiers is mentioned by Bolton (1916:163). But in a footnote on the same page Bolton lists "Espejo, [and] twelve other soldiers" (Bolton 1916:163, n1). Hammond and Rey (1966:18) list 14 soldiers, but do not count Antonio de Espejo in their total.

- ²¹ Included "servants" according to Bolton (1916:163, n1); Hammond and Rey (1966:18). The precise number of servants, however, is unspecified in both references.
- ²² Included Fray Pedro de Heredia and Fray Bernaldino Beltrán according to Bolton (1916:163, n1) and Hammond and Rey (1966:18).
- ²³ Included "interpreters" according to Bolton (1916:163, n1). The precise number of interpreters is unspecified.
- ²⁴ The figure of 115 horses and mules is mentioned by both Bolton (1916:164) and Hammond and Rey (1966:18).
- ²⁵ Hammond and Rey (1966:xii) mention the figure of 170 people for the entire colony. Schroeder and Matson (1965:11) indicate that the Castaño de Sosa party consisted of a "group of 160 or 170 people" and that amongst them "were several Indian interpreters".
- ²⁶ Schroeder and Matson (1965:11) indicate that the Castaño de Sosa party consisted of a "group of 160 or 170 people" and that amongst them "were several Indian interpreters".
- ²⁷ The figure of "at least ten carts", mentioned by Schroeder and Matson (1965:11) suggests that the Castaño de Sosa expedition may have had at least 10 oxen.
- ²⁸ Hammond and Rey indicate that the Morlete was authorized to "enlist forty of the finest soldiers he could obtain" (1966:43) and was instructed to take along a friar, one Juan Gómez (1966:45-46). The total number of soldiers is 41 when we include Captain Juan Morlete.
- ²⁹ Hammond and Rey (1966:43) indicate that Morlete was instructed to take along a friar, one Juan Gómez (1966:45-46).
- ³⁰ Hammond and Rey (1966:50) mention at least one unnamed soldier associated with the Leyva and Humaña expedition: i.e., in addition to Captain Leyva de Bonilla and Captain Gutiérrez de Humaña (the latter cited as a Captain in Hammond and Rey 1966:xii), although there were undoubtedly more individuals included in this party.
- ³¹ Hammond and Rey (1966:49) mention an Indian, Jusepe Gutiérrez, who was part of the Leyva and Humaña expedition.
- ³² The figure of 130 soldier-colonists is mentioned by Bolton (1916:202), while Hammond and Rey (1953:14) and Simmons (1991:87) list 129 soldiers. Furthermore, Bancroft (1889:124) and Bolton (1916:202) indicate that 130 men brought their families with them (presumably the

soldiers since the number of 130 matches); hence the figure of 260 is cited here - i.e., 130 men plus at least one family member each = 260.

- ³³ Bancroft (1889:124) and Bolton (1916:202) indicate that Onate's expedition included "a large number of servants and Indians", though the precise number is not specified.
- ³⁴ Bancroft (1889:124) and Bolton (1916:202) indicate that Onate's expedition included "a large number of servants and Indians", though the precise number is not specified..
- ³⁵ 10 Franciscan friars are mentioned by Bancroft (1889:124), as well as by Hammond and Rey (1953:16). The latter provide the names of all of these individuals, including Fray Alonso Martínez, Fray Andrés Corchado, Fray Juan Claros, Fray Alonso de Lugo, Fray Juan de Rosas, Fray Cristóbal de Salazar, Fray Francisco de San Miguel, and Fray Francisco de Zamora, as well as two lay brothers, Pedro de Vergara and Juan de San Buenaventura.
- ³⁶ Bancroft (1889:124) and Bolton (1916:202), mention that as it departed, the colony consisted of 400 men, of whom 130 had families. The figure of 270 listed here excludes the quoted number of soldiers in Oñate's party, i.e., men that formed part of the expedition but did not bring family members.
- ³⁷ The figure of 7000 "head of stock" is mentioned by Bancroft (1889:124) and Bolton (1916:202). Hammond and Rey (1953:44-45) indicate that Oñate's contract specified 1000 head of cattle; 3000 sheep; 1000 rams; 1000 goats; and 100 head of black cattle; total = 6100. The lower of the two figures appears to be more specific, accurate and well documented. Also, as Hammond and Rey (1953:14) indicate with regard to Oñate's contract: "he was short of cattle and supplies".

The figures used to arrive at the total cited here (i.e., 5113 livestock for the Oñate expedition), are based on the Inspection conducted by Juan de Frías Salazar from 22 December, 1597 to 8 January, 1598, which were agreed upon formally and signed at Aviño on 21 January, 1598. The document relating to this inspection that was translated and cited by Hammond and Rey (1953:199-308) - i.e., Inspection Made by Juan de Frias Salazar of the expedition - indicates the following totals for the expedition's livestock:

□	Goats:	716	(Hammond + Rey 1953: 215)
□	Oxen:	198	(Hammond + Rey 1953: 215)
□	Sheep:	2,517	(Hammond + Rey 1953: 215)
□	Rams:	383	(Hammond + Rey 1953: 215)
□	Cattle:	799	(Hammond + Rey 1953: 224)
□	Calves:	500	(Hammond + Rey 1953:224).

Hammond and Rey (1953:215), indicate that the following were short of the agreed targets in Oñate's contract:

- Goats: 1,000-716 = 284 short
- Sheep: 3,000-2,517 = 483 short
- Rams: 1000-383 = 617 short
- Cattle: 1000-799 = 301 short, but this total excludes the 500 calves. The Frías Salazar inventory suggests that the contract specified that the cattle needed to be full grown, and that this issue was therefore a discretionary one for the Viceroy, Don Luis de Velasco (Hammond and Rey 1953:224).

³⁸ Made by Juan de Frias Salazar of the expedition - indicates the following totals for the expedition's horses and mules:

- Mules-Jackasses: 41 (Hammond + Rey 1953:216)
- Colts: 96* (Hammond + Rey 1953:216)
- Mares: 101* (Hammond + Rey 1953:216)

*Hammond and Rey (1953:215), indicate that the totals for colts (96) and mares (101) were 54 animals, and 49 animals, short, respectively, of the targets of 150 specified for each.

Environs of El Morro National Monument

An adequate amount of potable water is a critical factor when a competent leader of an expedition selects a campsite. The environs of El Morro environs meet this particular requirement, owing not only to the natural collection tank (*tinaja*) at Inscription Rock, but also because of the various other water sources located within a three-mile radius of this landmark. Assuming El Morro did figure in the route(s) of the Vázquez de Coronado expedition, it is possible that only a few members of this party actually exploited the water resources (natural tank) at Inscription Rock. The large size of this expedition may well have required disbursement of livestock and attendant herders over a wide area around El Morro. This portion of El Morro Valley has numerous small basins of various sizes and the absence of external drainage from the valley causes water runoff to collect in these areas. An additional water source within El Morro is located at the head of Box Canyon, a landform that also functions as a natural enclosure for livestock. In addition, there is a reliable spring at the north end of Bond Mesa, two miles east of Inscription Rock (Bradford 2007:8).

As suggested by data derived from agronomic studies (Lardy and Stoltenow 1999), we calculate that a conservative estimate of the daily potable water requirements for the Vázquez de Coronado expedition would have been between 40,000 and 50,000 gallons--the bare minimum for approximately 2,400 humans and 7,000 head of livestock combined. We suggest that, when encamped at El Morro, captains may have dispersed their respective commands over the countryside in order to obtain sufficient water. Additionally, expedition companies may have marched as much as a day apart in order for spring-fed pools and seeps to recharge for each successive company.

Other desirable camp attributes include reasonably level areas to facilitate placement of tents, hearths, and work areas; sufficient forage for livestock; and firewood. These advantageous topographic and environmental characteristics are largely available within the El Morro environs and in the valley as a whole. This assessment presumes, however, that the expedition remained in the region for a limited period so that the area's carrying capacity would not be exceeded by such a large host of humans and livestock. Aeolian and colluvial soils found north, south, and east of Inscription Rock present a landscape that is virtually flat to gently rolling. These soils support stands of native grasses that are palatable to livestock and that grow in abundance in many areas. Piñon and oak also are found widely in this landscape, with dense stands located at the base of Inscription Rock (Bradford 2007:8-10).

It is likely that the various components of the Vázquez de Coronado expedition experienced significantly different camping conditions in the El Morro area during the late autumn and early winter of 1540 enroute to the Rio Grande Valley. Unlike the Alvarado, Lopez de Cárdenas and Vázquez de Coronado parties that traveled to the Tiguex area in latter part of autumn, during what appears to have been a period of abnormally high precipitation (Van West et al. 2009), the Luna y Arellano contingent faced colder conditions and snowfall during their trip in early December 1540 (Flint and Flint 2005:401-402). At that time of year the El Morro Valley can be blanketed with snow, which can obscure native grasses and easily gathered firewood. Water sources also can be obscured or frozen over. We suspect, however, that such harsh conditions

did not prevail in November of 1540, since the expedition traveled from Zuni to the Rio Grande Valley in eight days, suggesting a rate of approximately 15 miles per day.

This rate of travel seems unlikely if snow hampered movement and obscured sources of animal fodder.

Survey Methods

The goal of this project is the recording of all historic artifacts and any surface remains of encampment features (e.g., rock-cleared tent pads, rock-lined hearths) reflective of over 350 years of historic visitations to El Morro. To maximize probability of locating pertinent objects and features, the project made use of historical background information from documents and archaeological investigations elsewhere, as well as the combined experience of the survey team in evaluating encampments of the Spanish Colonial and Territorial periods (e.g., Damp 2005; Haecker 1998; King and Haecker 2008). In an attempt to investigate large areas of the El Morro National Monument over a short period, four sample areas were defined, termed Zones A-D (Figure 4). These transects were chosen based on relative proximity to Inscription Rock and its natural tank, and on the presence of terrain suitable for the placement of tents and other encampment-related features. The basic characteristics of these four Zones are outlined below:

Zone A: a ~6.6 acre area that abuts the northeast side of Inscription Rock. This area includes a portion of virtually flat upland, with the toe of the talus slope forming its southern boundary.

Zone B: a ~10 acre area of flat to rolling terrain that extends eastward from the northernmost extension of Inscription Rock, up to a now-abandoned dirt road.

Zone C: a ~3.3 acre area of flat to rolling terrain that abuts Inscription Rock in the general vicinity of the natural tank. This zone includes Nine Pine Cove (LA 46049).

Zone D: a ~9.4 acre area of flat to rolling terrain bounded on its northern site by Nine Pine Cove. Its western side is demarcated by relatively dense vegetation cover that impedes the use of metal detectors; while its eastern and southern boundaries are delimited by intermittent drainages.

The survey team employed two basic types of equipment: metal detectors, and a Trimble GeoXH® global positioning system (GPS) with a maximum horizontal accuracy of ± 10 cm with respect to target objects. All of the detectors are models that employ very low frequencies, and have the capability of detecting objects the size of a match head at approximately 20 cm below surface. These particular machines are also able to identify all types of metals. The detector models employed during this survey were the MineLab Explorer II®, Tesoro Tejon®, and Tesoro SuperTraq® (two surveyors utilized the latter detector model). Once detected the metal object was then excavated, its location determined via GPS, photographed and, if considered especially significant, collected by the park archeologist and curated. If it was not selected for

curation the artifact was re-buried at its depth of discovery. Curated artifacts were later weighed, measured, sketched, and photographed under controlled conditions.

El Morro National Monument: 2007 Survey Areas



Figure 6: Survey Areas

El Morro National Monument: All Artifact Locations

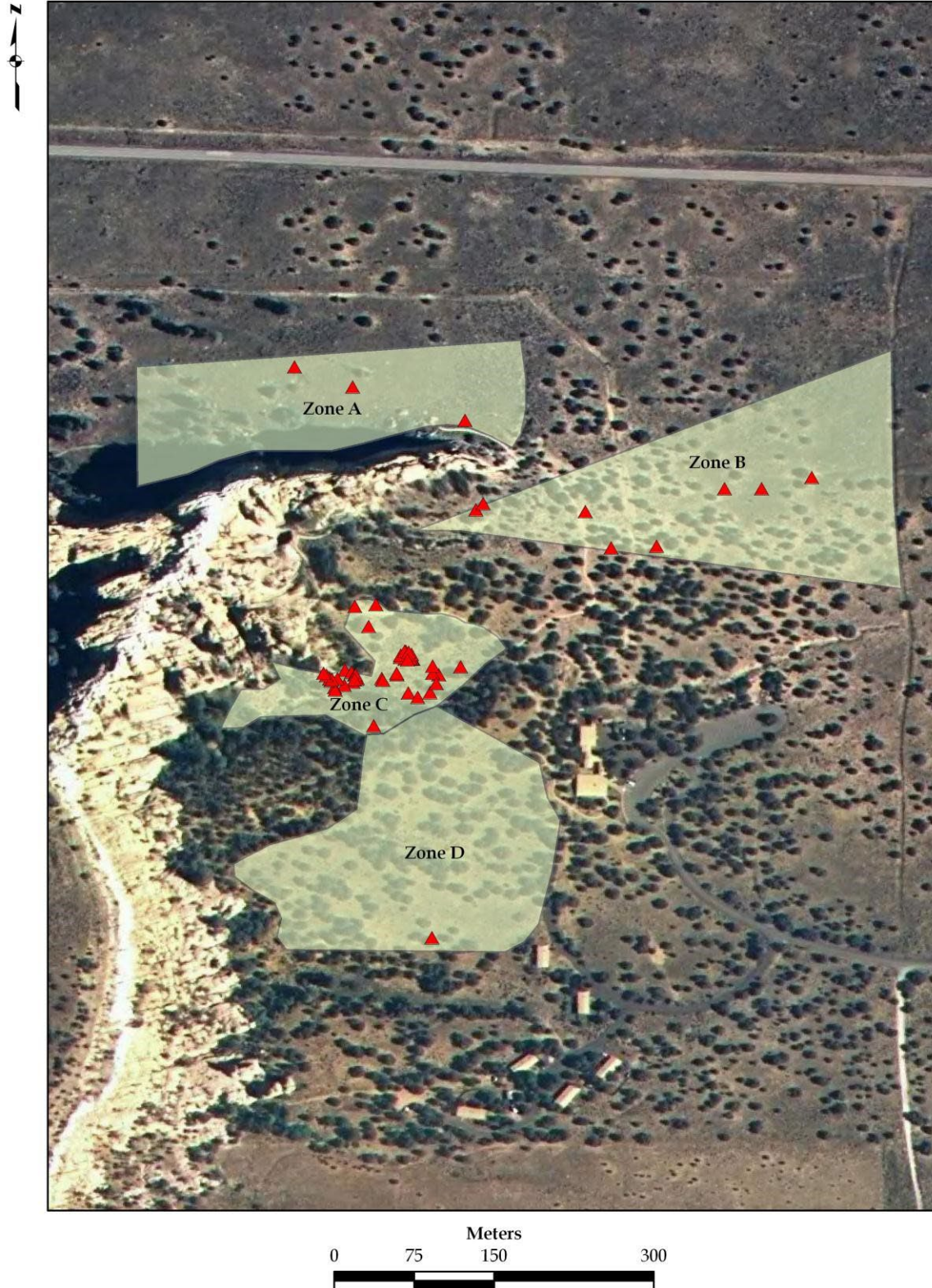


Figure 7: Distribution of All Artifacts

Survey Results

The three-day survey resulted in the discovery of 73 metal artifacts, which are described in detail below (see also Figure 5 for a frequency histogram of artifacts by century):

Nineteenth and Twentieth Centuries Artifacts

- Roller Buckle: (PD 33)

Roller buckles, introduced some time after circa 1850 (Douglas Scott, pers. comm. 1992), represent an artifact type from the horse era that is difficult to date with precision. This object is identified as an iron strap buckle of a type typically used on cinch and saddle straps.

- Lead Balls: (PDs 30, 31, 35, 36, 38)

Unlike cartridge cases, lead balls are problematic because of the difficulties in determining their chronology based solely on ball morphology. All five of the lead balls identified during the survey are deformed to some degree due to having been fired. The weight of PD 30 indicates it is .29 caliber, and probably fired as part of a multi-shot load. Hemispherical lines indicate it was cast in a mold. PD 31 has the weight of a .36 caliber ball (Branstner 2008:177). The ball has a distinct ramrod mark, which is typical of Civil War era firearms. The width of the lands and grooves indicates it was fired from a Colt Navy pistol (Doug Scott, pers. comm., January 2009). One side of PD 36 shows the unmistakable impressions of the cloth patch that was used to make the ball fit tightly in the rifle barrel. The other two lead balls (PDs 35 and 38) are too distorted to permit even approximate calibers identification.

- .22 Caliber Rimfire Cartridge Cases: (PDs 13, 54, 60, 63, 64, 76)

- .22 Caliber Bullets: (PDs 6, 17, 62)

- Copper Jacket Fragment from a .22 Caliber Bullet: (PD 2)

The common .22 Short cartridge dates from 1857 and is the oldest cartridge still in use today. It was the first American metallic cartridge, introduced in the first Smith and Wesson revolver, a pocket pistol developed for personal protection. The .22 Long was introduced in 1871; the .22 Extra Long was introduced in 1880 and discontinued circa 1935. In 1887 the Stevens Arms Co. introduced the .22 Long Rifle. It was adapted to both rifles and pistols, and became the most popular sporting and target shooting cartridge in the world. It is intended for small game.

The .22 Winchester Rim Fire (WRF) was introduced in 1890. The .22 Remington Special and WRF are the same cartridge and are interchangeable. The .22 Winchester automatic cartridge was designed for their Model 1903 automatic loading rifle (discontinued in 1932). This ammunition type continued to be produced into the 1970s. Remington's .22 Automatic appeared in their Model 16

autoloader. That rifle was discontinued in 1928, and the ammunition was not loaded after 1945. Winchester introduced its .22 Winchester Magnum Rimfire (WMR) in 1959. Due to its high velocity, .22 WMR cartridges are loaded with jacketed bullets. Copper-jacketed bullets were introduced in 1883 (Suydam 1960:45-63).

- .32 Caliber Cartridge Case, Headstamp - REM UMC 32 LCF: (PD 8)
- .32 Caliber Bullet, Copper Jacketed: (PD 10)
The .32 caliber Long Colt center fire cartridge was introduced by Colt in 1875 along with the New Line model revolvers. REM UMC (Remington-Union Metallic Company) is a head stamp used after 1912.
- .45 Caliber Handgun Bullet: (PD 54)
Popularly termed the *Peacemaker* the Colt model 1873 handgun is a single action revolver that became one of the most popular and legendary small arms in the United States. Both the cartridge and revolver were adopted by the U.S. Army in 1875, and served as its official hand gun until 1892 when it was replaced by .38 caliber revolver models. Colt began production in 1878 of various .45 handgun models intended for civilian use. The .45 remains a popular handgun caliber due to its stopping power (Barnes 1997:193).
- .45-70 Cartridge Case, No Head Stamp: (PDs 56, 57)
The .45-70 cartridge was developed at the Springfield Armory for use in the Springfield Model 1873, .45 caliber rifle. The rifle was originally issued with a copper cartridge, but soldiers soon discovered that the copper expanded in the breech when heated upon firing, which sometimes jammed the rifle by preventing extraction of the fired cartridge case. The cartridges were redesigned with brass instead of copper cases, to reduce expansion and extraction problems. Head stamps are not found on cartridges made at the Frankford Arsenal before March 1877. The Frankford Arsenal continued to manufacture .45-70 ammunition up until 1898 (Reuland 1993:17-21).
- .50-70 Cartridge Case: (PD 51)
Shortly after the Civil War approximately 25,000 Springfield Model 1863 rifled muskets were converted to breechloaders for use by U.S. troops. The converted rifle, termed the Springfield Model 1866, utilized a trapdoor-breech-loading mechanism. The rifle was chambered for a .50-70 cartridge (.50 caliber, 70 grains of black powder). The Model 1866 was issued in 1867, and it soon provided much-needed firepower superiority for outnumbered troops fighting Sioux and Cheyenne warriors on the northern Plains. It was soon superseded by the Model 1868, which also was chambered for the .50-70 cartridge. This was the first newly manufactured breech-loading military rifle for the U.S. Army. This model

was the standard Army rifle until it, too, was replaced a few years later by the Springfield Model 1873, .45 caliber rifle (Suydam 1960).

- .52 Caliber Sharps; Carbine Sharps Bullet, So-called *Ringtail* Type; Unfired, with Ramrod Worm Extraction Mark: (PD 40)

The Sharps rifle and carbine, patented in 1852, was a popular military and commercial firearm. The Sharps could use either a percussion cap or a pelleted primer feed, a device that held a stack of pelleted primers that flipped one over the nipple every time the trigger was pulled and the hammer fell. This device made it much easier to operate from horseback than individual percussion caps. The Sharps carbine was the weapon of choice in the pre-Civil War cavalry, and was the most accurate of the cap lock breech-loading arms perfected in the 1850s. Due to its great accuracy the Sharps rifle was preferred by U.S. Army sharpshooters during the Civil War. The carbine version also was very popular with the cavalry of both the Union and Confederate armies and was issued in much larger numbers than the full length rifle. After the Civil War a surplus Sharps was considered to be an excellent buffalo rifle. Springfield armory and others converted Sharps to military power metallic cartridges, which were reliable for buffalo hunting (Thomas and Thomas 1996:26-28).

- 56-56 Spencer Cartridge Cases: (PDs 58, 60, 61); No Head Stamps (PDs 58 and 60 are Unfired)
- 56-50 Spencer Cartridge Cases: PDs 24, 25, 26, 46, 59; No Head Stamps The Spencer rifle and carbine were important arms during the Civil War. Patented in 1860, this firearm used a rolling-block action operated by a trigger guard lever, feeding cartridges from a magazine in the stock into the breech of the barrel. The Spencer was the first practical arm using a cartridge suitable to the requirements of the U.S. military. In addition, Spencer cartridges became the standard to which other arms were altered or re-chambered as the war progressed. The magazine holds seven cartridges, which may be loaded separately or all at once.

Spencer military calibers used three cartridges: 56-56, 56-52, and 56-50. The 56-56, introduced along with the Spencer firearm in 1860, is the oldest and largest of the Spencer cartridge and was produced in three forms. The 56-50 Spencer cartridge, designed in 1864, was a development of the Ordnance Department and may be the first standardized metallic cartridge developed for use by the Army. This cartridge is characterized by a long case, tapered crimp, interior lubricated bullet, and three or more stabs in the case at the lower grease groove to hold the ball in place. The Spencer Company did not survive the economic downturn following the Civil War. In September 1869 it was purchased and absorbed by the Winchester Company (Suydam 1960:117-125).

- .58 caliber Minie Ball, Unfired: (PD 32)

In 1855 the U.S. Army adopted the .58 caliber rifled musket to replace the .69 caliber smoothbore. Instead firing a round ball, the Model 1855 fired a cylindrical bullet that had a conical nose and deeply concave base. The force of the explosion caused the concave base to expand, forcing the bullet tight into the rifling. The heavy, slow-moving bullet wrought serious damage, and it was effective up to 400 yards. This type of shoulder arm became obsolete shortly after the Civil War, having been replaced by breechloaders that utilized metallic cartridges

Summary: The unfired Sharps carbine bullet, unfired Minie ball, and eight Spencer carbine cartridge cases were discovered east of Inscription Rock and in the general vicinity of the natural tank. The period of Sharps carbine military use is circa 1852-1865; the Minie ball, circa 1858-1866; and Spencer carbine, circa 1863-1870. Nearby inscriptions suggest which military units may be responsible for depositing these particular artifacts; these include:

- **E.F. Beale** [*Lieutenant Beale commanded the Camel Corps, which stopped at El Morro in 1857 and 1859*]
- **1st Reg't N.M. Vols. Aug 13th 1863. Col. C. Carson Comm[ander] ○ H. Orton Capt. 1st Cal. Cav. 1866 ○ L.J. HARWOOD Col. 3. USC [Colonel, 3rd US Cavalry] 1867 & 8 ○ F.K. UPHAM 1st Cav. 1870**

The one .50-70 cartridge case, the two .45-70 cartridges cases, and the two .45 caliber bullets also have military associations. The U.S. Army adopted the .50-70 Springfield rifle in 1866, which became obsolete as a military firearm in 1873 with the introduction of the .45-70 Springfield rifle.

Yet it is possible that one or more civilians who visited El Morro actually possessed these military firearms. Inexpensive government surplus arms and ammunition were widely available for years after the Civil War. As late as 1927 the Bannerman catalog of surplus military goods lists varieties of Government Issue firearms that include Civil War era rifles, carbines and pistols in good condition, along with appropriate ammunition (Murtz and Schroeder, eds. 1927 [1980]). Archaeological finds within homesteads dating to the late nineteenth and early twentieth centuries, as well as Native American encampments, occasionally include Government Issue cartridge cases (e.g., Reher 1977:248; Haecker 2003).

Recovery of three .22 cartridge cases and one .32 cartridge case point to use of non-military issue firearms in the immediate vicinity of El Morro. The presence of these particular artifacts is

perhaps a reflection of Ramah Navajo occupation of this area since at least the midnineteenth century. Deposition of any non-military issue cartridge cases and bullets found within El Morro National Monument is likely to have occurred prior to 1916, the year when the NPS appointed the Monument's first custodian (Bradford 2007:37), and who presumably enforced prohibition of firearms by non-NPS visitors.

Nine Pine Cove/ LA 46049 is located at the base of El Morro and south of the natural tank. Since at least the early 1920s, Monument staff and tourists have picnicked and held barbecues in this area – a practice that continued until the 1950s (Jim Bradford, pers. comm., February 2009). Still present at this site are a picnic table and a barbecue grill box. Survey of Nine Pine Cove area with metal detectors produced 24 artifacts that are appropriate to this suggested period of site use (i.e., c. 1920s-1950s). These artifacts include: wire nails (2); galvanized roofing nails (2); segments of baling wire (2); the lid of an inner tube repair kit; steel nuts (2); a bolt; wood screw; hair pin; a 1914 penny; and a fragment of sanitary seal food can. The survey uncovered 12 other twentieth century metal objects within this site but their exact locations were not recorded via GPS. The project director terminated survey activity within Nine Pine Cove due to the large concentration of twentieth century material present here and the failure to recover objects of other periods.

El Morro National Monument: 19th Century Ammunition

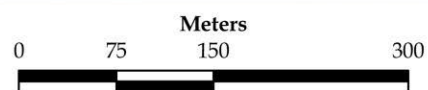
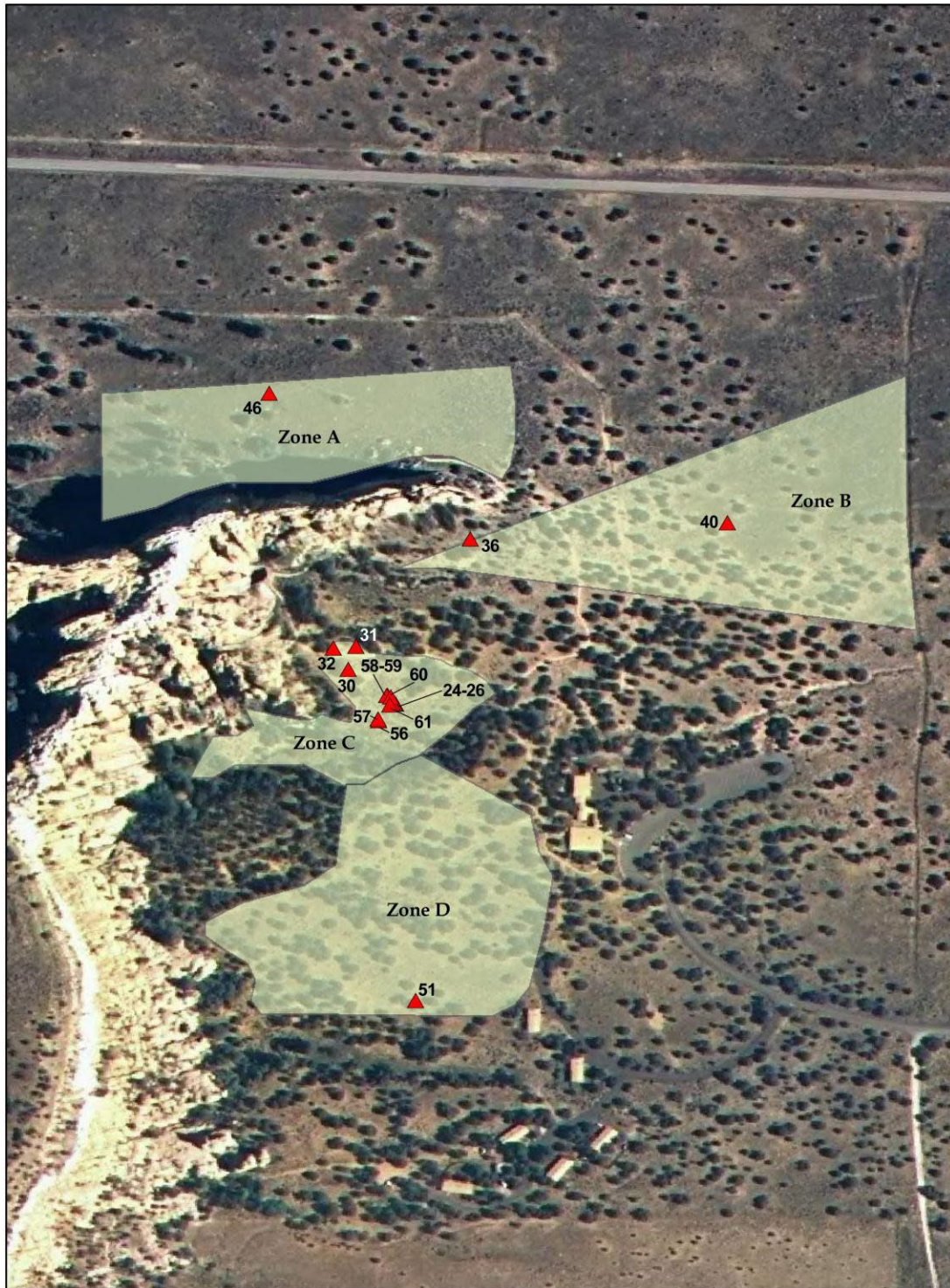


**Figure 8: Distribution of 19th Century Ammunition
El Morro National Monument: Probable 16th Century Artifacts**

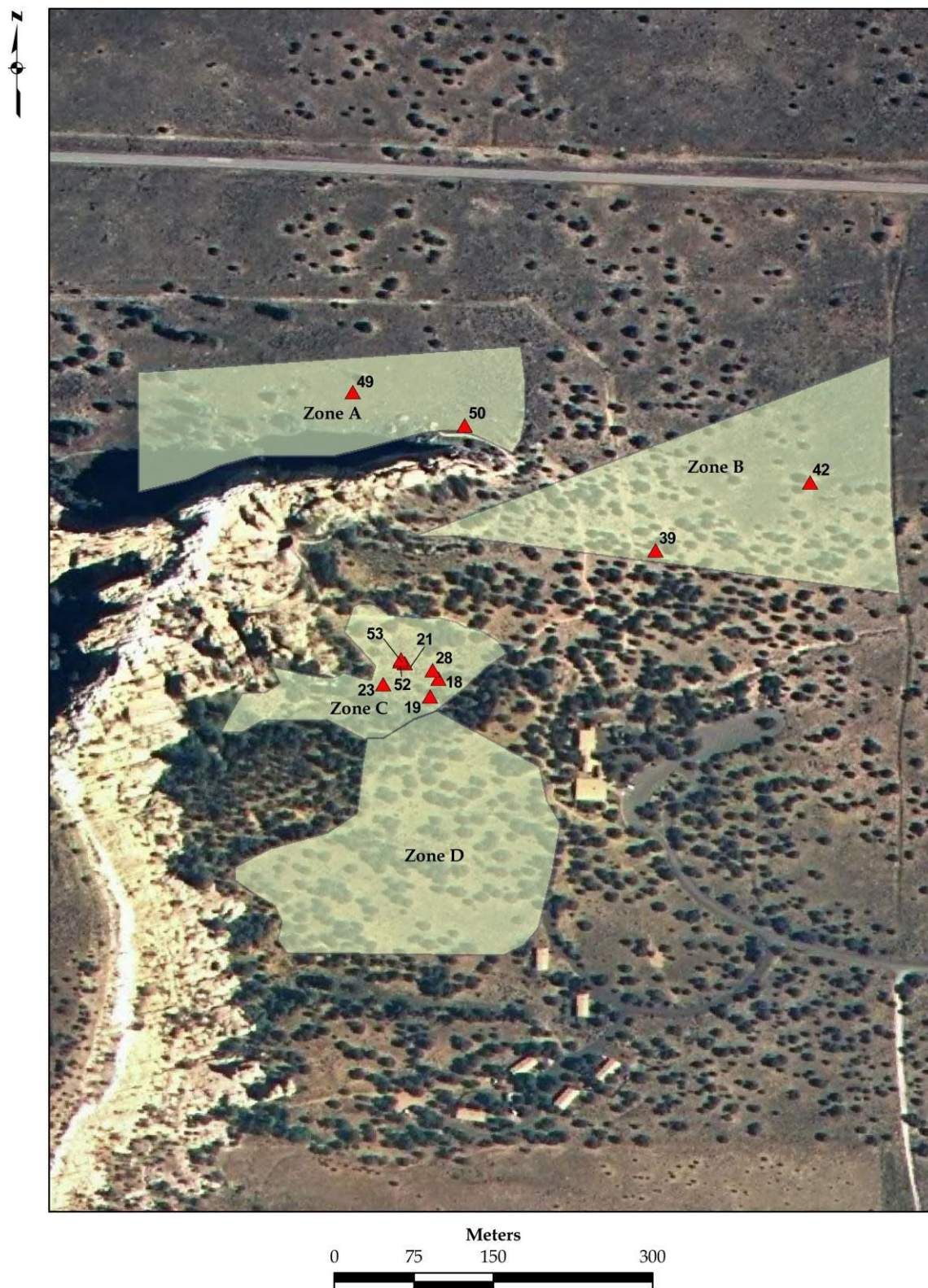


Figure 9: Distribution of probable 16th Century Artifacts

Spanish Colonial Artifacts

- Cast Iron Object, Possibly an Escutcheon Plate, Portion Missing: (PD 39)
(Figure 10) This object was initially identified as a buckle of early Spanish Colonial manufacture. Research to date, however, has yet to produce a buckle of comparable morphological characteristics. Additionally, its 5-7 mm thickness suggests it was too insubstantial for practical use as a clothing or harness buckle, and the characteristic brittleness and poor tensile strength of cast iron would have ensured breakage at points of stress if it had been used as a buckle. Dr. Kathleen Deagan, a recognized expert in early Spanish Colonial material culture, believes this object dates to the sixteenth or seventeenth centuries as suggested by its decorative aspect (pers. comm., April 2008). Historical archaeologist Cordelia Snow and Dr. Robin Gavin, Curator of the Spanish Colonial Arts Museum in Santa Fe, New Mexico, both agree with Deagan's assessment and further suggest it may be a fragment of an escutcheon plate from a wooden traveling chest (pers. comm., January 2009). Interestingly, Diego Pérez de Luxán, the principal chronicler of the Espejo expedition of 1582-1583, indicates that when their party reached the Zuni Pueblo of Malaque (Mats'a:kya) on the 14th of April, 1583: "...we found a book and a small old trunk left by Coronado (Hammond and Rey 1967:90).
- Ferrous Awl or Needle: (PD 19)
(Figure 11) This object is approximately 7 cm long by 0.35 cm wide, pointed at one end with the opposite end having a recessed groove (measuring 0.22 cm wide) encircling the shaft to form a head (measuring 0.25 cm long). Shafts of awls found on Euro-American and Native American sites dating to the seventeenth, eighteenth and nineteenth centuries are typically tapered or wedgeshaped, which is not the case with PD 19. If this object was used as a needle it is possible that, instead of inserting material through an eye, thread or sinew was tied around the groove and then pulled through seam holes punched into fabric or hide. An object similar in length and design (although corroded) was discovered at Kuykendall, an early Spanish Colonial site in southeastern Arizona (Brasher 2009: 34, Figure 24, center object).

Although Brasher suggests that the wrought iron awls from Kuykendall are likely to date to the sixteenth century - based on parallels with awls assumed to be of sixteenth century date at Hawikku – the chronological and cultural context of material from the latter site need to be considered carefully. It should be remembered that many of the awls known currently from Hawikku were recovered via metal detector surveys in areas that represent the excavated remains and spoil piles from investigations by the Hendricks-Hodge expedition of 1917-

1923 (Hodge 1937; Smith et al. 1966). Furthermore, the evidence of late sixteenth century visits to Zuni by the entradas of Sánchez Chamuscado-Rodríguez (1581), Antonio de Espejo (1583), Marcos Farfán de los Godos (1598) and Juan de Oñate (1599), together with a substantial seventeenth century occupation at Hawikku - including a Franciscan mission established there in 1629 (Smith et al. 1966:98) - suggests that the precise chronology of



Figure 10: Possible Escutcheon Plate (PD 39)



Figure 11: Awl (PD 19)

these awls is ambiguous. In addition, an awl very similar to those from both Kuykendall and Hawikku (albeit somewhat larger – i.e., 9 cm long) has been reported from the Pueblo of Paa-ko on the eastern slopes of the Sandia Mountains near Albuquerque, NM in a seventeenth century context (Lambert 1954:160-161). Until additional analyses are undertaken at Hawikku, and other early sixteenth century sites in the Southwest, the morphometric characteristics of awls and their associated chronology will remain unclear.

A more compelling parallel for the El Morro awl, with regard to its overall shape and grooved head, comes from a wooden artifact found in a well deposit discovered at St. Augustine, Florida which dates to 1575 (Deagan pers. comm., March 2009). This awl measures approximately 11.6 cm long by 0.6 cm wide (maximum width), and like the El Morro example, has a short head (measuring 0.7 cm long) formed by a recessed groove in the shaft (measuring 0.2 cm wide). Kathy Deagan suggests the St. Augustine awl was used for producing nets or baskets, and that our metal awl from El Morro was likely to have been used for leather working.

The possible use of wrought iron awls for the production of durable leather and other footwear, particularly *aparagates* (hemp sandals), is a suggestion made by Richard Flint some years ago in a review of the material inventory of the Vázquez de Coronado expedition (Flint 1992:45-46). Because of the large number of expeditionaries participating in this entrada, the duration of the expedition, the

expansive area covered, and the difficult terrain that was often traversed, the need for repairing and creating footwear on a regular basis would have been significant. Durable tools such as wrought iron awls would have been particularly useful in piercing hide and in threading plant fibers and sinew through small openings in leather soles to create sandals. Well-preserved iron awls, such as the example from El Morro, may provide us with the opportunity to test these ideas more explicitly by examining differential wear at the piercing end of these tools, a wear pattern that would be expected if these objects had been used to perforate leather/hides. If hemp, yucca and other plant fibers were used regularly as the raw materials for producing footwear for expedition members, it is possible that pollen analysis, and perhaps macrobotanical studies, of camp features might regularly reveal the presence of these plant remains.

□ Wrought Iron Caret-Headed Nails: (PDs 18, 21, 52)

(Figure 12) Three wrought iron nails with a roughly triangular-shaped head - often referred to as *caret-headed* or *bi-faceted nails* - were found in close proximity to one another in the eastern portion of Zone C at El Morro.

Examples of caret-headed/bi-faceted nails are now known at a number of sites in New Mexico and Texas – all in contexts relating to the mid-sixteenth century entrada of Francisco Vázquez de Coronado. These sites include Hawikku (Damp 2005); Kyaki:ma (Damp 2005); LA 54147 (Vierra 1989); and Piedras Marcadas (Schmader et al. 2007; Mathers et al. 2008) in New Mexico, and the



Figure 12: Caret-Headed Nail (PD 18)

Jimmy Owens site in the Texas Panhandle (Blakeslee and Blaine 2003). Similar nails have also been found elsewhere in the Southeast: at the Hernando de Soto winter camp (*Governor Martin site*) near Tallahassee, Florida (Ewen and Hann 1998); as well as on a number of Columbus-period settlements in Haiti (*Puerto Real*) (Deagan and Cruxent 2002) and the Dominican Republic (*La Isabella*) (Deagan and Reitz 1995). Further afield, caret-headed nails have been discovered in sixteenth century contexts in Guatemala (Jeb Card, pers. comm., May 2009) and Peru (Steve Wernke, pers. comm., April 2009); as well as the later fifteenth century in Britain (Burgess 2000). (For specific details and references see Table 1, below). As this report is submitted we are continuing to pursue contacts with other colleagues in the Americas and Europe – notably Mexico and Spain – to see whether additional examples of these nails can be identified elsewhere.

Our research to date, therefore, suggests that caret-headed or bi-faceted nails are widely distributed and occur in a variety of contexts dating to the later fifteenth and earlier sixteenth centuries. It is also worth noting that our attempts to locate this form of nail definitively in assemblages dating to the latter half of the sixteenth and early seventeenth century have not been successful to date. It is not clear at present whether there is a qualitative or quantitative difference in Spanish nail assemblages between the earlier and later halves of the sixteenth century (i.e., whether there is a genuine absence of caret-headed nails in the later sixteenth century, or simply a reduction in the popularity of that form after c. 1550 AD). Nevertheless, our inquiries concerning later sites and assemblages, both in the Southwestern and Southeastern US, as well as elsewhere in the Americas, has yet to produce any definitive examples of caret-headed nails in contexts dating after c. 1550. A listing of some of the major sites and regions we have investigated are included in Table 2 below. In addition to making inquiries about some of the larger and better documented colonial assemblages from the period c. 1550-1700 AD in North America and Mexico, we have consulted with a wide range of regional experts. To date, our contacts with colleagues working in the Canadian Arctic, New England, the Chesapeake, Outer Banks, Carolinas, Florida, and the Southwest have not produced evidence of these nails. These authorities on major French, English and Spanish Contact Period sites, as well as lesser known sites and assemblages have all pointed to the absence of caret-headed nails in contexts dating to 1550 AD or later.

In light of this evidence, and regardless of whether limited numbers of caretheaded nails are eventually found in later sixteenth century or early seventeenth century assemblages, we would like to suggest that the popularity of these nails had significantly declined after 1550. Furthermore, we believe that our research on caret-headed nails has a number of important implications for the history and archaeology of El Morro National Monument, as well as more generally for investigations of early Spanish entradas in the Southwestern U.S. and beyond. These implications include:

- In the American Southwest, at least, when caret-headed nails are found in any quantity, and/or in localized clusters - as they are at El Morro – they are strongly suggestive of a pre-1550 occupation;
- These nail forms are relatively ubiquitous in assemblages associated with the Vázquez de Coronado expedition and increasingly appear to be an artifact that is diagnostic of that entrada;
- In a wider geographic and cultural context, caret-headed nails appear to be employed most frequently from the mid-fifteenth to mid-sixteenth centuries;
- Caret-headed nails are fairly widely employed in the Americas, at least, during this period;
- Judging by the example of a caret-headed nail from a mass grave at the Battle of Towton in England (1461), however, these forms were neither exclusive to the Americas, nor were they used only by Spaniards;

Table 1: Caret-headed Nails from Archaeological Contexts in the Americas and Europe

Sites (Location)	1460-1469	1470-1479	1480-1489	1490-1499	1500-1509	1510-1519	1520-1529	1530-1539	1540-1549	1550-1559	1560-1569	1570-1579	1580-1589	1590-1599
Hawikku (NM) ¹									■					
Kyaki:ma (NM) ²									■					
El Morro (NM) ³									■					
LA 54147 (NM) ⁴									■					
Piedras Marcadas Pueblo (NM) ⁵									■					
Jimmy Owens (TX) ⁶									■					
Governor Martin (FL) ⁷									■					
Towton (UK) ⁸	■													
La Isabella (Dominican Republic) ⁹				■										
Puerto Real (Haiti) ¹⁰					■	■	■	■	■	■	■	■		
Ciudad Vieja (El Salvador) ¹¹							■	■	■	■				
Malata (Peru) ¹²									■	■	■			

■ Well-defined chronological context

■ Generalized chronological context

Date of First Spanish Entradas Following
the Vázquez de Coronado Expedition of
1540-1542

Footnotes for Table 1

- ¹ Damp (2005: 26-49, 59-62; Figures 6.8-6.10, 6.13-6.21)
- ² Damp (2005: 108-110; Figures 8.5)
- ³ See this report, pages 34-36
- ⁴ Vierra (1989: 131-134; Figures 43-44)
- ⁵ Schmader et al. (2007: 8-10, 13; Figures 3 and 8); Mathers et al. (2008)
- ⁶ Unpublished collections from 1995-2008 investigations by Dr. Donald Blakeslee (*Wichita State University*), courtesy of Nancy Marble, Director, Floyd County Historical Museum, Floydada, TX
- ⁷ Ewen and Hann (1998: 81-84, Figure 5.14 – large nail immediately left of center)
- ⁸ Burgess (2000: 26-49; Figure 3.4)
- ⁹ Deagan and Cruxent (2002: 105; Figures 6.6 – example in the upper right corner; 251-255, Figure 10.3 – Type “L”, *estoperole* [broad-headed tack] and Type “M” [anvil-head horseshoe nail]).
- ¹⁰ Deagan and Reitz (1995: 266-267; Figure 9.20 – second row of nails from the top, second and third examples from the left); while the solid gray bar in the diagram above represents that date range of Locus 39 which “was occupied primarily during the first half of the sixteenth century” (Deagan and Reitz 1995: 282), the more extended dotted line represents the full chronological range of the site (i.e., terminating in 1578).
- ¹¹ Dr. Jeb Card (*Southern Illinois University*), pers. comm., May 2009.
- ¹² Dr. Steve Wernke (*Vanderbilt University*), pers. comm., April 2009.

consulted with a wide range of regional experts. To date, our contacts with colleagues working in the Canadian Arctic, New England, the Chesapeake, Outer Banks, Carolinas, Florida, and the Southwest have not produced evidence of these nails. These authorities on major French, English and Spanish Contact Period sites, as well as lesser known sites and assemblages have all pointed to the absence of caret-headed nails in contexts dating to 1550 AD or later.

In light of this evidence, and regardless of whether limited numbers of caretheaded nails are eventually found in later sixteenth century or early seventeenth century assemblages, we would like to suggest that the popularity of these nails had significantly declined after 1550. Furthermore, we believe that our research on caret-headed nails has a number of important implications for the history and archaeology of El Morro National Monument, as well as more generally for investigations of early Spanish entradas in the Southwestern U.S. and beyond. These implications include:

- In the American Southwest, at least, when caret-headed nails are found in any quantity, and/or in localized clusters - as they are at El Morro – they are strongly suggestive of a pre-1550 occupation;
- These nail forms are relatively ubiquitous in assemblages associated with the Vázquez de Coronado expedition and increasingly appear to be an artifact that is diagnostic of that entrada;
- In a wider geographic and cultural context, caret-headed nails appear to be employed most frequently from the mid-fifteenth to mid-sixteenth centuries;
- Caret-headed nails are fairly widely employed in the Americas, at least, during this period;

- Judging by the example of a caret-headed nail from a mass grave at the Battle of Towton in England (1461), however, these forms were neither exclusive to the Americas, nor were they used only by Spaniards;
- While the function of these nails remains uncertain, claims that caret-headed nails could not have been used for attaching horseshoes cannot be sustained (e.g., Vierra 1988, pers. comm., quoted in Ewen 1998:83-84). Examples such as the sixteenth century horseshoe found at the undisputed Vázquez de Coronado campsite in the Texas Panhandle (i.e., Jimmy Owens) with several caret-headed nails still attached emphasize that these nails were indeed used for horseshoeing. Undoubtedly, caret-headed nails were used for a variety of other functions, which at the moment remain ill-defined.

Table 2: Archaeological Contexts in the Americas Where Caret-headed Nails are Absent
Currently

Site Name (Location)	1540- 1549	1550- 1559	1560- 1569	1570- 1579	1580- 1589	1590- 1599	1600- 1609	1610- 1619	1620- 1629	1630- 1639	1640- 1649	1650- 1659	1660- 1669	1670- 1679	1680- 1689
San Gabriel de Yunque Oweenge (New Mexico)															
Paa-ko Pueblo (New Mexico)															
Pueblo San Marcos (New Mexico)															
Abó (New Mexico)															
Gran Quivira/Las Humanas (New Mexico)															
Quarai (New Mexico)															
Plaza Montoya (New Mexico)															
Pecos (New Mexico)															
Las Majadas (New Mexico)															
Casa Quemada (New Mexico)															
Santiago (LA) (New Mexico)															
Tabira (New Mexico)															
Emanuel Point Shipwrecks (Florida)															
St. Augustine (Florida)															

Santa Elena (South Carolina)															
Site Name (Location)	1540- 1549	1550- 1559	1560- 1569	1570- 1579	1580- 1589	1590- 1599	1600- 1609	1610- 1619	1620- 1629	1630- 1639	1640- 1649	1650- 1659	1660- 1669	1670- 1679	1680- 1689
San Gabriel de Yunque Oweenge (New Mexico) ¹															
Paa-ko Pueblo (New Mexico) ²															
Pueblo San Marcos (New Mexico) ³															
Abó (New Mexico) ⁴															
Gran Quivira/Las Humanas (New Mexico) ⁵															

Puarai (New Mexico) ⁶															
Plaza Montoya (New Mexico) ⁷															
Pecos (New Mexico) ⁸															
Las Majadas (New Mexico) ⁹															
Casa Quemada (New Mexico) ¹⁰															
Santiago Pueblo (New Mexico) ¹¹															
Tabira (New Mexico) ¹²															

[illegible][illegible]

now (1973); David Snow, pers. comm., June 2009.

⁶ Ivey (1988).

⁷ Michael Bletzer and Dr. Tom O’Laughlin, pers. comm., January 2009.

¹⁰ Snow (1976); David Snow, pers. comm., June 2009.

⁸ Boyer et al. (2002).

³ Ramenofsky et al. (2008).

⁴ Ivey (1988).

⁵ Ivey (1988).

¹¹ Vierra (1989); Snow (1976). Richard Flint (pers. comm., August 2009) indicates that relic collector, Dee Brecheisen, reported finding caret-headed nails at Santiago Pueblo. Following Brecheisen’s death in 2004, however, it is difficult to confirm the validity of his reported findings, the specific provenience of these artifacts, or the current whereabouts of the nails referred to by Brecheisen. Until further data emerges to definitively establish the presence of caret-headed nails at Santiago Pueblo, our position is that evidence for this association remains unproven.

¹² Ivey (1988).

¹³ Bratten (1998).

¹⁴ Deagan (1985).

¹⁵ South et al. (1988).

¹⁶ Quinn (1991).

¹⁷ Kelso (2008).

¹⁸ Dr. Jeffrey Brain, pers. comm., April 2009.

¹⁹ Hoag (2009).

²⁰ Fitzhugh and Olin (1993).

□ Wrought Iron Bridle Chain: (PD 49)

The chain, which measures approximately 13 cm in overall length, is composed of four wrought iron links. Each link is a figure '8' shape varying in length from roughly 4.2 to 4.0 cm. One of the terminal links is only partially closed forming a hook. Our initial impression is that this piece is related to horse equipage and probably formed part of a bridle chain – a view that is supported by colleagues with a more extensive knowledge of both horse gear and blacksmithing (e.g., William Fouts – pers. comm., May 2009).

Excavations by the Museum of London in the waterfront area of Southwark on the River Thames, has produced a forked stirrup suspender (iron) with a similar figure '8' shaped link (Egan 2005:164-165, Figure 165 – Object #854 ABO92). The iron stirrup suspender from Southwark was found in a refuse dump with ceramics dating to c. 1575-1600. The single chain link from this object measures 2.8 cm.

In addition, Arnold and Weddle (1978:234-235, Figure 23c) illustrate a length of iron chain with three links from the wreck of the Spanish vessel *San Esteban*, which went down near Padre Island, Texas in April 1554. Like the example from El Morro, the chain from the *San Esteban* has a terminal link which is partial opened, forming a hook. Although the individual links form a figure '8' and measure approximately 4.0 cm – a size and form that compares well with the chain from El Morro - the configuration of the links from the *San Esteban* are significantly different. While the *San Esteban* chain has the top and bottom of each link oriented at right angles to one another (i.e., the upper and lower part of the '8'), the El Morro and Southwark chains have individual links with their upper and lower halves oriented more or less parallel to one another.

Another parallel for the chain found at El Morro, which is both geographically and chronologically closer, comes the Jimmy Owens site (41FL81) in Blanco Canyon near Floydada, TX. The Jimmy Owens site is a well established campsite associated with the Vázquez de Coronado expedition's entrada onto the Plains in 1541 (Blakeslee and Blaine 2003). Two large links of iron chain from this location exhibit characteristics that are similar to the chain found at El Morro National Monument. The first of the Jimmy Owens examples is an unpublished wrought iron chain with three closed links - displayed in the Floyd County Historical Museum. The other example from Jimmy Owens – like the chain from El Morro - has three closed links and a terminal one which is partially opened forming a hook.

This larger chain is also unpublished and was recovered from the May 2006 excavations by Dr. Donald Blakeslee of Wichita State University, Kansas. Both chains have links which appear to be similar in size to the El Morro



Figure 12: Bridle Chain (PD 49)

example (i.e., roughly 4 cm in length), and both have pronounced hammered facets running parallel with the long axes of each link.

Although it does not appear to be a segment of chain, there is another unpublished wrought iron piece from Blakeslee's 2006 investigations at the Jimmy Owens site that also appears to have some affinities with the chain we discovered at El Morro. This piece measures some six centimeters in overall length, forming a hook some 3.75 cm long at one end, and an irregular 'C'-shaped form measuring some 2.25 cm at the other. Again, this object displays pronounced hammered facets oriented along the long axis of the hook.

Although sixteenth century examples of wrought iron chain from Southwark, Padre Island and the Jimmy Owens site suggest close parallels with the chain reported here from El Morro, the results of these comparisons are not definitive. On the basis of current evidence, however, there seems to be some data to suggest that this object could date to the early Spanish Colonial period, and could perhaps be associated with the expedition of Vázquez de Coronado. Further testing – such as radiocarbon dating of the iron and compositional analysis using X-ray Fluorescence – could yield more authoritative results concerning the chronology of the El Morro

chain (see further discussion of these approaches and their potential in the *Recommendations* section, below).

□ Scale Balance Weight: (*PD 50*)

This object measures between 10.7 mm and 9.97 mm in diameter and 5.40 mm thick, and has a beveled edge between its two flattened surfaces (one with a larger diameter than the other). It weighs 3.9 gms and appears to be a scale balance weight or coin weight of a type in use during the late fifteenth and early sixteenth centuries in the Americas. Deagan illustrates one type of late fifteenth-century copper-alloy weight that is very similar to PD 50 in its appearance i.e., from the site of Concepción de la Vega (c. 1496-1502), located in the Dominican Republic (Deagan 2002:261, Figure 12.19, object in three o'clock position). Furthermore, the similarity between the El Morro example and the scale-coin weight from Concepción de la Vega has been confirmed by Kathleen Deagan (pers. comm. March 2009).

Evidence of scales/balances has also emerged from recent investigations of sixteenth-century sites in Britain and the United States. Large sixteenth century wrought iron scale arms have been found on the south bank of the Thames River in London (Egan 2005), as well as the site of Joara – associated with a fort constructed by the Juan Pardo expedition near Morganton, North Carolina in c. 1567 (Richards 2008:14, 17).

Scales may have been used in a variety of contexts during Spanish expeditions of this period, including payments for services and weighing of precious materials. Evidence of their use at other camps and sites associated with sixteenth-century entradas in the southwestern and southeastern U.S. can be anticipated in the future.



Figure 13: Scale Balance Weight (PD 50)

Additional Materials: Post-Survey Artifact Discovery

- Wrought Iron or Steel Object, Possible Plough Harness Hardware: (PD 85) This fragment was located approximately 145 m from the southeast corner of Zone D by Lesley Luffman Moosman near their family's NPS staff residence at the southern boundary of the El Morro National Monument. It measures some 5 cm in length and approximately 3 cm wide, with a large triangular opening at one end and a smaller bulbous, bell-like projection which has been broken off at the other. Although this object appears to be a fragment from a wrought iron or steel plough harness dating to the 19th century, its precise date and function remain uncertain. In this context, we would like to acknowledge the tremendous assistance we received from William Fouts and Melissa Fischbach, who regularly found images, suggested references and provided contact details to support our research on the chronology of this piece.

Summary and Recommendations

A metal detection sample survey within El Morro National Monument resulted in the discovery of 78 metal artifacts, reflective of over 350 years of non-Native American visitations to El Morro.

Table 3, below, provides a summary description of each of these 78 objects by geographic Zone, as well as the fragment of wrought iron or steel horse harness equipment found after the survey was completed.

As Figures 7A-E suggest, the largest concentration of objects of all periods was found in Zone C, on the eastern flanks of Inscription Rock. Included within this Zone were two rather distinct clusters of material: one consisting of relatively recent metal objects and located in the Nine Pine Cove area to the west, and another situated to the east with what appears to be a localized concentration materials including the majority of sixteenth century artifacts found in the course of this investigation. Consequently, while Figures A to D illustrate the estimated chronological distribution of objects within each of the Zones surveyed for this project, Figure E represents the two distinct spatial and temporal clusters of artifacts found within Zone C (i.e., Nine Pine Cove and the area immediately east of it).

The overall results of the survey have a number of important implications for our understanding of the historical and archaeological record at El Morro, despite the preliminary nature of our investigations. In addition, these results suggest a number of important methodological and other challenges for further research at El Morro – questions that may be of relevance in designing approaches to other historic period sites.

One of the outcomes of the survey was the discovery of materials representing a number of historic periods previously known only from inscriptions. The early Spanish Colonial period, for example, is represented by three bi-facet head nails, an iron awl, a wrought iron bridle chain, a lead scale or coin weight, and an object tentatively identified as a decorative inset for a Spanish Colonial wooden chest. The caret-headed nails hold particular significance since this artifact type appears to be diagnostic of early Spanish expeditions in the New World, up to circa 1550. Consequently, we believe these nails constitute evidence that the 1540-1542 Vázquez de Coronado expedition camped in the vicinity of El Morro. Other objects discovered in the course of this project provide tangible evidence of documented visits to El Morro by US military units that patrolled this region during the Civil War era; by later military expeditions during the last quarter of the nineteenth century; and by a variety of groups in the twentieth century whose activities were concentrated in the *Nine Pine Cove/LA 46049* area.

The survey did not identify surface evidence of hearths, tent pad clearings, or other feature types typically associated with encampments of the Spanish Colonial and Territorial periods. Although we believe that such camp features are likely to be present in the general vicinity of El Morro, many of them may be partially or completely obscured. Deposition of colluvial and aeolian soils may have buried these and other historic features. As a result, appropriate remote sensing techniques may be needed to identify them.

The reconnaissance-level survey area investigated as part of this three day survey project encompasses approximately 30 acres, or 2.6 percent of the El Morro National Monument. We estimate that less than two percent of this sample acreage (i.e., 0.6 acres) was actually swept with a metal detector coil given the gaps between field investigators, ground surface obstructions such

as rocks and vegetation, as well as the side-to-side motion of individual operators along a given transect.

Another significant consequence of this survey is the approach we have used in trying to define sixteenth century camp areas with minimal impact to sub-surface cultural resources and to ground surface natural resources (i.e., cryptogenic soils). Our metal detector survey was initiated with several major objectives in mind:

- to identify areas that might be associated with the Vázquez de Coronado expedition, or other early Spanish entradas, with a minimum number of artifacts;
- to limit the amount of to historic-prehistoric cultural features;
- to minimize the impact on fragile natural resources;
- to employ – as soon as possible – a suite of less intrusive techniques for identifying subsurface cultural features and artifacts (such as radar, magnetics and resistance).

From the beginning of this project, our plan was to employ metal detectors as an initial tool for identifying an early Spanish Colonial presence at El Morro. It was our objective to apply other techniques as soon as we had sufficient confidence that sixteenth century features and artifacts could be retrieved economically and efficiently by other means. Furthermore, our inclination was to collect a minimal number of objects to ensure that we maintain the highest levels of site integrity and preserve the greatest amount of contextual information.

able 3: Artifact List: El Morro National Monument Metal Detection Reconnaissance Survey, October 22-24, 2007

PD#	Zone	Estimated Chronology	Object Description
01	C	Late 19 th -21 st c.	Iron Wire nail, 1.0” long
02	C	Late 19 th -21 st c.	Copper jacket from a .22 cal. bullet
03	C	Unknown	Metal fragment, iron, threaded; unknown function
04	C	Unknown	Unexcavated object
05	C	Late 19 th -21 st c.	Iron Wire nail, 1.5” long, bent
06	C	Late 19 th -21 st c.	.22 cal. bullet, fired
07	C	Late 19 th -21 st c.	Hair pin, steel wire
08	C	Late 19 th -20 th c.	Brass .32 cal. cartridge case
09	C	Late 19 th -21 st c.	Iron baling wire
10	C	Late 19 th -20 th c.	Copper jacketed .32 cal. bullet, fired
11	C	20 th -21 st c.	Steel lid from a possible inner tube repair kit
12	C	Late 19 th -21 st c.	White metal tab with hole in one end; stamped
13	C	Late 19 th -20 th c.	Brass .22 cal. long cartridge case
14	C	20 th -21 st c.	Steel nut, pentagonal, 0.5” dia.
15	C	20 th -21 st c.	Steel bolt, round head, threaded
16	C	20 th -21 st c.	Steel screw fragment, with nut
17	C	Late 19 th -21 st c.	.22 cal. Bullet, fired
18	C	Mid 16 th c.	Wrought iron caret-headed nail
19	C	Mid 16 th	Iron or steel awl

20	C	20 th -21 st c.	Hair pin, possibly silver alloy
21	C	Mid 16 th c.	Wrought iron caret-head nail, bent as a result of excavation
22	C	20 th c. (<i>Post-1914</i>)	Copper penny, 1914
23	C	Mid-16 th -18 th c.	Wrought iron nail fragment, possibly caret-headed nail
24	C	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
25	C	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
26	C	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
27	C	Unknown	Bullet, damaged from impact; unknown caliber
28	C	Mid-16 th -18 th c.	Wrought iron nail fragment, head absent; possibly a portion of a caret-headed nail
29	C	19 th -21 st c.	Bullet, damaged from impact; unknown caliber
30	C	19 th c.	Round ball, lead, damaged from impact
31	C	19 th c. (<i>Post-1860</i>)	Round ball, lead, damaged from impact
32	C	19 th c. (<i>Post-1855</i>)	.58 caliber Minie ball, unfired
33	C	Late 19 th -20 th c.	Roller buckle, iron or steel
34	-	n/a	Transect B, origin point
35	B	Unknown	Round ball, lead, fired
36	B	19 th c.	Round ball, lead, fired
37	B	19 th -20 th c.	Cast iron chain link
38	B	Unknown	Lead ball, flattened from impact
39	B	16 th -17 th c.	Possible escutcheon plate, cast iron, portion(s) missing
40	B	19 th c. (<i>Post-1852</i>)	.52 cal. Sharps carbine bullet, unfired, worm extractor mark
41	B	19 th c.	Iron buckle
42	B	Mid-16 th - 19 th c.	Nail, wrought iron, possibly a rose-headed type
43	-	n/a	Transect B, end point
44	-	n/a	Transect C, origin point
45	-	n/a	Transect C, end point
46	A	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
47	-	n/a	Transect D, origin point
48	-	n/a	Transect D, end point
PD#	Zone	Estimated Chronology	Description
49	A	Mid-16 th c.	Wrought iron chain with hook
50	A	Early-Mid 16 th c.	Lead object, rounded and beveled, possibly a scale or coin weight
51	D	19 th c. (<i>Post-1866</i>)	Copper 50-70 Springfield cartridge case
52	C	Mid-16 th c.	Wrought iron caret-headed nail
53	C	Mid-16 th -19 th c.	Wrought iron nail tip, possibly from caret-headed nail
54	C	Late 19 th -21 st c.	Copper clad jacket for bullet
55	C	Unknown	Lead ball, impacted
56	C	19 th c. (<i>Post-1873</i>)	Brass 45-70 cartridge case
57	C	19 th c. (<i>Post-1873</i>)	Brass 45-70 cartridge case
58	C	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
59	C	19 th c. (<i>Post-1865</i>)	Copper 56-50 Spencer cartridge case
60	C	19 th c. (<i>Post-1865</i>)	Copper 56-56 Spencer cartridge case
61	C	19 th c. (<i>Post-1865</i>)	Copper 56-56 Spencer cartridge case
62	C	20 th c. (<i>Post-1919</i>)	Mercury head dime, 1919
63	C	20 th -21 st c.	Brass survey cap, "14"
64	C	19 th c. (<i>Post-1873</i>)	.45 cal. Bullet, unfired
65	C	Late 19 th -21 st c.	.22 cal. Brass cartridge case

66	C	Unknown	Iron fragment, unknown function
67	C	Unknown	Iron fragment, unknown function
68	C	20 th c. (<i>Post-1903</i>)	Iron can base, sanitary seal
69	C	19 th c. (<i>Post-1864</i>)	.44 or .45 cal. Bullet, impact damage
70	C	19 th -21 st c.	Iron can fragment
71	C	Late 19 th -21 st c.	.22 cal. Brass cartridge case
72	C	Unknown	Lead, possible bullet fragment
73	C	Late 19 th -21 st c.	.22 cal. Bullet, impact damage
74	C	Late 19 th -21 st c.	.22 cal. Bullet, impact damage
75	C	Late 19 th -21 st c.	.22 cal. Bullet, impact damage
76	C	Late 19 th -21 st c.	.22 cal. Bullet, impact damage
77	C	20 th -21 st c. (<i>Post-1948</i>)	Alkaline battery
78	C	Late 19 th -21 st c.	Bullet, impact damage, unknown caliber
79	C	Late 19 th -21 st c.	Bullet, impact damage, unknown caliber
80	C	Late 19 th -21 st c.	Brass cartridge case, fragment, unknown caliber
81	C	Late 19 th -21 st c.	Iron galvanized roofing nail
82	C	Late 19 th -21 st c.	Iron galvanized roofing nail
83	C	Late 19 th -21 st c.	Iron baling wire
84	C	Mid-19 th -21 st c.	Iron can fragment
85	n/a	19 th c.	Wrought iron or steel fragment, plough harness hardware(?)

: Estimated Chronological Distribution of Objects Recovered from

Table 4

Zone A

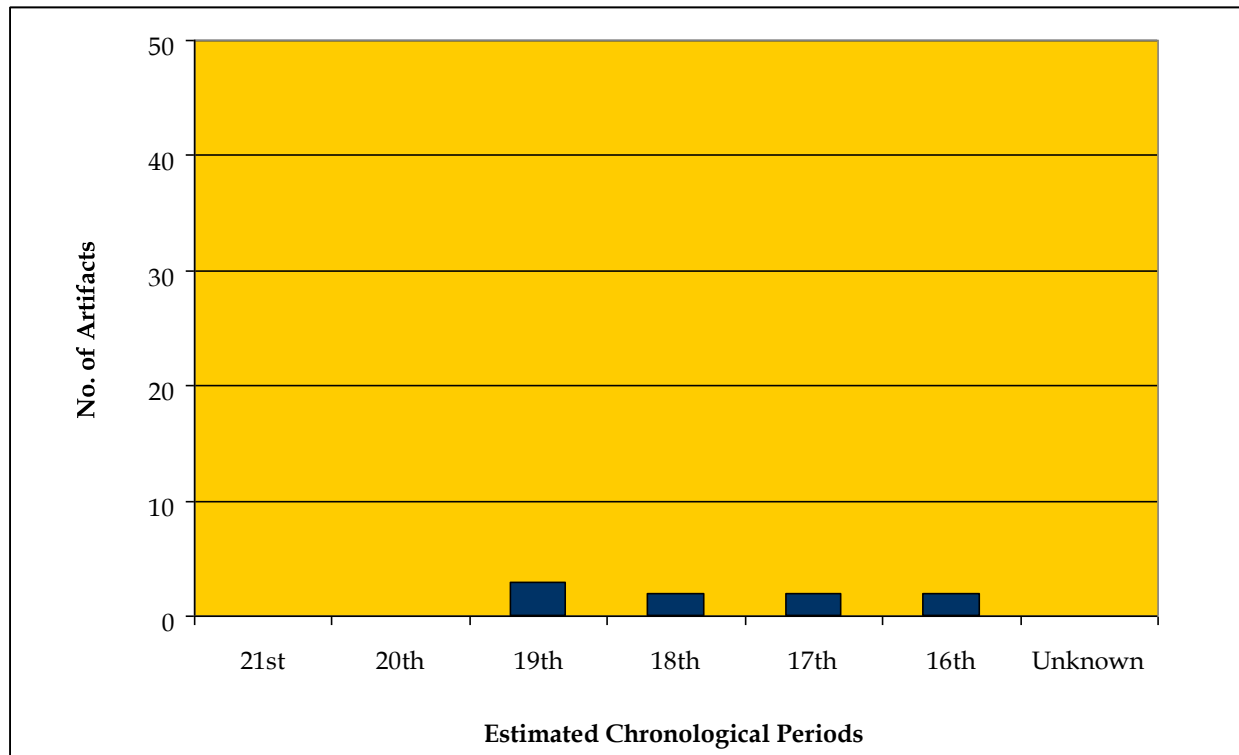


Table 5: Estimated Chronological Distribution of Objects Recovered from Zone B

: Estimated Chronological Distribution of Objects Recovered from

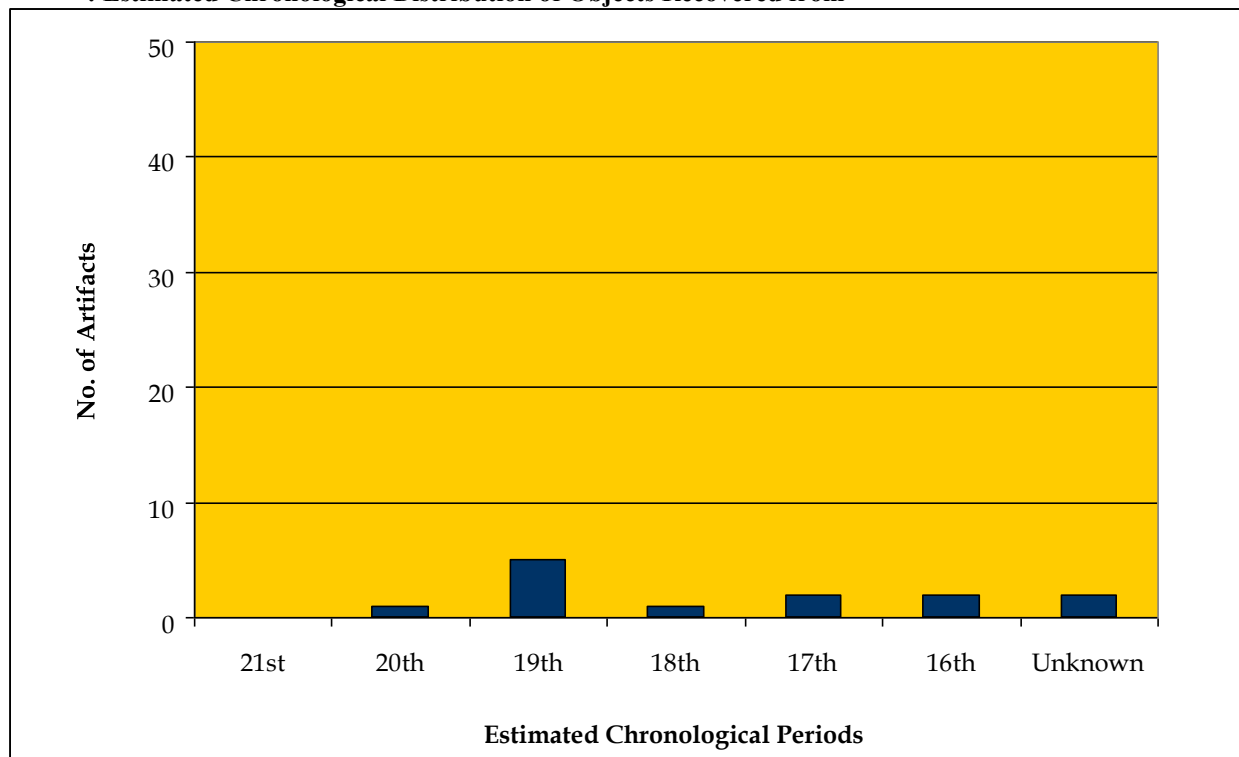
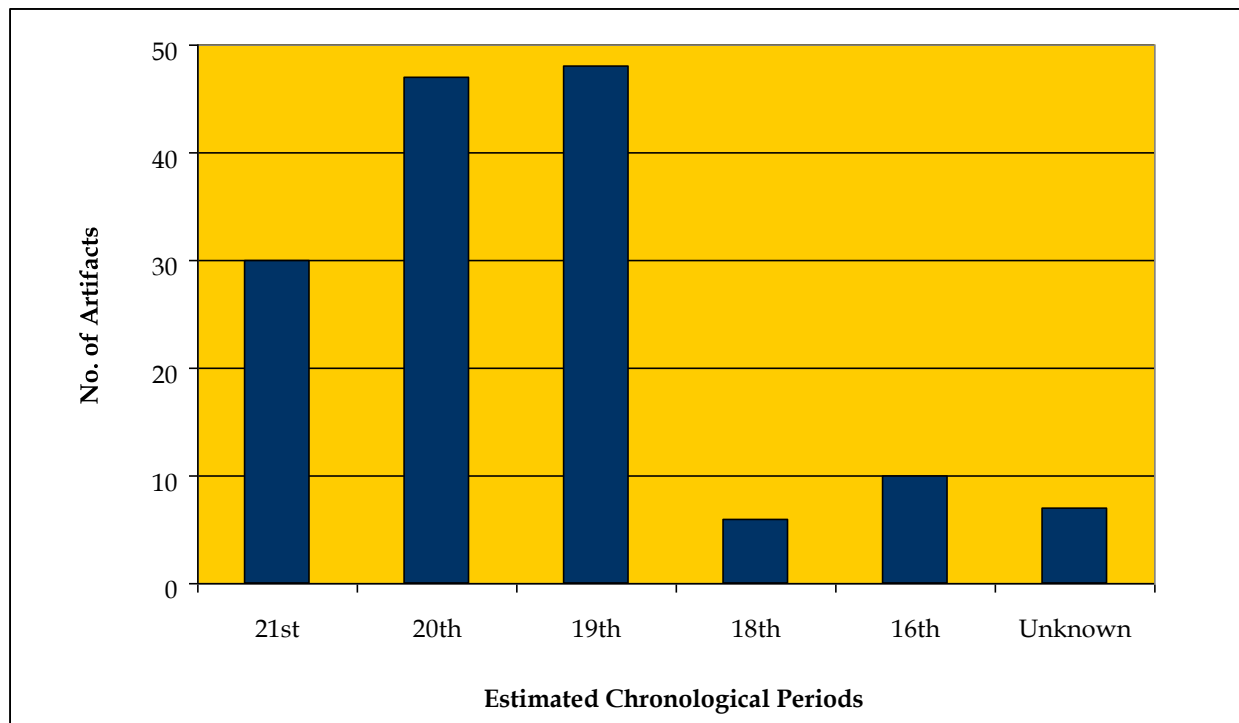


Table 6

Zone C



: Estimated Chronological Distribution of Objects Recovered from
Table 7: Estimated Chronological Distribution of Objects Recovered from Zone D

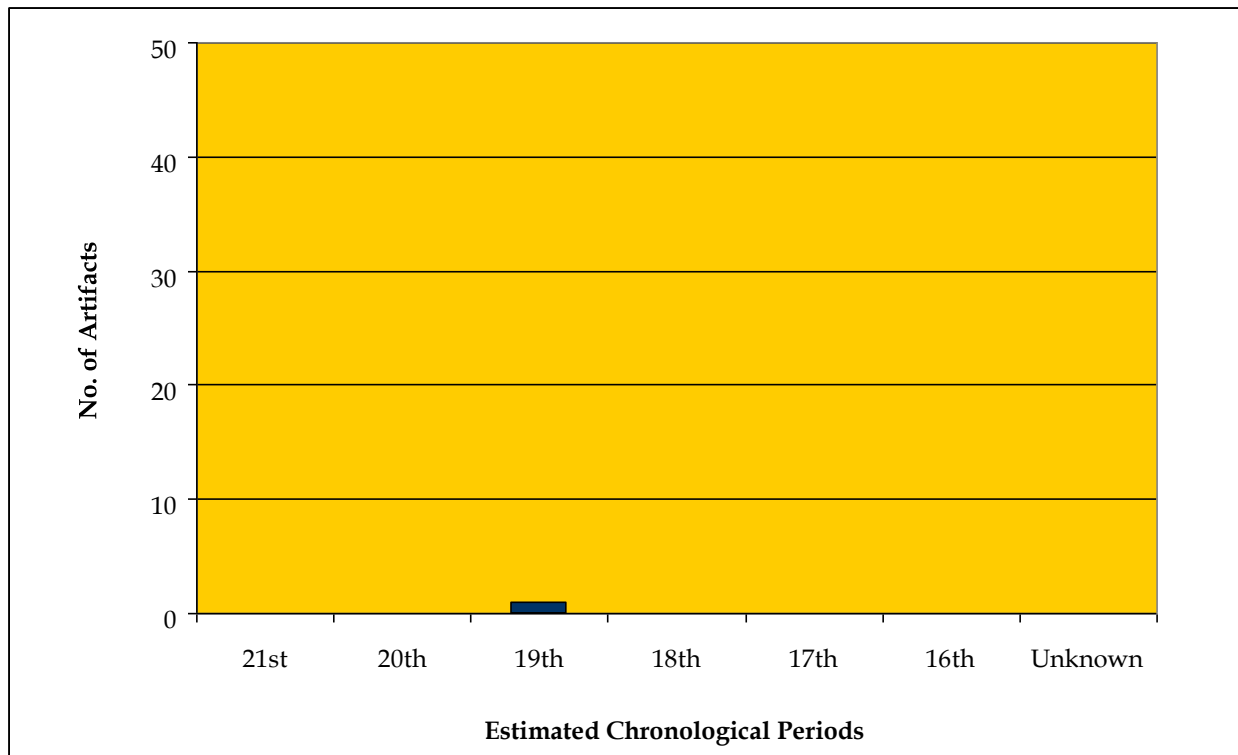
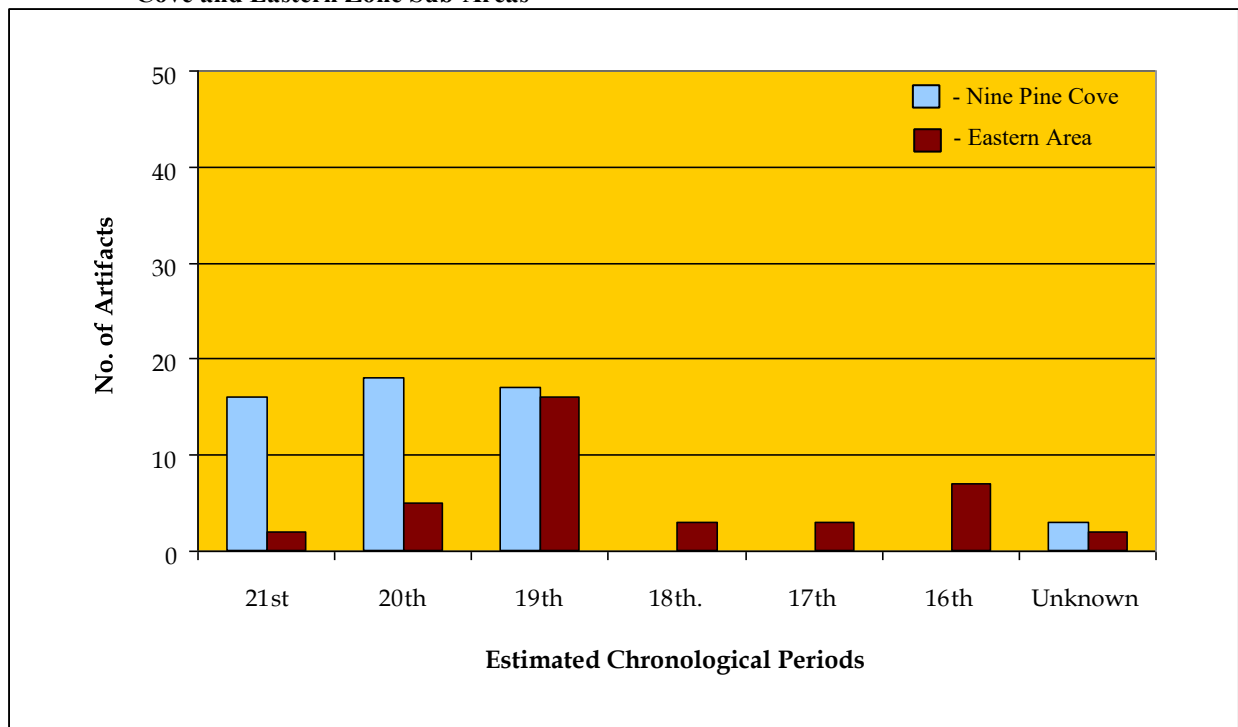


Table 8

Zone C – Comparison of Nine Pine

Cove and Eastern Zone Sub-Areas



: Estimated Chronological Distribution of Objects Recovered from

The objectives and approaches we have adopted for this project raise clear methodological and other challenges for historical and archaeological research in the American Southwest and elsewhere. As Vierra (1989), Railey (2007) and others have demonstrated, sixteenth century sites in the American Southwest have the potential to produce a variety of material evidence that is non-metallic and that is critical for our understanding of these sites and this period. As a consequence, continuing an exclusive or *privileged* focus on metal objects is neither desirable, nor will it maximize our understanding of the constellation of material evidence available to us.

However, the question of when to focus on less intrusive techniques such as geophysical prospection and more invasive ones like test excavation - as opposed to metal detecting - is a complex one and fraught with difficulties. While the former are more likely to produce contextual data, they are also more expensive with respect to time and resources, and may fail to produce results unless they are targeted on areas that have reasonable prospects of success. Both geophysical techniques and excavation will obviously impact environmental surfaces such as cryogenic soils also. On the other hand, while metal detecting is capable of investigating large areas efficiently and inexpensively, it nonetheless focuses on one type of material culture to the exclusion of others. These dilemmas are not new, or exclusive to our investigations, and they will no doubt surface again in other historic-period investigations.

For our part, the balance we have tried to strike in this initial phase of our work is to use metal detecting sparingly and to devote very considerable energies to researching the relatively small numbers of artifacts we have recovered and curated. We believe that in doing so two areas with

early Spanish Colonial objects have emerged with potential for future investigations using geophysical techniques. These areas* include:

- Zone A: represented by the lead scale-coin weight and wrought iron bridle rein; *and*
- Zone C (Eastern Area): represented by wrought iron caret-headed nails, other wrought iron nail forms and a wrought iron (or perhaps steel) awl.

** If the rose-head nail in Zone B can be dated to the early Spanish Colonial period, or found to be association with other artifacts diagnostic of this phase, Zone B may represent another promising locale for geophysical investigations.*

Notwithstanding the small size of the area investigated, this survey nonetheless produced remarkable physical evidence of historical events notable in American history. With the objective to build upon this information in the future, it is recommended that the Monument initiate a follow-up survey, which includes the following research components:

- Recovery, Analysis and Curation of Metal Objects. Several of the re-buried artifacts need to be recovered, analyzed, and photographed under studiocontrolled conditions. The resultant information is required in order to better identify their period(s) of deposition and function.
- Permanent Site Datum and Total Station Mapping. To ensure maximum locational fidelity in the future the establishment of a permanent site datum and a centimeter resolution total station mapping standard (i.e., for vertical and horizontal measurements) is essential.
- Use of Pulse-Induction Metal Detectors. The four metal detectors employed during the survey are capable of identifying metal objects to a depth of approximately 20 cm (8 in) below surface. Yet aeolian-deposited soils around the base of El Morro are estimated to be at least two meters deep (Jim Kendrick, pers. comm., February 2009), and taphonomic activity may have vertically re-located historic metal artifacts to depths beyond the range of VLF-type metal detectors. Concentrations of highly mineralized soils, which occur in places along the base of Inscription Rock, also may cause interpretive problems when using VLF metal detectors alone. To address these problems it is recommended that one or more pulse induction (PI) metal detector(s) be used to re-survey this area. PI metal detectors are well suited to locating more deeply buried objects (some PI models are capable of identifying metal objects up to two meters or more below surface), and where highly mineralized soils may compromise the efficacy of VLF-type metal detectors.
- Re-Survey When Soil Conditions are Favorable. Because soil conductivity increases dramatically with greater moisture, it is likely that significantly larger numbers of artifacts will be recovered at El Morro after heavy rains or snow melt. Our experience at the Monument, and elsewhere, suggests that resurveying areas

with metal detectors and some geophysical equipment (e.g., electrical resistance) may produce more artifacts-features, and markedly different results overall.

- Broader Survey Investigations. We postulate that the Vázquez de Coronado expedition required several square kilometers of camp area to meet its need for water, fuel, forage, and spatial segregation among its multiple ethnic and task-oriented groups. To test this theory it is necessary to conduct sample surveys east and southeast of the visitor center, and within the area located on the northern side of State Road 53.
- Use of Remote Sensing and Data Fusion. Various other ground-based remote sensing techniques, used in complementary fashion with metal detection, should be considered. *Magnetic Survey* methods are sensitive to subtle soil changes caused by anthropogenic enrichment resulting from human occupation, such as thermal features. *Electrical resistivity/electromagnetic conductivity* is a proven approach in delineating soil changes such as tent pads, wherein the soil may be compressed relative to surrounding soils. *Ground penetrating radar (GPR)* is useful at mapping changes in subsurface deposits and detecting virtually any kind of structural feature. *Aerial remote sensing* may indicate surface manifestations of buried archaeological features from differential growth patterns, microtopographic relief variations, and differential electromagnetic (EM) spectra. *Satellite Remote Sensing* allows the identification of phenomena on the surface with sub-meter spatial resolution. In addition, data fusion approaches are being used increasingly in archaeological and geospatial contexts to combine the results of field mapping, GIS analyses, geophysical applications, and air/space-borne remote sensing. Finally, it is recommended that NPS remote sensing specialist Steve DeVore assist in determining which of these remote sensing techniques and approaches are best suited to the specific conditions and research objectives at El Morro National Monument.
- Integrating Wider Vázquez de Coronado Research. If a remote sensing archaeological research program is developed for El Morro National Monument, then this plan should be closely associated with ongoing archaeological research regarding the Vázquez de Coronado expedition as a whole. Specifically, camp-related artifacts and features associated with this expedition and found at one location (e.g., near the Zuni ancestral pueblo of Hawikku), can assist in identifying intra-camp feature patterning that may exist at El Morro, and vice versa. It is also recommended that the Monument develop a partnership with the adjacent landowners, with the objective of extending a remote sensing survey program beyond the Monument boundaries as appropriate.
- Inter-Agency Support for Improved Archaeological Site Protection. A variety of federal agencies are currently developing sophisticated remote monitoring technologies for military defense and homeland security (such as protection against

Improvised Explosive Devices – IEDs – being developed by the U.S. Army Corps of Engineers, and electronic surveillance devices for border security – being pioneered by the U.S. Border Patrol. These technological advances could help provide practical and timely assistance to El Morro National Monument in developing more robust cultural resource protection measures. Technology transfer opportunities should be explored with these agencies and other potential partners, such as the Sandia and Los Alamos national laboratories, to ensure the maximum level of protection for El Morro’s significant cultural resources.

- Lead Isotope (Sourcing) Analyses. Recent research involving lead isotope analysis indicates this avenue of research may help to identify the geographic provenance, as well as the possible period of use, for otherwise nondescript/ non-diagnostic cuprous and lead artifacts (Haecker 2008). If future archaeological investigations within El Morro National Monument should recover lead and/or cuprous artifacts, then a number of these artifacts should be selected for lead isotope analysis.
- Spatially Referenced Database for Historic Inscriptions. The creation of a geospatial database with the location of all dated and undated inscriptions at El Morro would be helpful for a variety of reasons. First, these data would be especially useful for interpretive purposes at the El Morro Visitors Center and could potentially allow the public (or NPS staff on their behalf) to search for specific inscriptions or chronological periods of interest. Locational data for the inscriptions would also be valuable as a management tool for the Monument, as well as for research purposes (e.g., as source data to compare inscriptions on rock faces with artifacts and features found nearby). To date, we know of no specific inscriptions at, or near El Morro, which have been definitively associated with expeditions earlier than Juan de Onate’s in the early seventeenth century. Nevertheless, systematic analyses of the lettering associated with text inscriptions, and stylistic evaluations of other types of abstract and representational forms (e.g., solar symbols, dwellings and towns) could be productive. In addition, there is the possibility that while members of the Vazquez de Coronado expedition did not leave traces of their names, or the dates of their visits, that they nevertheless left other types of inscribed memorials at El Morro (such as crosses) which may exhibit characteristic elements that distinguish them as early, rather than later, sixteenth century.
- Digital Archive of Investigations at El Morro and its Environs. The establishment of a digital repository for reports, maps, photographs, drawings and other reference materials would significantly enhance the value and visibility of El Morro National Monument. By creating an archive of digital data relating to archaeological, historical and ethnographic investigations in the El Morro area, for example, the NPS could provide a variety of helpful aids to public interpretation, outreach and ongoing research at the Monument. In addition, arrangements for the off-site duplication of these data would protect these records from permanent loss in the event of any damage or destruction to the originals. For a very modest investment

these documents could be duplicated and a back-up copy stored at NPS offices in Grants or at other NPS offices in New Mexico.

- *X-ray Fluorescence (XRF) Analysis of Metal Objects.* A variety of high resolution portable devices are now available that are capable of undertaking XRF analyses in the field. These devices offer a number of potential advantages for research and public interpretation at El Morro national Monument, including: (a) non-destructive sampling; (b) rapid results; (c) the ability to bring instruments to the objects for testing – rather than vice versa; and (d) the demonstration of how new technologies are contributing to the study of history and archaeology. The latest generation of portable XRF units is particularly useful in identifying minor variations in metal composition and alloys – characteristics which are frequently used in archaeologically and archaeometallurgical analyses to identify the age of metal artifacts. One example of the potential value of employing XRF analyses at the Monument would be the discrimination of older and more recent iron objects based on whether they were composed of steel.
- *Radiocarbon Dating of Iron Objects.* One method that appears to show some promise in establishing the date of otherwise undiagnostic ferrous objects is the radiocarbon dating of the carbon in iron objects (e.g., Cook et al. 2003). Given the apparent success of this technique in some contexts and the number of wrought iron artifacts that might be amenable to dating using this technique, we recommend that further research be done to determine the cost and feasibility of this approach for investigations at the Monument. Radiocarbon dating of early historic wrought iron objects from El Morro could help to identify encampments associated with the Vázquez de Coronado entrada, as well as other early expeditions.
- *Geochronological and Geomorphological Investigations.* A better understanding of the historical development of landscapes will be critical to evaluating the nature and spatial distribution of cultural activities at this important site. A program of geochronological and geomorphological investigation should be formulated to identify major landscape impacts at El Morro (e.g., processes of aggradation and degradation), as well as the evolutionary history of aeolian and colluvial deposition in the surrounding area.
- *Investigation of Possible Mesa-top Occupation by Historic Expeditions.* Although Richard Woodbury directed a series of archaeological excavations in the 1950s on the mesa-top area at El Morro (Woodbury 1954, 1956; Woodbury and Woodbury 1956), very little material of European origin appears to have been found in the course of that work. An initial examination of the archaeological collections recovered by Woodbury at the pueblo of Atsinna has been undertaken by Steve Baumann (NPS, El Morro National Monument) with the assistance of Kim Beckwith (NPS, Western Archeological and Conservation Center). Although this review of the Atsinna materials produced no definitive artifacts relating to early Spanish colonial expeditions, and the pueblo appears to have been abandoned by c.

1350 AD, we believe it would be useful to conduct additional work to determine whether historic-period expeditions made use of this part of the monument. First, it would be helpful to review all of the published and unpublished work relating to Woodbury's archaeological research at El Morro. In addition, a combination of techniques such as magnetometry and metal detecting could be employed to determine if historic expeditions occupied this area. Whether or not entire expeditions camped on the mesa top, or simply deployed small components of their party there temporarily to serve as lookouts, some physical-material remains of their presence may be preserved in some areas on top of the mesa where there is some remaining cover of soil. Given appropriate tribal consultation, this survey activity might include areas in and around the pueblos of Atsinna and North Atsinna, as appropriate, since the ruins of these communities may have provided shelter for later historic expeditions (or smaller groups of individuals associated with them).

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