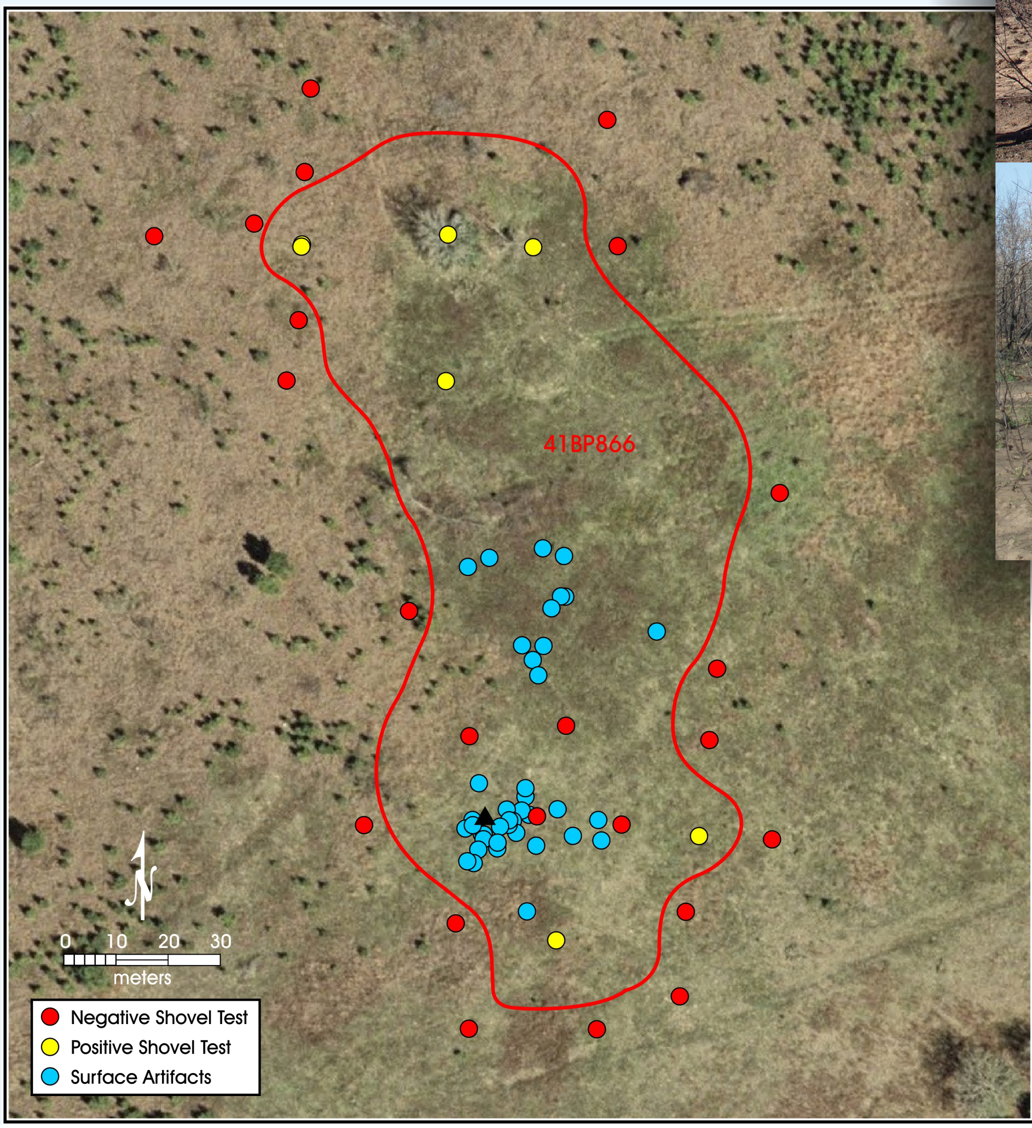
A Cultural Resource Inventory of 550 Previously Surveyed Acres on Camp Swift, Bastrop County, Texas



by
Cynthia M. Munoz

with contributions by
Raymond P. Mauldin

Principal Investigator
Steve A. Tomka

Interagency Cooperation Agreement
No. TX11-ENV-09 401-1-4839

Prepared for:
Texas Adjutant General's Department
P.O. Box 5218
Austin, Texas 78763

Prepared by:
Center for Archaeological Research
The University of Texas at San Antonio
One UTSA Circle
San Antonio, Texas 78249
Archaeological Report, No. 423

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Abstract:

From November 2011 to January 2012, the Center for Archaeological Research (CAR) of The University of Texas at San Antonio (UTSA) conducted an intensive archaeological reconnaissance survey of 550 acres of previously surveyed land located on the Texas Military Forces' (TXMF) Camp Swift Facility in north-central Bastrop County, Texas. The work was performed to fulfill contract requirements with the TXMF's Adjutant General's Office. The survey was conducted under the requirements of Section 106 and 110 of the National Historic Preservation Act (NHPA) of 1966. The survey was performed under interagency cooperation agreement TX11-ENV-09, with Dr. Steve Tomka, CAR Director, serving as Principal Investigator, Dr. Raymond Mauldin, CAR Assistant Director, serving as Project Manager, and Cynthia Moore Munoz serving as the Project Archaeologist. The work was conducted in advance of proposed improvements to the facility and in response to a large wildfire.

The improvements will consist of an expansion of approximately 39 acres to an existing dropzone. Because the wildfire burned off most of the vegetation on 1,454 acres of the facility leaving high ground visibility, a resurvey of a portion of the area was also conducted. The goal of the pedestrian survey was to identify and document prehistoric and historic archaeological sites that may be impacted by the dropzone improvement or exposed and/or affected by the wildfire. This report summarizes the results of the fieldwork and provides recommendations regarding the management of cultural resources located on the project area.

Pedestrian reconnaissance and 265 shovel tests were used to search for cultural resources on the 550 acre project area. Thirty-six isolated surface finds, including debitage, tools, a projectile point, a core, glass, ceramics, and a brick, were documented. Seven previously recorded sites were revisited. Ten new sites were identified during this survey. The CAR requested and was assigned trinomials (41BP859-868) for the sites. The TexSite records are on file at the Texas Archeological Research Laboratory (TARL). The ten new sites include two prehistoric surface scatters (41BP861 and 862), three prehistoric surface scatters with buried material (41BP859, 865, and 866), one buried prehistoric site with no visible surface scatter (41BP867), and four historic surface scatters (41BP860, 863, 864, and 868). Six of the ten sites (41BP860, 861, 862, 864, 867, and 868) were recommended by the CAR as not eligible for listing on the National Register of Historic Places. The remaining four sites (41BP859, 863, 865, and 866) were assessed as unknown with further investigations recommended.

Following laboratory processing and analysis, and in consultation with the TXMF's Adjutant General's Office, all sediment samples were discarded. This discard was in conformance with Texas Historical Commission (THC) guidelines. All remaining archaeological samples collected by the CAR, along with all associated artifacts, documents, notes, and photographs, were prepared for curation according to THC guidelines and are permanently curated at TARL at the University of Texas in Austin.

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Acknowledgements:

The successful completion of this project is owed in a large part to the able and hard-working field crew. They included the following individuals from the Center for Archaeological Research: Lindy Martinez, Tyrone Tatum, Justin Bloomquist, and Ben Hull. Nathan DiVito acted as crew chief. Thank you all. Dr. Raymond Mauldin, CAR Assistant Director, served as Project Manager on the project and provided comments on the report. Dr. Steve Tomka served as Principal Investigator. Kelly Harris acted as editor. The author would also like to thank Richard Young and Kelly Harris for drafting the figures and producing the final manuscript. Marybeth Tomka and Melissa Eiring prepared the artifacts and paperwork for curation. The author thanks Kristen Mt. Joy of the TXMF and Major Reginald W. Jackson and SFC Charles R. Shepherd of Camp Swift for their assistance.

Chapter 1: Introduction

The Center for Archaeological Research (CAR) of the University of Texas at San Antonio (UTSA) was contracted by the Texas Military Forces' Adjutant General's Office to conduct an intensive archaeological reconnaissance survey on 550 acres of previously surveyed land located on the Texas Military Forces' (TXMF) Camp Swift Facility in north-central Bastrop County, Texas. Camp Swift, consisting of approximately 11,500 acres is located roughly 13 km south of the city of Elgin and 13 km north of the city of Bastrop (Figure 1-1). The project area lies on the Lake Bastrop and Elgin East Texas USGS 7.5' quadrangles. The archaeological survey was performed under interagency cooperation agreement TX11-ENV-09 with Dr. Steve Tomka, CAR Director, serving as Principal Investigator, Dr. Raymond Mauldin, CAR Assistant Director, as Project Manager, and Cynthia Moore Munoz serving as Project Archaeologist.

The land impacted by the project is owned by the Corps of Engineers and utilized by the Texas Military Forces/ Adjutant General's Department (TXMF/AGD) through a lease agreement. The project was initiated to comply with the requirements of Section 106 and 110 of the National Historic Preservation Act (NHPA) of 1966. One outcome of the NHPA was the creation of the National Register of Historic Places (NRHP) and the Advisory Council of Historic Preservation. The protection of cultural resources is associated with their eligibility for inclusion in the NRHP, which is dependent on their NRHP significance as defined in 36 CFR Part 60. Under Section 110, federal agencies may evaluate the significance of cultural resources not currently threatened to assist with the development of preservation planning. The federal regulatory process is described in detail in 36 CFR Part 800. Sections 106 and 110 of the NHPA specify that the

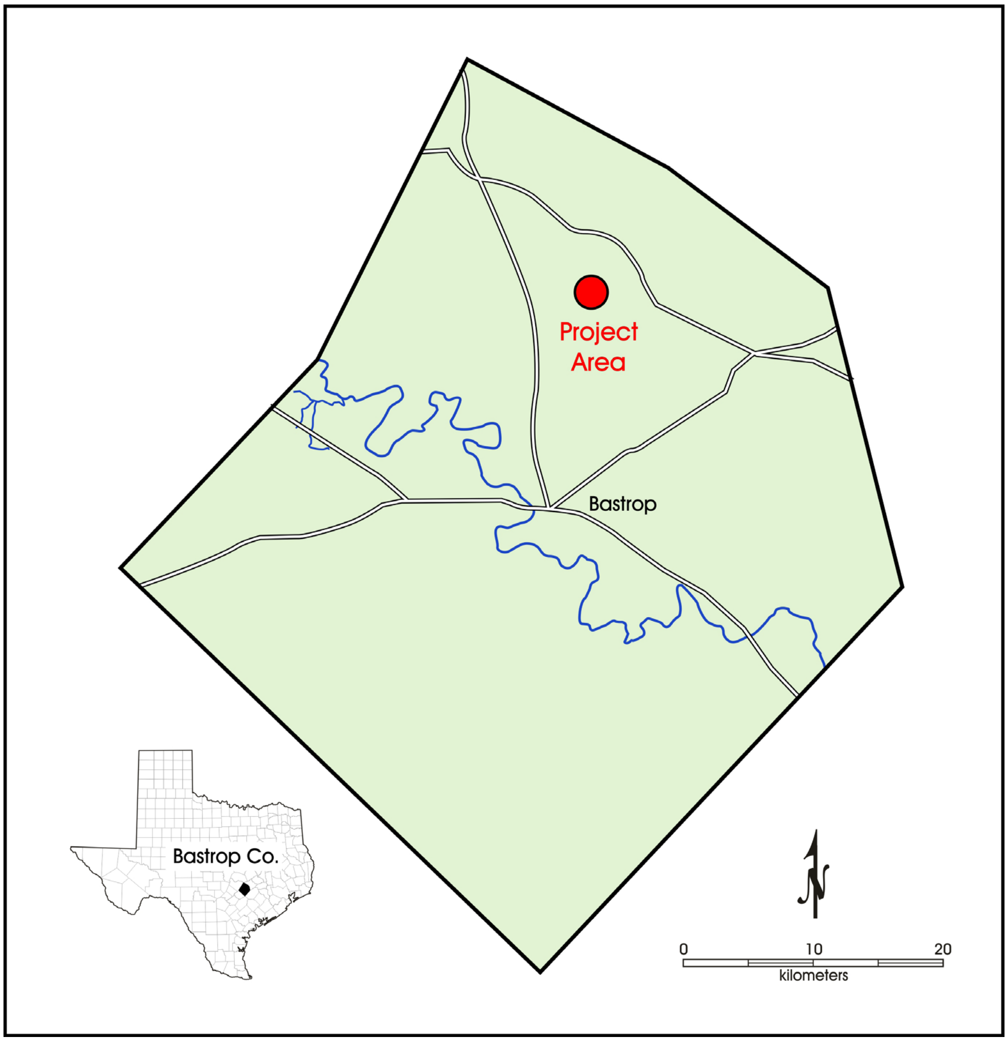

Figure 1-1. *Map of Bastrop County, showing location of the project area on Camp Swift.*

Figure 1-2. *Damage to the project area from a large wildfire in 2011.*

Advisory Council must be given "a reasonable opportunity to comment" regarding the effect of any undertakings that could impact properties that may be eligible for inclusion in the NRHP. The State Historic Preservation Officer (SHPO) at the Texas Historical Commission (THC) advises the TXMF/AGD regarding their obligations under Sections 106 and 110. To comply with these laws and recommendations the TXMF/AGD operates an Installation Cultural Resource Management Plan (ICRMP). This project supports the Camp Swift section of the ICRMP.

The survey, conducted in advance of proposed improvements and in response to a large wildfire, occurred from November 2011 to January 2012. The improvements will consist of an expansion of approximately 39 acres to an existing dropzone. The addition will involve the removal of trees and brushy groundcover. A second survey area consists of a burned portion of the facility. A large wildfire in the summer of 2011, affecting 1,454 acres of the facility, burned off most of the vegetation, including pine trees (Figure 1-2). Because this fire completely denuded large areas of the facility, leaving 100% ground visibility, it was determined that a resurvey of a portion of the area would be productive. The project area lies in the central eastern portion of Camp Swift. The burned portion of the survey area, the larger of the two areas, is bounded by surface roads and fire break bulldozer cuts. The dropzone extension is bounded by the current dropzone to the south and east. The western and northern boundaries run through heavily vegetated undeveloped land (Figure 1-3).

The goal of the project was to identify and document, through a combination of surface survey and shovel testing, prehistoric and historic period cultural resources that may be impacted by the dropzone improvement or exposed and/or affected by the wildfire. Information from this survey was used to assess each cultural resource for eligibility to the NRHP. The archaeological survey consisted of a 100% intensive pedestrian reconnaissance of the 550 acre portion of the facility. Transect spacing was 30 m. The reconnaissance included the hand excavation of 265 shovel tests dug in a systematic manner to find sites, define site boundaries, and to determine site depth and integrity. Ten previously unrecorded sites were identified during this survey, 7 previously recorded sites were revisited, and 34 isolated surface artifacts, including lithic debitage, modified flakes, bifaces, one core, glass, ceramics, and one brick, were documented. The newly documented sites consist of two prehistoric surface scatters (41BP861 and 862), three prehistoric surface scatters with buried material (41BP859, 865, and 866), one buried prehistoric site with no visible surface scatter (41BP867), and four historic surface scatters (41BP860, 863, 864, and 868). Prehistoric and historic sites and their artifacts are described in Chapter 5. NRHP eligibility recommendations are discussed in detail in Chapter 6.

This document summarizes the results of the fieldwork and provides recommendations regarding the management of cultural resources located on the project area. This report is organized into six chapters. Chapter 2 provides a brief overview of the project area environment. Chapter 3 summarizes aspects of the archaeological knowledge for the region. Chapter 4 discusses the fieldwork and laboratory methodology used during the project. The results of the archaeological survey are presented in detail in Chapter 5. Chapter 6 summarizes the work and provides recommendations for the Camp Swift resurvey project.

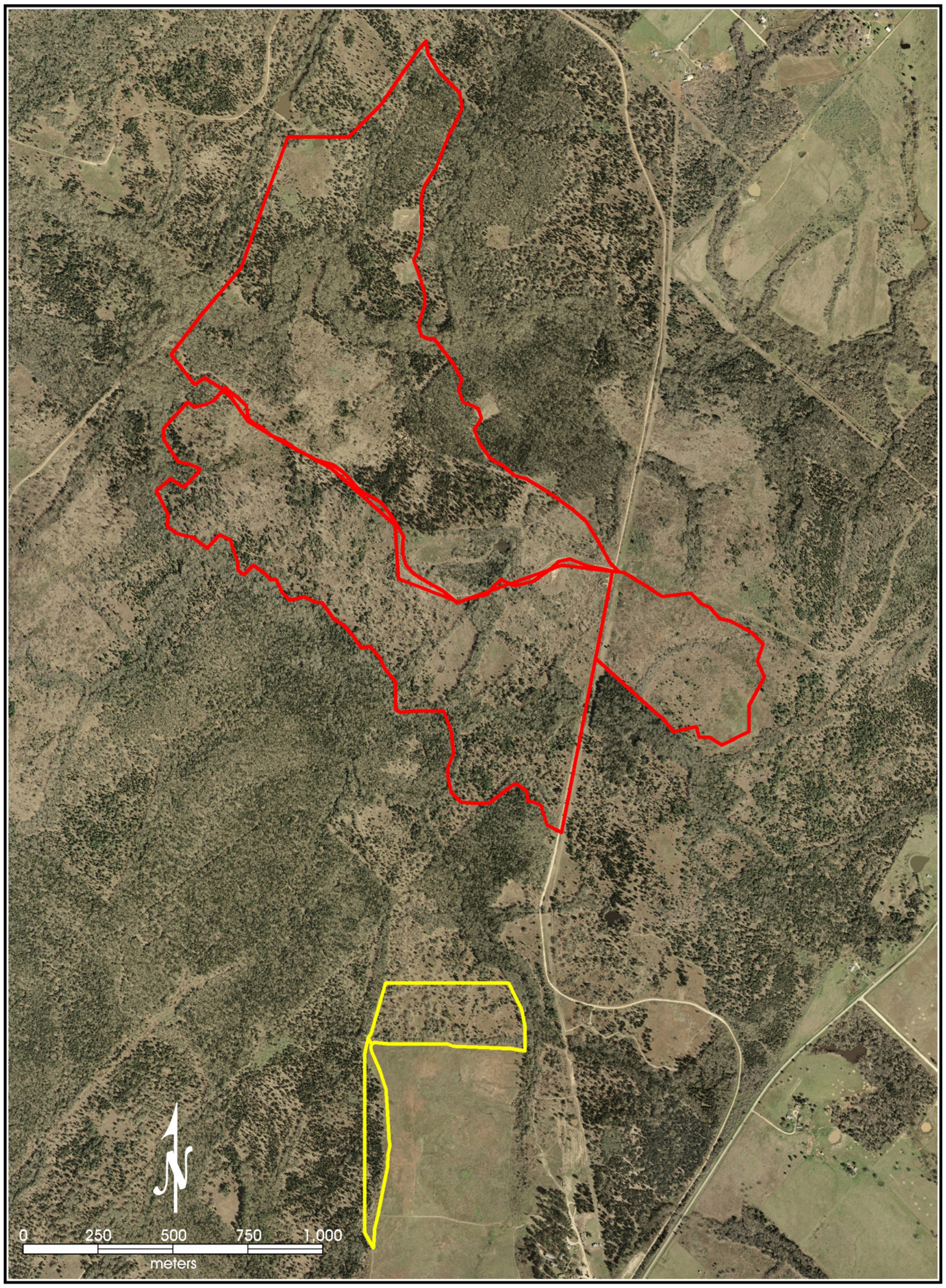

Figure 1-3. *Aerial map showing the dropzone expansion (yellow) and the surveyed portion of the burned area (red).*

Chapter 2: The Project Area

This chapter presents a brief description of the Camp Swift project area and describes the environs of the county. Bastrop County lies approximately 30 km east of the Balcones Escarpment and is divided roughly equally between oak woods and prairies and the Blackland Prairie. Camp Swift consists of rolling terrain dissected by both intermittent and flowing streams. Slope relief tends to be gentle to moderate ranging between 3 and 8%. The facility is drained by Big Sandy Creek and its tributaries, Dogwood Creek, Dogwood Branch, McLaughlin Creek, and Harris Creek, which eventually discharge into the Colorado River, approximately 13 km to the southwest (2012:383). Elevations in the county range from 122 to 183 m AMSL.

The project area is located in the central eastern portion of Camp Swift on the oak woods and prairies natural region and includes a portion of the tributaries and floodplains of McLaughlin Creek (Figure 2-1).

Geology and Soils

The geologic strata on Camp Swift consists primarily of recent sediments and soils that overlay sandstone and yellowish-brown to light gray mudstone beds with ironstone inclusions and lignite seams. This bedrock formation, the Wilcox Group-Calvert Bluff formation,

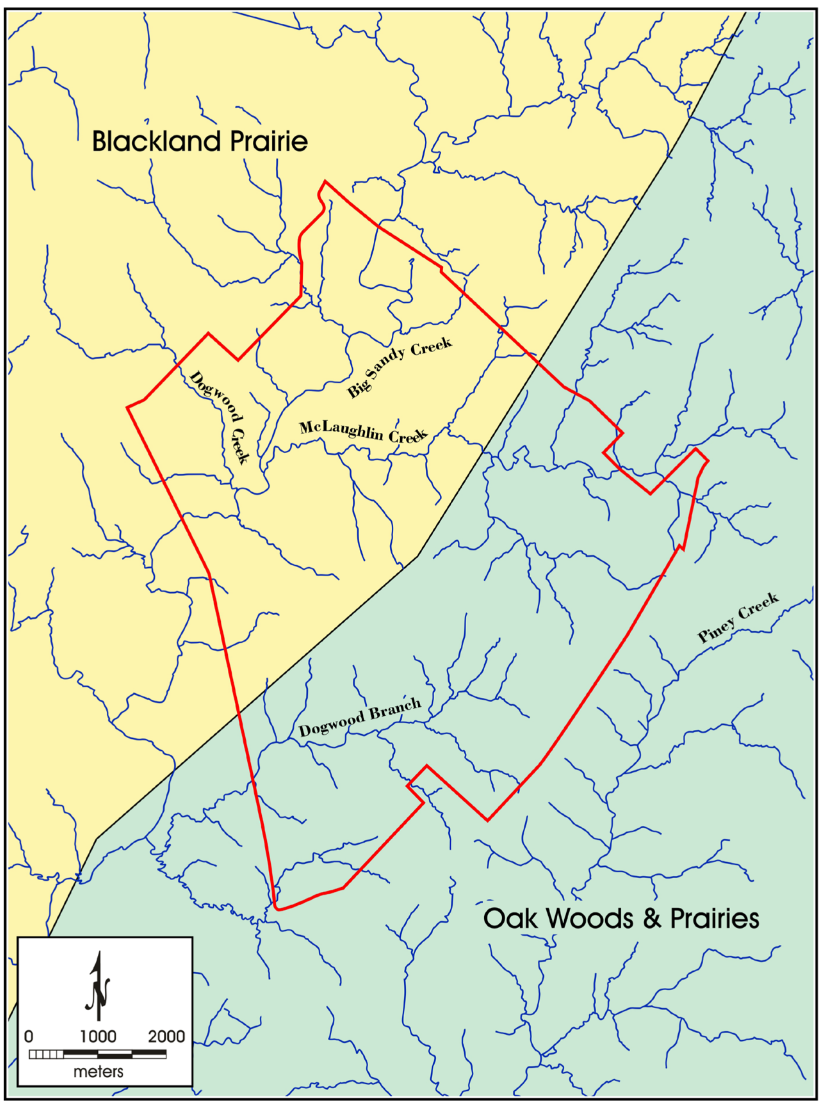

Figure 2-1. *Creeks and their tributaries on Camp Swift.*

was laid down during the Paleocene-Eocene Epochs (Barnes 1974). Weathering of the bedrock has resulted in red buff-colored sandy soils deposited as an outcome of colluvial, alluvial and possible eolian processes (Bousman and Fields 1988; Frederick and Bateman 2001). This sand mantle lies upon a pedogenically-altered argillic Bt horizon. Because it is unclear whether the interface between the argillic horizon and the sand mantle is the result of pedogenesis or of sedimentation, the integrity of archaeological deposits in the mantle has been a subject of contention among archaeologists and geologists (see Bateman et al. 2007; Boulter et al. 2010; Leigh 1998; Thoms 2007). If the sand mantle was formed in situ from pedological weathering of Tertiary bedrock, it follows that all the horizons from the surface (A) to the argillic (Bt) formed simultaneously from the same parent material. In this case any cultural materials would have reached their position from pedoturbation and would have minimal integrity (Frederick et al. 2002). On the other hand, if the sandy deposits are from the Holocene and developed after the Bt horizon formed then archaeological materials in the deposits may have considerable integrity. Frederick et al (2002) evaluated the geologic origins of sediments from hill summits on the sandy mantle using optically stimulated luminescence dating (OSL). The study tested summit settings to eliminate the possibility of colluvial deposition. OSL results suggest that the sediments were minimally disturbed and were exposed to sunlight during the Holocene, indicating that the deposits are episodic eolian Holocene deposits, not in situ weathered bedrock (Frederick et al. 2002). Research on the issue, however, is ongoing.

Camp Swift is composed of Edge, Robco, Padina, Crockett, Tabor, Sayers, Silstid, Uhland, and Jedd series soils associated with stream terraces, uplands, ridgetops, sideslopes, floodplains, and bottomlands (Baker 1979; Soil Survey Staff 2012). The 550 acre project area contains seven of these nine soil units: Edge fine sandy loam (AfC and AfC2), Robco loamy fine sand (DeC), Padina series (PaE), Crockett series (CsD3), Tabor series (TfB), Sayers series (Sa), and Silstid series (SkC, Figure 2-2). Edge fine sandy loams make up 59% of the project area and are associated with uplands and ridges and derive from residuum parent material weathered from shale and siltstone in the Wilcox formation of Eocene age. AfC and AfC2 soils are as deep as 203 cm and are composed of fine sandy loam transitioning to clay at 28 cm, to clay loam at 74 cm, and to weakly consolidated siltstone with a loamy texture at 122 cm below surface (cmbs). These depths gathered from the Web Soil Survey official soil descriptions are based on the interpretation of a small number of profiles (Soil Survey Staff 2012).

The Tabor series, covering 14% of the project area, are very deep, moderately well drained deposits located on upland stream terraces. The soil formed in loamy, clayey sediments. TfB series consist of 36 cm of fine sandy loam over 71 cm of clay. The clay transitions to 38 cm of clay loam, over 58 cm of sandy clay loam (Soil Survey Staff 2012). Nine percent of the survey area consists of Robco loamy fine sand (DeC). Located on nearly level to moderately sloping uplands, the DeC series are very deep, moderately well drained, and slowly permeable soils that formed in loamy sediments on Pleistocene terrace deposits. DeC soils are as deep as 208 cm and are composed of loamy fine sandy transitioning to sandy clay loam at 71 cm, to clay loam at 119 cm, and to sandy clay loam at 165 cmbs (Soil Survey Staff 2012).

Crockett (CsD3), Sayers (Sa), and Silstid (SkC) series covered 17% of the project area with CsD3 and Sa each on 6% and SkC on 5%. The Crockett series is made up of deep soils lying on weathered shale. These upland sediments are moderately well drained and very slowly permeable. The slightly sloping soils formed in residuum derived from weathered alkaline marine clays, sandy clays, or shale during the Cretaceous age. CsD3 sediments consist of 20 cm of fine sandy loam over 125 cm of clay. The clay transitions to 58 cm of clay loam (Soil Survey Staff 2012). Sayers series is located on nearly level to gently undulating flood plains along rivers and streams. Formed in alluvium, the sediments are deep, excessively drained, and moderately rapidly permeable. Sa soils are as deep as 152 cm and are composed of fine sandy loam transitioning to loamy fine sand at 25 cm, to fine sand at 61 cmbs (Soil Survey Staff 2012). The Silstid series consists of very deep soils that formed in residuum weathered from beds of loamy or sandy materials and interbedded sandstones. These upland sediments are well drained and moderately permeable. SkC sediments consist of 94 cm of fine sand over 119 cm of sandy clay loam (Soil Survey Staff 2012).

Covering 1% of the survey area, the Padina series (PaE) is located on uplands and high terraces. The soils are very deep, well drained, moderately permeable, and formed in thick sandy materials. PaE soils are as deep as 208 cm and are composed of fine sand transitioning to sandy clay loam at 124 cmbs (Soil Survey Staff 2012).

Flora and Fauna

Bastrop County falls within the Texan biotic province. The province is characterized by a general vegetation region known as the Post Oak Savannah. The project

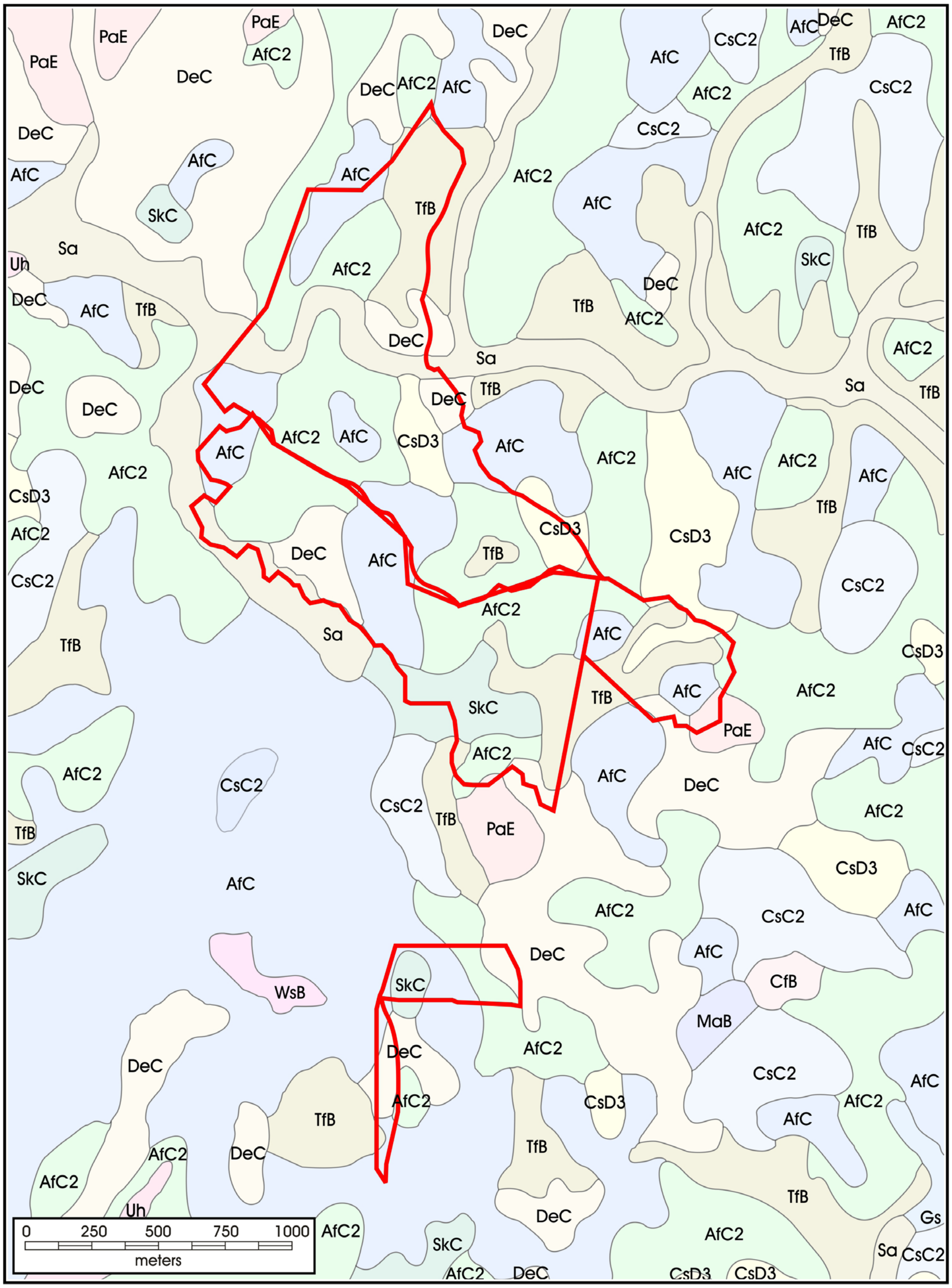

Figure 2-2. *Soil series on the project area.*

area supports a diverse assemblage of flora including two vegetation types, 1) Post Oak Woods, Forest and Grassland Mosaic and 2) Post Oak Woods, Forest, as defined by the Texas Parks and Wildlife (TPWD 2012). In this region, non-pastured area vegetation dominating the upper story consists largely of blackjack oak (*Quercus marilandica*), eastern red cedar (*Juniperus virginiana*), mesquite (*Prosopis* sp.), black hickory (*Carya texana*), live oak (*Quercus fusiformis*), cedar elm (*Ulmus crassifolia*), hackberry (*Celtis* sp.), yaupon (*Ilex vomitoria*), poison oak (*Rhus toxicodendron*), post oak (*Quercus stellata*) and loblolly pine (*Pinus taeda*; TPWD 2012). The understory consists of American beautyberry (*Callicarpa americana*), hawthorn (*Crataegus* sp.), supplejack

(*Berchemia* sp.), trumpet creeper (*Campsis radicans*), dewberry (*Rubus* sp.), coral-berry (*Symphoricarpos* sp.), sand lovegrass (*Eragrostis trichodes*), beaked panicum (*Panicum*), and three-awn (*Aristida*; TPWD 2012), as well as flora typical of tall grass prairies, which are dominated by little bluestem (*Schizachyrium scoparium*). Also present in the understory are switchgrass (*Panicum virgatum*), purpletop (*Tridens flavus*), silver bluestem (*Bothriochloa saccharoides*), and Texas wintergrass (*Stipa leucotricha*; Arbingast 1976; Gould 1975).

Dramatic changes in the native vegetation region have occurred during the post settlement periods mostly as a result of land disturbance associated with cultivation, ranching, and military activities. Indications of this disturbance can be seen in the form of non-native invader species, including eastern cedar elm, yaupon holly, eastern prickly pear, and green briar, currently found on Camp Swift. At the time of the CAR's archaeological survey, the majority of this vegetation was absent due to a large forest fire (Figure 2-3).

The common mammalian species found in this region include white-tailed deer (*Odocoileus virginianus*), eastern cottontail rabbit (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and fox squirrel (*Sciurus niger*). There are also numerous bird species common throughout the county including the northern bobwhite (*Colinus virginianus*), eastern meadowlark (*Sturnella magna*), mourning dove (*Zenaida macrour*a), killdeer (*Charadrius vociferous*), field sparrow (*Spizella pusilla*), red-tailed hawk (*Buteo jamaicensis*), and belted kingfisher (*Ceryle alcyon*; Blair 1950).

Modern Climate

Climate in Bastrop County is typically humid and subtropical with cool winters and hot summers. The closest weather station with long-term data on rainfall and temperature is located at Elgin, Texas, roughly 10 to 15 km to the north/northwest of Camp Swift. The

Figure 2-3. *Lack of vegetation on the survey area resulting from a large wildfire.*

30 year normal (1971-2000) data for Elgin (National Oceanic and Atmospheric Administration 2002) yielded an average yearly rainfall of 875 mm. Figure 2-4 shows that precipitation is bi-modal with a major peak during the early summer (May-June) and a secondary peak in the fall (October-November). On average, the driest month of the year during this period was August, with a mean rainfall of 49.5 mm. August is also the warmest month of the year at Elgin, with average daytime highs of 35.5°C (95.9°F). January in the coldest month, with average lows of 4.4°C (40°F). Yearly temperatures at Elgin average 20.4°C (68.8°F). Marks (2012a) estimates that the annual growing season in Bastrop County is 270 days.

Figure 2-5, using 100 years of rainfall data from Austin (National Oceanic and Atmospheric Administration 2012) located roughly 35 km due west of Camp Swift, shows that considerable year to year fluctuations are present in the region. The highest rainfall during this period was in 1919, when 1,643 mm of rainfall was recorded. This is almost twice the average for this 100 year period. The lowest yearly total was 290 mm in 1954, in the middle of several below average periods that were present in the early 1950s.

Paleoclimate

Several regional summaries of Central Texas paleoclimate are available, including summaries by Collins (1995), Johnson and Goode (1994), Cooke (2005), Toomey et al. (1993), Brown (1998), and Bousman (1998). A variety of different proxy data sets, including fluctuations in ratios of different species of shrews (see Toomey 1993), shifts in the availability of bison (Collins 1995), changes in arboreal pollen frequencies (e.g., Bousman 1998), shifts in soil isotopes (Cooke 2005; Nordt et al. 2002; Nordt et al. 1994), and episodes of soil stability and erosion (Hall 1990; Holliday 1989) have all been used to reconstruct climate patterns in the Central Texas region. Ellis et al. (1995) point out that these proxies frequently operate at different temporal and spatial scales. Temperature and precipitation shifts that impact the distribution of desert shrews, for example, may not be reflected by bison presence/absence. Similarly, climate changes that result in shifts in arboreal vegetation, which may show up in pollen frequencies in bogs in Lee County, may not show up in carbon isotopes from a location along the Medina River. If these various proxies do reflect the same shifts in climate, they are certainly not going to be expressed at the same temporal or spatial scale.

These scale questions are further exacerbated by problems of acquiring sufficient numbers of samples to reflect temporal and spatial variability, and to correctly assign dates to those samples. For example, pollen columns from bogs represent one of the best, long-term data sets in the state (see Bousman 1998; Camper 1991). Reconstructions from Boriack, Patschke, and Weakly bog form the basis of several reconstructions (see Nickels and Mauldin 2001). However, the entire 18,000 years Patschke sequence is dated on the basis of four radiocarbon dates and interpolated deposition rates (Camper 1991). The

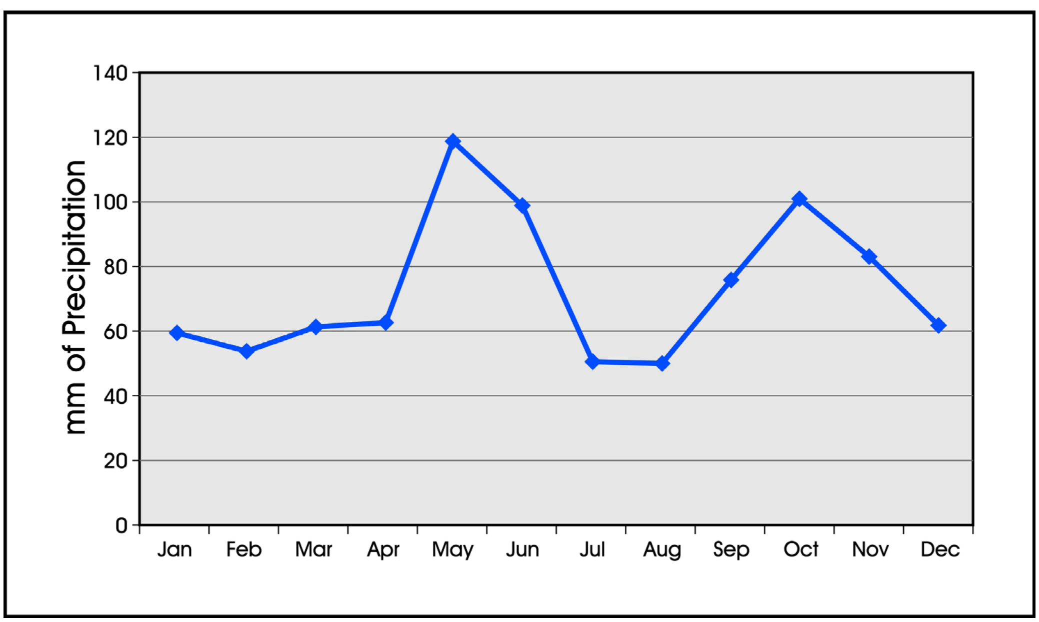

Figure 2-4. *Mean monthly precipitation (mm) at Elgin, Texas (1971-2000).*

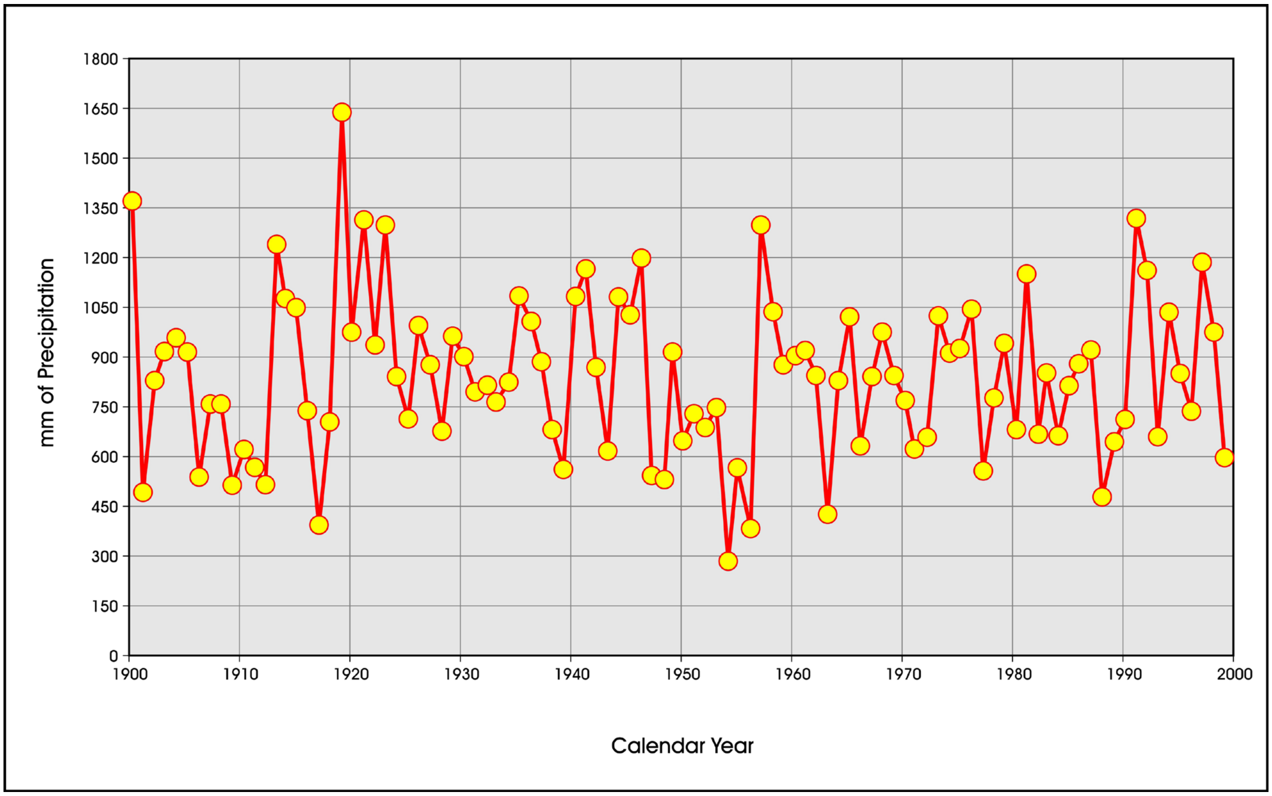

Figure 2-5. *Yearly precipitation (mm) at Austin, Texas, (1900-1999).*

Boriack/Weakly pollen bog sequences (Bousman 1998) are not as well dated as Patschke (Nickels and Mauldin 2001). Assuming that the dates are, in fact, correct, the Patschke sequence has nine data points delineating change from a grassland to a woodland environment for the last 4000 years, or roughly one data point for every 444 years (see Nickels and Mauldin 2001). Modern data, such as that reviewed for Camp Swift area previously (see Figure 2-5), demonstrates that significant climate variability is a characteristic of Central Texas. That is, a lot can happen in 444 years in Texas weather. The poor temporal resolution of these pollen data sets obscures that variability.

It is certainly possible to improve the temporal resolution of data sets, and recent efforts by Boulter et al. (2010) at Boriack, for example, move in that direction. It is also possible to develop a more detailed understanding of the temporal and spatial scales at which various proxy data sets respond, and progress in these areas is also occurring (see Kemp 2008; Munoz et al. 2011; Smith 2011). Our goal is not to criticize the specific reconstructions mentioned, but rather to begin to focus research in areas that may lead to an exploration of variability in climate, associated resource structures, and human adaptive response to that climate and resource variation.

Macrophysical Climate Models

The current investigation at Camp Swift is survey, and as such, generated no new empirical data on paleoclimate. Nevertheless, we can potentially provide some new insights on the climate of the Camp Swift area. Our approach to paleoclimate involves the development of what has been termed Macrophysical Climate Models (MCMs). Developed primarily by Reid and Robert Bryson (Bryson 1989, 1992, 1994; Bryson and Bryson 1997; Bryson and DeWall 2007a; Bryson and Goodman 1986), MCMs can provide high resolution estimates of key climate variables, including precipitation and temperature, for a specific location. Using seasonal solar radiation coupled with estimates of volcanic eruptions, ice and snow volumes, and other elements that can affect atmospheric transparency and absorption of solar radiation, MCMs are essentially heat budget models that take a "top-down" approach to modeling (Bryson 2005; Bryson et al. 2007). MCMs use average monthly data on precipitation, temperature, and other weather data for a specific station for the 1961-1990 period, coupled with the locations of what are termed "centers of action" during that same 30 year period (see Bryson and DeWall 2007b). These "centers" include approximations for elements that determine atmospheric circulation, including locations of sub-tropical highs, the intertropical convergence, jet streams, and temperature gradients in the northern and southern hemispheres. In all, 21 different modules or centers of action are present in the MCM program. Different modules are used for different areas of the world, with different combinations of these centers of action being used in specific regions (Bryson and DeWall 2007a, b).

MCMs have been used to model seasonal shifts in climate parameters and vegetation regimes experienced by large herbivores at the Last Glacial Maximum (see Higgins and MacFadden 2009), climate thresholds associated with extinct Pleistocene megafauna (McDonald and Bryson 2012), and to consider responses in human hunter-gatherers to shifting climate in the Near-East (Binford 2001:447-464). Details of the construction and application of MCMs, which work off of a Microsoft® Excel template, are available (Bryson and DeWall 2007a; DeWall 2007). The procedure initially relies on regression analysis between observed climate data entered by the user (e.g., month precipitation) and the estimates calculated by the model to calibrate the specific location. In the case of some climate parameters, such as precipitation, the user can make small adjustments to selected control variables, such as the latitude and width of specific centers of action, to increase the fit between the observed values and the estimated values for a parameter. Successful calibration is achieved when the overall r-squared value is over .95, the calculated estimates are in alignment with the observed estimates, and model parameters are within known ranges. Current MCMs have a 100-year resolution and are applicable to the last 40,000 years (Bryson and DeWall 2007a).

Below, we develop a macrophysical climate model for Camp Swift using data from Elgin, Texas. The model covers the last 18,000 years. Elgin is the closest station to Camp Swift with data from the 1961 to 1990 calibration period. The Swift/Elgin MCM develops data sets that allow us to 1) construct monthly and annual precipitation, temperature, and potential evaporation estimates for a given 100 year period and 2) use these estimates to model aspects of seasonal rainfall, moisture balance, and the resulting vegetation regimes for the past 18,000 years.

Like all models, the Swift/Elgin MCM developed here is a simplification of reality. We do not assume that the model is correct. It is, in fact, one of several such models that could be constructed that have acceptable parameters in this particular case. Any such model, this one included, will require testing against empirical data and subsequent refinement. MCM results have been assessed in many locations throughout the world (Bryson 1989; Bryson and DeWall 2007a) both by comparison to empirical data (e.g., Higgins and MacFadden 2009) and against other climate models, including more widely used general circulation models (GMCs). Results are generally supportive of the MCMs considered (Ruter et al. 2004). Here we will compare aspects of the Swift/Elgin model to proxy pollen data sets, which, as we have alluded to previously, are themselves plagued by problems of temporal control and a lack of high resolution. Pollen data sets, however, are one of the few long-term data sets available that can be compared to the macrophysical model. While we lack the detailed data that would allow us to verify the model, we show subsequently that the Swift/Elgin MCM is consistent with several aspects of the pollen data sets, though there are significant differences. While we lack verification, we will simply present the Swift/Elgin MCM. We hope that it will structure subsequent investigations both into past climate as well as into aspects of the prehistory of the Camp Swift region.

The Camp Swift/Elgin MCM

For the Camp Swift/Elgin Model (CSEM), we initially selected the North American climate regime module and determined the latitude, longitude, and elevation of the Elgin, Texas, weather station (National Oceanic and Atmospheric Administration 2002). The 1961 to 1990 mean monthly precipitation data was then entered, and the initial regression run. After multiple runs and adjustments, the final model had an r-squared of .976 and all coefficients and centers of action were within acceptable ranges. The final comparison between the 1961-1990 monthly means and the estimated totals are shown in Figure 2-6.

Following the precipitation model, average Elgin monthly temperature data were entered. There are no adjustments for the temperature values. The overall r-squared between the observed and estimated monthly temperature was .958.

The final element of the current CSEM is an estimate for the potential evapotranspiration (PET). Here we use monthly average data from the Texas Water development Board (Texas Water Development Board 2012) for the 1961-1990 calibration period. The data are available in

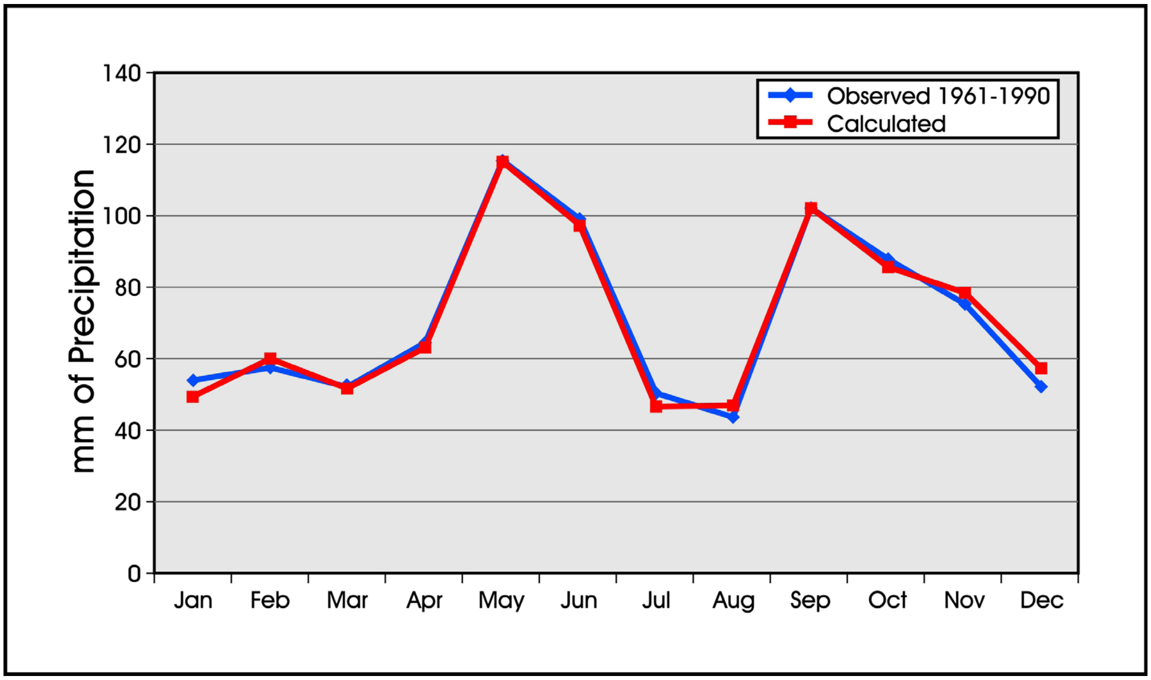

Figure 2-6. *Comparison of observed monthly rainfall (1961-1990) and modeled monthly rainfall for Elgin, Texas, based on Macroclimate Modeling.*

quadrants that are roughly 90 km by 110 km. The quadrant encompassing Camp Swift is centered roughly 35 km to the northwest of the Camp. As with the temperature module, there are no adjustments to the centers of action in the PET module. However, there is a coefficient to adjust the modern PET rate to match, at a gross level, the extant vegetation. Studies by Bryson (see Bryson 2007; Bryson and Wendland 1967) suggest that annual precipitation minus PET provides a rough scale for vegetation regimes. For the Camp Swift area, currently characterized as an oak dominated savannah, we adjusted this coefficient to produce a precipitation-PET value of 35 mm, in the middle of the 0 to 75 mm range suggested by Bryson (2007) for savannah settings.

The resulting CSEM provides 100 year resolution estimates of monthly precipitation, temperature and broad-scale estimates of vegetation regimes over the time span of human occupation at Camp Swift. Figure 2-7 presents data on annual rainfall over the last 18,000 years. We choose this terminal date to facilitate comparisons with pollen data sets. Given human occupation in the region, our focus is primarily on the last 12,000 years. Overall, the trend shown is one of increasing though highly variable precipitation, from the beginning of the sequence through roughly 5800 BP. A dramatic, rapid decline is then present, with yearly rainfall totals dropping about 76 mm over the next 400 years. Rainfall subsequently increased, stabilizing around 850 mm by about 4800 BP. While short periods of increased precipitation are suggested by the CSEM at 3900 and 1700 BP, the modeled annual totals hover around 850 mm until roughly 500 BP. Wetter, and move variable, conditions are suggested over the last 500 years.

Figure 2-8 further explores these modeled precipitation patterns by focusing on spring through early summer (March through August) rainfall totals. These months might be particularly important for initiating and sustaining new plant growth, especially over the last 10,000 years when temperatures, as modeled by average July temperatures, were closer to that seen in the modern period (Figure 2-9). Like the overall precipitation pattern (Figure 2-7), the Figure 2-8 precipitation pattern shows a gradual increase in spring/summer rainfall through roughly 5800 BP, followed by a substantial decline. Comparisons of the two precipitation figures will suggest that the decline at 5800 BP was entirely a decline in spring/summer precipitation, with a drop of 122 mm by 5400 BP. Fall/Winter precipitation actually increased slightly during this period. A slightly increasing yet variable spring/summer rainfall pattern is suggested for the next 2,000 years. Spring summer rainfall then declined slightly, stabilizing around 425 mm from 2000 to around 500 BP. As with the overall pattern, the spring/summer precipitation then increases, though not as dramatically as seen in Figure 2-7.

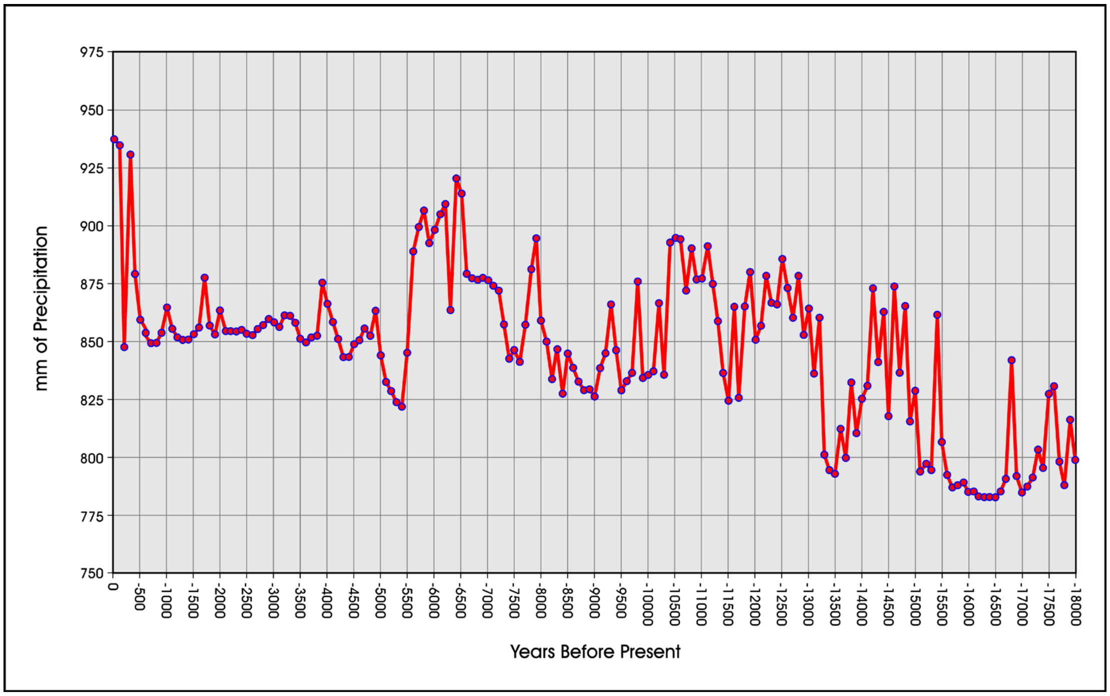

Figure 2-7. *A Macrophysical Climate Model for Camp Swift/Elgin of precipitation (0-18,000 BP) at 100 year resolution.*

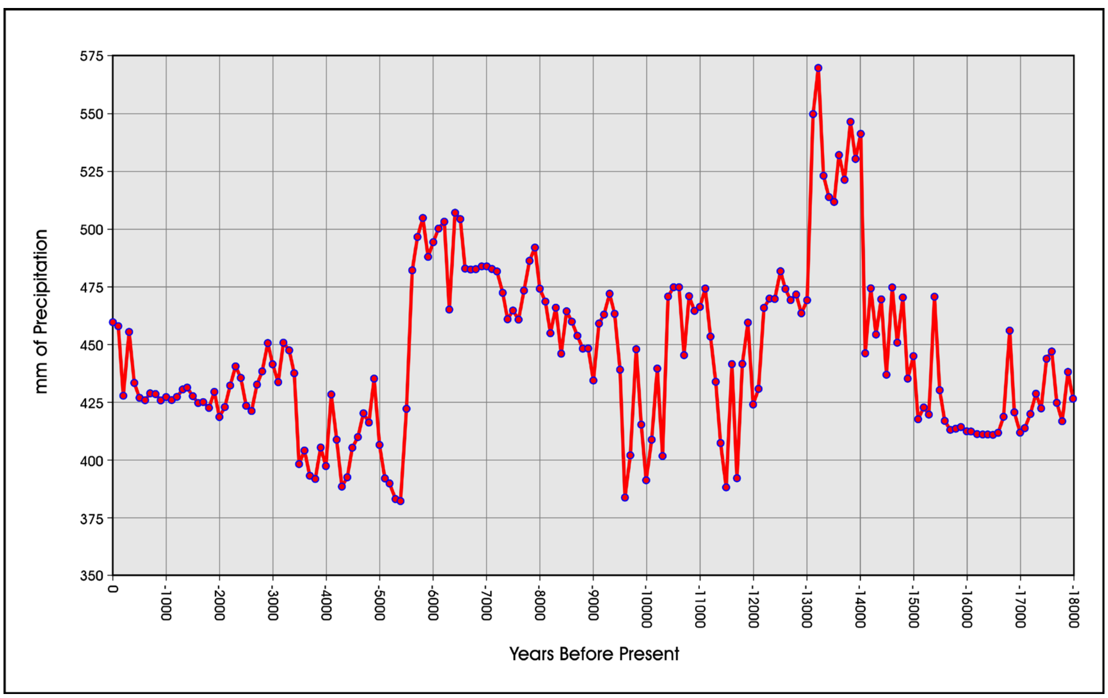

Figure 2-8. *A Macrophysical Climate Model for Camp Swift/Elgin of March through August precipitation (0-18,000 BP) at 100 year resolution.*

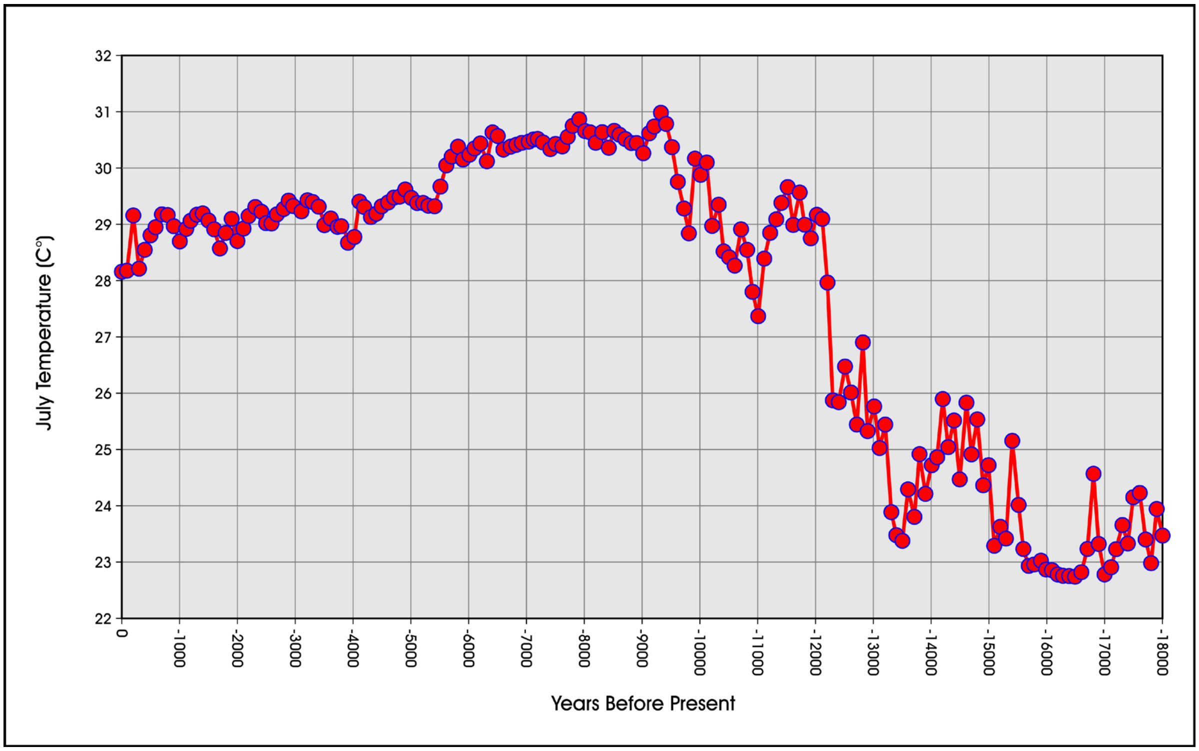

Figure 2-9. *A Macrophysical Climate Model for Camp Swift/Elgin of July temperature (0-18,000 BP) at 100 year resolution.*

Figure 2-10 shows the annual precipitation minus the potential evapotranspiration from the CSEM. The focus here is on the resulting vegetation regimes produced by the combination of temperature and rainfall. The model suggests that forests dominated the area prior to 12,000 BP. Over much of the last 12,000 years, Camp Swift was probably a grassland, with brief periods of woodland/ savannah vegetation present early and late in the sequence. Xeric periods are also suggested to be present around 5300 BP and at roughly 8800 BP.

The Figure 2-10 data also allows us to consider this suggested vegetation pattern with that shown by Bousman (1998) for Boriack Bog pollen, located roughly 35 km to the northeast of Camp Swift in Lee County, and Weakly Bog, located in Leon County, about 170 km away. As we noted previously, the Boriack sequence is dated by four radiocarbon dates from an adjacent core. Bryant (1977) reports the radiocarbon dates as 3700 +/- 90 at a depth of 40-50 cm, 9580 +/- 160 at 240-250 cm, 13180 +/- 210 at 440- 450 cm, and 15460 +/- 250 at 500-527 cm. The CSEM data points are in years before present, not radiocarbon years. We therefore calibrated the four radiocarbon dates using CALIB 4.1 (Ramsey 2009), and used the midpoint of the most likely 2-sigma distribution, as well as the midpoint of the sediment depths, as a plotting point. For example, the earliest date calibrated to 19,310 to 18,430 BP. This was plotted as an age of 18,870 BP for a depth of 513.5 cm. Using this procedure, we then ran least-squares regression predicting the date from the depth. The r-squared on the four points was .9988. The resulting equation (Estimated Date= 31.659*depth+ 2822.3) was used to assigned calibrated dates to the Boriack sequence. The intercept of 2822 BP suggests that the last 3,000 years are missing from the Boriack sequence. Following Bousman (1998) we will use the Weakley Bog data (Holloway 1987) as an estimate of the most recent period.

Figure 2-11 presents the Weakly/Boriack arboreal pollen data (Bousman 1998; see also Bryant Jr. 1977; Holloway 1987). Also included at the far right of the figure are Bousman's estimates of vegetation regimes represented. Comparisons of the vegetation patterns generated by the CSEM with the Figure 2-11 bog pollen/ vegetation data shows some similarities at a general scale. Both suggest that much of the sequence over the last 10,000 years is dominated by grasslands, with woodland present late in time (post 500 BP). Both sequences show a dry, grass dominated period in the 5-6000 BP range. Both sequences show increased grasslands for a short period (11-12K in the CSEM, 10-11K in Boriack) early in the

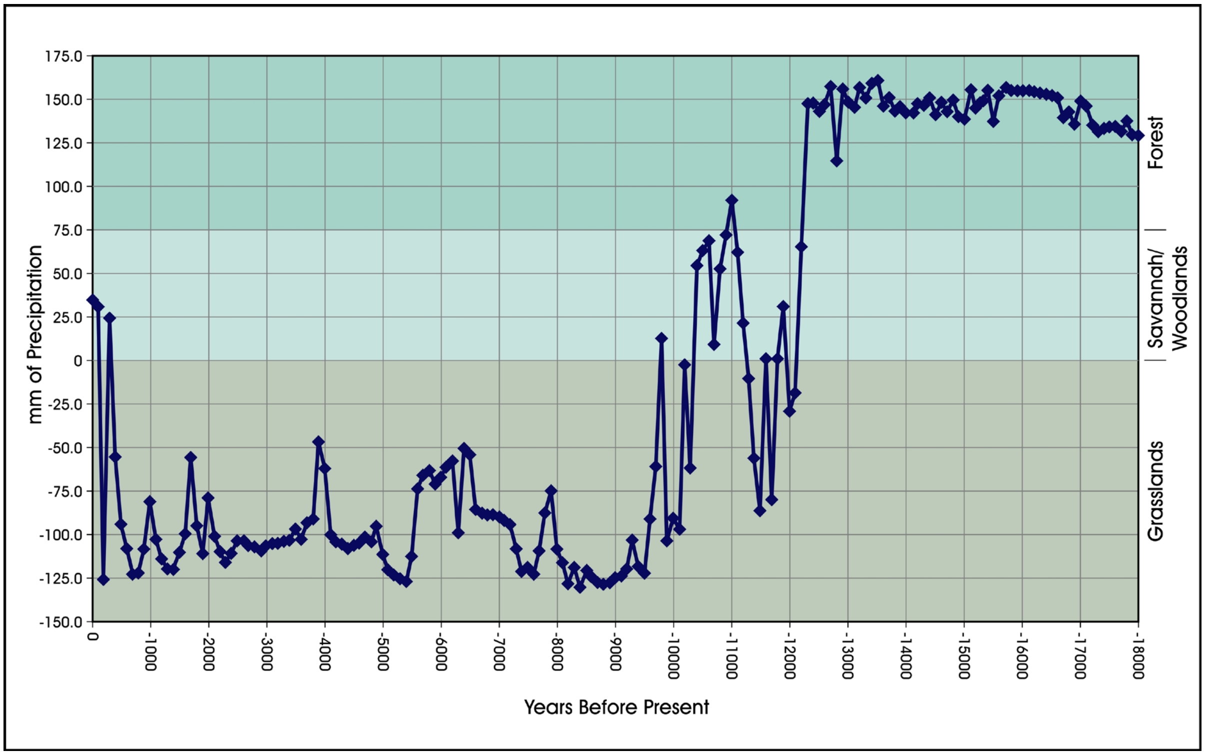

Figure 2-10. *A Macrophysical Climate Model for Camp Swift/Elgin of vegetation regimes (0-18,000 BP) at 100 year resolution. The model uses precipitation and potential evapotranspiration. See text for details.*

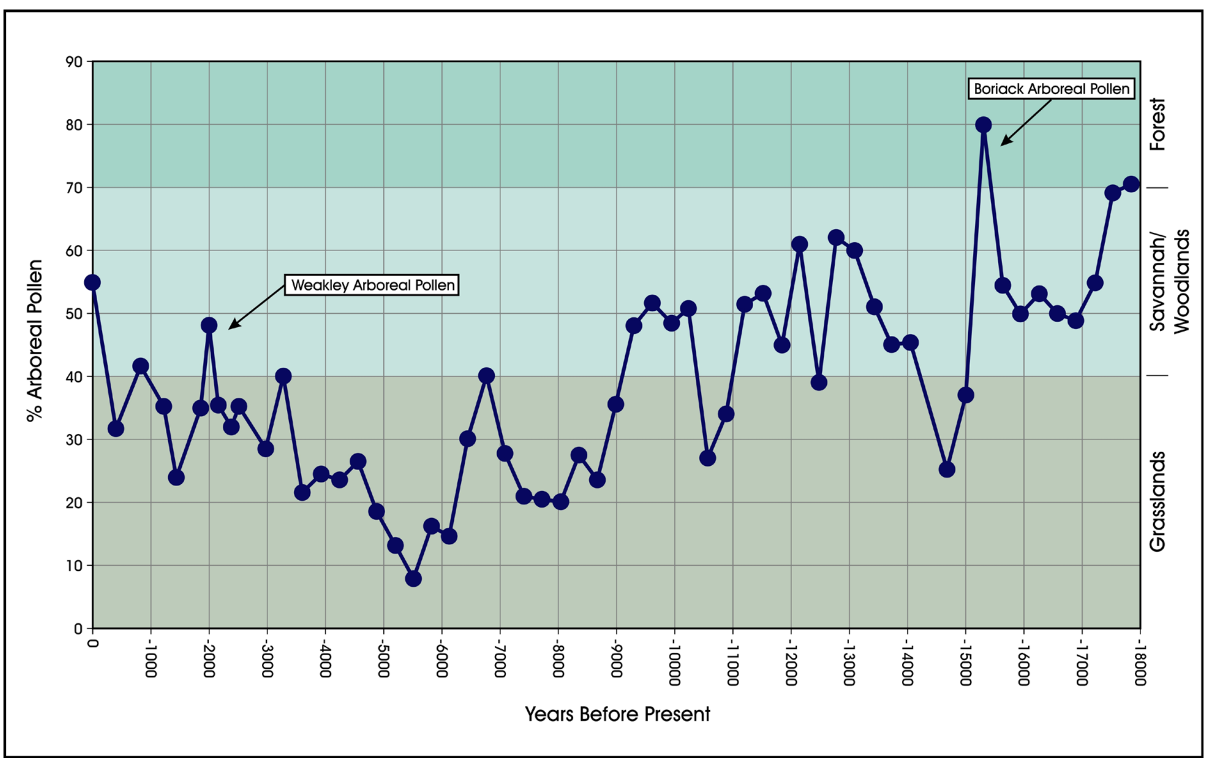

Figure 2-11. *Arboreal pollen percentages at Boriack and Weakley bogs, with associated vegetation regimes (see Bousman 1998).*

sequence, with a rapid return to more mesic conditions immediately after that event. There are also important differences. Prior to 12,300 BP, the CSEM suggests a forest dominated setting, while the pollen data is consistent with woodland/savanna, and only shows a forest setting sometime between 15 and 16,000 BP. The brief return to grassland at between 14 and 15,000 shown in the pollen data is not reflected in the CSEM vegetation plot. Other dry periods, such as at 8800 BP in the CSEM model are not clearly present in the pollen data.

We can only conclude that the current CSEM is generally consistent with the broad outlines of the pollen data set. This is not surprising given the temporal ambiguity associated with the pollen data set. While the verification and adjustments to climate models such as the CSEM should be an ongoing process, the use of such models allows us to explore detailed aspects of past climates and begin to frame expectations that can be considered in the archaeological record. For example, the presence of some warm, xeric period, perhaps associated with Anteve's (1955) Altithermal, was suggested in Texas in some of the earliest paleoenvironmental reconstructions (e.g., Bryant and Shafer 1977). Framed initially as a gradual process over a roughly 2,500 year period between 7000 and 4500 BP (Bryant and Shafer 1977:18), Collins (1995:384) has more recently suggested that this period, now focused at the close of the Middle Archaic between 4500 to 5000 BP, was "the most xeric conditions ever experienced by humans in Central Texas."

The CSEM data allows a more sophisticated consideration of the period. Looking at Figures 2-7 through 2-10 we can suggest that there was a 122 mm decline in summer rainfall over a four hundred year period between 5800 and 5400 cal BP. An increase in fall / winter precipitation, on the order of about 37 mm, was present at this time. There was also a decrease in July temperatures of roughly 1°C over this same 400 year period. While the resulting vegetation structure remained essentially a grassland, the details provided by the CSEM, which we have only summarized at a general level, can be used to model shifts in specific resources (e.g., sotol). This level of detail is not, and probably never will be, available from most proxy data sets. Is the CESM correct? We do not know. A better question at this point in time might focus on the utility of the CESM. Is it useful? We think it will be.

Chapter 3: Cultural History and Previous Archaeological Research

This chapter presents a description of the culture history of Bastrop County. The chapter concludes with a summary of previous archaeological work conducted on Camp Swift.

Cultural History

Three cultural areas converge in Bastrop County. Camp Swift's location places it on the Central, East, and Upper Coastal archaeological regions (Goode 1989). Researchers have been able to document a long prehistoric sequence that can be broken down into four major time periods: Paleoindian, Archaic, Late Prehistoric, and Historic (Black 1989a; Collins 1995, 2004; Fields 1995; Patterson 1995; Prewitt 1981). These periods are further divided into subperiods that correspond to changing material cultures. Each of these time periods is briefly discussed here to illustrate the general archaeological potential of the region.

Paleoindian

The Paleoindian period (11,500-8800 BP) is divided into early and late sub-periods, each characterized by particular projectile point styles and subsistence patterns (Collins 1995, 2004). The period begins at the close of the Pleistocene with the earliest evidence of humans in the Central Texas region. The environment during this period was generally cooler and wetter than the present (see Figures 2-8 and 2-10). Clovis and Folsom point types, and bifacial Clear Fork tools and finely flaked end scrapers characterize the early Paleoindian period (Black 1989a). Clovis is the earliest defined cultural assemblage and it is for the most part consistent across the North American continent. Material assemblages dating earlier than Clovis are referred to as pre-Clovis. One of the largest Clovis sites in North America, the Gault site, is located in Central Texas (Collins 1999a, b). One possible Clovis artifact has been documented at Camp Swift (Nickels et al. 2005: Table 6-2). The first stemmed points (i.e., Wilson), as opposed to lanceolate points (e.g., Golondrina), begin to appear during the late Paleoindian period. In the past, Paleoindian populations have generally been characterized as hunter-gatherers ranging over wide areas in pursuit of now extinct megafauna, such as mammoth and bison (*Bison antiquus*). However, research from the Wilson-Leonard site in Central Texas (Collins 1998) and other perspectives on Paleoindian adaptations (Tankersley and Isaac 1990) indicate that the diet of these early inhabitants may have been much broader. Although exploiting Late Pleistocene megafauna may have constituted a part of Paleoindian subsistence, these peoples are perhaps better characterized as more generalized hunter-gatherers, exploiting a wide variety of plants and animals including large herbivores like deer and bison (*Bison bison*) and small animals such as turtles, alligators, rabbit, and raccoons (Collins 1995; Nickels 2000).

Paleoindians were the first Americans, but it is not known precisely when they first entered the New World The first stemmed points (i.e., Wilson), as opposed to lanceolate points (i.e., Angostura and Golondrina), begin to appear during the late Paleoindian period. In the past, Paleoindian populations have generally been characterized as hunter-gatherers ranging over wide areas in pursuit of now extinct megafauna, such as mammoth and *Bison antiquus*.

In Central Texas, many of the sites containing Paleoindian materials are found on high terraces, valley margins, and upland locations (Black 1989a). This seems to fit with a broader pattern of Paleoindian site distributions where sites are located on landforms providing views of the surrounding landscape, are centered on critical resource zones, or are found in highly productive resource areas (Tankersley and Isaac 1990). Paleoindian artifacts are commonly recovered as isolated finds or from lithic scatters lacking good stratigraphic context including kill, quarry, cache, camp, ritual and burial sites (Collins 1995, 2004).

Archaic

The Archaic period (8800-1200 BP) is identified as a period of intensification of hunting and gathering and a move toward greater exploitation of local resources. As a result, a broadening of the material culture is evident, including the "extensive use of heated rock" in cooking (Collins 1995:383). Food processing technologies appeared to have broadened as features such as hearths, ovens, and middens increase in frequency during this time (Black and McGraw 1985). Large cemeteries also appeared during this period signaling the likely establishment of regional "territories" (Black and McGraw 1985). Collins (1995, 2004) and Johnson and Goode (1994) subdivided the Archaic into Early, Middle, and Late sub-periods. These sub-periods are distinguished by variances in climate conditions, resource availability, subsistence practices, and diagnostic projectile point styles (Collins 1995, 2004; Hester 1995).

Early Archaic

In Central Texas and adjacent regions, the Early Archaic dates from 8800 to 6000 BP (Collins 1995, 2004). Changing climate and the extinction of megafauna appear to have initiated a behavioral change by the Prehistoric peoples of Texas. Because of the necessary economic shift away from big game hunting, local resources in Central Texas, such as deer, fish, and plant bulbs were more intensively exploited. This behavioral change is indicated by greater densities of ground stone artifacts, burned rock cooking features, and more specialized tools such as Guadalupe bifaces and Clear Fork gouges (Turner and Hester 1999). Projectile point styles found in sites from this period include Angostura, Early Split Stem, Martindale-Uvalde, and then later Early Basal-Notched forms such as Bell and Andice (Collins 1995, 2004; Hester 1995:439). Early Archaic sites are often recorded on river terraces or on hills overlooking valleys (Hester 1995:439). Open campsites, including Loeve, Richard Beene, Wilson-Leonard, Jetta Court, Sleeper, Camp Pearl Wheat, Youngsport, and Landslide, and a cave site, Hall's Cave, contain notable Early Archaic components (Collins 1995, 2004). Diagnostics found at Camp Swift include an Angostura point fragment (Robinson 2001:122) and an Andice point placed in the Early rather than the Middle Archaic (Nickels et al. 2005:Table 6-2).

Weir (1976) concludes that the Early Archaic groups were highly mobile and small. He bases this inference on the fact that Early Archaic sites are thinly distributed and that projectile points are widely distributed across most of Texas and northern Mexico. The decline in bison numbers on the plains suggested to Hurt (1980) that the inhabitants were forced to broaden their diets to include animals and plants that produce equivalent amounts of calories and protein with the same or slightly more expended effort. Story (1985) concurs with Weir that population densities were low during the Early Archaic. She suggests that groups were made up of small bands of related individuals with "few constraints on their mobility" (Story 1985:39) subsisting on a broad range of resources, such as prickly pear, lechugilla, rodents, rabbits and deer.

Middle Archaic

The Middle Archaic, 6000 to 4000 BP (Collins 1995, 2004), appears to have been a period of increasing population, based on the large number of sites documented from this time in Central Texas and adjacent regions (Story 1985; Weir 1976). Projectile point variation at the Jonas Terrace Site points to a period of "ethnic and cultural variety, as well as group movement and immigration" (Johnson 1995:285). Diagnostic artifacts from this period include Bell, Andice, Calf Creek, Taylor, Nolan, Bulverde and Travis point types as well as triangular bifaces and tubular stone pipes (Black 1989a; Collins 2004; Hester 1995). In addition to the upland setting, Middle Archaic campsites are commonly located on floodplains, low terraces, and natural levees. Exploitation of broadly scattered, year-round resources such as prickly pear, deer and rabbit continued (Campbell and Campbell 1981) with the addition of seasonal nut harvests from the riverine settings of the Balcones Escarpment (Black 1989a, b). Weir (1976) posits that the expansion of oak on the Edwards Plateau and Balcones Escarpment resulted in intensive plant gathering and acorn processing that may have been the catalyst for the merging of the widely scattered bands prevalent in the Early Archaic into larger groups. These larger groups likely shared the intensive labor involved with the gathering and processing of acorns. Some investigators believe burned rock middens resulted from acorn processing (Creel 1986; Weir 1976) although others (e.g., Black et al. 1997; Goode 1991) question this argument. Black et al. (1997) suggest that the burned rock middens of Central Texas accumulated as a result of the baking of a relatively broad range of resources in rock/earth ovens. These resources potentially included carbohydrate laden nuts, bulbs, roots, and pads as well as various vertebrate and invertebrate animals. To date no cultural components have been firmly dated to the Middle Archaic period at Camp Swift.

Late Archaic

The final interval of the Archaic in Central Texas dates from 4000 to 1200 BP (Collins 2004). There is not a consensus among researchers as to population size in this sub-period. Prewitt (1985) posits an increase while Black (1989a) believes population remained the same or decreased. There is also disagreement as to the continuing use of burned rock middens. Prewitt (1981) suggests the near cessation of the midden construction, whereas excavations at a number of sites document large cooking features up to 15 m in diameter (Houk and Lohse 1993; Johnson 1995; Mauldin et al. 2003). Bison reemerge during this sub-period in Central Texas after evidence of a definitive decrease during the Middle Archaic (Dillehay 1974). Points from the Late Archaic sub-period are generally smaller than those of the Middle Archaic and include Pedernales, Kinney, Lange, Marshall, Marcos, Montell, Castroville, Ensor, Frio, and Darl types (Collins 1995, 2004; Turner and Hester 1999). Late Archaic sites are usually located near modern stream channels and occur in all topographic settings (Black 1989a; Hester 1995). During this period, large cemeteries were formed indicating an increasing population and the subsequent establishment of territories (Black and McGraw 1985). The earliest occurrences are at Loma Sandia (Taylor and Highley 1995), Ernest Witte (Hall 1981), Hitzfelder Cave (Givens 1968), and Olmos Dam (Lukowski 1988). Projectile points diagnostic of the Late Archaic period documented at Camp Swift include Pedernales, Frio, and Ensor (Lehman et al. 2003; Robinson 2001; Robinson et al. 2001).

Late Prehistoric

The Late Prehistoric period (1200-350 BP) in Central Texas marks a distinctive shift from the use of the atlatl and dart to the use of the bow and arrow (Black 1989a; Collins 2004; Hester 1995; Story 1985). The Late Prehistoric is subdivided into early and late sub-periods termed Austin and Toyah Phases, respectively (Prewitt 1981). Temporal diagnostics including Scallorn and Edwards arrow points define the Austin Phase (1200-650 BP; Prewitt 1981). It appears that the use of burned rock middens may have reached its peak during this phase (Black and Creel 1997). The subsequent Toyah Phase spans 650-350 BP and includes the first occurrence of pottery in Central Texas (Black 1989a). Characteristic artifacts of this phase include Perdiz and Cliffton arrow points (Black 1986). Material culture associated with the Late Prehistoric period points to increasing complexity in subsistence patterns and to very large prehistoric populations (Black 1989a; Collins 2004).

Historic

The Historic period in South Texas begins with the arrival of Europeans. Although the Historic period theoretically begins in Texas with the shipwreck of the Narvaez expedition along the Texas coast in 1528, the majority of the inhabitants of Texas were Native Americans until the late eighteenth century. From AD 1550 to the late 1600s European forays into South and Central Texas were infrequent. René Robert Cavelier, Sieur de La Salle, established a French settlement, Fort St. Louis, along Matagorda Bay on the Texas coast in 1685. Hunger, disease, and escalating hostilities between the French and the Karankawas subsequently destroyed the colony (Foster 1998). The first Europeans settled in the region in early AD 1700 (Taylor 1996). The southward incursion of the Comanche and Apache and the northward expansion of Spanish influence led to the displacement of many of the area's indigenous groups. Decimated by disease brought by Europeans, many of the remaining groups sought refuge in the numerous Spanish missions established early in the eighteenth century. The move to the missions significantly impacted the hunter-gatherer way of life and the material culture. Artifacts from the Historic period reflect European influences and include metal, glass, and ceramics along with pre-Hispanic Goliad wares and lithic arrow points, tools, and gunflints.

In Bastrop County, the early Historic period was emphasized by Spanish *entradas* across the region, including those by Domingo Teran de los Rios in 1691, Pedro de Aguirre in 1709, and Louis Jucherean St. Denis in 1714 (Foster 1995). In 1804 a small Spanish fort, Puesta de Colorado, was constructed at the Camino Real crossing of the Colorado River (Leffler 2001). This location was colonized by Stephen F. Austin in 1830 as the center of his "Little Colony" (Marks 2012b). Settlement further westward into the Camp Swift area was scarce, due to altercations with Native American groups, until roughly 1836 when Texas gained independence from Mexico and the Texas Rangers offered settlers better protection (Leffler 2001). Generous land grants offered by the Republic of Texas, a treaty with the Comanche in 1845, and the expansion of the railroads into the region in the 1870s resulted in the arrival of more people, new towns, such as Sayersville, McDade, Oak Hill, and Elgin, and a substantial increase in farming on the Camp Swift area (Leffler 2001). At the outbreak of World War II the United States Army began to acquire land for the construction of a military training base near Bastrop. A total of 55,906 acres was originally purchased displacing approximately 350 families (Sitton 2006). By 1943 Camp Swift was the largest training facility in Texas (Leffler 2001).

Previous Archaeological Investigations

Two hundred and ninety-five archaeological sites have been documented as a result of multiple investigations at Camp Swift, including 224 ineligible sites, 13 eligible sites, and 58 sites with unknown eligibility for the NRHP. Table 3-1 lists the number of sites recorded during various surveys on the facility.

Multiple archaeological investigations have been completed on the facility over the last 30 years. These investigations includes two University of Texas Archaeological Society (UTTAS) surveys (Fawcett Jr. 1975; Skelton and Freeman 1979), a 1991 LCRA survey (Nightengale and Moncure 1996) several EH&H surveys (Moore 1987; Nash et al. 1996; Schmidt and Cruse 1995) a series of TXMF/AGD surveys (Leshley 1994, 1996; Stringer and Wormser 1996; Sullo and Wormser 1996; Wormser 1993a, b, 1994; Wormser et al. 1997; Wormser and Leshley 1995; Wormser and Sullo 1996), a 2000 TXMF/AGD/University of Texas at San Antonio Center for Archaeological Research (UTSA-CAR) survey (Robinson et al. 2001), one UTSA-CAR testing project (Munoz 2010), two CAS surveys (Nickels et al. 2010; Nickels et al. 2005), and four CAS testing projects (Lohse and Bousman 2006; Nickels and Bousman 2008; Nickels and Lehman 2004; Nickels et al. 2003).

A review of the 295 documented sites on Camp Swift revealed that 64 sites lie within a 2.5 km radius of the centerpoint of the two survey areas (the dropzone expansion and the area affected by wildfire, Figure 3-1). Of the 64, 33 are

Table 3-1. Recorded Sites on Camp Swift

Investigator		Date	# of Recorded Sites
UT-TAS	Skelton and Freeman	1979	85
LCRA	Nightengale and Moncure	1996	15
EH&A	Schmidt and Cruse	1995	
	Nash et al.	1996	
AGTX	Wormser	1993	15
	Wormser	1993	
	Leshley	1994	
	Wormser	1994	
	Wormser and Leshley	1995	
	Leshley	1996	
	Stringer and Wormser	1996	
	Sullo and Wormser	1996	
	Wormser and Sullo	1996	
	Wormser et al.	1997	
AGTX/UTSA	Robinson et al.	2001	58
UTSA	Munoz	2010	1
CAS	Nickels et al.	2005	11
	Nickels et al.	2010	110
Total			295

prehistoric (41BP97, 112, 120, 121-123, 125, 126, 431, 432, 435, 498, 518, 522, 524, 527, 528, 747, 754-759, 761-766, 768-770) 26 are historic (41BP133, 141-144, 149-156, 163, 166, 169, 514, 516, 517, 519, 525, 752, 760, 767, 771, and 854), and 5 sites have both prehistoric and historic components (41BP119, 122, 430, 433, and 523). Seven of the documented sites (41BP125, 144, 155, 430, 432, 522, and 523) lie on the survey area and will be discussed in detail in Chapter 4.

Of the 33 prehistoric sites, 2 are recorded as quarries, 5 as lithic scatters, and 26 as open campsites. Of the open campsites, three are documented as containing hearths. Twenty-six of the sites are ineligible and seven have unknown eligibility (41BP528, 747, 754, 759, 761, 765, and 766) for the NRHP. Site 41BP528 was originally reported by Robinson (2001). Nickels and Lehman (2004) revisited the site and recommended additional work on the basis of shovel tests suggesting multiple discrete components. In 2005 CAS revisited the site concluding, based on backhoe testing, that it is an open campsite dating to the Late Archaic. Additional work was recommended (Lohse and Bousman 2006). The remaining six potentially eligible site were shovel tested as part of a 2010 archaeological survey of 3,475 acres of the facility (Nickels et al. 2010). All were recorded as open campsites with the potential for deeply buried intact burned rock features.

Three of the 26 historic sites within the 2.5 km radius are documented as water features (cisterns, wells, water troughs), 1 as an historic quarry, 2 as trash scatters, 1 as the foundations and cistern/well of the Wayside school, 1 as the site of a farmstead and an earlier fort, and 18 as homesteads. Of the 18 homesteads, 3 contain a water feature and 1 the remains of a kiln and fragmented tombstones, indicating a burial. Site 41BP854 was first identified and partially documented by TXMF personnel during construction of a Volksmarch trail in the area in 2008. Because of the possibility of damage to the site from the installation of firebreaks to suppress a large wildfire in July 2009, the CAR was contracted to complete the site documentation. A large surface scatter of historic artifacts was recorded on the site, including features. Because one of the features, a brick alignment, is in close proximity to large numbers of glazed brick and numerous stoneware sherds including pinched ceramic remnants, it was concluded that the site was a homestead with a kiln for producing stonewares. Another of the features, a grouping of gravestone fragments, indicates the presence of a burial on the site. The CAR recommended that 41BP854 be considered eligible for the NRHP (Munoz 2010).

Of the 26 historic sites, 4 were documented as having unknown eligibility for the NRHP (41BP143, 154, 752, and

771). Site 41BP154, the site of the one-room Wayside School, was first recorded by Skelton and Freeman (1979), revisited by the CAR in 1997 (Robinson et al. 2001), and finally revisited by the CAS in 2006 (Nickels et al. 2010). All that remains of the structure are foundation stones, a cistern, and scattered artifacts. The CAS suggests that extensive archival research as well as the excavation of test units may reveal significant information and therefore, that the site is potentially eligible for the NRHP. The probable site of an early fort, 41BP143, was first visited by Freeman in 1979. She noted at least three discrete collapsed buildings and mounded earth (Skelton and Freeman 1979). The CAR placed shovel probes on the site during a revisit in 1997 (Robinson et al. 2001). The CAS revisited the site in 2005, noted historic artifacts on the surface, but could find no evidence of building remains. Based on the artifacts recovered from during shovel testing and the location, the CAS concluded that the site could possibly represent a fort-like structure and occupation. More work was recommended and the sites NRHP eligibility was listed as unknown (Nickels et al. 2010). The two remaining potentially eligible sites were shovel tested as part of the CAS 2010 archaeological survey (Nickels et al. 2010). Both were recorded as homesteads with the potential for buried features.

All five of the sites with both historic and prehistoric components were deemed ineligible for the NRHP. The historic components consisted of four homesteads, one with a cistern/well, and one trash scatter. Four open campsites and one lithic scatter comprised the prehistoric components (Nickels et al. 2010; Nickels and Lehman 2004; Nickels et al. 2003; Robinson et al. 2001; Schmidt and Cruse 1995; Skelton and Freeman 1979).

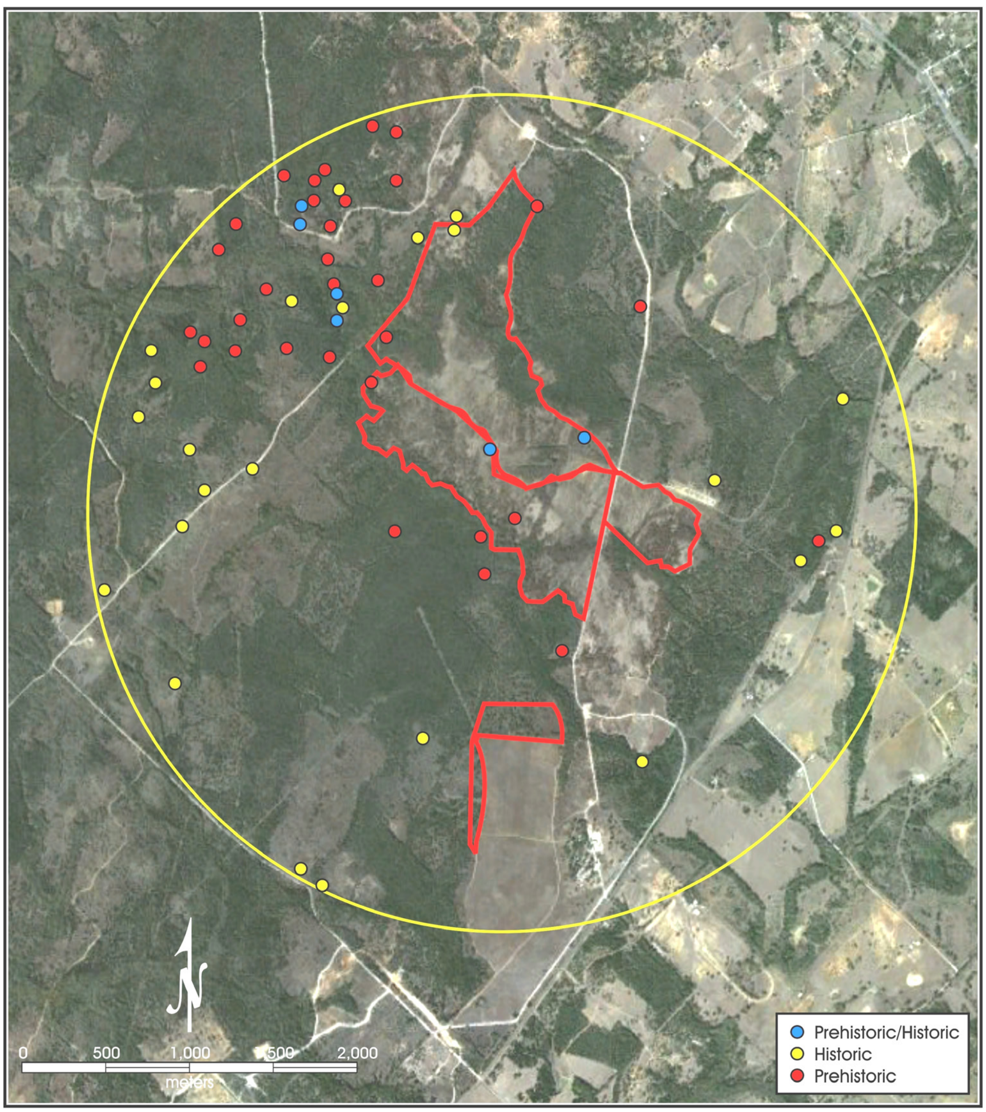

Figure 3-1. *Archaeological sites located within a 2.5 km radius of the survey area centerpoint.*

Chapter 4: Field and Laboratory Methods

As part of the archaeological services provided to the Texas Military Forces, and in accordance with the Texas Historical Commission guidelines, the Center for Archaeological Research was contracted to conduct the following fieldwork: 1) complete an intensive archaeological reconnaissance survey of 100% of a 550 acre portion of Camp Swift accompanied by shovel testing; 2) GPS any isolated finds; 3) GPS all shovel tests; 4) identify, delineate and GPS the boundary of any newly discovered archaeological sites as well as objects or features of interest associated with the site; 5) record any sites and request trinomials; 6) create GIS data layers and deliver shape files of any site boundaries to the TXMF; and 7) assess the NRHP eligibility of any newly discovered sites and determine if the sites are considered not eligible or eligible for the NRHP or if further investigation is recommended. This chapter presents the field and laboratory methods used during the archaeological investigations of 550 previously surveyed acres on Camp Swift.

Field Methods

Experienced staff archaeologists under the direct supervision of the project archaeologist conducted the fieldwork. CAR survey teams worked one ten-day, one four day session, and one two day session. The project archaeologist and a crew of three to five staff archaeologists performed all work involved in the site discovery and recording stages. The project manager visited the survey area and worked with the crew during site delineation. The field investigations consisted of three stages: site discovery, site recording, and revisits of previously recorded sites. The first two stages of work included shovel testing for the discovery of buried cultural deposits. No shovel tests were excavated during site revisits.

Prior to the start of fieldwork, the project manager and project archaeologist reviewed geologic and topographic maps, soil surveys, and aerial photographs to evaluate the survey area and as an aid for transect and shovel test placement. Reports of previous investigations were reviewed and previously recorded sites were noted. A preliminary visit to and assessment of the survey area indicated that approximately 75% of the area was burned resulting in excellent ground visibility. Most of the vegetation was completely burned away exposing what appeared to be substantial sandy deposits over the majority of the survey area. The remaining 25% of the project area had poor visibility due to heavy grass cover and ground shrubs in clearings and dense leaf litter in heavily forested areas. The archaeological investigation consisted of a pedestrian survey and shovel testing of 100% of the project area.

Pedestrian Survey and Shovel Testing

Survey transects were spaced at 30 m intervals across the entire 550 acre survey area. The project archaeologist delineated the area into manageable parcels of land (Areas 1 to 6) by using facility roads, bulldozer cuts excavated as firebreaks, and treelines (Figure 4-1). In each area the project archaeologist calculated transect degree headings using a hand-held compass and aerial photograph. Each transect's starting and ending points were marked with biodegradable toilet paper. Crew members maintained their bearing on each transect with hand-held compasses. The CAR field crew traversed the project area notating, photographing, and recording surface feature and artifact concentrations with Trimble Geo XT GPS units. All surface artifacts (n=34) encountered that did not meet the minimum requirements for a site (see the following section) were recorded as isolated finds. These artifacts were recorded with a GPS unit and their locations were plotted on the maps and aerials. Surface artifacts were not collected.

No THC minimum survey standards are documented for non-linear properties of over 200 acres. After consulting with the TXMF cultural resource manager, it was agreed to excavate 1 shovel test per 5 acres, resulting in 110 shovel tests across the project area. Shovel tests were systematically distributed across Areas 1 to 6 according to soil type. This distribution was intended to enable conclusions to be drawn on the depth of the sandy mantle on the project area and the potential for archaeological sites by soil series. As discussed in Chapter 2, the survey area is made up of seven soil types: Edge (AfC and AfC2), Crockett (CsD3), Robco (DeC), Sayers (Sa), Silstid (SkC), Tabor (TfB), and Padina (PaE). Based on area, the percentage of each soil type in each of the areas (1 to 6) was calculated. The total number of shovel tests for each area (based on one test per five acres) was then multiplied by these percentages to determine placement and number of shovel tests in each soil unit (Table 4-1). Shovel tests locations were then placed on the soil series using ArcGIS (Figure 4-2).

UTM coordinates for these 110 locations were determined and uploaded into Trimble Geo XT GPS units prior to the CAR's commencement of fieldwork. Each test was numbered sequentially by area (e.g. ST 3-23 would be the third shovel test on Area 3). Shovel tests were located in the field using the GPS map feature. No shovel tests were excavated

Figure 4-1. *Breakdown of survey area for management purposes.*

in areas exceeding 20% slopes due to the likely secondary depositional context of such materials. If a predetermined location fell on a slope, the project archaeologist determined a new location for the shovel test.

Shovel tests were 30 cm in diameter, and when not prevented by obstacles (i.e. large roots, cobbles), extended to 70 cmbs or until sterile red clay was encountered. The shovel tests were excavated in 10-cm increments, and all soil from each level was screened through ¼ inch hardware cloth (Figure 4-3). A small 4-x-6 mm bag of soil was sampled from each level and returned to the CAR for soil susceptibility and Munsell color analysis. All artifacts encountered in shovel tests were recovered by appropriate provenience and returned to the CAR laboratory for processing and analysis. A standardized shovel test form was completed for each shovel test, even if no artifacts were recovered. Data collected from each shovel test included the final excavation depth, a tally of all materials recovered from each 10 cm level, and a brief soil description (hardness, inclusions, and texture). Any additional observations considered pertinent were included as comments on the standard shovel test excavation form. All shovel tests were

Table 4-1. Number of Shovel Tests per Soil Series

Area 1	**39 acres**		**8 STs**
Soil Series	**Acreage**	**% of Area**	**STs/Soil Series**
AfC	16.2	42	3
AfC2	6.5	17	2
DeC	10.7	27	2
SkC	5.2	13	1
TfB	0.4	1	0
Area 2	**51 acres**		**10 STs**
Soil Series	**Acreage**	**% of Area**	**STs/Soil Series**
AfC	14	27	3
AfC2	7.6	15	1
CsD3	6.5	13	1
DeC	3.1	6	1
PaE	3.4	7	1
TfB	16.4	32	3
Areas 3 and 4	**199 acres**		**40 STs**
Soil Series	**Acreage**	**% of Area**	**STs/Soil Series**
AfC	42.2	21	9
AfC2	79.6	40	16
DeC	21.9	11	4
PaE	0.4	0	0
Sa	8.9	5	2
SkC	24	12	5
TfB	22	11	4
Areas 5 and 6	**261 acres**		**52 STs**
Soil Series	**Acreage**	**% of Area**	**STs/Soil Series**
AfC	54.7	21	11
AfC2	105	40	21
CsD3	24.9	10	5
DeC	14.6	6	3
Sa	24.5	9	5
TfB	37.3	14	7

backfilled immediately upon completion. The location of every shovel test was identified through the use of GPS units. Shovel test locations were sketched onto aerial photographs as a backup to GPS provenience information.

Site Recording and Identification

For the purposes of this survey, newly encountered archaeological sites were defined as locations containing a certain number of cultural materials or features that are at least 50 years old within a given area. The definition of a site used for this project was as follows: (1) Five or more surface artifacts within a 15 m radius (ca. 706.9 m^2), or (2) a single cultural feature, such as a hearth, observed on surface or exposed in shovel testing, or (3) a positive shovel test containing at least three total artifacts, or (4) two positive shovel tests located within 30 m of each other.

If cultural materials meeting the minimum criteria for an archaeological site were encountered in a shovel test or on the surface, a minimum of six shovel tests were excavated

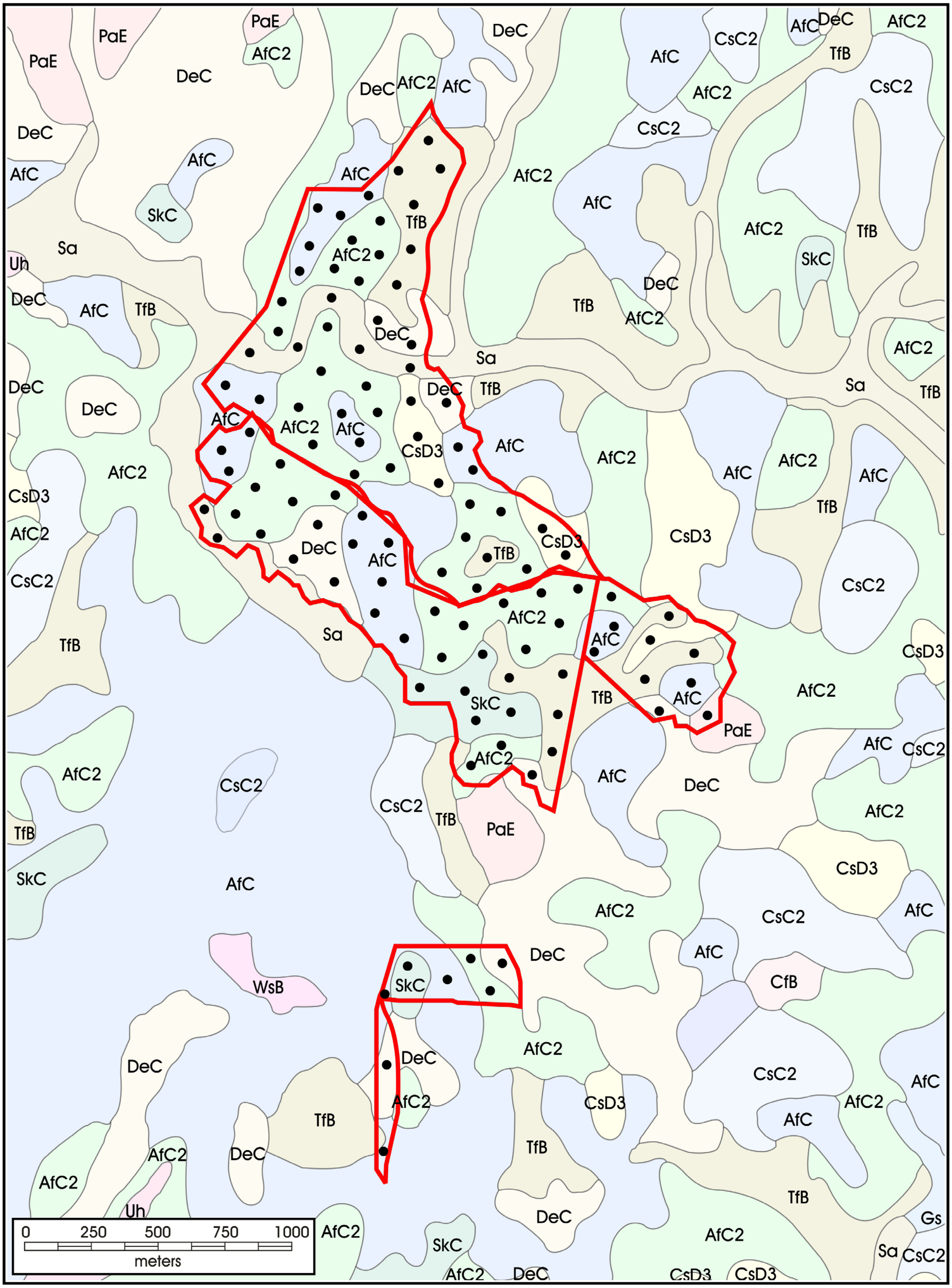

Figure 4-2. *Project map showing planned shovel test locations by soil type.*

Figure 4-3. *Shovel testing in Area 6.*

at close intervals to define the extent of the distribution. The site boundaries were then plotted on aerial photographs and a topographic quadrangle map and location data was collected with a GPS unit. The location of any cultural features, surface artifact densities, and any temporally diagnostic artifacts were plotted with the GPS. Digital photographs were taken of and temporary field numbers were assigned for each site. To establish site datums, rebar was hammered deeply into the center of the sites. An aluminum tag with the field site number was attached. Texas Site Forms were prepared for all new sites and trinomials were obtained. Aluminum tags with the trinomials were created and replaced field site number tags on the datums. All datums were recorded with a GPS unit.

At the conclusion of the site discovery phase of the fieldwork, the project archaeologist reviewed locations that had sufficient artifact density to be labeled as potential sites. Revisiting these locations for detailed inspection formed the second phase of fieldwork.

Revisiting and Documenting Sites

In order to record all sites systematically, the project archaeologist and the survey crew revisited potential sites as a team. The survey team would intensively examine the ground surface, flag artifacts, and note any high-density concentrations and/or features. Where possible, the field crew attempted to make a 100% inventory of the surface assemblage at each site. Each artifact was recorded with the GPS unit specifying artifact types (e.g., debitage, biface, core, aqua glass, stoneware, white earthenware, etc). Artifacts appearing to be temporally diagnostic were collected and transported to the CAR for analysis. To identify horizontal and vertical site boundaries, shovel tests were excavated off of previously recorded positive tests in each of the cardinal directions. Additional tests were dug around any positives resulting from the delineation. For sites consisting of surface scatters, shovel tests were excavated outside the edges of the scatter as well as within the scatter. The project archaeologist determined the number of shovel tests, taking into consideration site size, artifact frequency over the site surface, and topographic variation over the site surface. The number of shovel tests excavated during this stage of the fieldwork at each site ranged from a minimum of 6 to a maximum of 30, depending on site size.

During the site revisit stage, shovel tests were numbered using two methods. For additional shovel tests placed off of previously recorded positive tests from the discovery phase of fieldwork, the shovel tests were numbered sequentially from the positive test number (e.g. ST 2-9-2 is the second shovel test excavated off of positive ST 2-9, the ninth shovel test in Area 2). For sites initially noted from surface scatters, shovel tests were numbered sequentially by site with the temporary site field numbers preceded by an x (e.g. ST x1-14 would be the fourteenth shovel test excavated during the revisit of Field Site 1). Site boundaries were established according to surface artifacts and positive shovel test distribution. A site boundary was determined by a substantial decrease in surface or subsurface artifact densities.

Ten new archaeological sites were recorded as a result of this process (Figure 4-4, *see envelope at back of report*). One hundred and sixteen shovel tests were excavated to delineate these sites. Five possible fieldsites, based on positive shovel tests previously recorded during the discovery phase, did not meet the definition of an archaeological site. Thirty-nine additional shovel tests were placed around these positive tests. Overall, the cultural resource inventory resulted in the hand excavation of 265 shovel tests (Figure 4-5).

Revisits of Previously Recorded Sites

Seven previously recorded sites are located on the survey area (41BP125, 144, 155, 430, 432, 522, and 523). The UTM coordinates for these seven locations were determined, and uploaded into Trimble Geo XT GPS units prior to the CAR's site revisits. The CAR field crew thoroughly traversed the areas corresponding to the UTM coordinates with the goal of determining if the wildfire damaged previously recorded aspects of the site or exposed unrecorded artifacts or features. Surface artifacts were noted and recorded with the GPS units.

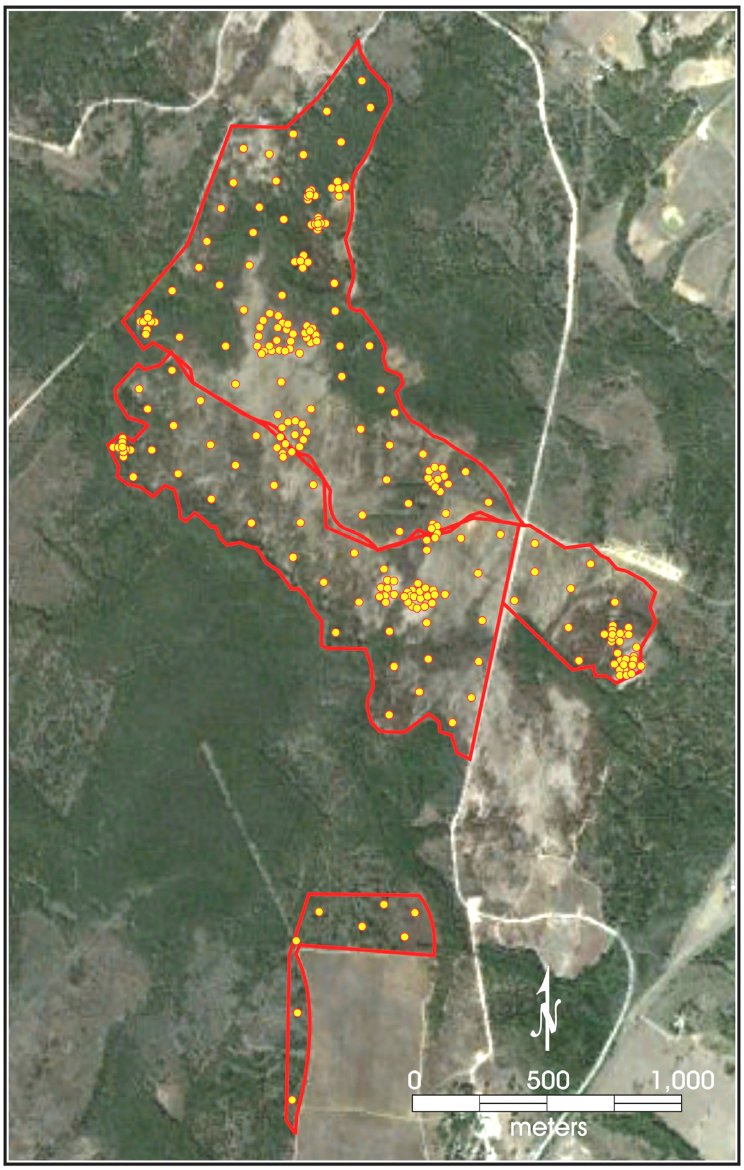

Figure 4-5. *The location of shovel tests (n=265) on the project area.*

No shovel tests were excavated on these sites. Based on the results from previous excavations the NRHP eligibility of all seven sites was classified as not eligible.

Archaeological Laboratory Methods

Cultural materials and records obtained and/or generated during the project were prepared in accordance with federal regulation 36 CFR part 79, and THC requirements for State Held-in-Trust collections. Additionally, the materials were curated in accordance with current guidelines of TARL. Digital photographs were printed on acid-free paper and labeled with archivally appropriate materials and placed in archival-quality sleeves. All field forms were completed with pencil. Field notes, forms, photographs, and drawings were printed on acid-free paper and placed in archival folders. A copy of this survey report and all computer data pertaining to the investigations were stored in an archival box and curated with the field notes and documents. Following laboratory processing and analysis, and in consultation with both the TXMF/AGD and the THC, all sediment samples were discarded. This discard was in conformance with THC guidelines. Upon completion of the project, all remaining materials and records were submitted to the Texas Archaeological Research Laboratory (TARL) for permanent storage.

Chapter 5: Survey Results

The survey of the Camp Swift project area was completed in January 2012. This chapter discusses the results of the cultural resource inventory. The fieldwork consisted of an intensive pedestrian reconnaissance accompanied by shovel testing of the 550-acre project area and revisits of previously recorded archaeological sites.

The pedestrian survey and shovel testing of the project area revealed surface scatters of historic and prehistoric artifacts and subsurface prehistoric cultural material. Isolated surface finds, consisting of 17 prehistoric artifacts and 17 historic artifacts, were noted on the project area. Additional isolated finds (seven prehistoric and one historic) were recovered from shovel tests. Six surface scatters (two prehistoric and four historic), three buried prehistoric sites with surface scatters, and one buried prehistoric site without evident surface artifacts were documented on the project area (Table 5-1).

Shovel Tests

Two hundred and sixty-five shovel tests (ST) were excavated during the resurvey of the Camp Swift project area (see Appendix A, Table A-1). Of the 265 tests, 88 (33%) were excavated to the target depth of 70 cmbs and 53 (20%) terminated upon hitting red clays by 20 cmbs (Figure 5-1). The remaining 124 shovel tests were terminated at depths ranging from 22 to 60 cmbs due to red clay (Figure 5-2) or large roots (2%). Only 11% of the shovel tests (n=28) were positive for cultural material. All positive tests were delineated to determine if the material was isolated or met the CAR's definition of an archaeological site. Four of the twenty-eight positives were determined to contain isolated cultural material. Isolated Find 1 consists of one piece of debitage and one small burned rock found in Level 1 (0-10 cmbs) of ST 5-5. The eight shovel tests placed around ST 5-5 were negative (Figure 5-3). Isolated Find 2 is a single specimen of burned rock uncovered in Level 4 (30-40 cmbs) of ST 5-11 (see Figure 5-3), Isolated Find 3 is a shard of clear flat glass recovered from Level 1 (0-10 cmbs) of ST 5-12, and Isolated Find 4 consists of two pieces of burned rock from Levels 3 (20-30 cmbs) and 4 (30-40 cmbs) of ST 5-18. All the additional shovel tests placed around the isolated finds were negative (Figure 5-4). The remaining 24 positive tests, part of archaeological sites, are discussed in detail in a subsequent section of this chapter.

Shovel Test Soils

The soils from the shovel tests corresponded for the most part to the soil types as located and described by Baker (1979) and the Soil Survey Staff (2012, see Chapter 2). Table 5-2 presents the depths of shovel tests dug in the various sedi-

Table 5-1. Summary of New Archaeological Sites and NRHP Eligibility Recommendations

Site	Time Period	Description	NRHP Eligibility Recommendation
41BP859	Prehistoric	Buried site with surface scatter	Unknown
41BP860	Historic	Surface scatter	Not Eligible
41BP861	Prehistoric	Surface scatter	Not Eligible
41BP862	Prehistoric	Surface scatter	Not Eligible
41BP863	Historic	Surface scatter	Unknown
41BP864	Historic	Surface scatter	Not Eligible
41BP865	Prehistoric	Buried site with surface scatter	Unknown
41BP866	Prehistoric	Buried site with surface scatter	Unknown
41BP867	Prehistoric	Buried site with no evidence of surface scatter	Not Eligible
41BP868	Historic	Surface scatter	Not Eligible

Figure 5-1. *Termination of Shovel Test 6-4-1 at 10 cmbs upon exposing red clay.*

ment types. In general, soil samples collected from Levels 1 through 7 (0-70 cmbs) of the 159 shovel tests excavated into the Edge series (AfC and AfC2) ranged in color from a hue of 10YR, value of 5 to 7, and chroma of 1 to 4 (light gray to very pale brown to gray to light brownish gray to pale brown to grayish brown to brown to yellowish brown) to a hue of 7.5YR, value of 5 to 6, and chroma of 3 to 4 (light brown to brown) to a hue of 5YR 5/2 (reddish gray, Table 5-3). Because of the large wildfire, most of the sediments in the upper level (0-10 cmbs) of survey area shovel tests contain ash and charcoal, evident as a grayish hue in the sediments. Shovel tests with sandy deposits to termination at 70 cmbs (19%) tended towards a hue of 10YR, value of 5 to 7, and chroma of 2 to 3 (light gray to very pale brown to light brownish gray to pale brown to brown). Shovel tests on the Edge series where the sandy mantle was shallow tended to terminate on clay sediments with a color of brown (7.5YR 5/4) to reddish

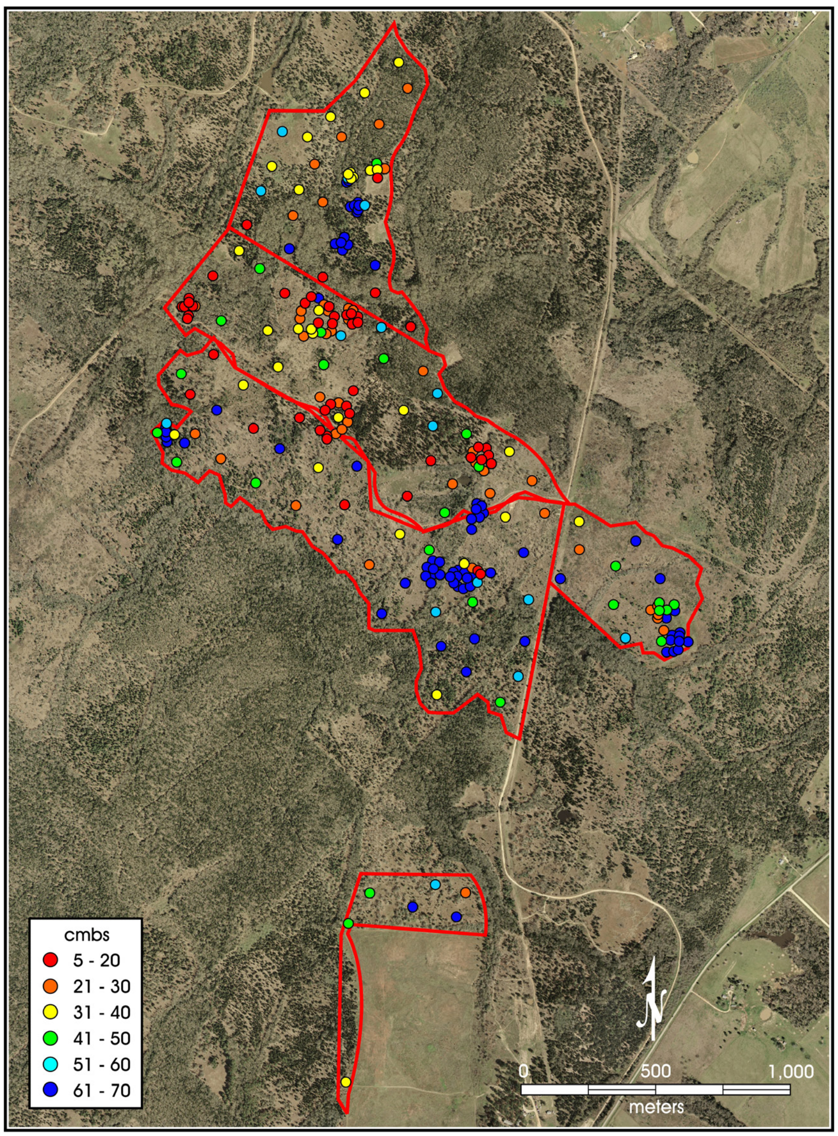

Figure 5-2. *Aerial map of project area showing termination depths of shovel tests.*

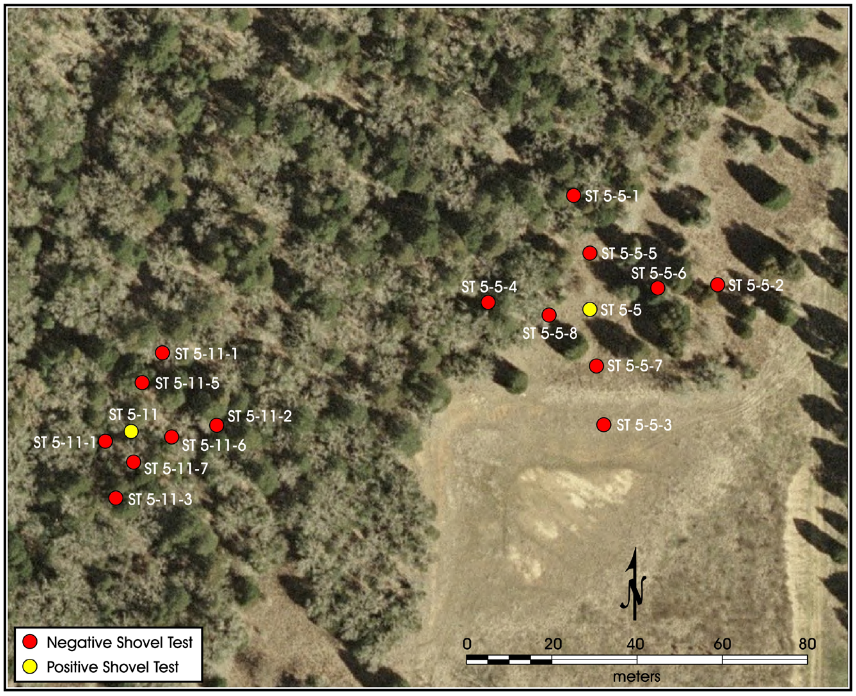

Figure 5-3. *Shovel tests in the area of Isolated Finds 1 and 2.*

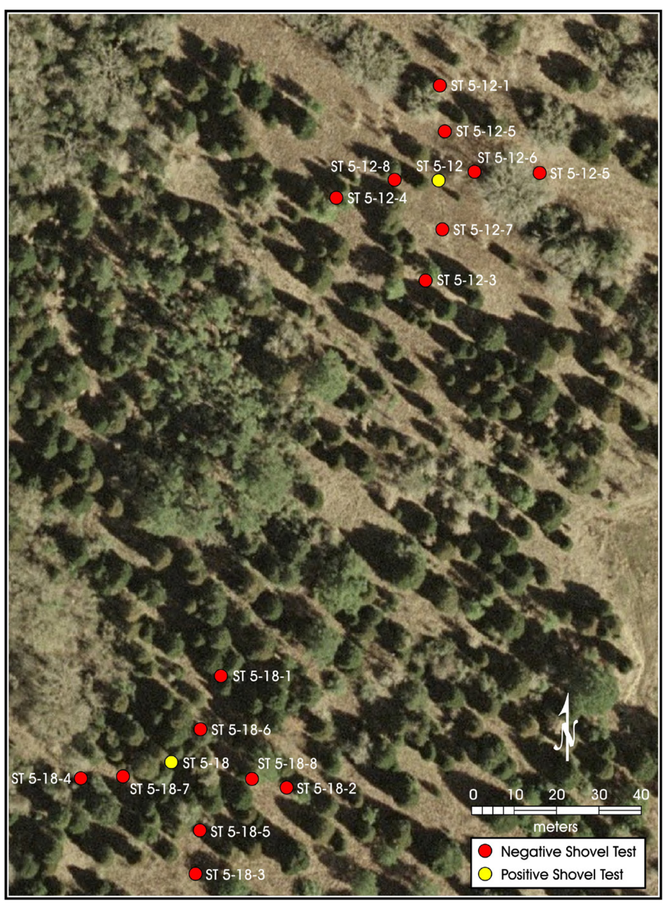

Figure 5-4. *Shovel tests in the area of Isolated Finds 3 and 4.*

Table 5-2. Depths of Sediments as Indicated by Shovel Tests

Soil Series	Setting	Number of Shovel Tests	Average Depth (cm)	Sites Recorded During CAR Survey
Edge fine sandy loam, 1 to 12% slopes (AfC and AfC2)	Gently sloping to strongly sloping uplands	159	37.0	7.6
Robco loamy fine sand, 0 to 8% slopes (DeC)	Nearly level to moderately sloping uplands	18	56.8	0
Padina series, 0 to 15% slopes (PaE)	Uplands and high terraces	17	67.9	0.5
Crockett series, 0 to 10% slopes (CsD3)	Broad nearly level to moderately sloping uplands	6	45.0	0
Tabor series, 0 to 5% slopes (TfB)	Stream terraces and terrace remnants on uplands	39	52.8	0.7
Sayers series, 0 to 3% slopes (Sa)	Nearly level to gently undulating flood plains along streams and rivers	15	48.6	1
Silstid series, 0 to 8% slopes (SkC)	Uplands	11	66.7	0.2

Table 5-3. Soil Colors from Shovel Tests by Soil Series

Hue Value/Chroma	Name	Soil Series						
		Edge	Robco	Padina	Crockett	Tabor	Sayers	Silstid
10YR 7/2	light gray	x						x
10YR 7/3	very pale brown	x				x		
10YR 6/1	gray	x						
10YR 6/2	light brownish gray	x	x	x		x		x
10YR 6/3	pale brown	x	x		x	x	x	x
10YR 6/4	light yellowish brown							x
10YR 5/2	grayish brown	x	x	x	x	x		
10YR 5/3	brown	x	x		x	x	x	
10YR 5/4	yellowish brown	x					x	x
10YR 5/6	yellowish brown							x
10YR 4/2	dark grayish brown					x		
7.5YR 6/3	light brown	x						
7.5YR 5/4	brown	x						
7.5YR 5/3	brown		x			x	x	x
5YR 5/2	reddish gray	x						

gray (5YR 5/2). Figure 5-5 illustrates the color range from soil samples from each level of STs 3-4, 4-4, 6-12, and 6-8.

Examples of the color range from the excavated levels of STs 5-12 and 6-25 on Tabor (TfB) and STs 2-7 and 4-12 on Robco (DeC) sediments are shown in Figure 5-5. Soil sampled from each level of the 39 shovel tests located on the Tabor deposits ranged in color from a hue of 10YR, value 4 to 6, and chroma 2 to 3 (very pale brown to pale brown to light brownish gray to brown to grayish brown to dark grayish brown) to 7.5 YR 5/3 (brown, see Table 5-3). Shovel tests containing sandy deposits to 70 cmbs (44%) contained brown to pale brown to very pale brown sediments. Shallow deposits tended towards dark grayish brown (10YR 5/2) sediments over dark grayish brown (10YR 4/2) clay. A similar pattern was documented on the Robco series. Soil samples collected from the 18 shovel tests ranged in color from a hue of 10YR, value 5 to 6, and chroma 2 to 3 (light brownish gray to pale brown to grayish

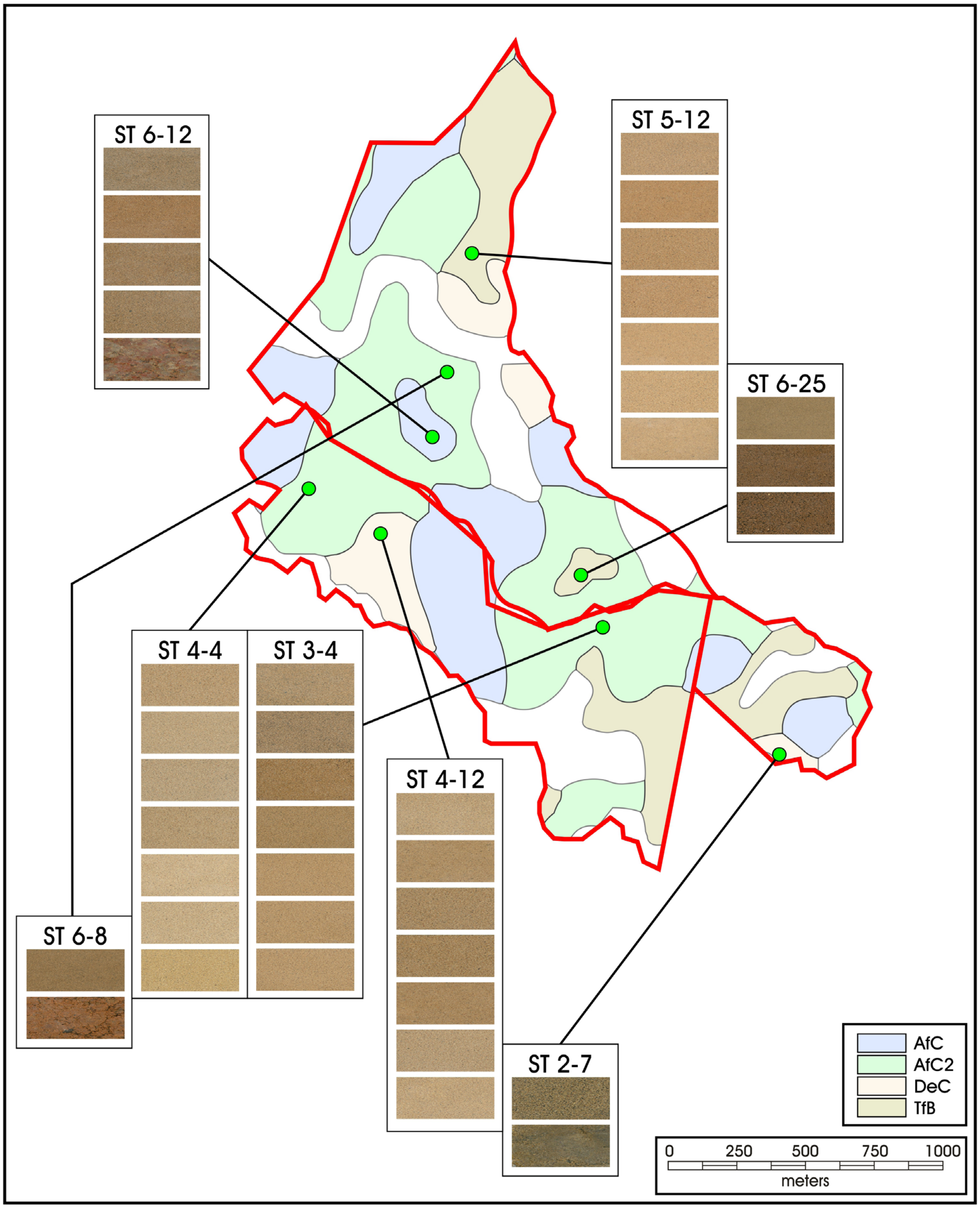

Figure 5-5. *Map showing soil colors excavated from representative shovel tests on areas of AfC, AfC2, DeC, and TfB soil series.*

brown to brown) to 7.5YR 5/3 (brown). Shovel tests with sandy deposits to termination (56%) tended towards a hue of 10YR, value of 5 to 7, and chroma of 2 to 3 containing pale brown, brown and light brownish gray sediments. DeC shovel tests where the sandy mantle was shallow tended to terminate on grayish brown (10YR 5/2) clay sediments.

Soil excavated from each level of the six shovel tests located on the Crockett (CsD3) deposits ranged in color from a hue of 10YR, value 5 to 6, and chroma 2 to 3 (pale brown to brown to grayish brown) to 7.5 YR 5/3 (brown, see Table 5-3). The deepest shovel test in this soil type terminated at 60 cmbs, at the commencement of clay. The sandy levels, containing pale brown to brown sediments, topped grayish brown clay. Resembling Crockett sediments but for a yellowish rather than grayish brown termination, the soil colors from the 15 shovels tests in the Sayers (Sa) series range from a hue of 10YR, value 5 to 6, and chroma 3 to 4 (pale brown to brown to yellowish brown) to 7.5YR 5/3 (brown). Of the 15 shovel tests, 40% contained sandy soils to termination (70 cmbs). The sandy sediments overlie a yellowish brown clay. Examples of the color range from the excavated levels of STs 2-5 and 6-15 on CsD3 deposits and from the excavated levels of STs 4-9 and 5-17 on Sa deposits are shown in Figure 5-6.

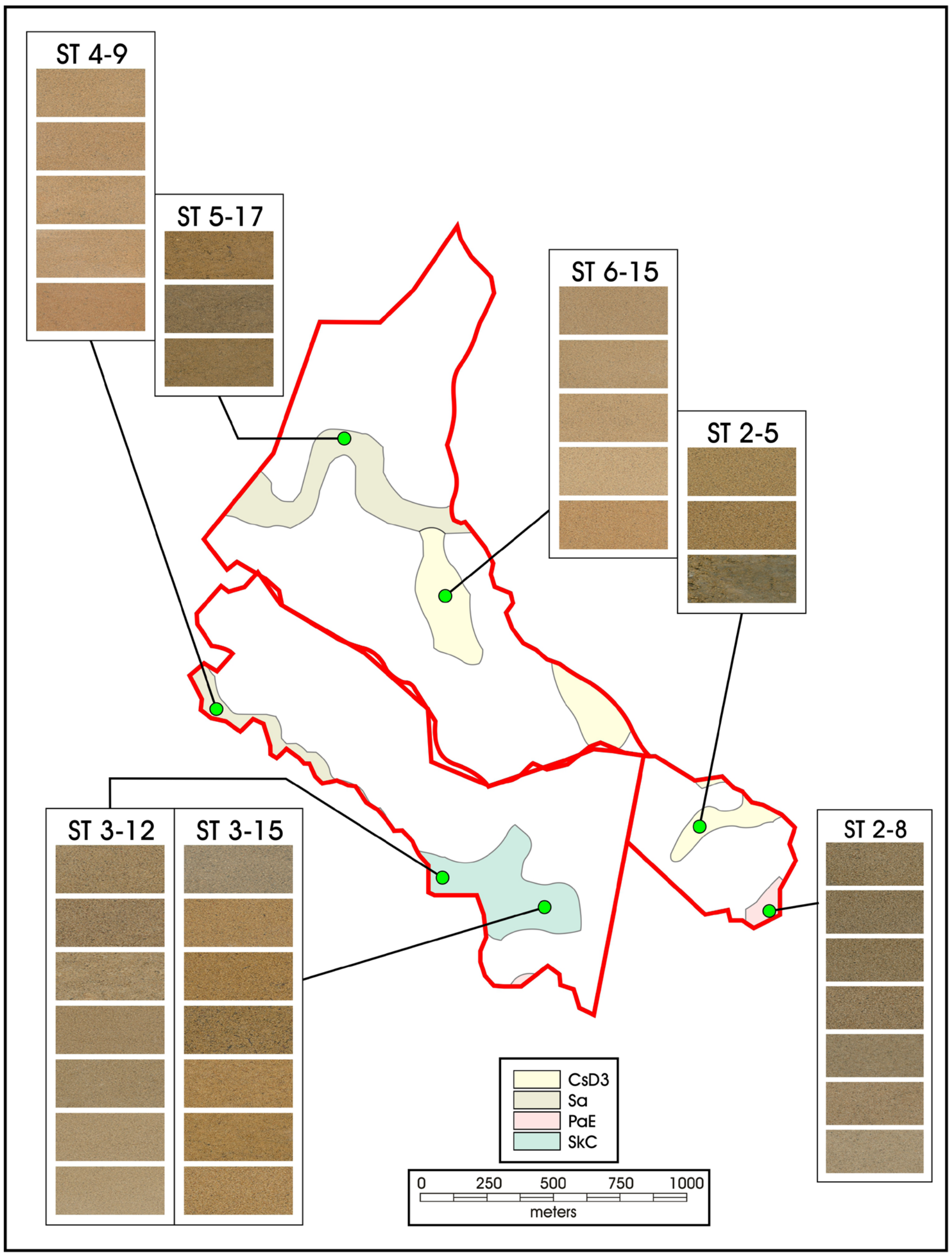

Figure 5-6. *Map showing soil colors excavated from representative shovel tests on areas of Sa, CsD3, SkC, and PaE soil series.*

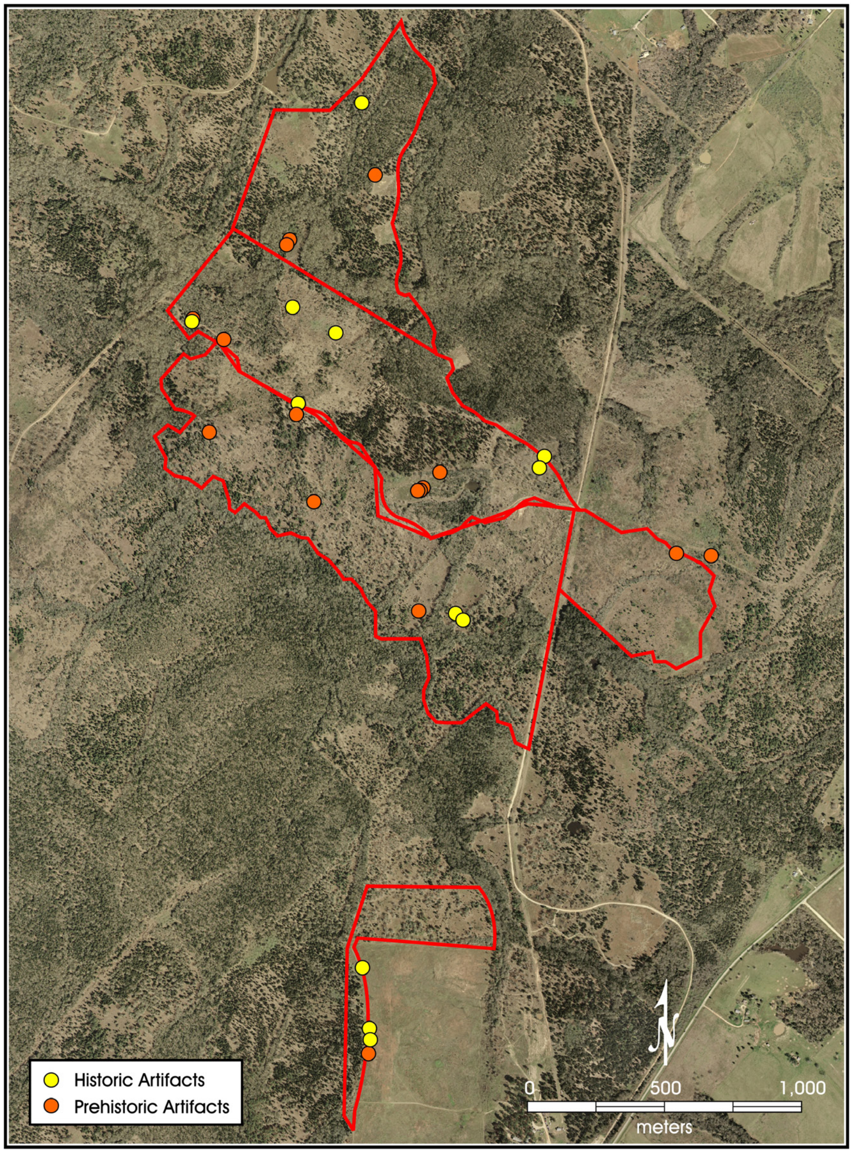

Figure 5-7. *Location of isolated finds (prehistoric and historic artifacts) on the project area. (Note that some locations are overlapping).*

Silstid (SkC) deposits removed from each level of 11 shovel tests ranged in color from a hue of 10YR, value 5 to 7, and chroma 2 to 6 (light gray to light brownish gray to pale brown to light yellowish brown to yellowish brown) to 7.5 YR 5/3 (brown). Of the 11 shovels tests, 82% terminated at 70 cmbs without exposing clay. The sandy levels, containing pale brown to brown sediments, topped yellowish brown clay (10YR 5/6). Seventeen shovel tests were excavated in the Padina (PaE) series with 88% containing sandy deposits to 70 cmbs. The sandy sediments ranged in color from a hue of 10YR, value 5-6, and chroma 2 (light brownish gray to grayish brown, see Table 5-3). Two shovel tests exposed grayish brown clay. Figure 5-6 illustrates the color range from the excavated levels of STs 3-12 and 3-15 on SkC and ST 2-8 on PaE sediments.

Reconnaissance of the Project Area

In addition to the shovel testing, the survey consisted of a 100% pedestrian reconnaissance of the 550-acre project area. The CAR field crew traversed the project area along transects evenly spaced at 30 m. During the reconnaissance, 34 surface artifacts (10 specimens of debitage, 6 tools, 1 core, 11 ceramic items, 5 fragments of glass, and 1 brick) were recorded as isolated finds (Table 5-4, Figure 5-7). Isolated surface finds were not collected. These artifacts were not found in concentrations meeting the CAR's definition of a surface archaeological site (i.e., five or more surface artifacts within a 15 m radius). Artifact scatters qualifying as sites were also documented and are discussed in a subsequent section.

Table 5-4. Isolated Surface Artifacts on the Project Area

Area	Debitage	Biface	Modified Flake	Core	Ceramic	Glass	Brick	Total
1	1				2	4		**7**
2		1						**1**
3	1				3			**4**
4	1	2	1			1		**5**
5	2		1		1			**4**
6	5	1		1	5		1	**13**
Total	**10**	**4**	**2**	**1**	**11**	**5**	**1**	**34**

Revisits of Previously Recorded Sites

The CAR's fieldwork included revisits of seven previously recorded archaeological sites on the project area. Of the seven, three are prehistoric, two are historic, and two contain both components (Table 5-5). Because the sites have all been fully documented, additional work other than brief site inspections was not conducted. Using predetermined UTM locations loaded onto GPS units, the CAR located the seven sites. Two of the seven, 41BP125 and 144, were not affected by the wildfire. No surface artifacts were evident but the remains of probable shovel tests were noted on 41BP125. The remains of what may be a collapsed cistern as well as a surface scatter of historic artifacts and three grouping of white cemetery iris (*Iris albacans*) were noted on the previously recorded location of 41BP144. At the time the site was first recorded (Skelton and Freeman 1979), it was comprised of a well or cistern and a scatter of historic trash probably associated with a twentieth-century historic house site. A large scatter of historic artifacts continued to the west and southwest of the site polygon. The CAR recorded what was obviously visible on the surface. Artifact visibility was hindered by heavy undergrowth and leaf litter. Cultural material consisted of glass (n=25); ceramics (n=3); enamelware (n=2); metal, including cans, barrel hoops, scrap, etc. (n=22); and brick spread among the artifacts (n=5) and in a scatter (n= at least 20). No artifacts were collected. Based on the artifact scatter, the site boundary of 41BP144 was extended, expanding the site from 662 m^2 to 4,679 m^2 (Figure 5-8). The previous investigation determined that the research value of this site has been exhausted, and thus 41BP144 was not eligible for nomination to the NRHP (Mauldin 2001). The CAR concurs with the previous recommendation.

The remaining five sites all contained evidence of the large wildfire with 70 to 100% of vegetation burned off. Both 41BP155, a large historic homestead, and 41BP430, a historic homestead with lithic scatter, were easily relocated. Ceramics, including white earthenware and stoneware; glass; bricks, and cut sandstone were documented on the surface. What appears to be a collapsed well was located near the center of 41BP430 (Figure 5-9). The feature was noted in the approximate location documented on a previous site map (Nickels and Lehman 2004). Although two of the sites, 41BP432, a lithic scatter, and 41BP522, an open campsite, were located using UTM coordinates, the CAR could find no cultural material, site datums, or evidence of prior shovel testing. Both sites were burned; the former 70%, the latter 100%. Of interest, the UTMs for site 41BP522 are located approximately 111 m west from a newly discovered lithic scatter, 41BP865. The two sites are approximately the same shape, but the newly recorded site is roughly twice as large. It is possible that 41BP522 is misplotted. 41BP865 is discussed in detail in a subsequent section of this chapter. The last of the seven previously recorded sites, 41BP523, was completely denuded of vegetation by the fires. A large brick scatter, noted on a previous site map (Nickels et al. 2003) was relocated. Historic artifacts and a lithic scatter were noted on the surface.

Archaeological Sites Documented on the Survey Area

At the request of the TXMF/AGD Environmental Resources Office, this chapter does not include site locations. A USGS topographic map showing the site locations is included within a pocket envelope attached to the back cover of this report. Site location information is restricted to protect sites. Access to this information must be granted by the TXMF or TARL. Ten sites were discovered and tested during this survey; four have historic components and six historic components (see Table 5-1).

Table 5-5. Previously Recorded Sites on the Project Area

Trionomial	Type	Level of Investigation	NRHP Status	Reference
41BP125	Open Campsite	Shovel Tests and Test Units	Ineligible	Nickels and Bousman 2008
41BP144	Historic Homestead	Pedestrian	Ineligible	Robinson et al. 2001
41BP155	Historic Homestead	Pedestrian	Ineligible	Robinson et al. 2001
41BP430	Historic Homestead and Lithic Scatter	Shovel Tests	Ineligible	Nickels and Lehman 2004
41BP432	Lithic Scatter	Shovel Tests	Ineligible	Nickels et al. 2003
41BP522	Open Campsite	Shovel Tests	Ineligible	Robinson et al. 2001
41BP523	Historic Homestead and Lithic Scatter	Shovel Tests	Ineligible	Nickels et al. 2003

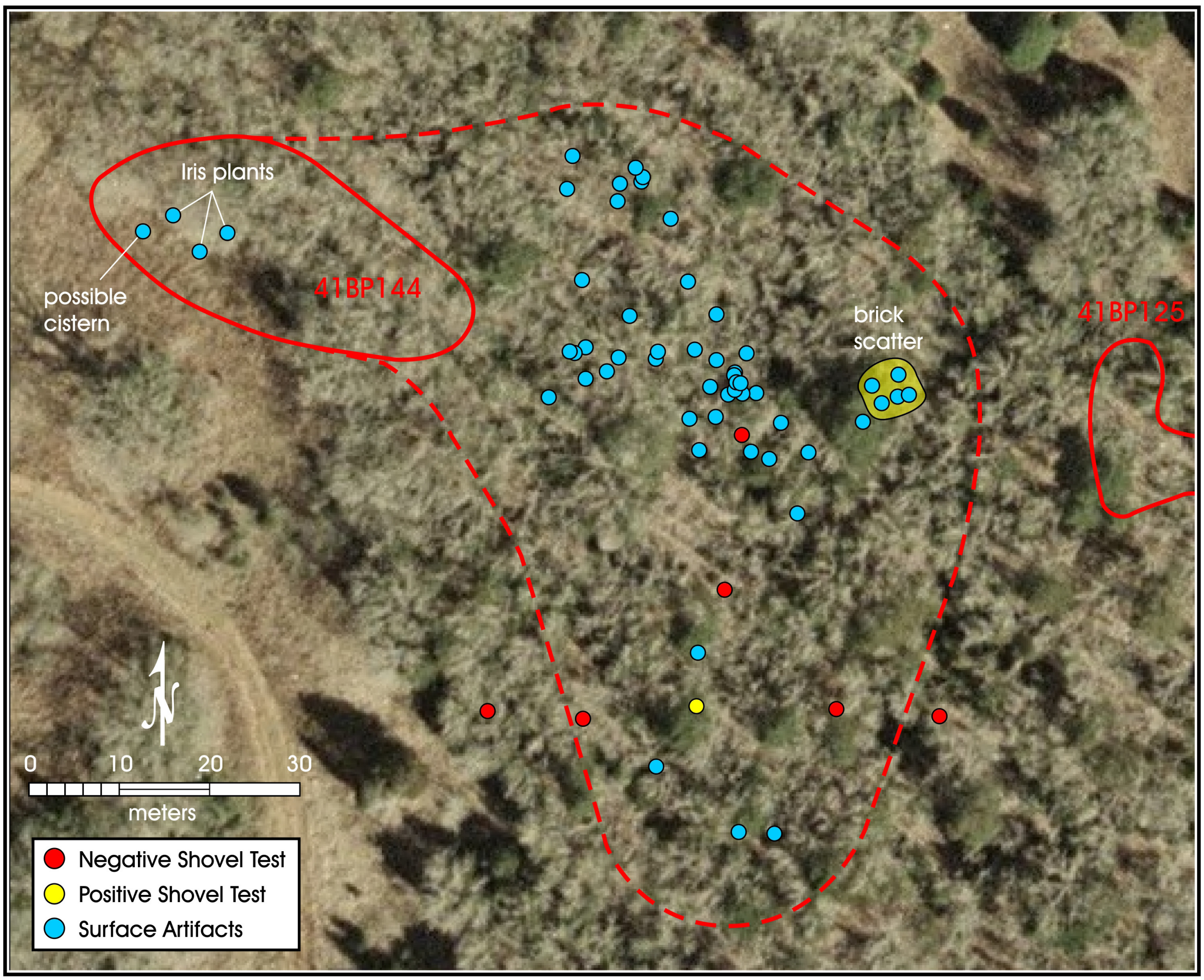

Figure 5-8. *Proposed extension of previously recorded historic site 41BP144 showing location of positive (yellow) and negative (red) shovel tests and location of surface artifacts (blue).*

Figure 5-9. *Collapsed well on previously recorded historic site 41BP430.*

Prehistoric Site 41BP859

41BP859, consisting of a surface scatter of lithic debitage (n=27), tools (n=6, Figure 5-10), and one Alba arrow point (Figure 5-11) is located immediately adjacent to a tributary of McLaughlin Creek, approximately 245 m south of East Loop Road and 200 m north of McLaughlin Creek. The site ranges in elevation from 146 to 149 m AMSL. Tabor (TfB), Edge (AfC2), and Silstid (SkC) sandy soils cover the area and prior to the wildfires supported grasses and weeds, with scattered pine and cedar trees. The site appears to have been cleared in the past. At the time of the survey all surface vegetation was burned resulting in 100% surface visibility (Figure 5-12).

The lithic scatter was discovered during the pedestrian reconnaissance on a 30 m interval transect. Seventeen shovel tests, five located in the scatter and twelve on the edges of the scatter, were excavated to determine the depth of the site and to delineate the site's boundary (Figure 5-13). Seven of the shovel tests were positive yielding debitage (n=13), and burned rock (n=10). The results of the positive shovel tests are presented in Table 5-6. All seven positive tests contained sandy deposits to termination. Of the ten negative tests, five terminated at 70 cmbs in sandy sediments and five were terminated upon hitting red clay at depths ranging from 10 to 52 cmbs. These five were all located to the north and east of the scatter, four on Edge (AfC2) and one on Tabor (TfB) series. Based on the edges of the scatter and the distribution of positive shovel tests, the site covers 6,037 m^2.

To attempt to determine if increases in organic matter were evident on the site, soil samples from three of the shovel tests (STs X1-4 and X1-14 both on-site, and X1-7 off-site) were analyzed for magnetic susceptibility (MSS). In archaeological research, magnetic soil susceptibility has primarily been used to help identify buried soils that may be associated with occupation (e.g., Takac and Gose 1998) and as an aid in identifying sediment (Bellomo 1983; Dalan and Banerjee 1998) or rock associated with hearths (Mauldin and Figueroa 2006). The magnetic susceptibility of a given sample can be thought of as a measure of how easily that sample can be magnetized (Dearing 1999). While the measure of susceptibility is initially dependent on the mineralogy of a particular sample, that is the concentration and grain size of ferro- and ferrimagnetic minerals, a number of processes can result in an increase in MSS values in a sediment sample. These processes include an increase in the organic constitutes and changes in the mineralogy of sediments in a given sample (see Collins et al. 1994; McClean and Kean 1993; Singer and Fine 1989). Sediments with higher organic content tend to have higher magnetic susceptibility values, probably as a result of the production of maghemite, an iron oxide, during organic decay (Reynolds and King 1995). Pedogenic processes, such as soil formation and weathering, can result in the concentration of organic material, as well as alterations in the mineralogy of a given zone. These processes can significantly increase susceptibility readings. Cultural processes, such as the concentration of ash, charcoal, and organic refuse, would also produce higher MSS readings (see Mauldin 2003).

Figure 5-10. *Biface located on prehistoric site 41BP859.*

Figure 5-11. *Projectile point found on the surface of 41BP859.*

Figure 5-12. *Overview of prehistoric site 41BP859.*

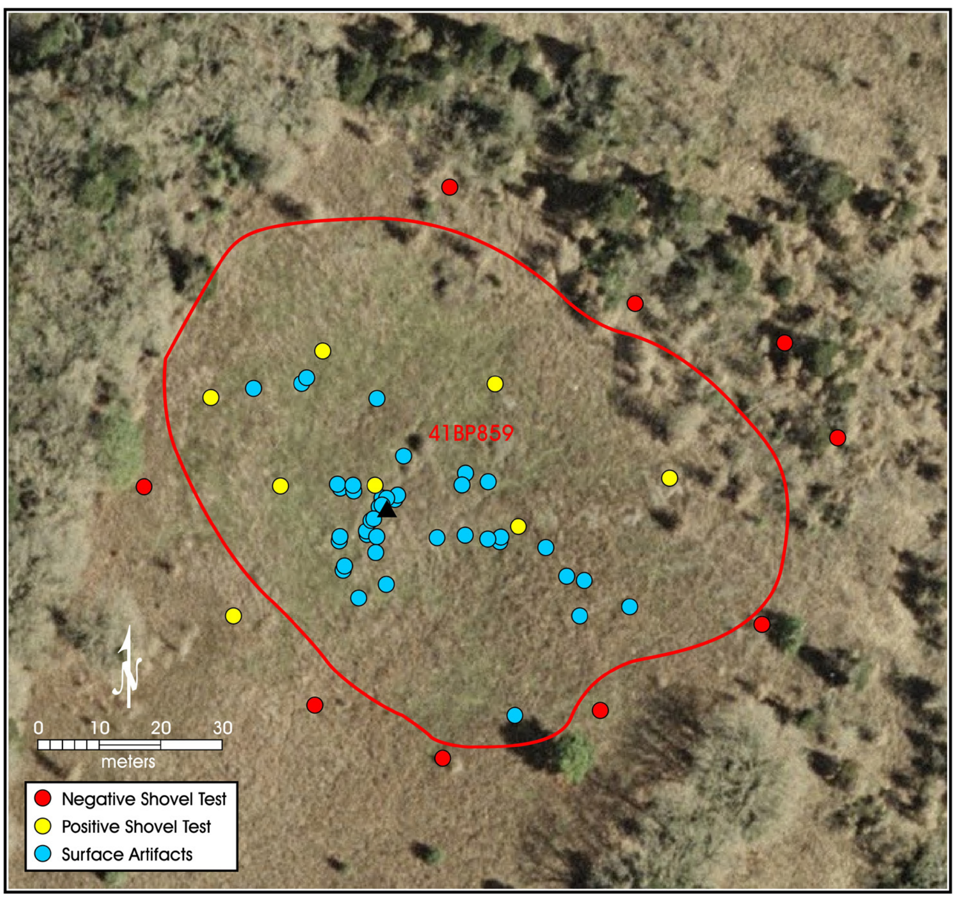

Figure 5-13. *Aerial map of 41BP859 showing site boundary, location of positive (yellow) and negative (red) shovel tests, and location of surface artifacts (blue).*

Table 5-6. Results of Positive Shovel Tests at 41BP859

Depth (cm)	ST X1-1	ST X1-2	ST X1-3	ST X1-4	ST X1-11	ST X1-14	ST X1-16
0-10					1 D	1 BR	
10-20						3 D	1 BR
20-30	1 D			1 D		2 D	1 BR
30-40	1 BR						2 D
40-50			1 D			1 D	2 BR
50-60		2 BR					1 BR
60-70							1 D, 1 BR

Key: D- debitage; BR - burned rock

Soil samples from the surface to 70 cmbs or the emergence of red clay were obtained at 10 cm intervals. Collected in plastic bags, the samples were transported to the CAR laboratory where they were air dried and then crushed using a ceramic mortar and pestle. The sediment was then screened through a 2 mm mesh, with material passing through the mesh packed into plastic pots (10 cm^3). The mass of the sample was determined by subtracting the weight of the pots. Low frequency volume susceptibility (kappa, κ) was measured on a Bartington MS2 meter with an MS2b sensor, and the mass corrected magnetic susceptibility (chi, χ) values were calculated using the sample mass (see Dearing 1999).

The values obtained from STs X1-4, X1-7, and X1-14 are reported in Table 5-7 in SI units ($10^{-6}m^3kg^{-1}$). Figure 5-14 plots the MSS values relative to depth. Note that while there were minor variations in the color of the sediment, no evidence of a buried soil was seen either in the field or in the laboratory review of the samples. The plot, however, shows one peak that may be associated with a surface. The high value in the first 10 cm on the off-site shovel test is likely associated with charcoal and ash from the wildfire. The elevated surface value did not show up in the on-site tests. One possibility is that the Level 1 soil samples from the on-site tests were collected from the bottom of the levels, whereas, the off-site sample was collected closer to the surface. This is speculation but would explain the variance. A peak is present in one of the on-site shovel tests, ST X1-14, at 35 cmbs, but not in the other, ST X1-4. The peak may represent a buried surface with prehistoric associations.

The lithic scatter and the presence of subsurface burned rock on 41BP859 suggest that the site was probably used as an open campsite. Subsurface burned rock suggests the possibility of intact buried features. The presence of debitage in every level but one from the surface to 70 cmbs indicates that the site may contain multiple components. Based on the diagnostic Alba projectile point (AD 800-1200, Turner and Hester 1999), buried burned rock, and the possibility of multiple components, the CAR is unable to recommend an eligibility status for the NRHP and therefore, recommends additional testing on 41BP859. The excavation of test units in the artifact scatter in the immediate vicinity of positive shovel tests should be used to further test this site.

Prehistoric Site 41BP861

41BP861 is a 3,299 m^2 prehistoric lithic scatter at an elevation of 155 m AMSL. The site is located approximately 78 m northeast of a stock tank, 194 m north of East Loop Road, and 643 m north of McLaughlin Creek. Evidence of recent disturbance on the general area of the site was indicated by push piles and dirt mounds. A jeep track runs through the center of the site. Shallow sandy soils (Edge series) lying over red clay cover the area. At the time of the survey site visibility was excellent due to the recent fires. Portions of the site were not affected by the fires (Figure 5-15). Prior to the wildfires, the site was covered with grass, low groundcover, and oak, pine, and cedar trees.

The lithic scatter was noted during the pedestrian reconnaissance on a 30 m interval transect. The scatter included debitage (n=12), tools (n=3), one core, and one historic brick. Ten shovel tests, one located in the scatter and nine on its edges, were excavated to determine the site's boundary and depth (Figure 5-16). All shovel tests were negative with termination depths, due to red clay, ranging from 15 to 47 cmbs; 60% uncovered red clay in Level 2 (10-20 cmbs), 30% in Level 3, and 10% in Level 5 (40-50 cmbs). No diagnostic artifacts or features were noted. Because of the lack of material depth, features, and diagnostics, and heavy disturbance noted on portions of the site, the potential for future research value is low. The CAR recommends the site as ineligible for the NRHP.

Table 5-7. MSS Values of Sediments from Three Shovel Tests on 41BP859

Location	Midpoint Depth	Sample Wt.	K Reading	MSS Value
ST X1-4	5	11.9	17.0	0.142
ST X1-4	15	12.2	16.1	0.132
ST X1-4	25	12.9	18.9	0.146
ST X1-4	35	11.8	17.7	0.149
ST X1-4	45	11.7	19.1	0.163
ST X1-4	55	12.0	19.2	0.159
ST X1-4	65	12.9	23.3	0.180
ST X1-7	5	11.2	37.4	0.332
ST X1-7	15	12.5	27.0	0.215
ST X1-7	25	13.4	29.7	0.221
ST X1-7	35	12.7	21.5	0.169
ST X1-14	5	9.8	21.3	0.216
ST X1-14	15	12.5	27.3	0.218
ST X1-14	25	13.7	32.5	0.237
ST X1-14	35	13.2	36.8	0.278
ST X1-14	45	13.2	30.3	0.229
ST X1-14	55	13.5	30.3	0.223
ST X1-14	65	14.2	29.0	0.204

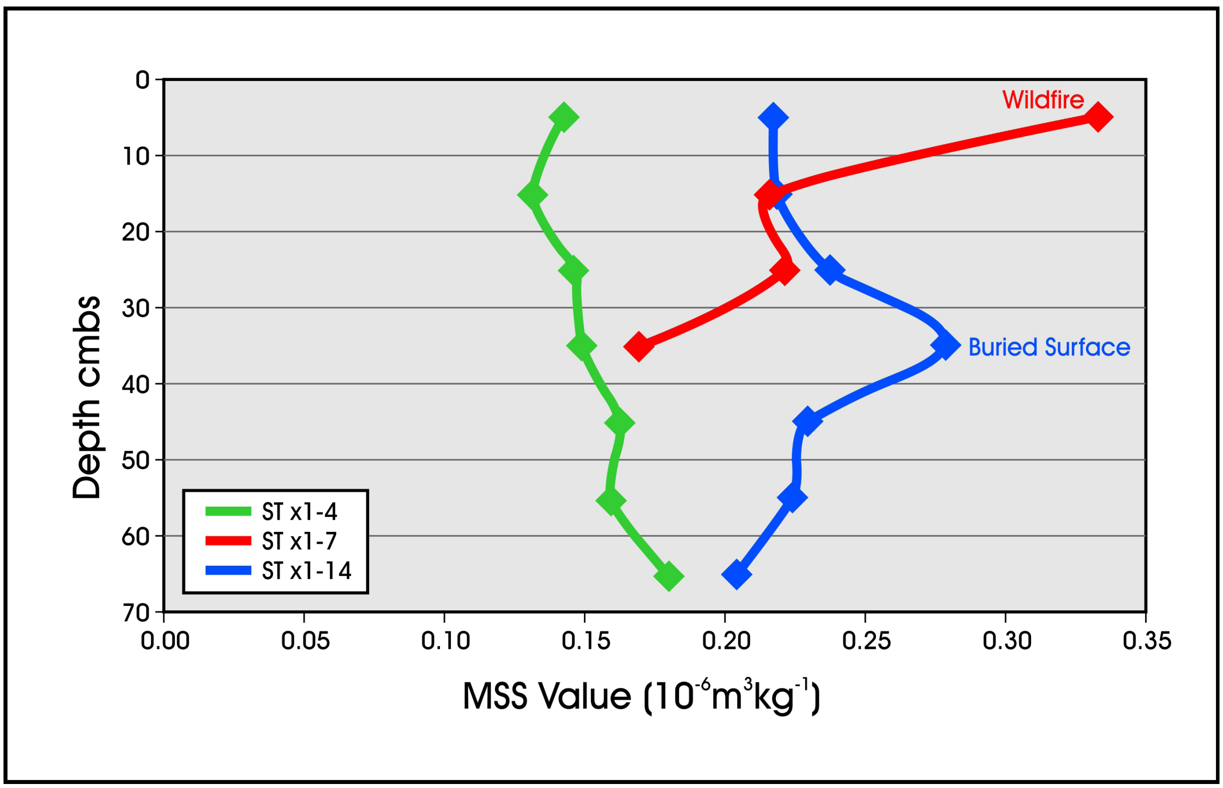

Figure 5-14. *A plot of magnetic susceptibility values from sediments in STs X1-4, X1-7, and X1-14 on 41BP859.*

Figure 5-15. *Overview of prehistoric site 41BP861.*

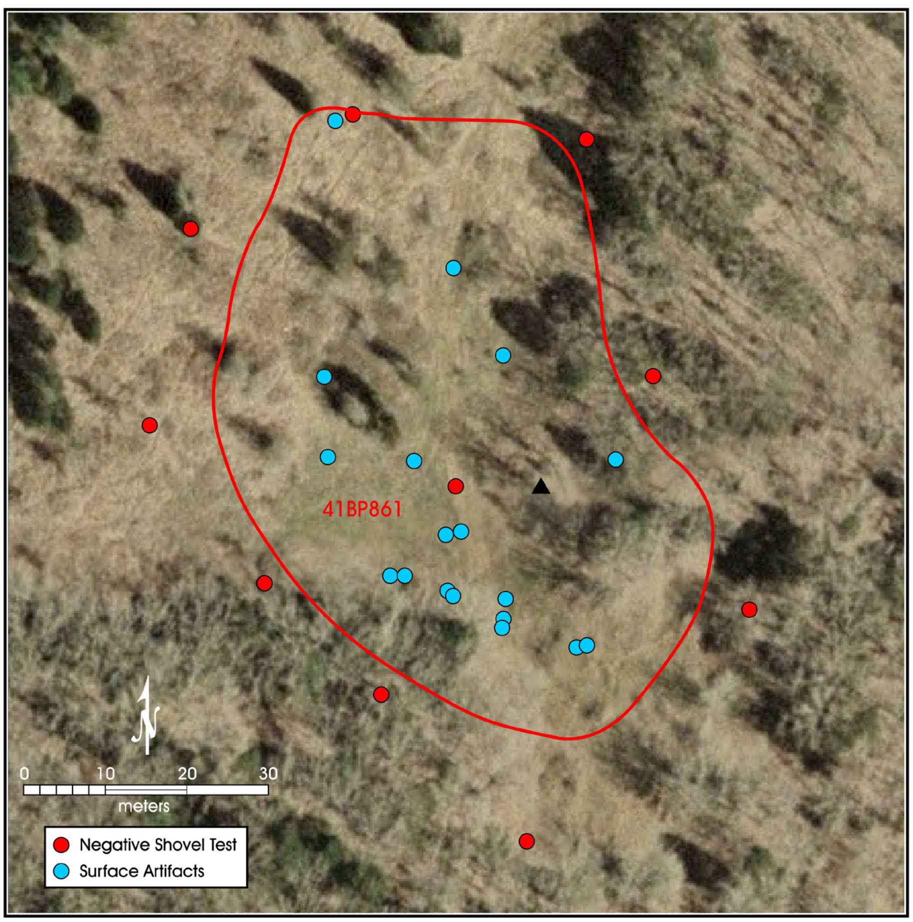

Figure 5-16. *Aerial map of 41BP861 showing site boundary, location of negative shovel tests (red), and location of surface artifacts (blue).*

Prehistoric Site 41BP862

41BP862 consists of a surface scatter of lithic debitage (n=7), tools (n=3), and one core. The site is located approximately 116 m south of McLaughlin Creek and 482 m north of East Loop Road. The site ranges in elevation from 140 to 143 m AMSL. Edge series shallow sandy soils cover the area and prior to the wildfires supported grasses and weeds, with scattered mesquite, pine and cedar trees. At the time of the survey all surface vegetation was burned resulting in 100% surface visibility (Figure 5-17).

41BP862 was noted on a 30 m interval transect during the pedestrian reconnaissance. Nine shovel tests, one situated in the scatter and eight on the edges, were excavated to determine the depth of the site and to delineate the site's boundary (Figure 5-18). All nine tests were negative for cultural material and uncovered red clay in the first few levels; four in Level 1 (0-10 cmbs), two in Level 2 (10-20 cmbs), and three in Level 3 (20-30 cmbs). Based on the edges of the scatter, the site covers 1,354 m^2. No diagnostic artifacts or features were noted. Because of the lack of material depth, features, and diagnostics, the potential for future research value is low. The CAR recommends the site as ineligible for the NRHP.

Figure 5-17. *Overview of prehistoric site 41BP862.*

Figure 5-18. *Aerial map of 41BP862 showing site boundary, location of negative shovel tests (red), and location of surface artifacts (blue).*

Prehistoric Site 41BP865

41BP865, consisting of a surface scatter of lithic debitage (n=38) is located immediately adjacent to a tributary of McLaughlin Creek, approximately 158 m south of East Loop Road, and 256 m north of McLaughlin Creek. The site ranges in elevation from 146 to 149 m AMSL. Site 41BP859 is located across the drainage from 41BP865 (see previous section). Of interest, the UTMs for previously recorded site 41BP522 (see previous section) are located approximately 111 m west from the site. The field crew was unable to locate the site datum, shovel test depressions, or surface artifacts at the recorded UTM. The two sites are approximately the same shape, but the newly recorded site, 41BP865, is roughly twice as large. The CAR suggests the possibility that 41BP522 is misplotted and that 41BP865 may be the same site. However, because that determination cannot be made with any certainty, the lithic scatter was recorded as a new site. Edge (AfC2) and Silstid (SkC) sandy soils cover the area and prior to the wildfires supported grasses and weeds, with scattered pine and cedar trees. The site sits in a clearing. At the time of the survey all surface vegetation was burned resulting in 100% surface visibility (Figure 5-19).

The lithic scatter was discovered during the pedestrian reconnaissance. Eight shovel tests, one located in the scatter and seven on the edges of the scatter, were excavated to determine the depth of the site and to delineate the site's boundary (Figure 5-20). Two of the shovel tests were positive yielding debitage (n=3, Table 5-8). All eight tests contained sandy deposits to termination at 70 cmbs. Based on the edges of the scatter and the distribution of positive shovel tests, the site covers 2,151 m^2.

Soil samples from two of the shovel tests, one on-site, ST X10-6, and one off-site, ST X10-1, were analyzed for magnetic susceptibility to determine if increases in organic matter were evident in the sediments. Soil samples from the surface to 70 cmbs were obtained at 10 cm intervals. The values obtained from the two shovel tests are reported in Table 5-9 in SI units ($10^{-6}m^3kg^{-1}$). Figure 5-21 plots the MSS values relative to depth. No evidence of a buried soil was seen either in the field, in the laboratory review of the samples, or on the MSS plot.

The lithic scatter appears to consist solely of debitage. No burned rock was recorded on the surface or in the shovel tests. No diagnostics or features were uncovered. The presence of debitage on the surface, and below 30 cmbs suggests the possibility of more than one component on 41BP865. The CAR is unable to recommend an eligibility status for the NRHP until additional testing is conducted to resolve this issue. The excavation of test units in the artifact scatter should provide data to determine if the site is made up of multiple components.

Figure 5-19. *Overview of prehistoric site 41BP865.*

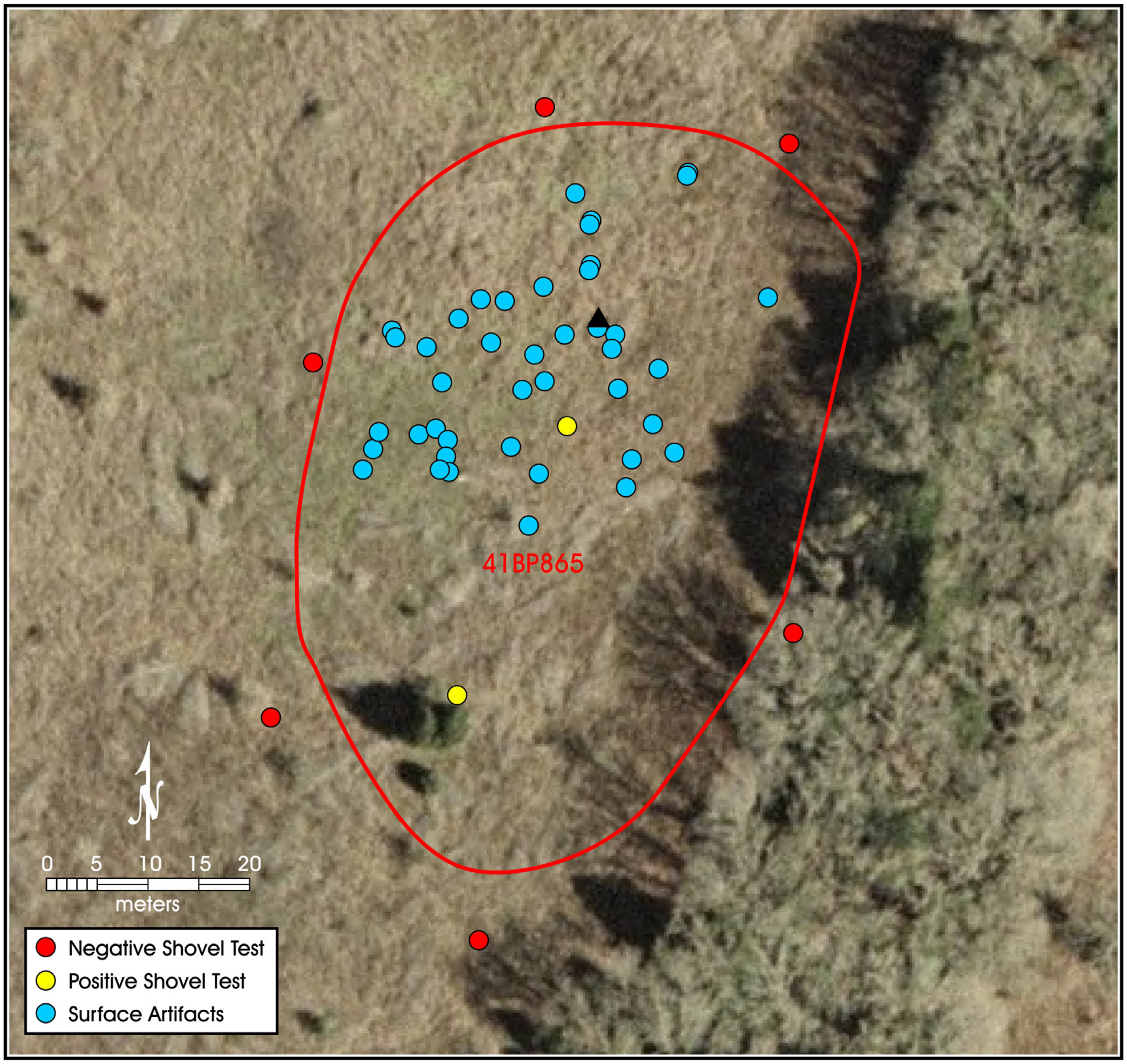

Figure 5-20. *Aerial map showing site boundary, location of positive (yellow) and negative (red) shovel tests, and location of surface artifacts (blue).*

Table 5-8. Results of Positive Shovel Tests at 41BP865

Depth (cm)	ST X10-4	ST X10-6
0-10		
10-20		
20-30		
30-40		1 D
40-50		
50-60		1 D
60-70	1 D	

Key: D - debitage

Table 5-9. MSS Values of Sediments from Two Shovel Tests on 41BP865

Location	Midpoint Depth	Sample Wt.	K Reading	MSS Value
ST X10-1	5	12.4	13.9	0.112
ST X10-1	15	14.6	16.1	0.110
ST X10-1	25	14.9	15.5	0.103
ST X10-1	35	15.0	14.3	0.095
ST X10-1	45	15.2	14.0	0.092
ST X10-1	55	14.7	11.6	0.079
ST X10-1	65	14.8	8.2	0.055
ST X10-6	5	12.5	13.8	0.110
ST X10-6	15	13.2	14.3	0.108
ST X10-6	25	14.0	15.3	0.109
ST X10-6	35	14.7	15.0	0.101
ST X10-6	45	14.7	12.1	0.082
ST X10-6	55	15.1	8.7	0.058
ST X10-6	65	14.8	7.7	0.052

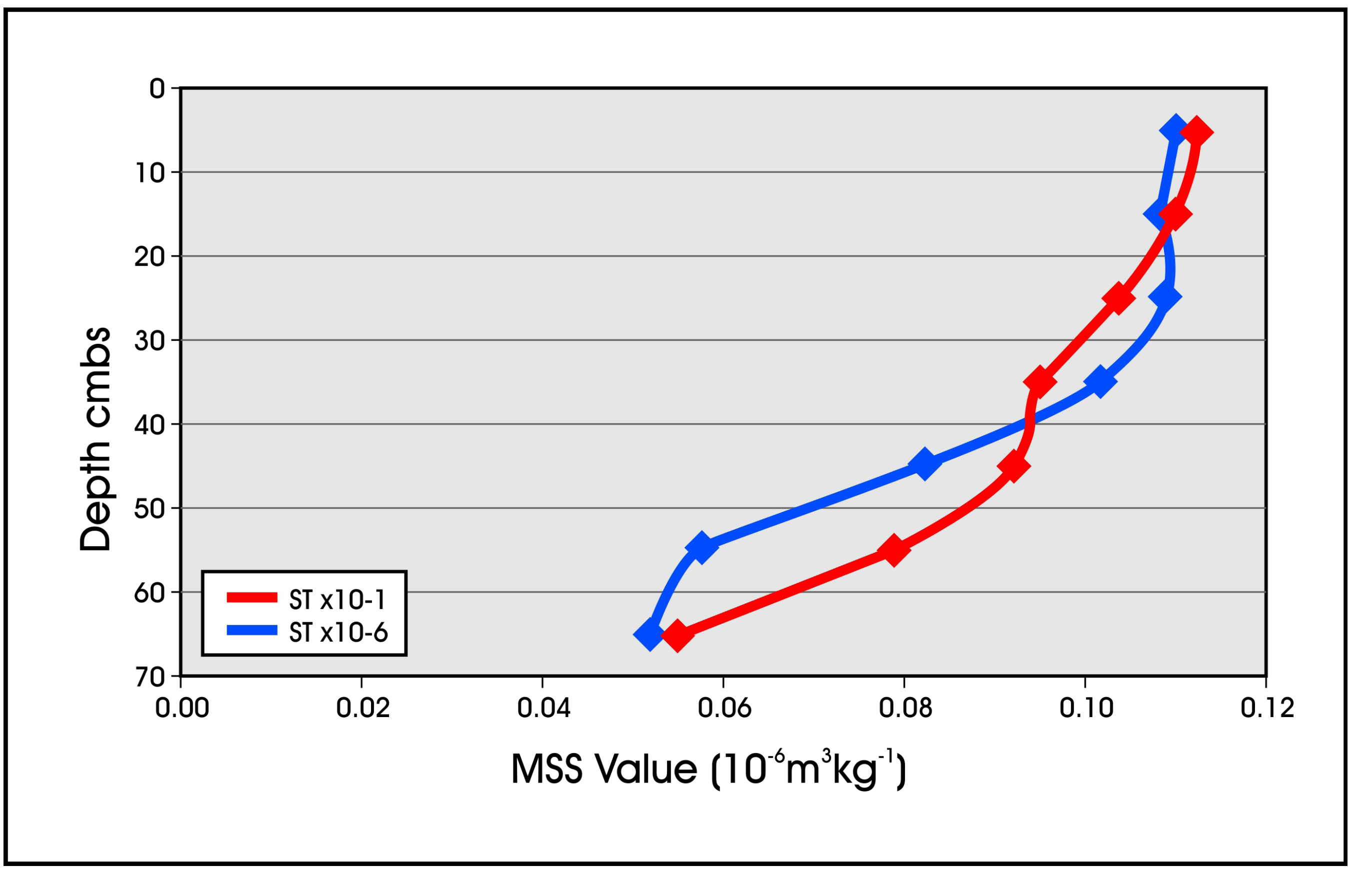

Figure 5-21. *A plot of magnetic susceptibility values from sediments in STs X10-1 and X10-6 on 41BP865.*

Prehistoric Site 41BP866

41BP866 is located approximately 400 m south of East Loop Road, and 240 m northeast of McLaughlin Creek. The site, a prehistoric lithic scatter and probable campsite, covers 9,494 m^2 and has an elevation ranging from 154 to 158 m AMSL. The central and southern portion of the site slopes away from the northern portion which is located on the top of a rise. Deep sandy soils (Padina series) lying over red clay cover the southern half of the site. The sediments on the northern half vary, ranging from shallow to deep areas of Edge series sand over clay. At the time of the survey site visibility was excellent due to the recent fires. The majority of the site vegetation was burned off (Figure 5-22). Prior to the wildfires, the site was covered with grass and low groundcover with sparse scatters of pine and cedar trees. The area appears to have been cleared in the past.

Two shovel tests excavated as part of the site discovery phase during the pedestrian reconnaissance, STs 2-8 and 2-9 (southern and northern portion of 41BP866, respectively), were positive for cultural material. Both positive tests were delineated with additional shovel tests dug in the cardinal directions. Two additional shovel tests dug to the east of ST 2-9, STs 2-9-2 and 2-9-9 were positive. The tests dug off of ST 2-8 were all negative. However, during the excavation of the additional tests near ST 2-8 the surface scatter of lithic material was noted. The scatter consisted of 40 specimens of debitage all clustered on the southern and middle portion of the site. No artifacts were noted on the surface on the northern portion. Because a shovel test (ST X12-2) placed in between the positive tests on the northern section and the surface scatter was positive, it was determined that the positive tests to the north and the surface scatter were all part of one site. All together, 30 shovel tests, 5 located within the scatter and 25 outside, were excavated to determine the site's boundary and depth (Figure 5-23). Of the 30, 6 were positive producing debitage (n=4), burned rock (n=7), and one fragment of metal (Table 5-10). Two of the six positive shovel tests, both located on Edge series sediments on the northern half of the site, were terminated upon the exposure of red clay at roughly 50 cmbs. The remaining four contained sandy sediments to 70 cmbs. Termination depths for the 24 negative tests ranged

Figure 5-22. *Overview of prehistoric site 41BP866.*

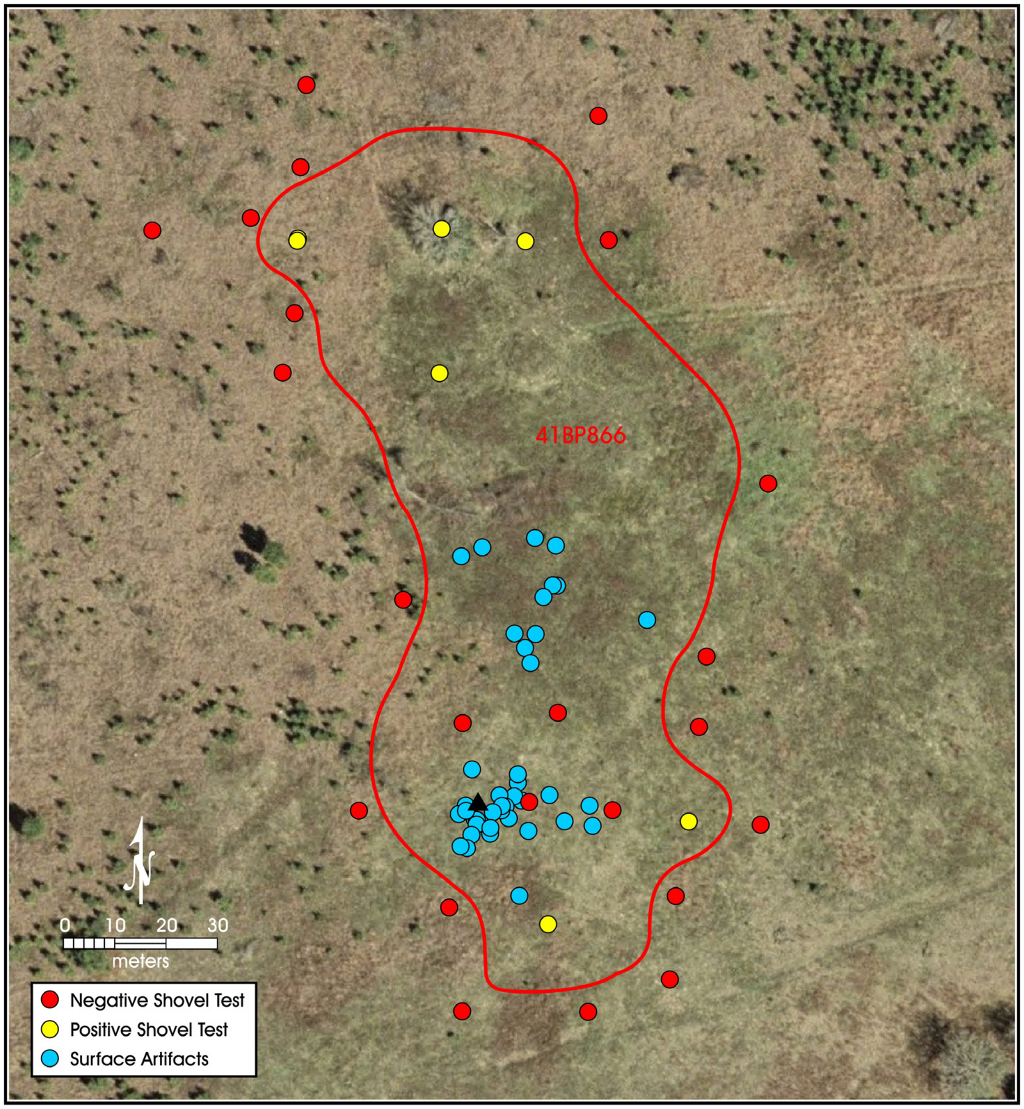

Figure 5-23. *Aerial map of 41BP866 showing site boundary, location of positive (yellow) and negative (red) shovel tests, and location of surface artifacts (blue).*

Table 5-10. Results of Positive Shovel Tests at 41BP866

Depth (cm)	ST 2-8 (south)	ST X11-5 (south)	ST X12-2 (north)	ST 2-9 (north)	ST 2-9-2 (north)	ST 2-9-9 (north)
0-10				1 D, 1 BR		
10-20			1 HS	1 BR		1 BR
20-30					1 M	1 BR
30-40					1 BR	
40-50		1 D			1 BR	
50-60	1 D	1 D				
60-70						

Key: D - debitage; BR - burned rock; HS - heat spall; M - metal; [grey box] - not excavated from 30 to 70 cmbs with 58% consisting of sandy deposits to 70 cmbs and 33% terminating at clay between 30 and 45 cmbs. No diagnostic artifacts or features were noted.

Soil samples from four of the shovel tests, two on-site, STs 2-8-4 (south) and X12-2 (north), and two off-site, STs 2-8-2 (south) and 2-9-1 (north), were analyzed for magnetic susceptibility to determine if increases in organic matter were evident in the sediments. Soil samples were obtained at 10 cm intervals. The values obtained from the four shovel tests are reported in Table 5-11 in SI units ($10^{-6}m^3kg^{-1}$). The MSS values relative to depth are plotted on Figure 5-24. Although no evidence of a buried soil was seen either in the field or in the laboratory review of the soil samples, a spike is apparent at 35 cmbs in ST 2-8-4 that may be associated with a buried surface. In comparison to the other three shovel tests,

Table 5-11. MSS Values of Sediments from Four Shovel Tests on 41BP866

Location	Midpoint Depth	Sample Wt.	K Reading	MSS Value
ST 2-8-2	5	12.5	10.5	0.083
ST 2-8-2	15	13.3	11.3	0.085
ST 2-8-2	25	12.3	11.2	0.090
ST 2-8-2	35	13.1	12.2	0.092
ST 2-8-2	45	12.8	13.0	0.101
ST 2-8-2	55	11.9	12.0	0.101
ST 2-8-2	65	13.3	13.5	0.101
ST 2-8-4	5	12.7	21.1	0.165
ST 2-8-4	15	13.3	22.2	0.166
ST 2-8-4	25	11.9	22.2	0.186
ST 2-8-4	35	13.4	32.6	0.242
ST 2-8-4	45	12.5	26.0	0.207
ST 2-8-4	55	12.9	25.7	0.198
ST 2-8-4	65	12.1	24.2	0.199
ST 2-9-1	5	12.5	10.9	0.087
ST 2-9-1	15	12.9	11.1	0.086
ST 2-9-1	25	12.5	12.2	0.097
ST 2-9-1	35	12.5	11.9	0.094
ST 2-9-1	45	13.1	12.2	0.093
ST X12-2	5	12.3	9.4	0.076
ST X12-2	15	13.1	10.8	0.082
ST X12-2	25	11.9	9.6	0.080
ST X12-2	35	13.3	10.5	0.078
ST X12-2	45	12.5	8.8	0.070
ST X12-2	55	13.5	9.7	0.071
ST X12-2	65	13.5	9.6	0.071

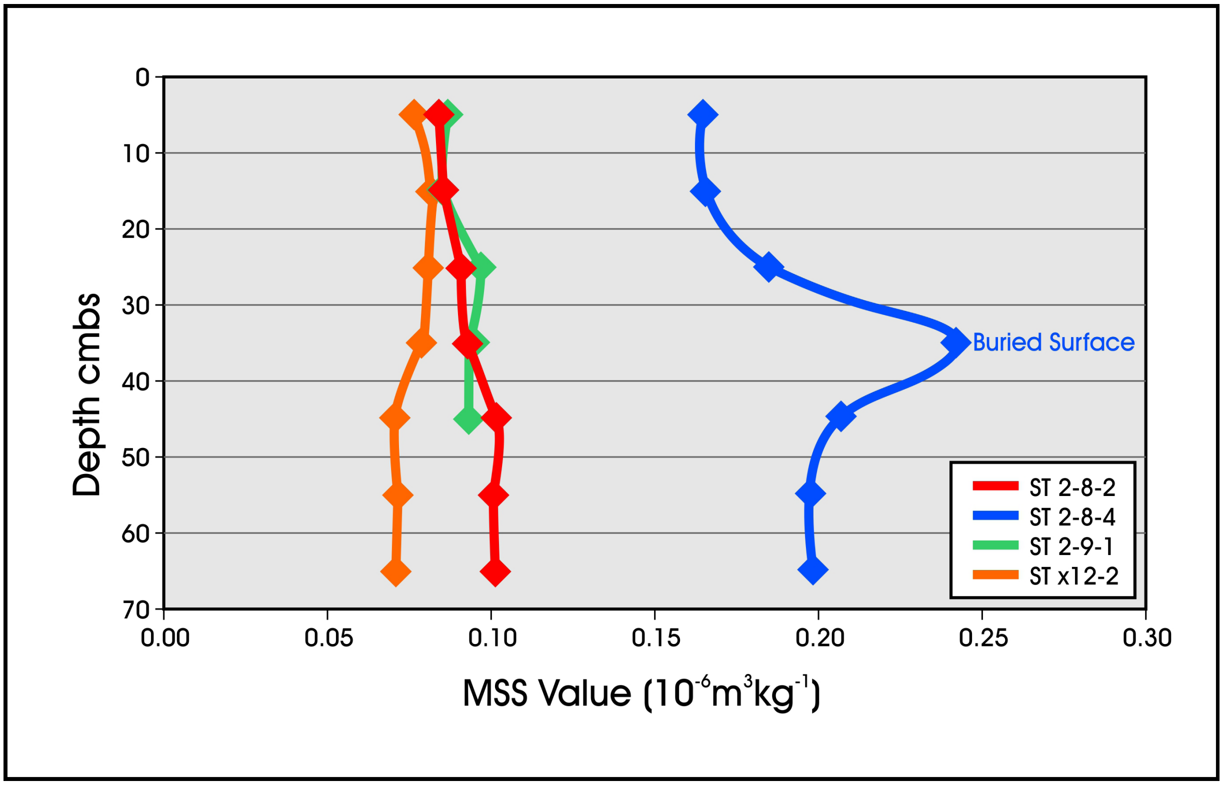

Figure 5-24. *A plot of magnetic susceptibility values from sediments in STs 2-8-2, 2-8-4, 2-9-1, and X12-2 on 41BP866.*

the MSS values as a whole on ST 2-8-4 are elevated suggesting higher concentrations of organic material on the southern portion of 41BP866.

The lithic scatter and the presence of subsurface burned rock on 41BP859 suggest that the site was likely used as an open campsite. The presence of debitage on the surface and from 40 to 60 cmbs on the southern half of the site indicates that the site may contain multiple components. Of interest, burned rock was limited to the shovel tests on the northern portion of the site, on the top of the rise. The surface scatter was only evident down the slope from the rise suggesting the possibility that cultural material has migrated down the slope. It is also possible that the southern lithic scatter and northern campsite are two unrelated sites. Because of the possibility of multiple components, buried intact thermal features, and questions related to site formation, the CAR is unable to recommend an eligibility status for the NRHP and therefore, recommends additional testing on 41BP866. Excavation of test units on the northern half of the site adjacent to the shovel tests positive for buried burned rock in addition to test units over the lithic scatter on the southern half of the project area to help determine if multiple components are present should be used to further test this site. Data gathered from the additional work should enable the CAR to make an eligibility determination for the NRHP.

Prehistoric Site 41BP867

Site 41BP867, consisting of buried artifacts from two positive shovel tests, is located approximately 56 m east of McLaughlin Creek and 520 m east of East Center Road. The site, ranging in elevation from 137 to 140 m AMSL, lies on Sayers Series sediments (Sa) and supports grasses, low groundcover, cedar and pine trees. Because the area was not affected by the wildfires and contains large trees, thick leaf litter, grasses, and weeds, visibility is poor (Figure 5-25).

No artifacts were noted on the surface of 41BP867. The site was documented during the site discovery phase of the survey. To delineate ST 4-8, which contained one specimen of debitage in Level 2 (10-20 cmbs); eight additional shovel tests were dug in the cardinal directions. One of the eight (ST 4-8-7) was positive for cultural material with one piece of debitage in Level 7 (60-70 cmbs; Figure 5-26). Six of the nine shovel tests (67%) contained deep sandy sediments to termination at 70 cmbs. The sandy deposits were shallower in three of the tests with red clay uncovered at 36 cmbs, 44 cmbs, and 60 cmbs. Based on the positive shovel tests, the site covers 947 m². No diagnostic artifacts or features were noted. The lack of features and diagnostics, and the scarcity of artifacts, suggests the potential for future research value is low on 41BP867. The CAR recommends the site as ineligible for the NRHP.

Figure 5-25. *Overview of prehistoric site 41BP867.*

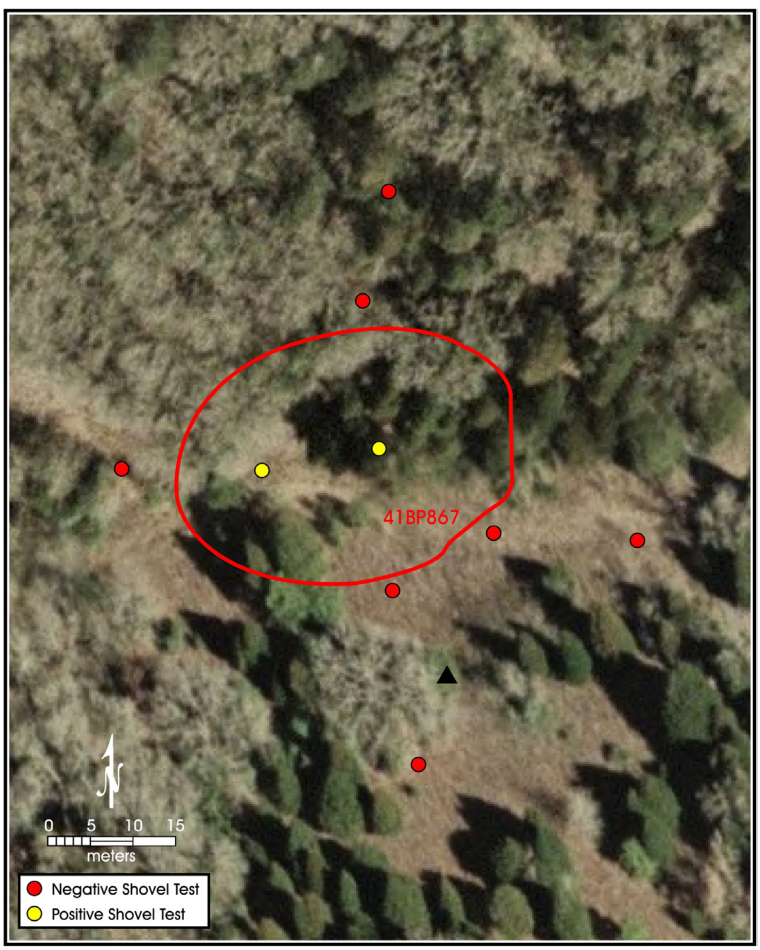

Figure 5-26. *Aerial map of 41BP867 showing site boundary and location of positive (yellow) and negative (red) shovel tests.*

Historic Site 41BP860

Site 41BP860 is an historic trash scatter with no features or evidence of structures. Two historic maps of the area from 1929 and 1936 show no designation of structures in the area of the site. Based upon a surface scatter and shovel tests, the site encompasses 2,222 m^2. Edge Fine Sandy Loam (AfC2) covers the area and prior to the wildfires supported grasses, weeds, cedar and pine trees. At the time of the survey all the vegetation had burned leaving the ground surface 100% visible (Figure 5-27). The site, with an elevation of 152 m AMSL, is located on and adjacent to East Loop road approximately 480 m north of McLaughlin Creek and immediately adjacent to a drainage of the creek. A stock pond is located on the sites southwest boundary.

The surface scatter consisted of brick (n=2); ceramics, including fragments of stoneware (n=1), porcelain (n=3), and white earthenware (n=8); glass, including shards of clear glass (n=6), milk glass (n=4), aqua glass (n=1), and green glass (n=1); and one strand of barbed wire (Figure 5-28). One fragmented aqua bottle base with embossing was collected from the surface as a diagnostic artifact. The aqua base was embossed with a maker's mark from the American Bottle Company (Figure 5-29). These bottles were produced from 1905 to 1929 (Whitten 2012). Aqua glass was a commonly produced color in all types of American made bottles dating from the early nineteenth century to the 1920s. After the 1920s colorless glass largely replaced aqua glass (Miller and McNichol 2002). One of the bricks documented on the surface was labeled with an Elgin maker's mark. Thomas O'Conner started a brick-making enterprise in 1884 that eventually led the town of Elgin, 13 km north of Camp Swift, to adopt the epithet "Brick Capital of the Southwest". The manufacture of Elgin brick continues today (Marks 2012c). The glass and brick suggest that the trash scatter dates from 1905 to 1929.

To delineate the artifact scatter and to determine the depth of cultural material, six shovel tests were excavated, one within and five on the edge of the scatter (Figure 5-30). Because

Figure 5-27. *Overview of historic site 41BP860.*

Figure 5-28. *Concentration of artifacts on the surface scatter at 41BP860.*

Figure 5-29. *Diagnostic aqua bottle base embossed with the maker's mark from the American Bottle Company.*

Figure 5-30. *Aerial map of 41BP860 showing site boundary, positive (yellow) and negative (red) shovel tests, and location of surface artifacts (blue).*

the western edge of the scatter abuts a drainage and artifacts were not apparent in the drainage or on its far side, shovel tests were not placed along the scatters western boundary. Of the six, one, ST X4-6, was positive with one shard of clear glass in Level 1 (0-10 cmbs). All of the shovel tests contained deep sandy sediments to termination at 70 cmbs. Because of the lack of features and structural remains, and the lack of any evidence that the site contains significant historic importance, the potential for future research value is low on 41BP860. The CAR recommends the site as ineligible for the NRHP. No further work is recommended.

Historic Site 41BP863

41BP863 consists of a large surface scatter of historic artifacts and a feature comprised of a brick scatter. Based upon the surface scatter and shovel tests, the site encompasses 11,250 m^2. With an elevation ranging from 140 to 146 m AMSL, the site is located approximately 187 m south of McLaughlin Creek and 344 m north of East Loop Road. At the time of the survey all the vegetation had burned leaving the ground surface 100% visible (Figure 5-31). Edge Fine Sandy Loam (AfC and AfC2) covers the area and prior to the wildfires supported grasses, weeds, cedar and pine trees.

The surface scatter consisted of large numbers of brick, glass, ceramics, and metal. Due to the large size of the scatter, the field crew did not document every visible artifact. Ten surface artifacts with diagnostic potential consisting of aqua glass bottle fragments (n=2), an aqua platter base (n=1), clear glass bottle fragments (n=1), clear glass bottle (n=1), purple glass bottle fragment (n=1), ceramic white earthenware with blue decoration (n=2), stoneware (n=1), and a metal fragment embossed with a maker's mark (n=1), were collected and brought back to the CAR. Neither of the white earthenware fragments, the stoneware, nor the aqua platter base was datable.

From the early nineteenth century to the 1920s aqua colored glass was commonly produced. For the most part colorless glass replaced aqua to make the product more visible (Miller

Figure 5-31. *Overview of historic site 41BP863.*

and McNichol 2002). The aqua glass bottle fragments had discontinuous side mold seams which date from 1800 to 1915 (Figure 5-32a). Finishes were tooled, dating from the 1870s to between 1910 and the early 1920s when semi-automatic and then fully automatic bottle producing machines became widespread (Lindsey 2012). The attributes of the aqua glass suggest a manufacture date from between 1870 to 1915.

The clear glass bottle fragment consists of a neck and lip (see Figure 5-32b). It is a machine-made bottle with a side mold seam running to the highest vertical point of the neck and over the rim. The lip is not ground down. These mold seams are diagnostic of manufacture by either semi-automatic or fully automatic bottle machines and date after 1900 (for wide mouth bottles and jars) and after 1910 for narrow bore bottles. Machine-made bottles with colorless glass can date from any time after 1905 (Lindsey 2012; Miller and McNichol 2002). The evidence suggests that the clear neck and lip was produced after 1905.

The clear glass bottle (see Figure 5-32c) also has visible mold seams. It appears to have been made in a cup-bottom mold which was in use subsequent to 1850 (McDougall 1990). This was the dominant mold type used for automatic bottle machines by the late 1910s. A suction scar, the diagnostically distinctive mark most commonly found on the base of earlier bottles produced by the Owens Automatic Bottle Machine, is evident on the base of the bottle. Suction scars date from 1905 through most of the 1920s (Barnett 1926; Miller and Sullivan 1984). The bottle base has a maker's mark, an "I" within a diamond. This mark was used from 1915 to 1929 by the Illinois Glass Company of Alton, Illinois (Lindsey 2012).

One of the collected diagnostics is a fragmented purpled bottle consisting of a shoulder, neck, and lip (see Figure 5-32d). To produce clear glass a decolorizing agent was added to the mix to offset residual iron impurities (Dillon 1958). Manganese dioxide was commonly used. After exposure to sunlight, the glass will turn a light pink or lavender to moderately dark amethyst or purple depending on the amount of manganese and amount of ultraviolet (UV) light. Manganese dioxide was commonly used from the 1880s to about the end of World War I (Lockhart 2006; Tooley 1983; Trowbridge 1870). The bottle has a discontinuous or fading side mold seam which typically dates prior to 1915 and a tooled finish. Tooled finishes typically date no earlier than 1885 to 1890. All hand tooled finishes disappeared between 1910 and the early 1920s when automatic bottle making machines dominated production (Lindsey 2012). Based on the attributes of the purpled fragment, it was likely produced from 1885 to 1915.

The last diagnostic artifact collected from 41BP863 was a fragment of iron embossed with "B. F. Avery and Sons". The B.F. Avery Company first opened in Richmond, Virginia around 1822 to manufacture cast iron plows. By 1847, the company was operating in Louisville, Kentucky. In the early 1930s Avery started manufacture of tractors for both agricultural and industrial applications. B.F. Avery and Sons was purchased by Minneapolis Moline in 1951 (Tractor Wiki 2011). The iron fragment could have been produced from 1822 to 1951.

One area on the site included a brick scatter (375 m^2) of at least 60 bricks (Figure 5-33). Elgin brick was noted in the scatter (Figure 5-34). As discussed in the previous section,

Figure 5-32. *Diagnostic artifacts collected from the surface of 41BP863 (clockwise from the top left: a. neck/lip of an aqua bottle, b. neck/lip of a clear bottle, c. clear bottle, d. neck/lip of purpled bottle).*

Elgin brick was produced from 1884 to the present (Marks 2012c). Based on the manufacture date ranges of the diagnostic historic artifacts, 41BP863 was likely occupied sometime between the 1870s and the 1920s. Three historic maps of the area, from 1904, 1929 and 1936 were studied for evidence of structures in the general area of the site. No structures were indicated.

To delineate the artifact scatter and to determine the depth of cultural material, 19 shovel tests were excavated, 4 within and 15 on the edge of the scatter. Two shovel tests outside the scatter on the southern edge of the site were excavated previously as part of the site discovery phase of the survey (Figure 5-35). Of the 19 shovel tests, 3 (STs X8-16, X8-17, and X8-18) were positive with 1 shard of purpled bottle glass; 1 fragment of blue bottle glass; and 2 pieces of flat glass, 1 fragment of clear lamp glass, and 1 piece of white earthenware, respectively. All the artifacts were recovered from Level 1 (0-10 cmbs). The sandy sediments in the shovel tests were fairly shallow with the emergence of clay at 2 to 44 cmbs. One test reached 70 cmbs without exposing clay. Excluding the one deep shovel test, on average clay was exposed at 26 cmbs.

In general, the ages of the artifacts on 41BP863 indicate a late eighteenth to early nineteenth century occupation. The large size of the lithic scatter and the brick scatter on the southwestern quadrant of 41BP863 suggest that the site was likely used as a homestead or farmstead. Although no structures in the area of the site are evident on historical maps from before the opening of Camp Swift, the presence of the brick scatter points to the possibility of a structure or the ruins of a fireplace. The site is located on the edges of the Wayside Community. This historic community was located within the present boundaries of Camp Swift along the Sayers-McDade Road, adjacent to the northeastern border of the facility. Wayside was one of several small communities, including Oak Hill, Spring Branch and Sayersville, which were made up of groups of farming families (Freeman et al. 2006; Sitton 2006). Buried features and or diagnostics in the vicinity of the brick scatter have the potential to provide information on the purpose and age of the structure. The CAR recommends additional testing on 41BP863 to resolve these questions and therefore is unable to determine an eligibility status for the NRHP. Test units in the area of the scattered brick as well as additional archival research is recommended.

Figure 5-33. *Large brick scatter on the southwest quadrant of 41BP863.*

Figure 5-34. *Fragment of an Elgin brick on the surface of 41BP863.*

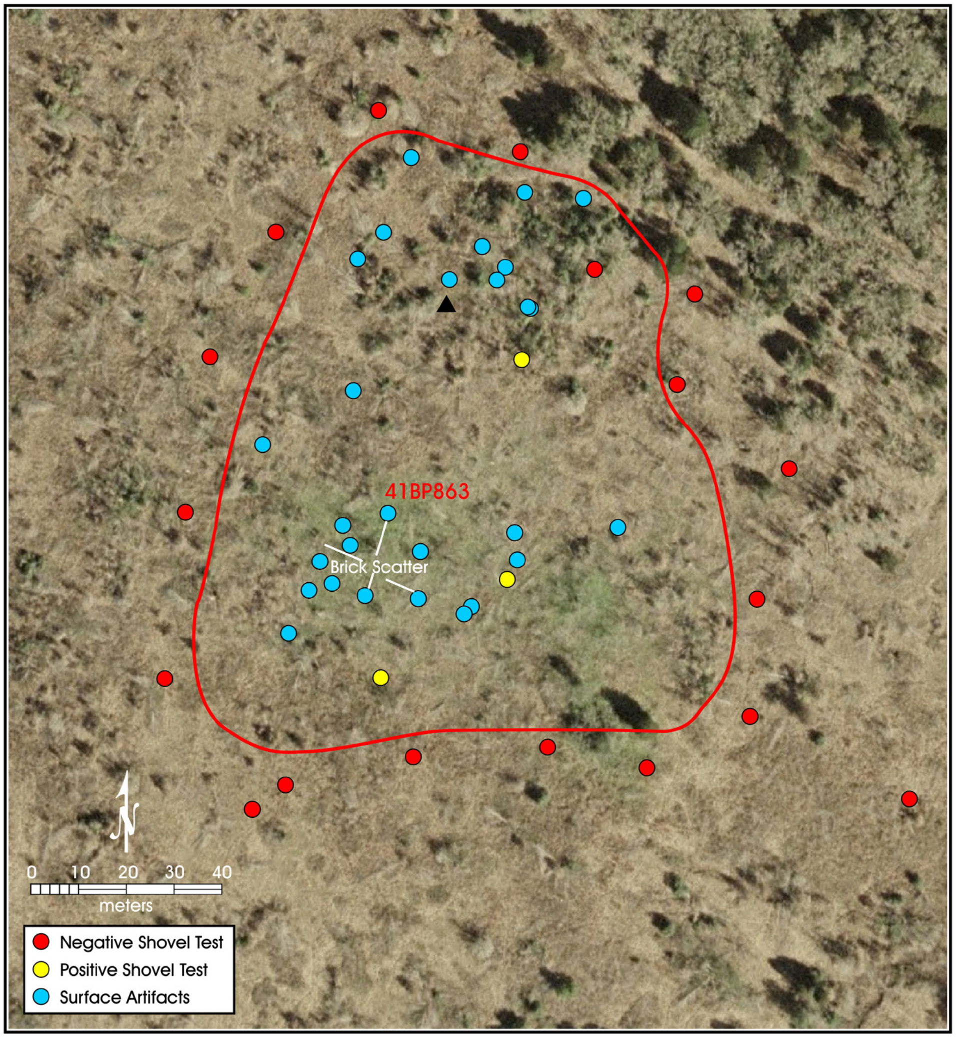

Figure 5-35. *Aerial map of 41BP863 showing site boundary, location of positive (yellow) and negative (red) shovel tests, and location of selected surface artifacts (blue).*

Historic Site 41BP864

Consisting of an historic trash scatter with no features or evidence of structures, site 41BP864 covers 8,526 m^2. The site, with an elevation ranging from 151 to 152 m AMSL, is located on and adjacent to East Loop road and is approximately 543 m south of McLaughlin Creek. The site lies on shallow sandy Edge (AfC) series sediments overlying red clay. At the time of the survey all the vegetation had burned leaving the ground surface 100% visible (Figure 5-36). The site previously supported grasses, pine, oak, and cedar trees.

The surface scatter consisted of ceramics including fragments of white earthenware (n=19), stoneware (n=13), and porcelain (n=1); various colors of glass shards including aqua (n=13), green (n=3), brown (n=8), black (n=1), purpled (n=4), and clear (n=5); sandstone blocks (n=3); debitage (n=1); and a Yarbrough point. Three of the surface artifacts, the point, an embossed shard of aqua glass from a recessed panel bottle, and a fragment of ceramic with a maker's mark, were collected as temporal diagnostics. Unfortunately neither the ceramic nor the glass contained enough of the maker's mark for identification (Figure 5-37). The maker's mark on the ceramic includes "OWN ... STER". The embossing remaining on the aqua glass fragment consists of "AM ... ZAR". Aqua glass was used in all types of American made bottles dating from the early nineteenth century to the 1920s. After the 1920s colorless glass largely replaced aqua glass (Miller and McNichol 2002). Fragments of purpled glass noted in the surface scatter indicate the addition of Manganese dioxide to the glass during production. Manganese dioxide was commonly used from the 1880s to about the end of World War I (Lockhart 2006; Tooley 1983; Trowbridge 1870). The glass suggests that the trash scatter dates from the 1880s to the 1920s.

Figure 5-36. *Overview of historic site 41BP864.*

Figure 5-37. *Fragment of embossed aqua glass and ceramic with makers' marks collected from the surface of 41BP864.*

Three sandstone blocks suggest the possibility of a foundation; however, the blocks were not aligned nor did they in any way resemble a feature and no brick was documented on the site. A review of historic maps of the area from 1904, 1929, and 1936 show no designation of structures in the area of 41BP864. The Yarbrough point, dated to the Late Archaic period (Turner and Hester 1999), and a single specimen of debitage were documented on the surface of this site (Figure 5-38).

Figure 5-38. *Yarbrough projectile point collected from the surface of 41BP864.*

To delineate the artifact scatter and to determine the depth of cultural material, 13 shovel tests were excavated, 1 from within and 12 on the edge of the scatter (Figure 5-39). Of the 13, one, ST X9-9, was positive with one piece of brown glass in Level 2 (10-20 cmbs). No prehistoric artifacts were recovered in the shovel tests. Because of the lack of other prehistoric material, the Yarbrough point and the debitage were treated as isolated prehistoric artifacts. The shovel tests all terminated at clay. The shallow sandy sediments ranged from 6 to 38 cm deep, with an average of 22 cm of sandy deposits. Because of the lack of features and structural remains, and the lack of any evidence that the site contains significant historic importance, the potential for future research value is low on 41BP864. The CAR recommends the site as ineligible for the NRHP. No further work is recommended.

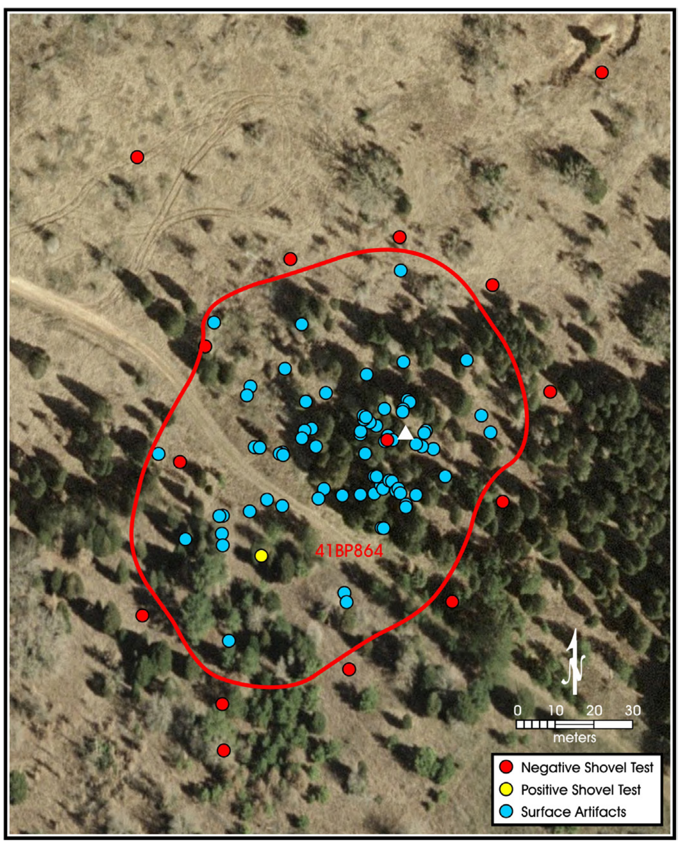

Figure 5-39. *Aerial map of 41BP864 showing site boundary, location of positive (yellow) and negative (red) shovel tests, and location of surface artifacts (blue).*

Historic Site 41BP868

41BP868 consists of a trash scatter in a ravine located approximately 50 m north of McLaughlin Creek and 235 m east of East Center Road. The site, at an elevation of 140 m AMSL, is heavily vegetated with large trees, underbrush, and dense leaf litter (Figure 5-40). Ground visibility is poor with roughly 90% of the area obscured by vegetation. The site was not affected by the wildfires. The ravine is approximately 70 m south of the southern boundary of previously recorded site 41BP155, an historic homestead. 41BP868 may represent a dump site related to the homestead.

Because the scatter is contained in the ravine, the site was not shovel tested. One shovel test (ST 5-14) from the site discovery phase of the survey is located immediately east of the ravine. The test, terminating on the emergence of clay in Level 4 (30-40 cmbs), consisted of shallow sandy deposits of Edge series (AfC2) sediments. Based on the edges of the cultural material, 41BP868 encompasses 52 m^2 (Figure 5-41). Stoneware, glass bottles, and rusted metal including bed springs were noted in the ravine. One artifact, a cobalt blue bottle, was collected from the site (Figure 5-42). The base of the bottle is embossed with a triangle within a triangle. It resembles a Noxzema or Vicks container but does not have the brand embossed on the base. Diagnostic mold seams indicate a manufacture date after 1900 from an automatic bottle machine, and external screw threads suggest a date from the late 1920s or later (Miller and McNichol 2002). Although cobalt and sapphire blue glass was used for many types of bottles, including ink, figured flasks, beer bottles, and food bottles (Covill 1971; Martin and Martin 1973; McKearin and Wilson 1978; Zumwalt 1980), the color is somewhat more common in bottles intended for poisonous substances and cosmetics. Cobalt blue glass was frequently used for soda and mineral water bottles from the 1840s into the early 1900s and for ink bottles from the 1840s to the 1930s (Covill 1971; Markota and Markota 1994; Schmeiser 1968, 1970). The bottle suggests the site post dates the 1920s.

The lack of features and structural remains, the general lack of integrity, and the lack of any evidence that the site contains significant historic importance indicates that the potential for future research value is low on 41BP868. The CAR recommends the site as ineligible for the NRHP. No further work is recommended.

Figure 5-40. *Overview of historic site 41BP868.*

Figure 5-41. *Aerial map of 41BP868 showing site boundary and location of negative (red) shovel test.*

Figure 5-42. *Cobalt blue bottle collected from the surface of 41BP868.*

Archaeological Site Density Relative to Soil Type and Hydrology

Over the past four decades all of Camp Swift's 11,500 acres have been surveyed by various investigators resulting in the documentation of 295 sites with 208 prehistoric and 131 historic components. Diagnostic artifacts and radiocarbon dates from various surveys date the occupations on the Camp Swift facility from the Paleoindian period to the early 1940s with the commencement of World War II. As stated in Chapter 4, the current survey used systematically planned shovel test locations to evenly sample each soil series located on the project area. By means of GIS analysis, the archaeological sites boundaries documented from the current survey were overlaid on a map of the facility's soil types and streams in order to study the distribution and relationship of sites to these landscape features. The CAR collected site location data in the field using GPS units. Georeferenced hydrology and soil map shape files were downloaded from the Natural Resources Conservation Service of the United States Department of Agriculture and the United States Geological Survey, respectively (Soil Survey Staff 2012; U.S. Geological Survey 2012).

Table 5-12 presents the distribution and percentage of soil types on the survey area. The ten archaeological sites documented during the current survey are sorted by soil type and the number of sites per acre on each soil type is calculated. The prehistoric data is plotted in Figure 5-43. Of the 6 prehistoric sites, half were discovered on Edge fine sandy loam. However when the data are normalized per acre, the site frequency on Padina sediments is 9, 20, and 29 times that on Sayers, Tabor, or Edge soils, respectively. Padina series contained the deepest sandy deposits on the project area with an average depth in the survey area of 68 cm (see Table 5-2). This series, located on uplands and high terraces, is comprised of very deep, well drained, moderately permeable sandy soils (Soil Survey Staff 2012). All four of the historic sites documented on the survey area were located on Edge fine sandy loam, on average the shallowest sandy sediments excavated during the field work. The historic sites may have been placed on these locations to take advantage of the loamy soils as loam is ideal for gardening and farming.

To further explore site distribution and soil type patterns, the CAR accessed the TXMF site database to investigate all the sites recorded on the facility. The database contains

Table 5-12. Archaeological Sites on the Current Survey Area by Soil Series

Soil Series	Soil Series on Project Area			Prehistoric Components		Historic Components	
	m²	acres	%	Total	Per Acre	Total	Per Acre
Edge fine sandy loam (AfC, AfC2)	18578743.715	326	59%	3	0.009	4	0.012
Robco loamy fine sand (DeC)	7047757	50	9%	0	0.000	0	0.000
Crockett soils (CsD3)	5489806.246	31	6%	0	0.000	0	0.000
Padina complex (PaE)	4688036	4	1%	1	0.263	0	0.000
Tabor series (TfB)	3894175	76	14%	1	0.013	0	0.000
Sayers series (Sa)	2449702	34	6%	1	0.029	0	0.000
Silstid series (SkC)	2162554	29	5%	0	0.000	0	0.000
Total	44310774	550	100%	6		4	

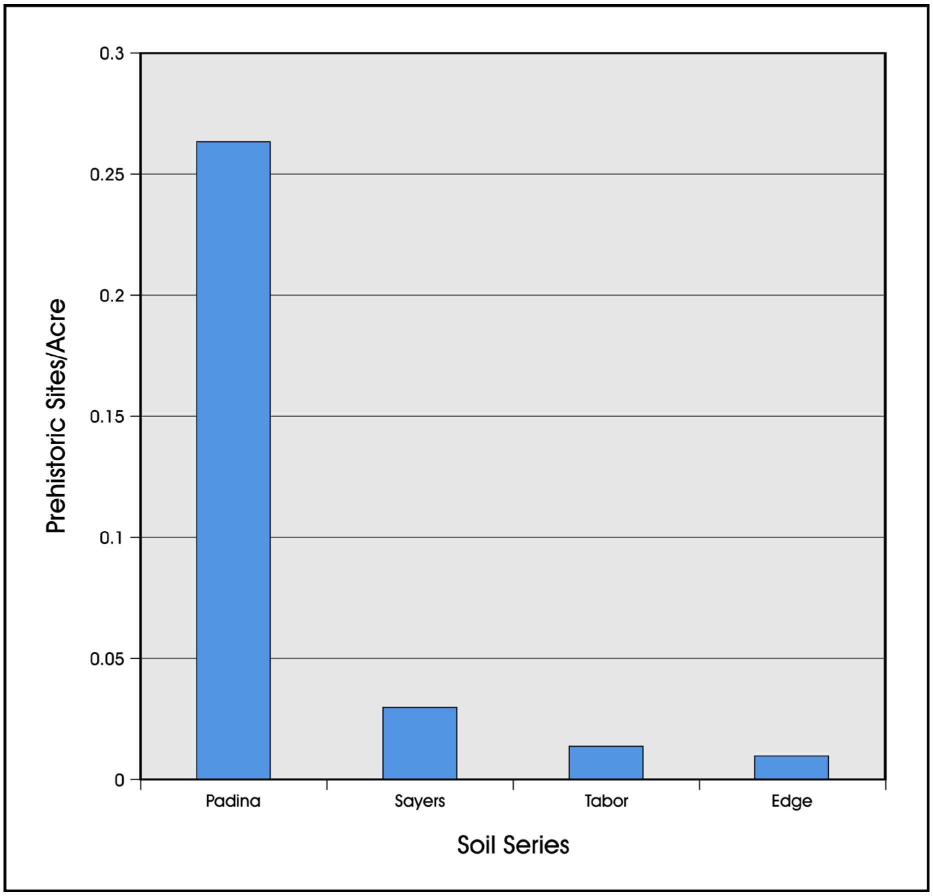

Figure 5-43. *Prehistoric sites per acre on the survey area by soil series.*

GIS layers of all of Camp Swift's archaeological sites, including boundary, centroids, and general site information. As discussed in the previous paragraph, site boundaries were overlaid on georeferenced soil and hydrological maps. Facility wide site distribution by soil units is shown in Table 5-13. The most prevalent soil type on Camp Swift is Edge fine sandy loam, comprising 40% of the soils. However as Figure 5-44 illustrates, it is one of the series with the lowest distribution of prehistoric components per acre. As on the current project area, the highest frequency of prehistoric sites are located on the Padina series. Plots of prehistoric site density by depth to clay in each soil series are presented in Figure 5-45. The top plot shows a strong but non-linear relationship. The bottom plot is a log transformation of the original data. Based on the assumption that more sites should be discovered in shallow soils since all shovel tests should reach clay, no artifacts should be located below shovel test termination, and the probability of surface materials is increased, the plot did not meet expectations. Prehistoric site density increases as sandy deposits deepen.

The distribution of sites with prehistoric components that could be dated from diagnostic artifacts and radiocarbon dates were explored with GIS to further define prehistoric site patterns. Artifacts dating to the Late Prehistoric, Late Archaic, Early Archaic, and the Paleoindian periods have been recovered from Camp Swift over the last several decades (Nickels et al. 2010:372). Thirteen radiocarbon dates, recovered from seven sites, range from the Late Prehistoric to the transition from the Middle to Early Archaic periods (490 to 5980 BP +/- 40; Nickels et al. 2010:373). Table 5-14 presents the temporal distribution of prehistoric components by soil series. The Padina soil type, with 0.0147 sites per acre, contains 4 times the sites on Robco, the second highest series. Archaeological components dating to all four time periods have been located on Padina soils (Figure 5-46).

In contrast to the preferred location of prehistoric sites in deep sandy sediments, the 131 historic components documented on Camp Swift are most frequently found (sites/acre) on Wilson clay loam and Jedd stony soils (see Table 5-13 and

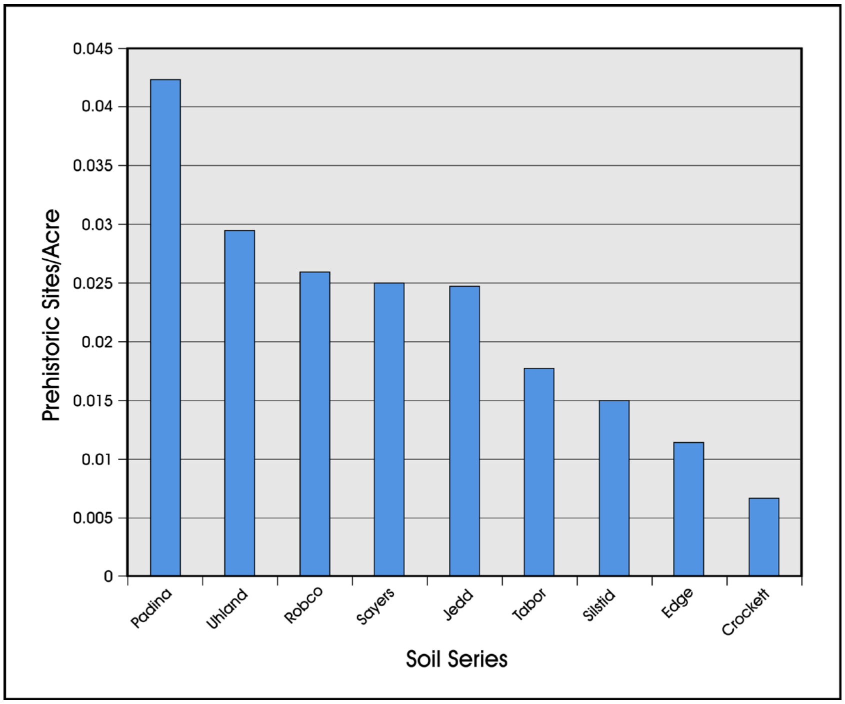

Figure 5-44. *Prehistoric archaeological sties on Camp Swift by soil series.*

Table 5-13. Archaeological Sites on Camp Swift by Soil Series

Soil Series	Soil Series on Camp Swift			Prehistoric Components		Historic Components	
	m^2	acres	%	Total	Per Acre	Total	Per Acre
Edge fine sandy loam (AfC, AfC2, AfE2)	18578743.715	4591	40%	52	0.011	47	0.010
Robco loamy fine sand (DeC)	7047757	1742	15%	45	0.026	20	0.011
Crockett soils (CfB, CsC2, CsD3, CsE2)	5489806.246	1357	12%	9	0.007	17	0.013
Padina complex (PaE)	4688036	1158	10%	49	0.042	15	0.013
Tabor series (TfB)	3894175	962	8%	17	0.018	9	0.009
Sayers series (Sa)	2449702	605	5%	15	0.025	9	0.015
Silstid series (SkC)	2162554	534	5%	8	0.015	7	0.013
Uhland Soils (Uh)	1510815	373	3%	11	0.029	2	0.005
Wilson clay loam (WsB)	390207	96	1%	0	0.000	3	0.031
Jedd stony soils(JeF)	328284	81	1%	2	0.025	2	0.025
Total	46540080	11500	100%	208		131	

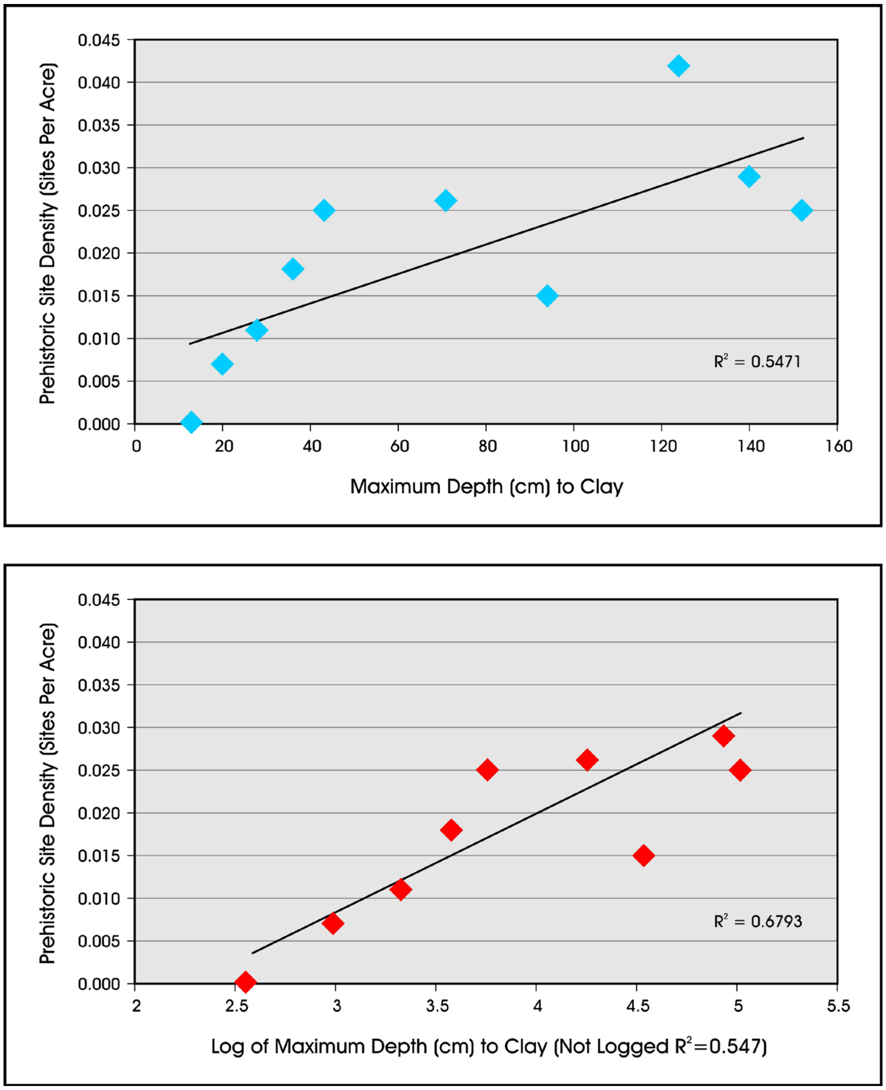

Figure 5-45. *Prehistoric site density by depth to clay in a soil series.*

Figure 5-47). As on the current survey area, historic sites on Camp Swift tend to be located on shallower soils, not deep sandy deposits. Unlike the graph of prehistoric sites (see Figure 5-45), historic site density by depth to clay in each soil series, illustrated in Figure 5-48, plotted as we expected with site density decreasing as depth to clay increases.

Soil data was combined into groups of similar depth to clay to determine if prehistoric components would still pattern mainly on deep Padina soils and if the pattern seen for historic components would still be evident. Table 5-15 presents the combined series and the merged component counts. Historic components appear to be evenly spread across shallow, moderate, and deep deposits. Prehistoric components, however, are overly represented on deep soils (Figure 5-49). To determine if these patterns are statistically significant, standardized adjusted residuals were calculated in Table 5-16. Adjusted residuals are analogous to Z scores. Values greater than 1.96 are considered statistically significant at the 0.05 level of probability (Everitt 1977; Haberman 1973). The patterns seen on the shallow and deep soils are over 1.96, with values of 4.0/-4.0 and 2.8/-2.8, respectively. Given the sites per acre densities, the table and adjusted residuals suggest that prehistoric site components are underrepresented on shallow soils and overrepresented on deep soils. To attempt to determine if the prehistoric pattern is a function of behavior or of geomorphic processes, the distribution of sites and streams was analyzed.

A GIS analysis of the distance of the 295 sites on Camp Swift to mapped streams was conducted using the ArcGIS Near tool. This tool measured and tabulated the distance between individual site centroids and the nearest point on stream center lines. The results are plotted in Figures 5-50, 5-51, 5-52, and 5-53. Figure 5-50, illustrating prehistoric components, suggests that four sites were within 25 m of stream channels.

Table 5-14. Prehistoric Archaeological Sites on Camp Swift by Soil Series

Soil Series	**Soil Series on Camp Swift**			**Paleoindian**		**Early Archaic**		**Late Archaic**		**Late Prehistoric**	
	m²	**acres**	**%**	**Total**	**Per Acre**	**Total**	**Per Acre**	**Total**	**Per Acre**	**Total**	**Per Acre**
Edge fine sandy loam (AfC, AfC2, AfE2)	18578744	4591	40%	0	0.000	0	0.000	2	0.000	2	0.000
Robco loamy fine sand (DeC)	7047757	1742	15%	0	0.000	1	0.001	2	0.001	3	0.002
Crockett soils (CfB, CsC2, CsD3, CsE2)	5489806	1357	12%	0	0.000	0	0.000	0	0.000	0	0.000
Padina complex (PaE)	4688036	1158	10%	1	0.001	3	0.003	5	0.004	8	0.007
Tabor series (TfB)	3894175	962	8%	0	0.000	0	0.000	1	0.001	1	0.001
Sayers series (Sa)	2449702	605	5%	0	0.000	0	0.000	0	0.000	0	0.000
Silstid series (SkC)	2162554	534	5%	0	0.000	0	0.000	1	0.002	0	0.000
Uhland Soils (Uh)	1510815	373	3%	0	0.000	0	0.000	0	0.000	0	0.000
Wilson clay loam (WsB)	390207	96	1%	0	0.000	0	0.000	0	0.000	0	0.000
Jedd stony soils(JeF)	328284	81	1%	0	0.000	0	0.000	0	0.000	0	0.000
Total	46540080	11500	100%	1		4		11		14	

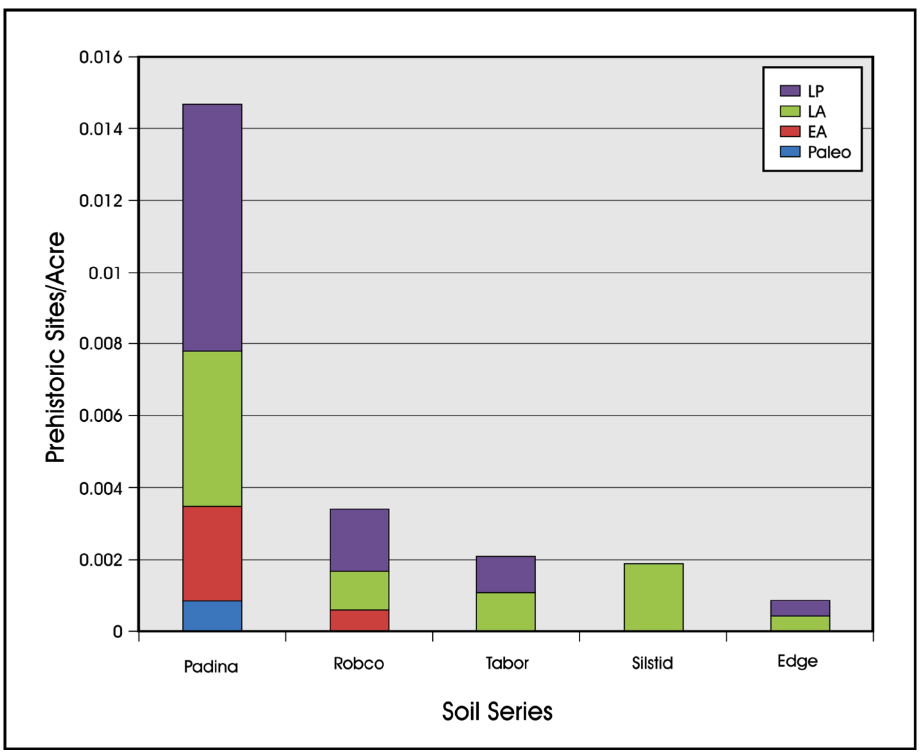

Figure 5-46. *Prehistoric archaeological sites on Camp Swift by soil series broken down by time period.*

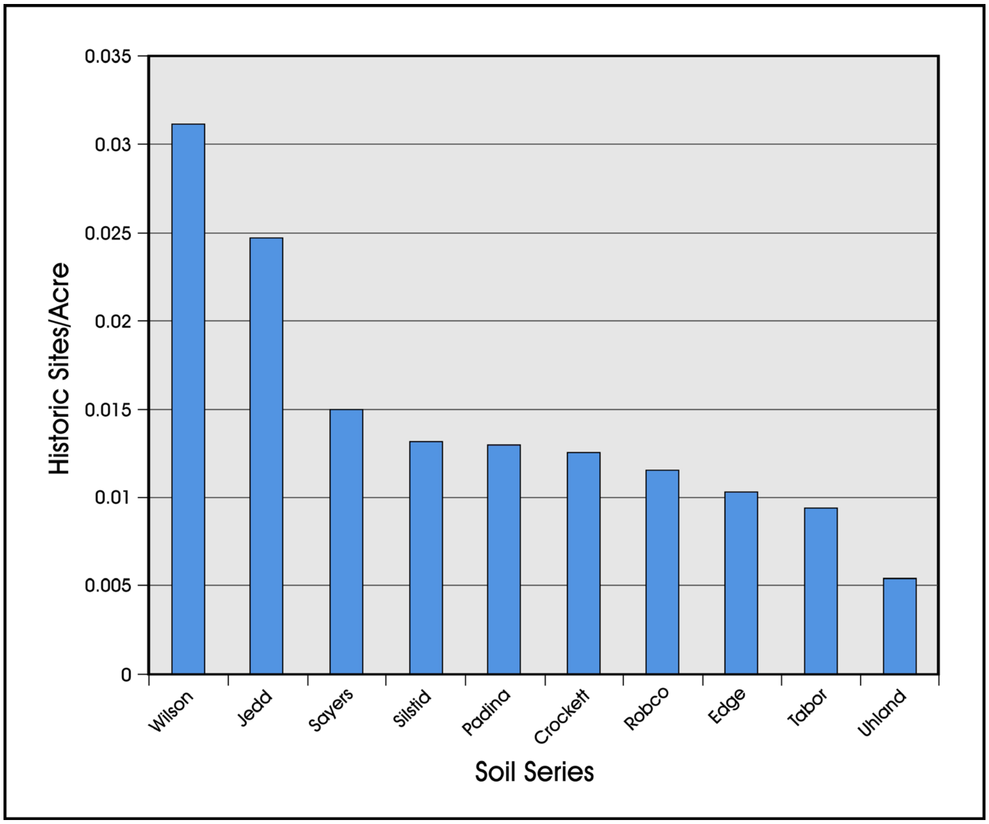

Figure 5-47. *Historic archaeological sites on Camp Swift by soil series.*

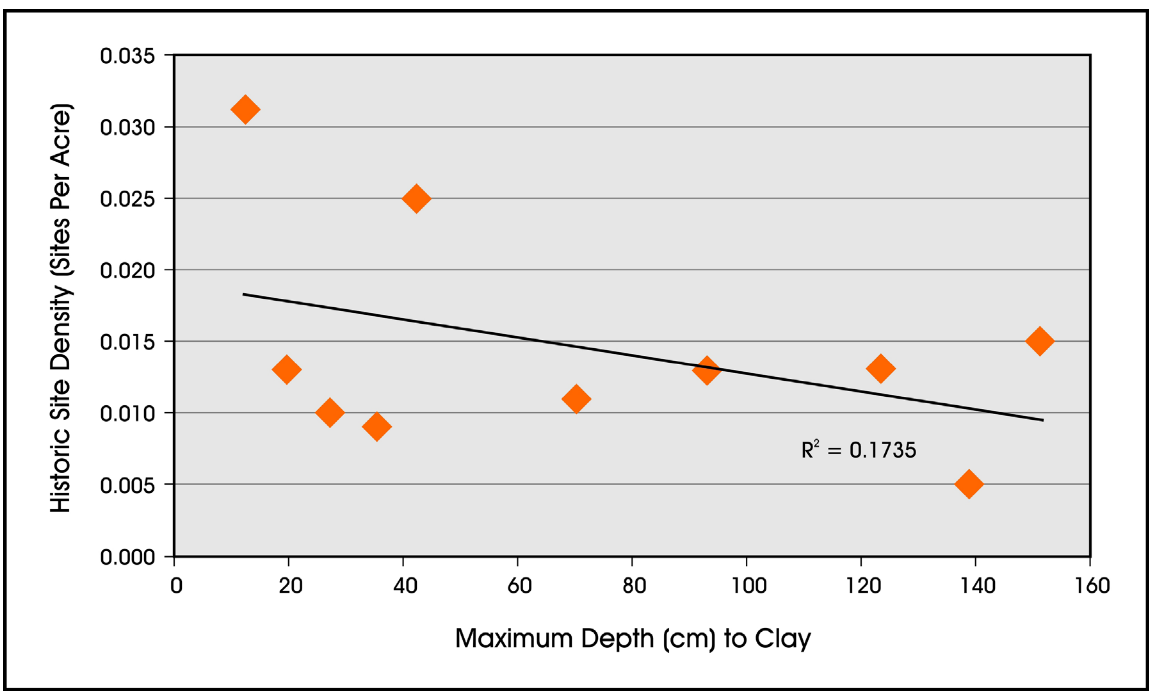

Figure 5-48. *Historic site density by depth to clay in a soil series.*

Table 5-15. Archaeological Sites on Camp Swift by Soil Series Combined by Depth

Soil Depth	Soil Series	Range to clay (cmbs)	Acres on Camp Swift	%	Prehistoric Components		Historic Components	
					Count	Sites/Acre	Count	Sites/Acre
Shallow	Edge, Crockett, Wilson	0-28	6044	53	61	0.010	67	0.011
Moderate	Robco, Tabor, Jedd	0-71	2785	24	64	0.023	31	0.011
Deep	Padina, Sayers, Silstid, Uhland	0-152	2672	23	83	0.031	33	0.012

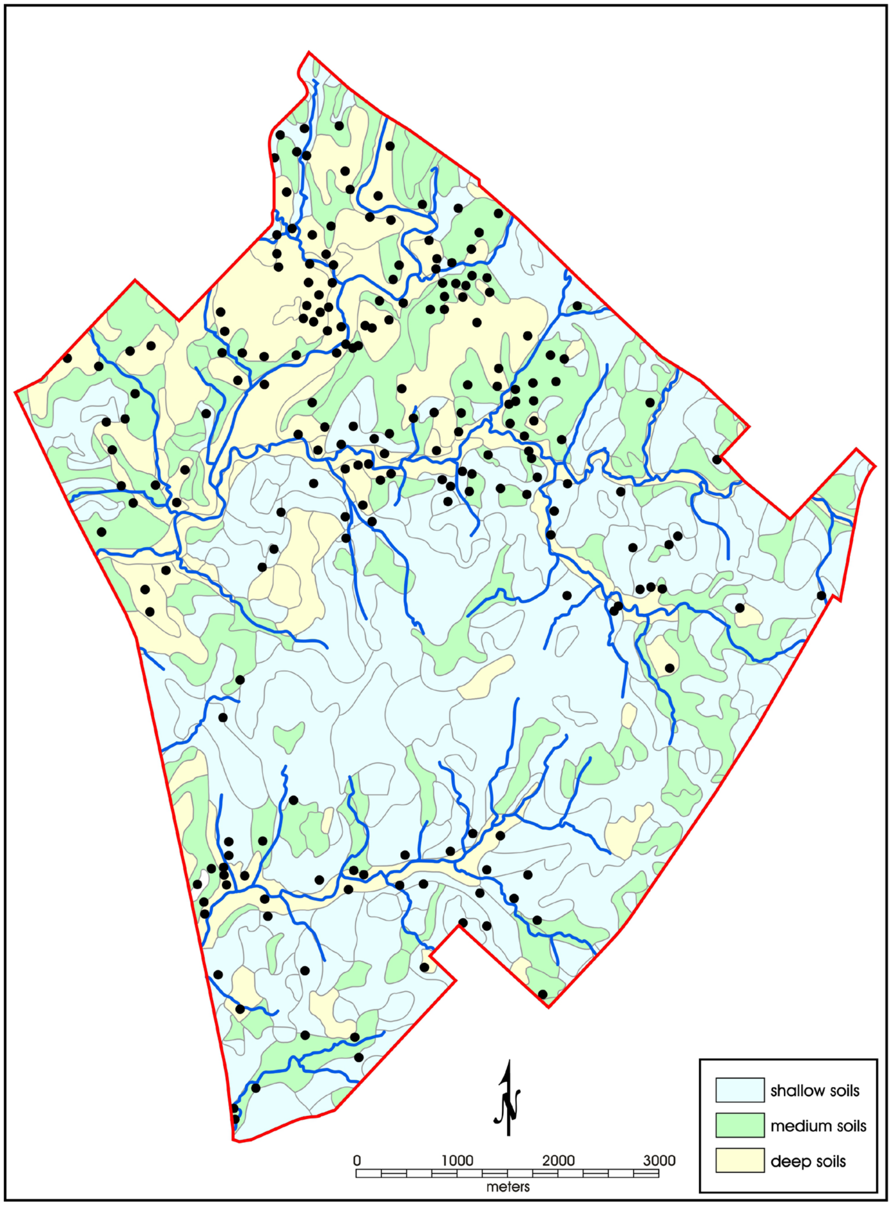

Figure 5-49. *The relationship of prehistoric sites to soil series and streambeds on Camp Swift.*

Table 5-16. Standardized Adjusted Residuals of Counts of Archaeological Components on Camp Swift by Soil Depth

Soil Depth		Component		Total
		Historic	Prehistoric	
Shallow	Count	67	61	128
	Expected Count	49.5	78.5	128
	Adjusted Residual	**4.0**	**-4.0**	
Moderate	Count	31	64	95
	Expected Count	36.7	58.3	95
	Adjusted Residual	-1.4	1.4	
Deep	Count	33	83	116
	Expected Count	44.8	71.2	
	Adjusted Residual	**-2.8**	**2.8**	
Total	Count	131	208	339
	Expected Count	131	208	339

The data appears to be represented by a single mode that is skewed to the right with a peak from 100 to 125 m and a range from 20 to 440 m. Thirty-two sites make up the peak. Five prehistoric sites are located over 475 m from a stream. The mean distance from stream midlines for the prehistoric components is 158 m.

The sites with diagnostic artifacts and radiocarbon dates, discussed above, are plotted on Figures 5-51 and 5-52. Figure 5-51 presents boxplots of distance to streams for sites by time period. Note that there are only five sites in the Paleoindian and Early Archaic periods. These were combined. Boxplots by time period suggest a tendency towards statistical significance for increasing nearness to water sources in the Late Prehistoric relative to the Late Archaic Period. The mean and median distances for Late Archaic components are 213 and 193 m. For the Late Prehistoric those distances are 142 and 123 m. Although the sample size is small, histographs clearly show a move closer towards water sources during the Late Prehistoric period (Figure 5-52). Just over 38% of all Late Prehistoric sites are within 125 m of streams. All identified Late Archaic components are located more than 125 m from water sources. This pattern suggests variance in past use of the region.

The distance from sites with historic components to the nearest water source is shown in Figure 5-53. The majority of the sites are within 500 m of a stream location. Five are located more than 600 m from water. The data appears to consist of at least two modes with a peak at 0 to 25 m and at 150 to 175 m.

The association of prehistoric sites with water may account for the pattern of greater site density in soil series with deeper sandy deposits since deeper sands tend to lie adjacent to streams. Sites and soil series acreage associated with streambeds were removed from the data. Using the ArcGIS buffer tool, three data sets were generated each with a different buffered area of stream bed removed from the acreage and site centroid data. Soil series data were combined into groups of similar depth to clay (Table 5-17). Little change is present when we remove the 50 m buffer. However, the pattern of increasing site density in deeper soils continues and increases when 100 and 150 m buffers are placed on the streambeds with 5 and 14 times more sites per acre in the deep soils than the shallow soils, respectively. Clearly site location choice appears to be influenced by soil series. Other factors related to soil type such as vegetation or soil permeability may be involved in site patterns. Another possibility is that the site location/soil series relationship may be a result of type and intensity of previous surveys on Camp Swift (see Nickels et al. 2010:362). That is surveys that focus on high probability areas may result in an underrepresentation of site discovery on areas of shallow soils.

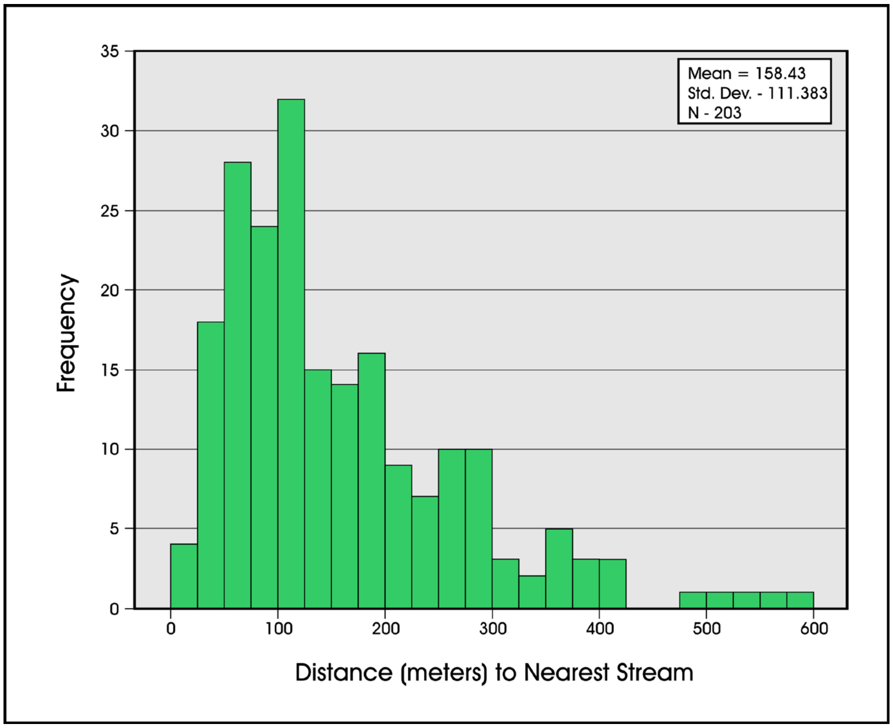

Figure 5-50. *Distance to water from prehistoric component centroids.*

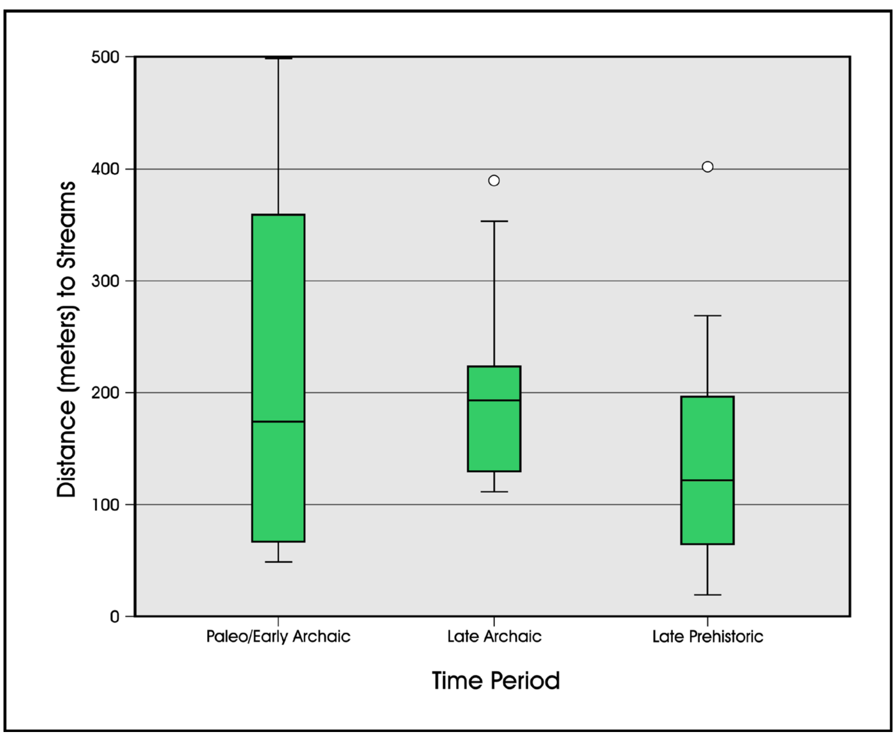

Figure 5-51. *Boxplots of distance to water from prehistoric component centroids.*

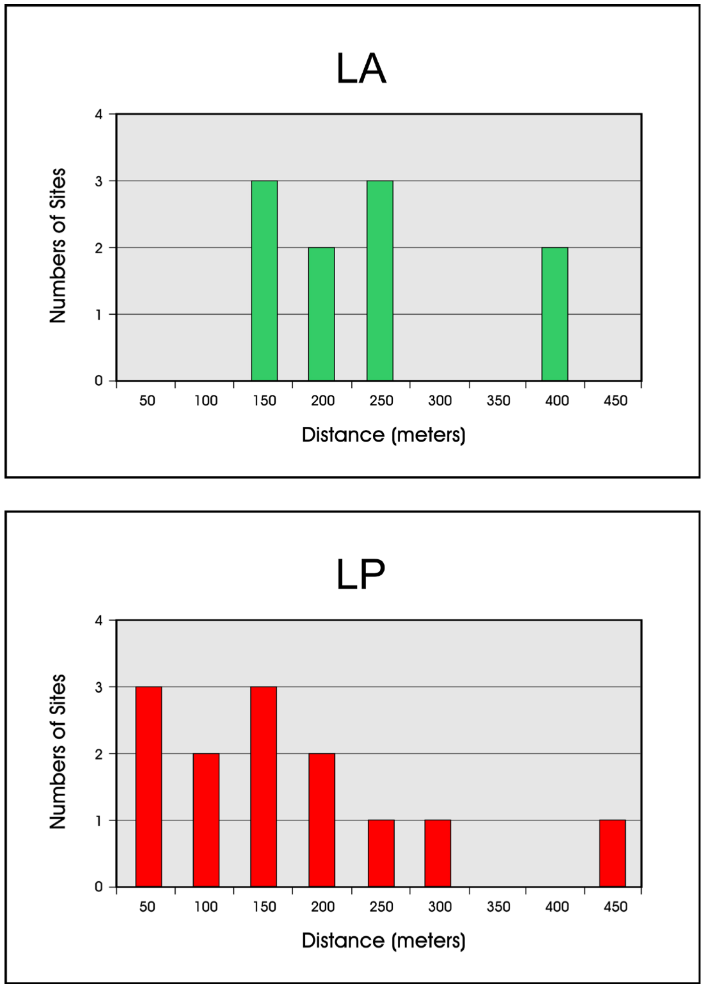

Figure 5-52. *Comparison of distance to water from Late Archaic and Late Prehistoric components.*

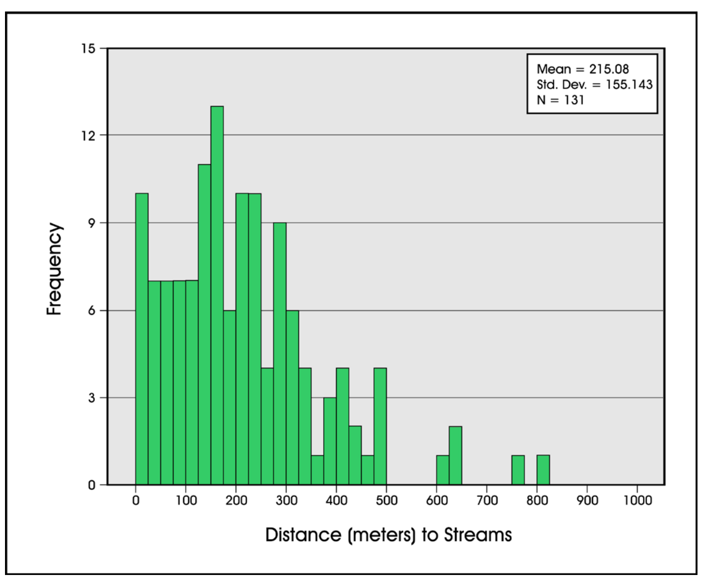

Figure 5-53. *Distance from historic period components to water.*

Table 5-17. Prehistoric Archaeological Sites on Camp Swift by Soil Series Combined by Depth with Buffered Streambed Acreage and Associated Sites Removed

No buffer						
Soil Depth	**Soil Series**	**Range to clay (cmbs)**	**Acres on Camp Swift**	**%**	**Prehistoric Components**	
					Count	**Sites/Acre**
Shallow	Edge, Crockett, Wilson	0-28	6044	53	61	0.010
Moderate	Robco, Tabor, Jedd	0-71	2785	24	64	0.023
Deep	Padina, Sayers, Silstid, Uhland	0-152	2672	23	83	0.031
50 m buffer around streambed removed						
Soil Depth	**Soil Series**	**Range to clay (cmbs)**	**Acres on Camp Swift**	**%**	**Prehistoric Components**	
					Count	**Sites/Acre**
Shallow	Edge, Crockett, Wilson	0-28	5390	53	41	0.008
Moderate	Robco, Tabor, Jedd	0-71	2356	24	52	0.022
Deep	Padina, Sayers, Silstid, Uhland	0-152	1862	23	58	0.031
100 m buffer around streambed removed						
Soil Depth	**Soil Series**	**Range to clay (cmbs)**	**Acres on Camp Swift**	**%**	**Prehistoric Components**	
					Count	**Sites/Acre**
Shallow	Edge, Crockett, Wilson	0-28	4575	53	33	0.007
Moderate	Robco, Tabor, Jedd	0-71	1806	24	28	0.016
Deep	Padina, Sayers, Silstid, Uhland	0-152	1057	23	39	0.037
150 m buffer around streambed removed						
Soil Depth	**Soil Series**	**Range to clay (cmbs)**	**Acres on Camp Swift**	**%**	**Prehistoric Components**	
					Count	**Sites/Acre**
Shallow	Edge, Crockett, Wilson	0-28	3627	53	34	0.009
Moderate	Robco, Tabor, Jedd	0-71	1153	24	38	0.033
Deep	Padina, Sayers, Silstid, Uhland	0-152	250	23	31	0.124

Summary of the Archaeological Resurvey

The survey of the project area used an intensive pedestrian reconnaissance accompanied by shovel testing to investigate the effects of recent wildfires and proposed improvements to a dropzone on a 550-acre segment of Camp Swift. Two-hundred and sixty-five shovel tests were excavated resulting in the removal of approximately 8.4 m^3 of sediment. Shovel testing produced 64 artifacts, including debitage, burned rock, glass, ceramics, and metal. Thirty-six isolated surface finds, consisting of debitage, a projectile point, tools, a core, ceramics, glass, and a brick, were recorded. Seven previously recorded sites were located and revisited resulting in the extension of the site boundary on one historic site, 41BP144. Ten archaeological sites were recorded as a result of the CAR's survey, six prehistoric and four historic. Three of the prehistoric sites, 41BP861, 862, and 867, and three of the historic sites, 41BP860, 864, and 868, were recommended as not eligible for the NRHP based on low potentials for future research value. Unknown eligibility for the NRHP was suggested by the CAR for three of the prehistoric sites, 41BP859, 865, and 866, and for one historic site, 41BP863. Additional work was recommended on these sites before eligibility can be determined.

Chapter 6: Summary and Recommendations

Summary

The Center for Archaeological Research of the University of Texas at San Antonio conducted an intensive archaeological reconnaissance survey on 550 acres of previously surveyed land located on the Texas Military Forces' (TXMF) Camp Swift Facility for the Adjutant General's Office. The resurvey of a portion of the facility was initiated in response to a large wildfire affecting 1,454 acres of the facility and in advance of a proposed 39 acre expansion to an existing dropzone. The 550 acre project area lies in the central eastern portion of Camp Swift. The burned portion is bounded by surface roads and fire break bulldozer cuts and the dropzone expansion area is bounded by the existing dropzone and undeveloped, heavily vegetated land. Through a combination of surface survey and shovel testing, the goal of the reconnaissance survey was to identify, document, and assess NRHP eligibility status of prehistoric and historic period cultural resources that may be impacted by the dropzone improvement or exposed and/or affected by the wildfire. This report discussed the survey of this property conducted in November and December of 2011 and January 2012.

The archaeological survey consisted of a 100% intensive pedestrian reconnaissance of the 550 acre portion of the facility. The reconnaissance included the hand excavation of 265 shovel tests resulting in the removal of approximately 8.4 m^3 of sediment. Seven previously recorded sites on the project area were revisited during the survey. The documentation of a surface scatter of historic trash immediately adjacent to 41BP144, a previously recorded historic site, resulted in a recommendation by the CAR to extend the site boundary. Ten previously unrecorded sites were identified during this survey and 36 isolated surface artifacts, including lithic debitage, modified flakes, bifaces, a projectile point, a core, glass, ceramics, and a brick, were documented. The newly documented sites consist of two prehistoric surface scatters (41BP861 and 862), three prehistoric surface scatters with buried material (41BP859, 865, and 866), one buried prehistoric site with no visible surface scatter (41BP867), and four historic surface scatters (41BP860, 863, 864, and 868).

Sites 41BP861 and 862, both comprised solely of surface scatters, included debitage, tools, and cores. Both sites were located on shallow sandy soils. Neither contained features nor diagnostic artifacts. Shovel test results from sites 41BP859, 865, and 866, all lithic scatters with buried cultural material, suggest the possibility that all three contain multiple components. Two of these, 41BP859 and 866, may be open campsites. They contain subsurface burned rock perhaps indicating the presence of intact thermal features. Of the three, one, 41BP859, produced a diagnostic artifact dating the site to the Late Prehistoric period. No surface scatter was documented on 41BP867. This site consisted of two positive shovel tests, each containing a single specimen of debitage. No burned rock, diagnostic artifact, or features were noted.

One of the four historic sites documented during the survey, 41BP863, an extensive scatter of historic artifacts, contains a large scatter of brick suggesting the remnants of a structure. The remaining three historic sites, comprised of surface scatters of brick, ceramics, glass, and metal, had no evidence of structural remnants. Based on diagnostic artifacts, two of the sites, 41BP863 and 864, range in date from the late 1800s to the 1920s. Sites 41BP860 and 868, date from 1905 to 1929, and post 1920s, respectively.

Recommendations

As part of the archaeological services provided to the Texas Military Forces, the CAR agreed to assess the NRHP eligibility of any newly discovered sites and provide one of the following recomm psite. The presence of debitage in six of the seven excavated levels indicates that the site may contain multiple components. An Alba projectile point dates the surface component, assuming there are multiple components, to the Late Prehistoric period. The presence of subsurface burned rock, suggests the possibility of intact buried thermal features. The CAR recommends additional testing on the site, consisting of the excavation of three test units on the artifact scatter in the immediate vicinity of the positive shovel tests that contained burned rock and debitage.

Ten new sites were documented during the survey. Six of the ten sites (three prehistoric and three historic) were recommended as not eligible for listing on the NRHP. Table 6-2 presents the reasoning for the CAR's assessment. Four of the ten sites (41BP859, 865, 866, and 863) were assessed as unknown with further investigations recommended. A surface lithic scatter and the presence of subsurface burned rock on 41BP859 suggest that the site was used as an open campsite. The presence of debitage in six of the seven excavated levels indicates that the site may contain multiple components. An Alba projectile point dates the surface component, assuming there are multiple components, to the Late Prehistoric period. The presence of subsurface burned rock, suggests the possibility of intact buried thermal features. The CAR recommends additional testing on the site, consisting of the excava-

Table 6-1. Summary of New Archaeological Sites and NRHP Eligibility Recommendations

Site	Time Period	Date from Diagnostics	Site Size (m^2)	Description	Number of Positive Shovel Tests	Maximum Known Depth of Cultural Material	NRHP Eligibility Recommendation	Recommended Additional Work
41BP859	Prehistoric	AD 800-1200	6,037	Buried site with surface scatter	7	70 cmbs	Unknown	3 1-x-1 m test units
41BP860	Historic	AD 1905-1929	2,222	Surface Scatter	1	10 cmbs	Not Eligible	None
41BP861	Prehistoric	None	3,299	Surface Scatter	0	Surface	Not Eligible	None
41BP862	Prehistoric	None	1,354	Surface Scatter	0	Surface	Not Eligible	None
41BP863	Historic	AD 1870s-1920s	11,250	Surface Scatter	3	10 cmbs	Unknown	2 1-x-1 m test units and archival research
41BP864	Historic	AD 1880s-1920s	8,526	Surface Scatter	1	20 cmbs	Not Eligible	None
41BP865	Prehistoric	None	2,151	Buried site with surface scatter	2	70 cmbs	Unknown	2 1-x-1 m test units
41BP866	Prehistoric	None	9,494	Buried site with surface scatter	6	60 cmbs	Unknown	4 1-x-1 m test units
41BP867	Prehistoric	None	947	Buried site with no evidence of surface scatter	2	70 cmbs	Not Eligible	None
41BP868	Historic	Post AD 1920s	52	Surface Scatter	0	Surface	Not Eligible	None

Table 6-2. Sites Recommended as Not Eligible for the NRHP

Reason for Low Research Value	Prehistoric Sites			Historic Sites		
	41BP861	41BP862	41BP867	41BP860	41BP864	41BP868
Lack of material depth	x	x				
Lack of features	x	x	x	x	x	x
Lack of diagnostic artifacts	x	x	x			
Sparsity of artifacts			x			
Heavy disturbance	x					
Lack of structural remains				x	x	x
Lack of significant historic importance				x	x	x
General lack of integrity						x

tion of three test units on the artifact scatter in the immediate vicinity of the positive shovel tests that contained burned rock and debitage.

Site 41BP865 only produced debitage. No burned rock was recorded on the surface or in the shovel tests and no diagnostics or features were documented. However, the presence of debitage on the surface, and below 30 cm suggests that the site may contain more than one component. The CAR recommends additional testing to resolve this issue. The excavation of two test units on the artifact scatter should provide the necessary data to determine if multiple components are present.

The lithic scatter and subsurface burned rock on 41BP866 suggest that the site was an open campsite. The presence of debitage on the surface and from 40 to 60 cmbs on the southern half of the site indicates that the site may contain multiple components. The buried burned rock was limited to the shovel tests on the northern portion of the site, on the top of a knoll, whereas the surface scatter was only evident down the slope from the rise suggesting the possibility that cultural material may have migrated down the slope. A second explanation is that the southern lithic scatter and northern campsite are two unrelated sites. To address uncertainties about site formation, the possibility of multiple components, and possible intact buried thermal features, the CAR recommends excavation of test units on the northern half of the site adjacent to the shovel tests positive for buried burned rock in addition to test units over the lithic scatter on the southern half of the project area. Data gathered from the additional work should enable the CAR to make an eligibility determination for the NRHP.

The presence of a large brick scatter on the southwestern quadrant of 41BP863 indicates a possible structure or the ruins of a fireplace. The extensive size of the historic lithic scatter and the possible structure suggest that the site was likely used as a homestead or farmstead. In general, the dates of diagnostic artifacts on 41BP863 indicate a late 18th to early ninteenth-century occupation. No structures in the area of the site are evident on historical maps from before the creation of Camp Swift. Buried features, specifically foundations, and/or diagnostic artifacts in the vicinity of the brick scatter have the potential to provide information on the purpose and age of the structure. The CAR recommends additional testing on 41BP863 to resolve these questions. Test units in the area of the scattered brick as well as additional archival research is recommended.

References Cited:

Antevs, E.
1955 Geologic-Climate Dating in the West. *American Antiquity* 20:317-335.

Arbingast, S.A.
1976 *Atlas of Texas*. Bureau of Business Research, The University of Texas at Austin.

Baker, F.E.
1979 *Soil Survey of Bastrop County, Texas*. Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C.

Barnes, V.E.
1974 *Geological Atlas of Texas. Austin Sheet*. Robert Hamilton Cuyler Memorial ed. Bureau of Economic Geology, The University of Texas at Austin.

Barnett, G.E.
1926 *Chapters on Machinery and Labor*. Harvard University Press, Cambridge, Massachusetts.

Bateman, M.D., C.H. Boulter, A.S. Carr, C.D. Frederick, D. Peter, and M. Wilder
2007 Preserving the Paleoenvironmental Record in Drylands: Bioturbation and its Significance for Luminiescence-Derived Chronologies. *Sedimentary Geology* 195:5-19.

Bellomo, R.V.
1983 A Methodological Approach to Identifying Archaeological Evidence of Fire Resulting from Human Activities. *Journal of Archaeological Science* 20:523-553.

Binford, L.R.
2001 *Constructing Frames of Reference: An Analytical Method for Archaeological Theory Building Using Hunter-Gatherer and Environmental Data Sets*. University of California Press, Berkeley.

Black, S.L.
1986 *The Clemente and Herminia Hinojosa Site, 41JW8: A Toyah Horizon Campsite in Southern Texas*. Special Report No. 18. Center for Archaeological Research, The University of Texas at San Antonio.

1989a Central Texas Plateau Prairie. In *From the Gulf Coast to the Rio Grande: Human Adaptation in Central, South and Lower Pecos Texas*, edited by T.R. Hester, S.L. Black, D.G. Steele, B.W. Olive, A.A. Fox, K.J. Reinhard, and L.C. Bement, pp. 17-38. Research Series No. 33. Arkansas Archeological Survey, Fayetteville.

1989b Environmental Setting. In *From the Gulf Coast to the Rio Grande: Human Adaptation in the Central, South, and Lower Pecos Texas*, edited by T.R. Hester, S.L. Black, D.G. Steele, B.W. Olive, A.A. Fox, K.J. Reinhard, and L.C. Bement, pp. 5-17. Research Series No. 33. Arkansas Archeological Survey, Fayetteville.

Black, S.L., and D.G. Creel
1997 The Central Texas Burned Rock Midden Reconsidered. In *Hot Rock Cooking on the Greater Edwards Plateau: Four Burned Rock Midden Sites in West Central Texas*, edited by S.L. Black, L.W. Ellis, D.G. Creel, and G.T. Goode, pp. 446-515. Studies in Archeology 22. Texas Archeological Research Laboratory, The University of Texas at Austin.

Black, S.L., L.W. Ellis, D.G. Creel, and G.T. Goode

1997 *Hot Rock Cooking on the Greater Edwards Plateau: Four Burned Rock Midden Sites in West Central Texas*. Studies in Archeology 22. Texas Archeological Research Laboratory, The University of Texas at Austin; Texas Department of Transportation Environmental Affairs Department, Archeology Studies Program, Report 2.

Black, S.L., and A.J. McGraw

1985 *The Panther Springs Creek Site: Cultural Change and Continuity in the Upper Salado Creek Drainage, South-Central Texas*. Archaeological Survey Report, No 100. Center for Archaeological Research, The University of Texas at San Antonio.

Blair, W.F.

1950 The Biotic Provinces of Texas. *The Texas Journal of Science* 2(1):93-117.

Boulter, C., M.D. Bateman, and C.D. Frederick

2010 Understanding Geomorphic Responses to Environmental Change: A 19,000-year Case Study from Semi-arid Central Texas, USA. *Journal of Quaternary Science* 25(6):889-902.

Bousman, C.B.

1998 Paleoenvironmental Change in Central Texas: The Palynological Evidence. P*lains Anthropologist* 43(164):201-219.

Bousman, C.B., and R.C. Fields

1988 Results of the Geoarcheological Investigations. In *Archeological Survey of the 1989-1993 Permit Area, Jewitt Mine Project, Freestone and Leon Counties, Texas*, edited by R.C. Fields, pp. 195-237. Reports of Investigations No. 63. Prewitt and Associates, Inc., Austin.

Brown, D.O.

1998 Late Holocene Climates of North-Central Texas. *Plains Anthropologist* 43:157-172.

Bryant Jr., V.M.

1977 A 16,000 Year Pollen Record of Vegetational Change in Central Texas. *Palynology* 1:143-156.

Bryant, V.M., Jr., and H.J. Shafer

1977 The Late Quaternary Paleoenvironment of Texas: A Model for the Archeologist. B*ulletin of the Texas Archeological Society* 48:1-25.

Bryson, R.A.

1989 Modeling thee NW Indian Monsoon for the Last 40,000 Years. *Climate Dynamics* 3:169-177.

1992 A Macrophysical Model of the Holocene Intertropical Convergence and Jetstream Positions and Rainfall for the Saharan Region. *Meteorology and Atmospheric Physics* 47:247-258.

1994 On Integrating Climatic Change and Cultural Change Studies. *Human Ecology* 22:115-128.

2005 Archeoclimatology. In E*ncyclopedia of World Climatology*, edited by J. E. Oliver, pp. 58-63. Encyclopedia of Earth Science Series, Springer, New York.

2007 Calculating Potential Evapo-Transpiration (PET). In A *Paleoclimatology Workbook: High Resolution, Site-Specific, Macrophysical Climate Modeling*, edited by R. A. Bryson and K. M. DeWall, pp. 53-58. The Mammoth Site of Hot Springs, South Dakota, Inc.

Bryson, R.A., and R.U. Bryson
1997 Macrophysical Climate Modeling of Africa's Late Quaternary Climate: Site-Specific, High-Resolution Applications for Archaeology. *African Archaeological Review* 14:143-160.

Bryson, R.A., and K.M. DeWall
2007a An Introduction to the Archaeoclimatology Macrophysical Climate Model. In *A Paleoclimatology Workbook: High Resolution, Site-Specific, Macrophysical Climate Modeling*, edited by R.A. Bryson and K.M. DeWall, pp. 3-10. The Mammoth Site of Hot Springs, South Dakota, Inc.

2007b Overview of the Excel Model: Applying the Model to a New Location. In A *Paleoclimatology Workbook: High Resolution, Site-Specific, Macrophysical Climate Modeling*, edited by R.A. Bryson and K.M. DeWall, pp. 59-67. The Mammoth Site of Hot Springs, South Dakota, Inc.

Bryson, R.A., and B.M. Goodman
1986 Milankovitch and Global Ice Volume Simulation. *Theoretical and Applied Climatology* 37:22-28.

Bryson, R.A., and W.M. Wendland
1967 Tentative Climate Patterns for Some Late-Glacial and Post-Glacial Episodes in Central North America. In *Life, Land, and Water*, edited by W.J. Mayer-Oakes, pp. 271-298. University of Manitoba, Winnipeg.

Bryson, R.U., R.A. Bryson, and A.H. Ruter
2007 A Calibrated Radiocarbon Database of Late Quaternary Volcanic Eruptions. In A *Paleoclimatology Workbook: High Resolution, Site-Specific, Marcophypsical Climate Modeling*, edited by R.A. Bryson and K.M. DeWall, pp. 27-31. The Mammoth Site of Hot Springs, South Dakota, Inc.

Campbell, T.N., and T.J. Campbell
1981 *Historic Indians of the Choke Canyon Reservoir Surrounding Area, Southern Texas*. Choke Canyon Series, No. 1. Center for Archaeological Research. The University of Texas at San Antonio.

Camper, H.A.
1991 Pollen Analysis of Patschke Bog. Unpublished Master's thesis, Department of Botany, Texas A&M University, College Station.

Collins, M.B.
1995 Forty Years of Archeology in Central Texas. *Bulletin of the Texas Archeological Society* 66:361-400.

1998 *Wilson-Leonard: An 11,000 Year Archeological Record of Hunter-Gatherers in Central Texas*. Studies in Archeology 31. Texas Archeological Research Laboratory. The University of Texas at Austin.

1999a *Clovis Blade Technology*. University of Texas Press, Austin.

1999b Gault Site. In *The Handbook of Texas*, edited by R.R. Barkley, pp. 117-118. Texas State Historical Association, Austin.

2004 Archeology in Central Texas. In *The Prehistory of Texas*, edited by T.K. Perttula, pp. 205-265. Texas A&M University Press, College Station.

Collins, M.B., W.A. Gose, and S. Shaw
1994 Preliminary Geomorphological Findings at Dust and Nearby Caves. *Journal of Alabama Archaeology* 40:35-56.

Cooke, M.J.
2005 Soil Formation and Erosion in Central Texas: Insights from Relict Soil and Cave Deposits. Unpublished Ph.D dissertation, University of Texas at Austin.

Covill, W.E.
1971 *Ink Bottles and Inkwells*. William S. Sullwold, Publishing, Tauton, Massachusetts.

Creel, D.G.
1986 Study of Prehistoric Burned Rock Middens in West Central Texas. Unpublished Ph.D. dissertation, The University of Arizona.

Dalan, R.A., and S.K. Banerjee
1998 Solving Archaeological Problems Using Techniques of Soil Magnetism. *Geoarchaeology* 13:3-36.

Dearing, J.
1999 *Environmental Magnetic Susceptibility*. Chi Publishing, Kenilworth, England.

DeWall, K.M.
2007 Questions and Answers: Troubleshooting. In A *Paleoclimatology Workbook: High Resolution, Site-Specific, Macrophysical Climate Modeling*, edited by R.A. Bryson and K.M. DeWall, pp. 69-72. The Mammoth Site of Hot Springs, South Dakota, Inc.

Dillehay, T.
1974 Late Quaternary Bison Population Changes on the Southern Plains. *Plains Anthropologist* 19(64):180-196.

Dillon, C.L.
1958 Current Trends in Glass Technology. *American Journal of Enology* 9(2):59-63.

Ellis, L.W., G.L. Ellis, and C.D. Frederick
1995 Implications of Environmental Diversity in the Central Texas Archeological Region. *Bulletin of the Texas Archeological Society* 66:401-426.

Everitt, B.S.
1977 The Analysis of Contingency Tables. Chapman and Hall, London.

Fawcett Jr., W.B.
1975 *An Archeological Survey of the Proposed Federal Youth Center, Bastrop County, Texas*. Technical Bulletin No. 10. Texas Archeological Survey, The University of Texas at Austin.

Fields, R.C.
1995 The Archeology of the Post Oak Savannah of East Central Texas. *Bulletin of the Texas Archeological Society* 66:310-330.

Foster, W.C.
1995 *Spanish Expeditions into Texas 1689-1768*. University of Texas Press, Austin.

1998 *The La Salle Expedition to Texas: The Journal of Henri Joutel 1664-1687*. Texas State Historical Association, Austin.

Frederick, C.D., and M.D. Bateman
2001 OSL Dating and Sandy-Mantle Sites in East Texas: A Reply. *Current Archeology in Texas* 3(2):14-18.

Frederick, C.D., M.D. Bateman, and R. Rogers
2002 Evidence for Eolian Deposition in the Sandy Uplands of East Texas and the Implications for Archaeological Site Integrity. *Geoarchaeology: An International Journal* 17(2):191-217.

Freeman, M.D., D.L. Nickels, and T. Sitton
2006 *An Oral History of Camp Swift: 2004 Interviews*. Archaeological Studies Report No. 9. Center for Archaeological Studies. Texas State University, San Marcos.

Givens, R.D.
1968 A Preliminary Report on Excavations at Hitzfelder Cave. *Bulletin of the Texas Archeological Society* 38:47-50.

Goode, G.T.
1989 Archaeological Testing and Recommendations for the Kennedy Bluffs Site, 41BP19, in Bastrop County, Texas. Appendix II. In *Excavations at 41BP19, the Kennedy Bluffs Site, Bastrop County, Texas*, edited by L.C. Bement. Contract Reports for Archaeology, Report 5, Texas State Department of Highways and Public Transportation, Highway Design Division, Austin.

1991 Late Prehistoric Burned Rock Middens in Central Texas. In T*he Burned Rock Middens of Texas: An Archaeological Symposium*, edited by T.R. Hester, pp. 71-93. Studies in Archeology 13. Texas Archeological Research Laboratory. The Universtiy of Texas at Austin.

Gould, F.W.
1975 *Texas Plants-A Checklist and Ecological Summary*. Bulletin MP 585:5-14. Texas Agricultural Experimentation Station, College Station.

Haberman, S.J.
1973 The Analysis of Residuals in Cross-classified Tables. *Biometrics* 29:205-220.

Hall, G.D.
1981 *Allens Creek: A Study in the Cultural Prehistoric of the Brazos River Valley*. Research Report 61. Texas Archeological Survey. The University of Texas at Austin.

Hall, S.A.
1990 Channel Trenching and Climatic Change in the Southern U. S. Great Plains. *Geology* 18:342-345.

Handbook of Texas Online
2012 Big Sandy Creek (Lee County). Electronic document, http://www.tshaonline.org/handbook/online/articles/BB/rbbda.html, accessed February 16, 2012.

Hester, T.R.
1995 The Prehistory of South Texas. *Bulletin of the Texas Archeological Society* 66:427-459.

Higgins, P., and B.J. MacFadden
2009 Seasonal and Geographic Climate Variabilities During the Last Glacial Maximum in North America: Applying Isotopic Analysis and Macrophysical Climate Models. *Palaeogeography, Palaeoclimatology, Palaeoecology* 283:15-27.

Holliday, V.T.
1989 Middle Holocene Drought on the Southern Plains. *Quaternary Research* 31:74-82.

Holloway, R.G.
1987 Late Holocene Paleoenvironmental Studies in Northcentral Texas. In *Introduction to the Richland Creek Archaeological Project, Environmental Background and Cultural Setting*, edited by J.E. Bruseth and R.W. Moir. Richland Creek Technical Series, Volume 1, Appendix A. Archaeological Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Houk, B.A., and J.C. Lohse
1993 Archaeological Investigations at the Mingo Site, Bandera County, Texas. *Bulletin of the Texas Archeological Society* 61:193-247.

Hurt, R.D.
1980 Archeological Investigations of Portions of the Middle Concho Valley. Unpublished Master's thesis, Texas Tech University, Lubbock.

Johnson, L.
1995 *Past Cultures and Climates at Jonas Terrace, 41ME29, Medina County, Texas*. Office of the State Archeologist, Report 40. Texas Department of Transportation and Texas Historical Commission, Austin.

Johnson, L., and G. Goode
1994 A New Try at Dating and Characterizing Holocene Climates, as well as Archaeological Periods, on the Eastern Edwards Plateau. *Bulletin of the Texas Archeological Society* 65:1-15.

Kemp, L.
2008 Buffaloed by Bison: Modeling Bison Abundance in Prehistoric Central Texas. Unpublished Master's thesis, The University of Texas at San Antonio.

Leffler, J.J.
2001 The History of the Camp Swift Area, 1830-1950. In *An Archaeological Inventory of Camp Swift, Bastrop County, Texas*, edited by B. A. Meissner, pp. 14-30. Archaeological Survey Report, No. 316. Center for Archaeological Research, The University of Texas at San Antonio.

Lehman, M.L., D.L. Nickels, and A. Padilla
2003 Site Descriptions, Analysis, and Recommendations. In A*rchaeological Evaluation of 39 Category V Sites at Camp Swift, Bastrop County, Texas: 2001*, edited by D.L. Nickels, M.L. Lehman, and C.B. Bousman, pp. 25-132. Archaeological Studies Report No. 3 Center for Archaeological Studies, Southwest Texas State University, San Marcos.

Leigh, D.S.
1998 Evaluating Artifact Burial by Eolian versus Bioturbation Processes, South Carolina Sandhills, USA. *Geoarchaeology: An International Journal* 13(3):309-330.

Leshley, C.M.
1994 Archeological Survey for Ammunition Storage Facilities at Camp Swift, Bastrop County, Texas. Unpublished Archeological Survey Report. Adjutant General's Department of Texas, Austin.

1996 Archeological Survey for the Proposed Army Aviation Support Facility at the Camp Swift Military Reservation, Bastrop County, Texas. Unpublished Archeological Survey Report. Adjutant General's Department of Texas, Austin.

Lindsey, B.
2012 Historic Glass Bottle Identification and Information. Electronic document, http://www.sha.org/bottle/index.html, accessed February 16, 2012.

Lockhart, B.
2006 A Tale of Two Machines and A Revolution in Soft Drink Bottling. *Bottles and Extras* 17(2):19-25.

Lohse, J.C., and C.B. Bousman
2006 *National Register Evaluation of Eight Sites at Camp Swift Army National Guard Training Center, Bastrop County, Texas: Swift V*. Archaeological Studies Report No. 8. Center for Archaeological Studies, Texas State University, San Marcos.

Lukowski, P.D.
1988 *Archaeological Investigations at 41BX1, Bexar County, Texas*. Archaeological Survey Report, No. 135. Center for Archaeological Research, The University of Texas at San Antonio.

Markota, P., and A. Markota
1994 *Western Blob Top Soda and Mineral Water Bottles*. 2nd ed. Privately Published.

Marks, P.M.
2012a The Handbook of Texas Online. Bastrop County. Electronic document, http://www.tshaonline.org/handbook/online/articles/hcb03, accessed February 16, 2012.

2012b The Handbook of Texas Online. Bastrop, Texas. Electronic document, http://tshaonline.org/handbook/online/articles/BB/hgb4.html, accessed February 16, 2012.

2012c Handbook of Texas Online. Elgin, TX. Electronic document, http://www.tshaonline.org/handbook/online/articles/hge06, accessed December 21, 2011.

Martin, B., and V. Martin
1973 *Here's to Beers: Blob Top Beer Bottles 1880-1910*. Privately Published.

Mauldin, R.P.
2001 Assessments and Recommendations. In A*n Archaeological Inventory of Camp Swift, Bastrop County, Texas*, edited by D.G. Robinson, T.M. Meade, L.H. Kay, L. Gassaway, and D. Kay, pp. 175-186. Archaeological Survey Report No. 316. Center for Archaeological Research, The University of Texas at San Antonio.

2003 Development of Burned Rock Middens. In A*rchaeological Testing to Determine the National Register Eligibility Status of 18 Prehistoric Sites on Camp Bowie, Brown County, Texas*, 2 vols. edited by R.P. Mauldin, D.L. Nickels, and C.J. Broehm, pp. 175-196. Archaeological Survey Report 334. Center for Archaeological Research, The University of Texas at San Antonio.

Mauldin, R.P., and A.L. Figueroa
2006 *Data Recovery Excavations at 41PR44, Fort Wolters, Parker County, Texas*. Archaeological Report No. 369, Center for Archaeological Research, University of Texas at San Antonio.

Mauldin, R.P., D.L. Nickels, and C.J. Broehm
2003 *Archaeological Testing to Determine the National Register Eligibility Status of 18 Prehistoric Sites on Camp Bowie, Brown County, Texas*. Archaeological Survey Report, No. 334. Center for Archaeological Research, The University of Texas at San Antonio.

McClean, R.G., and W.F. Kean
1993 Contributions of Wood Ash Magnetism to Archeomagnetic Properties of Fire Pits and Hearths. *Earth and Planetary Science Letters* 119:387-394.

McDonald, H.G., and R.A. Bryson
2012 Modeling Pleistocene Local Climate Parameters Using Macrophysical Climate Modeling and the Paleoecology of Pleistocene Megafauna. *Quaternary International* 217:131-137.

McDougall, D.P.
1990 The Bottles of the Hoff Store Site. In T*he Hoff Store Site and Gold Rush Merchandise from San Francisco, California*, edited by A.G. Pastron and E.M. Hattori, pp. 58-74. Society for American Archaeology, Special Publication Series, Number 7.

McKearin, H., and K.M. Wilson
1978 *American Bottles and Flasks and Their Ancestry*. Crown Publishers, Inc., New York.

Miller, G.L., and T. McNichol
2002 Dates for Suction Scarred Bottoms: Chronological Changes in Owens Machine-Made Bottles. In *Society for Historical Archaeology Meeting*, Mobile, Alabama.

Miller, G.L., and C. Sullivan
1984 Machine-made Glass Containers and the End of Production for Mouth-blown Bottles. *Historical Archaeology* 18(2):83-96.

Moore, D.
1987 *Appendix II: Additional Archival Investigations of Seven Historic Sites Within the CPS Butler Lignite Prospect, Bastrop and Lee Counties, Texas*. Espey, Huston, & Associates, Austin.

Munoz, C.M.
2010 Archaeological Phase I Testing of 41BP854 at the Texas Military Force's Camp Swift Facility in Bastrop County, Texas. Manuscript on file, Center for Archaeological Research, The University of Texas at San Antonio.

Munoz, C.M., R.P. Mauldin, D.Paul, and L. Kemp
2012 Monitoring Paleovegetation Shifts through Stable Carbon Isotope Variability in Archaeologically Recovered Leporids. *Texas Journal of Science* 63, in press.

Nash, M.A., D. Green, E. Baxter, and R. Brownlow
1996 *Class III Cultural Resources Inventory and Biological Survey of 4 Wellpads and Access Road Routes, Camp Swift, Bastrop County, Texas*. Document No. 960561, EH&A Job No. 17293. Espey, Huston & Associates, Inc., Environmental Consultants, Austin, Texas.

National Oceanic and Atmospheric Administration (NOAA)
2002 Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000, 41 Texas. Climatography of the United States No. 81. National Climate Data Center, NESDIS/NOAA, Asheville, North Carolina.

2012 Monthly/Annual/Average Precipitation for Austin, TX (1856-2012), http://www.srh.noaa.gov/images/ewx/aus/attmonrain.pdf, accessed March 15, 2012.

Nickels, D.L.
2000 The Beisenbach Site (41WN88): A Case Study in Diet Breadth. Unpublished Master's thesis, The University of Texas at San Antonio.

Nickels, D.L., and C.B. Bousman
2008 *Archaeological Excavations on 20 Prehistoric Sites at Camp Swift, Bastrop County, Texas: 2002*. Archaeological Studies Report No. 12. Center for Archaeological Studies, Texas State University, San Marcos.

Nickels, D.L., C.B. Bousman, and J.L. Hurley
2010 *An Archaeological Survey of 3,475 Acres at Camp Swift, Bastrop County, Texas*. Archaeological Studies Report No. 11. Center for Archaeological Studies, Texas State University, San Marcos.

Nickels, D.L., and M. Lehman
2004 *Archaeological Evaluation of Sandy Mantle Prehistoric and Historic Sites at Camp Swift: Bastrop County, Texas: 2003*. Archaeological Studies Report No. 5. Center for Archaeological Studies, Texas State University, San Marcos.

Nickels, D.L., M.L. Lehman, and C.B. Bousman
2003 *Archaeological Evaluation of 39 Category V Sites at Camp Swift, Bastrop County, Texas: 2001*. Archaeological Studies Report No. 3. Center for Archaeological Studies, Southwest Texas State University.

Nickels, D.L. and R.P. Mauldin
2001 *The Project Environment. In Archaeological Survey of Twin Buttes Reservoir, Tom Green County, Texas*, Vol. 1, edited by R.P. Mauldin and D.L. Nickels. Archaeological Survey Report, No. 300. Center for Archaeological Research. The University of Texas at San Antonio.

Nickels, D.L., A.E. Padilla, and J.E. Barrera
2005 A*n Archaeological Survey of 307 Acres at Camp Swift, Bastrop County, Texas: 2003*. Archaeological Studies Report No. 6. Center for Archaeological Studies, Texas State University, San Marcos.

Nightengale, B.A., and H.B. Moncure
1996 *Intensive Cultural Resource Survey and Monitoring at the LCRA Camp Swift Regional Wastewater Project, Bastrop County, Texas*. Cultural Resources Report No. 3. Lower Colorado River Authority, Environmental Protection Division, Austin.

Nordt, L.C., T.W. Boutton, J.S. Jacob, and R. Mandel
2002 C_4 Plant Productivity and Climate CO_2 Variations in South-Central Texas during the Late Quaternary. *Quaternary Research* 58(2):182-188.

1994 *Late Quaternary Climates of Central Texas Based on the Stable Isotope Composition of Organic Carbon*. Program and Abstracts. 52nd Plains Conference, 65th Annual Meeting of the Texas Archeological Society, Lubbock.

Patterson, L.W.
1995 The Archeology of Southeast Texas. *Bulletin of the Texas Archeological Society* 66:239-264.

Prewitt, E.R.
1981 Culture Chronology in Central Texas. *Bulletin of the Texas Archeological Society* 52:65-89.

1985 From Circleville to Toyah: Comments on Central Texas Chronology. *Bulletin of the Texas Archeological Society* 54:201-238.

Ramsey, C.B.
2009 Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51:337-360.

Reynolds, R.L., and J.W. King
1995 Magnetic Records of Climate Change. U.S. National Report to I.U.G.G., 1991-1994. *Rev. Geophys. Suppl.* 33:101-110.

Robinson, D.G.
2001 Historic Contexts for Camp Swift. In A*n Archaeological Inventory of Camp Swift, Bastrop County, Texas*, edited by B.A. Meissner, pp. 155-159. Archaeological Survey Report No. 316. Center for Archaeological Research, The University of Texas at San Antonio.

Robinson, D.G., T.M. Meade, L. Haslouer Kay, L. Gassaway, and D. Kay
2001 *An Archaeological Inventory of Camp Swift, Bastrop County, Texas*. Archaeological Survey Report No. 316. Center for Archaeological Research, The University of Texas at San Antonio.

Ruter, A.H., J. Arzt, S. Vavrus, R.A. Bryson, and J. E. Kutzbach
2004 Climate and Environment of the Subtropical and Tropical Americas (NH) in the Mid-Holocene: Comparison of Observations with Climate Model Simulations. *Quaternary Science Reviews* 23:663-679.

Schmeiser, A.
1968 *Have Bottles, Will Pop!* Michalan Press, Dixon, California.

1970 *More Pop!* Michalan Press, Dixon, California.

Schmidt, J.S., and M.E. Cruse
1995 *Cultural Resources Survey, Camp Swift, Bastrop County, Texas*. Espey, Huston & Associates, Inc., Austin.

Singer, M.J., and P. Fine
1989 Pedogenic Factors Affecting Magnetic Susceptibility of Northern California Soils. *Soil Science of America Journal* 53:1119-1127.

Sitton, T.
2006 *Sandyland Farmers: Life in the Countryside Before Camp Swift, 1920-1942*. Archaeological Studies Report No. 9. Center for Archaeological Studies. Texas State University, San Marcos.

Skelton, D.W., and M.D. Freeman
1979 *A Cultural Resource Inventory and Assessment at Camp Swift, Texas*. Report No. 72. Texas Archeological Survey, University of Texas at Austin.

Smith, C.S.
2011 Stable Carbon Isotope Analysis of Modern Leporids to Assess their Usefulness as Fine-Grained Ecological Proxies to Reconstruct Local Paleoecology. Unpublished Master's thesis, University of Texas at San Antonio.

Soil Survey Staff
2012 Web Soil Survey. Natural Resources Conservation Service, United States Department of Agriculture, http://websoilsurvey.nrcs.usda.gov/, accessed February 16, 2012.

Story, D.A.
1985 Adaptive Strategies of Archaic Cultures of the West Gulf Coastal Plain. In *Prehistoric Food Production in North America*, edited by R.I. Ford, pp. 19-56. Anthropological Papers No. 75. Museum of Anthropology. University of Michigan, Ann Arbor.

Stringer, S.S., and A.J. Wormser
1996 Archeological Survey for Proposed Pond Improvements, Camp Swift Military Reservation, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Sullo, D.M., and A.J. Wormser
1996 Archeological Survey for Proposed Bradley Fighting Vehicle Training "Area A" at Camp Swift Military Reservation, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Takac, P.R., and W.A. Gose
1998 Magnetic Susceptibility of Sediments. In W*ilson-Leonard. An 11,000-year Archeological Record of Hunter-Gatherers in Central Texas. Volume IV: Archeological Features and Technical Analyses*, edited by M.B. Collins, pp. 1329-1341. Studies in Archeology 31. Texas Archeological Research Laboratory, University of Texas at Austin and Archeology Studies Program, Report 10, Texas Department of Transportation, Environmental Affairs Division, Austin.

Tankersley, K.B., and B.L. Isaac
1990 *Early Paleoindian Economies of North America*. JAI Press, Greenwich, Connecticut.

Taylor, A.J., and C.L. Highley
1995 *Archaeological Investigations at the Loma Sandia Site (41LK28): A Prehistoric Campsite in Live Oak County, Texas*. Studies in Archeology No. 20. Texas Archeological Research Laboratory. The University of Texas at Austin.

Taylor, R.
1996 *The New Handbook of Texas*. 6 vols. The Texas State Historical Association, Austin.

Texas Parks and Wildlife Department (TPWD)
2012 GIS Vegetation Types of Texas, http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_bn_w7000_0120/woods/, accessed February 16, 2012.

Texas Water Development Board
2012 Precipitation and Lake Evaporation Data for Texas, http://midgewater.twdb.state.tx.us/Evaporation/evap.html, accessed March 15, 2012.

Thoms, A.V.
2007 Fire-Cracked Rock Features on Sandy Landforms in the Northern Rocky Mountains: Toward Establishing Reliable Frames of Reference for Assessing Site Integrity. *Geoarchaeology: An International Journal* 22(5):477-510.

Tooley, F.V.
1983 *Handbook of Glass Manufacture: A Book of Reference for the Factory Engineer, Chemist and Plant Executive*. Ogden Publishing Company, New York.

Toomey, R.S.
1993 Late Pleistocene and Holocene Faunal Environmental Changes at Hall's Cave, Kerr County, Texas. Unpublished Ph.D. dissertation, The University of Texas at Austin.

Toomey, R.S., M. D. Blum, and S. Valastro Jr.
1993 Late Quaternary Climates and Environments of the Edwards Plateau, Texas. *Global and Planetary Change* 7:299-320.

Tractor Wiki
2011 B.F. Avery and Sons Co., http://tractors.wikia.com/wiki/B.F.Avery_%26_Sons_Co., accessed December 21, 2011.

Trowbridge, J.T.
1870 *Lawrence's Adventures among the Ice-Cutters, Glass-Makers, Coal-Miners, Iron-Men, and Ship-Builders*. Henry T. Coates and Company, Philadelphia.

Turner, S.E., and T.R. Hester
1999 *A Field Guide to Stone Artifacts of Texas Indians*. 3rd ed. Gulf Publishing, Houston.

U.S. Geological Survey
2012 National Hydrography Dataset, http://nhd.usgs.gov/, accessed December 21, 2011.

Weir, F.A.
1976 The Central Texas Archaic. Unpublished Ph.D. dissertation, Washington State University, Pullman.

Whitten, D.
2012 Glass Manufacturer's Marks on Bottles. Electronic Document, http://myinsulators.com/glass-factories/bottlemarks.html#ABCDEF, accessed February 16, 2012.

Wormser, A.J.
1993a Archeological Survey of a Proposed Septic Field East of the Blackwell Drop Zone at Camp Swift, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

1993b Archeological Survey of Proposed Tank Ditches at the Northwest Side of Scott Hill at Camp Swift, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

1994 Archeological Survey for Rechannelization of a Stream at the M60 Range Firing Line at Camp Swift, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Wormser, A.J., L.H Kay, and D. Kay
1997 Archeological Investigation of Road and Firebreak Improvements at Camp Swift, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Wormser, A.J., and C.M. Leshley
1995 Archeological Survey for the Proposed 386th Engineer Battalion Annual Squad and Platoon Training at Camp Swift, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Wormser, A.J., and D.M. Sullo
1996 Archeological Survey for Proposed Driver Training "Area B" at Camp Swift Military Reservation, Bastrop County, Texas. Unpublished Report. Adjutant General's Department of Texas, Austin.

Zumwalt, B.
1980 *Ketchup, Pickles, Sauces: 19th Century Food in Glass*. Mark West Publishers, Fulton, California.

Appendix A:
Shovel Test Data

Appendix A
Shovel Test Data

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
1	1-1	Edge	4	35	red clay	negative	
1	1-2	Robco	4	40	red clay	negative	
1	1-3	Edge	5	45	red clay	negative	
1	1-4	Silstid	5	50	red clay	negative	
1	1-5	Edge	7	70	complete	negative	
1	1-6	Edge	6	60	red clay	negative	
1	1-7	Robco	3	30	red clay	negative	
1	1-8	Edge	7	70	complete	negative	
2	2-1	Edge	4	32	red clay	negative	
2	2-2	Edge	3	30	red clay	negative	
2	2-3	Edge	7	70	complete	negative	
2	2-4	Tabor	7	70	complete	negative	
2	2-5	Crockett	5	50	red clay	negative	
2	2-6	Tabor	5	50	red clay	negative	
2	2-7	Robco	6	52	red clay	negative	
2	2-8	Padina	7	70	complete	positive	41BP866
2	2-9	Edge	5	50	red clay	positive	41BP866
2	2-10	Tabor	7	70	complete	negative	
2	2-8-1	Padina	7	70	complete	negative	41BP866
2	2-8-2	Padina	7	70	complete	negative	41BP866
2	2-8-3	Padina	7	70	complete	negative	41BP866
2	2-8-4	Padina	7	70	complete	negative	41BP866
2	2-8-5	Padina	7	70	complete	negative	41BP866
2	2-8-6	Padina	7	70	complete	negative	41BP866
2	2-8-7	Padina	7	70	complete	negative	41BP866
2	2-8-8	Padina	7	70	complete	negative	41BP866
2	2-9-1	Edge	5	50	red clay	negative	41BP866
2	2-9-2	Edge	5	50	large root	positive	41BP866
2	2-9-3	Edge	3	30	red clay	negative	41BP866
2	2-9-4	Edge	3	30	red clay	negative	41BP866
2	2-9-5	Edge	3	30	red clay	negative	41BP866
2	2-9-6	Edge	7	70	complete	negative	41BP866
2	2-9-7	Edge	3	30	red clay	negative	41BP866
2	2-9-8	Edge	4	40	red clay	negative	41BP866
2	2-9-9	Edge	7	70	complete	positive	41BP866
2	X11-1	Padina	7	70	complete	negative	41BP866
2	X11-2	Padina	5	45	red clay	negative	41BP866

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
2	X11-3	Padina	6	60	red clay	negative	41BP866
2	X11-4	Padina	7	70	complete	negative	41BP866
2	X11-5	Padina	7	70	complete	positive	41BP866
2	X11-6	Padina	7	70	complete	negative	41BP866
2	X11-7	Padina	7	70	complete	negative	41BP866
2	X11-8	Edge	3	30	red clay	negative	41BP866
2	X11-9	Padina	7	70	complete	negative	41BP866
2	X12-1	Edge	4	41	red clay	negative	41BP866
2	X12-2	Edge	7	70	complete	positive	41BP866
3	3-1	Edge	3	22	red clay	negative	
3	3-2	Edge	7	70	complete	negative	
3	3-3	Edge	4	40	red clay	negative	
3	3-4	Edge	7	70	complete	negative	
3	3-5	Edge	7	70	complete	negative	
3	3-6	Tabor	6	60	red clay	negative	
3	3-7	Tabor	7	70	complete	negative	
3	3-8	Tabor	5	45	red clay	negative	
3	3-9	Silstid	7	70	complete	negative	41BP859
3	3-10	Edge	5	50	red clay	negative	
3	3-11	Edge	7	70	complete	negative	
3	3-12	Silstid	7	70	complete	negative	
3	3-13	Silstid	6	54	red clay	negative	
3	3-14	Silstid	7	70	complete	negative	
3	3-15	Silstid	7	70	complete	negative	
3	3-16	Edge	7	70	complete	negative	
3	3-17	Edge	4	40	red clay	negative	
3	3-18	Robco	5	50	red clay	negative	
3	3-19	Tabor	6	53	red clay	negative	
3	X1-1	Silstid	7	70	complete	positive	41BP859
3	X1-2	Silstid	7	70	complete	positive	41BP859
3	X1-3	Tabor	7	70	complete	positive	41BP859
3	X1-4	Tabor	7	70	complete	positive	41BP859
3	X1-5	Silstid	7	70	complete	negative	41BP859
3	X1-6	Silstid	7	70	complete	negative	41BP859
3	X1-7	Tabor	4	40	red clay	negative	41BP859
3	X1-8	Tabor	3	30	red clay	negative	41BP859
3	X1-9	Tabor	7	70	complete	negative	41BP859
3	X1-10	Tabor	7	70	complete	negative	41BP859
3	X1-11	Tabor	7	70	complete	positive	41BP859
3	X1-12	Edge	2	20	red clay	negative	41BP859
3	X1-13	Edge	6	52	red clay	negative	41BP859

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
3	X1-14	Tabor	7	70	complete	positive	41BP859
3	X1-15	Edge	1	10	red clay	negative	41BP859
3	X1-16	Tabor	7	70	complete	positive	41BP859
3	X4-3	Edge	7	70	complete	negative	41BP860
3	X4-4	Edge	7	70	complete	negative	41BP860
3	X4-5	Edge	7	70	complete	negative	41BP860
6	X4-6	Edge	7	70	complete	positive	41BP860
3	X10-1	Edge	7	70	complete	negative	41BP865
3	X10-2	Edge	7	70	complete	negative	41BP865
3	X10-3	Edge	7	70	complete	negative	41BP865
3	X10-4	Edge	7	70	complete	positive	41BP865
3	X10-5	Silstid	7	70	complete	negative	41BP865
3	X10-6	Edge	7	70	complete	positive	41BP865
3	X10-7	Edge	7	70	complete	negative	41BP865
3	X10-8	Edge	7	70	complete	negative	41BP865
4	4-1	Edge	2	20	red clay	negative	
4	4-2	Edge	5	48	red clay	negative	41BP432
4	4-3	Edge	1	5	red clay	negative	
4	4-4	Edge	7	70	complete	negative	
4	4-5	Edge	4	35	red clay	negative	
4	4-6	Edge	2	20	red clay	negative	
4	4-7	Edge	3	30	red clay	negative	
4	4-8	Sayers	7	70	complete	positive	41BP867
4	4-9	Sayers	5	42	red clay	negative	
4	4-10	Edge	3	30	red clay	negative	
4	4-11	Robco	5	49	red clay	negative	
4	4-12	Robco	7	70	complete	negative	
4	4-13	Edge	2	20	red clay	negative	
4	4-14	Edge	2	20	red clay	negative	
4	4-15	Edge	4	40	red clay	negative	
4	4-16	Robco	3	30	red clay	negative	
4	4-17	Edge	7	70	complete	negative	
4	4-18	Edge	2	20	red clay	negative	
4	4-19	Edge	7	70	complete	negative	
4	4-20	Edge	3	22	red clay	negative	
4	4-21	Edge	4	40	red clay	negative	
4	4-8-1	Sayers	7	70	complete	negative	41BP867
4	4-8-2	Sayers	4	36	red clay	negative	41BP867
4	4-8-3	Sayers	6	60	red clay	negative	41BP867
4	4-8-4	Sayers	5	44	red clay	negative	41BP867
4	4-8-5	Sayers	7	70	complete	negative	41BP867

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
4	4-8-6	Sayers	7	70	complete	negative	41BP867
4	4-8-7	Sayers	7	70	complete	positive	41BP867
4	4-8-8	Sayers	7	70	complete	negative	41BP867
4	X9-8	Edge	3	24	red clay	negative	41BP864
4	X9-9	Edge	2	20	red clay	positive	41BP864
4	X9-10	Edge	3	27	red clay	negative	41BP864
4	X9-12	Edge	2	20	red clay	negative	41BP864
4	X9-13	Edge	1	10	red clay	negative	41BP864
5	5-1	Tabor	4	40	red clay	negative	
5	5-2	Tabor	3	25	red clay	negative	
5	5-3	Tabor	4	40	red clay	negative	
5	5-4	Tabor	3	30	red clay	negative	
5	5-5	Tabor	4	35	red clay	positive	isolated find
5	5-6	Edge	3	30	red clay	negative	
5	5-7	Edge	4	40	red clay	negative	
5	5-8	Edge	6	58	red clay	negative	41BP155
5	5-9	Edge	4	40	red clay	negative	41BP155
5	5-10	Edge	3	30	red clay	negative	41BP155
5	5-11	Edge	6	60	red clay	positive	isolated find
5	5-12	Tabor	7	70	complete	positive	isolated find
5	5-13	Edge	3	30	red clay	negative	
5	5-14	Edge	4	40	red clay	negative	
5	5-15	Edge	4	33	red clay	positive	41BP155
5	5-16	Edge	6	58	large root	negative	
5	5-17	Sayers	3	30	red clay	negative	
5	5-18	Robco	7	70	complete	positive	isolated find
5	5-19	Robco	7	70	complete	negative	
5	5-20	Sayers	2	20	red clay	negative	
5	5-21	Robco	2	20	red clay	negative	
5	5-22	Sayers	1	10	red clay	negative	
5	5-23	Edge	7	70	complete	negative	
5	5-24	Edge	2	20	red clay	negative	
5	5-5-1	Tabor	5	50	red clay	negative	
5	5-5-2	Tabor	3	30	red clay	negative	
5	5-5-3	Tabor	1	10	red clay	negative	
5	5-5-4	Tabor	4	40	red clay	negative	
5	5-5-5	Tabor	5	50	red clay	negative	
5	5-5-6	Tabor	3	30	red clay	negative	
5	5-5-7	Tabor	5	50	red clay	negative	
5	5-5-8	Tabor	4	40	red clay	negative	
5	5-11-1	Edge	4	40	red clay	negative	

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
5	5-11-2	Edge	4	40	red clay	negative	
5	5-11-3	Edge	7	70	complete	negative	
5	5-11-4	Edge	3	25	red clay	negative	
5	5-11-5	Edge	4	40	red clay	negative	
5	5-11-6	Edge	4	40	red clay	negative	
5	5-11-7	Edge	7	70	complete	negative	
5	5-12-1	Tabor	3	30	red clay	negative	
5	5-12-2	Tabor	6	60	red clay	negative	
5	5-12-3	Tabor	7	70	complete	negative	
5	5-12-4	Tabor	7	70	complete	negative	
5	5-12-5	Tabor	7	70	complete	negative	
5	5-12-6	Tabor	7	70	complete	negative	
5	5-12-7	Tabor	7	70	complete	negative	
5	5-12-8	Tabor	7	70	complete	negative	
5	5-18-1	Robco	7	70	complete	negative	
5	5-18-2	Robco	7	70	complete	negative	
5	5-18-3	Robco	7	70	complete	negative	
5	5-18-4	Robco	7	70	complete	negative	
5	5-18-5	Robco	7	70	complete	negative	
5	5-18-6	Robco	7	70	complete	negative	
5	5-18-7	Robco	7	70	complete	negative	
5	5-18-8	Robco	5	52	red clay	negative	
6	6-1	Edge	4	40	red clay	negative	
6	6-2	Sayers	5	50	large root	negative	
6	6-3	Sayers	2	17	red clay	negative	
6	6-4	Edge	2	20	red clay	positive	41BP144
6	6-5	Edge	5	44	red clay	negative	
6	6-6	Edge	4	34	red clay	negative	
6	6-7	Edge	1	10	red clay	negative	
6	6-8	Edge	2	20	red clay	negative	41BP863
6	6-9	Edge	3	25	red clay	negative	41BP863
6	6-10	Edge	3	34	red clay	negative	
6	6-11	Edge	3	25	red clay	negative	
6	6-12	Edge	5	45	red clay	negative	
6	6-13	Edge	6	60	red clay	negative	
6	6-14	Crockett	6	60	red clay	negative	
6	6-15	Crockett	5	50	red clay	negative	
6	6-16	Edge	2	20	red clay	negative	
6	6-17	Crockett	4	40	red clay	negative	
6	6-18	Edge	3	24	red clay	negative	
6	6-19	Edge	6	60	red clay	negative	

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
6	6-20	Edge	6	60	red clay	negative	
6	6-21	Edge	5	50	red clay	negative	
6	6-22	Edge	1	10	red clay	negative	
6	6-23	Edge	2	20	red clay	negative	
6	6-24	Edge	5	50	red clay	negative	
6	6-25	Tabor	3	30	red clay	negative	
6	6-26	Crockett	4	40	red clay	negative	
6	6-27	Edge	3	30	red clay	negative	
6	6-28	Crockett	3	30	red clay	negative	
6	6-4-1	Edge	1	10	red clay	negative	41BP144
6	6-4-2	Edge	3	26	red clay	negative	41BP144
6	6-4-3	Edge	2	14	red clay	negative	41BP144
6	6-4-4	Edge	2	16	red clay	negative	41BP144
6	6-4-5	Edge	2	20	red clay	negative	41BP144
6	6-4-6	Edge	2	12	red clay	negative	41BP144
6	6-4-7	Edge	1	10	red clay	negative	41BP144
6	6-4-8	Edge	1	10	red clay	negative	41BP144
6	X4-1	Edge	7	70	complete	negative	41BP860
6	X4-2	Edge	7	70	complete	negative	41BP860
6	X5-1	Edge	2	20	red clay	negative	41BP861
6	X5-2	Edge	3	30	red clay	negative	41BP861
6	X5-3	Edge	2	20	red clay	negative	41BP861
6	X5-4	Edge	2	15	red clay	negative	41BP861
6	X5-5	Edge	3	30	red clay	negative	41BP861
6	X5-6	Edge	2	20	red clay	negative	41BP861
6	X5-7	Edge	2	15	red clay	negative	41BP861
6	X5-8	Edge	3	30	red clay	negative	41BP861
6	X5-9	Edge	5	47	red clay	negative	41BP861
6	X5-10	Edge	2	20	red clay	negative	41BP861
6	X7-1	Edge	2	20	red clay	negative	41BP862
6	X7-2	Edge	1	10	red clay	negative	41BP862
6	X7-3	Edge	3	30	red clay	negative	41BP862
6	X7-4	Edge	2	20	red clay	negative	41BP862
6	X7-5	Edge	3	26	red clay	negative	41BP862
6	X7-6	Edge	3	26	red clay	negative	41BP862
6	X7-7	Edge	1	10	red clay	negative	41BP862
6	X7-8	Edge	1	8	red clay	negative	41BP862
6	X7-9	Edge	1	5	red clay	negative	41BP862
6	X8-1	Edge	5	44	red clay	negative	41BP863
6	X8-2	Edge	4	39	red clay	negative	41BP863
6	X8-3	Edge	2	20	red clay	negative	41BP863

Area	Shovel Test	Soil Series	Termination Level	Depth (cmbs)	Reason for Termination	Results	Trinomial
6	X8-4	Edge	4	35	red clay	negative	41BP863
6	X8-5	Edge	3	23	red clay	negative	41BP863
6	X8-6	Edge	3	28	red clay	negative	41BP863
6	X8-7	Edge	1	10	red clay	negative	41BP863
6	X8-8	Edge	1	2	red clay	negative	41BP863
6	X8-9	Edge	7	70	complete	negative	41BP863
6	X8-10	Edge	3	30	red clay	negative	41BP863
6	X8-11	Edge	3	30	red clay	negative	41BP863
6	X8-12	Edge	2	17	red clay	negative	41BP863
6	X8-13	Edge	2	18	red clay	negative	41BP863
6	X8-14	Edge	3	24	red clay	negative	41BP863
6	X8-15	Edge	3	25	red clay	negative	41BP863
6	X8-16	Edge	2	20	red clay	positive	41BP863
6	X8-17	Edge	4	40	red clay	positive	41BP863
6	X8-18	Edge	4	36	red clay	positive	41BP863
6	X9-1	Edge	2	17	red clay	negative	41BP864
6	X9-2	Edge	2	18	red clay	negative	41BP864
6	X9-3	Edge	2	28	red clay	negative	41BP864
6	X9-4	Edge	1	6	red clay	negative	41BP864
6	X9-5	Edge	2	20	red clay	negative	41BP864
6	X9-6	Edge	3	30	red clay	negative	41BP864
6	X9-7	Edge	3	25	red clay	negative	41BP864
6	X9-11	Edge	4	38	red clay	negative	41BP864