National Register Eligibility Testing of Sites 41BP471, 41BP477, and 41BP666, on Camp Swift, Bastrop County, Texas

by

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With Contributions by

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Archaeological Report, No. 495

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Abstract:

The Center for Archaeological Research (CAR) at The University of Texas at San Antonio conducted National Register of Historic Places (NRHP) eligibility testing of three archaeological sites, 41BP471, 41BP477, and 41BP666, on Camp Swift, a Texas Military Department (TMD) training facility located in Bastrop County, Texas. The project was conducted in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, as well as the Camp Swift section of the TMD's Installation Cultural Resource Management Plan (ICRMP). While not accomplished under a Texas Antiquities Permit, the investigation of the three sites was conducted in a manner consistent with the requirements of the Antiquities Code of Texas. The testing was performed under Interagency Cooperation Agreement TX17-2053-ENV, with Dr. Raymond Mauldin serving as Principal Investigator and Leonard Kemp serving as Project Archaeologist.

CAR excavated 14 1-x-1 m test units and screened approximately 18.5 m^3 of deposits from the three sites in October and November of 2020. CAR identified two burned rock features, one at site 41BP477 and another at site 41BP666. CAR collected 429 pieces of chipped stone debitage, a core, and a small number of chipped stone tools (n=5) including bifaces, edge modified flakes, and a projectile point from the current investigation. In addition, CAR collected 1275 pieces of burned rock weighing approximately 23,488 g. During the current investigation one diagnostic, a Middle Archaic Nolan-like point was found at 41BP471 during this testing. This is only the second Middle Archaic point found on the base. Three charred samples were submitted from 41BP471 and two samples from site 41BP477 to DirectAMS for radiocarbon dating. The calibrated radiocarbon dates fall within the Late Archaic and Late Prehistoric periods as is common for radiocarbon dates from Camp Swift and the surrounding region.

CAR used three interrelated research domains to determine the NRHP eligibility of the three sites. These criteria are the chronological potential of a site, the integrity of a site, and the content of a site. Based upon these analyses, CAR recommends that 41BP471, 41BP477, and 41BP66 should be considered eligible for listing to the NRHP.

Following analyses and quantification, artifacts associated with this project possessing little scientific value were discarded pursuant to Chapter 26.27(g)(2) of the Antiquities Code of Texas and in consultation with both the TMD and the Texas Historical Commission. All remaining cultural materials and all 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 and placed in Accession File 2471.

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Acknowledgements:

Leonard Kemp, the Project Archaeologist, would like to acknowledge the following people who have contributed their valued expertise: the field crew consisting of Michelle Carpenter, Jason Perez, and Peggy Wall. Thanks are also due to Dr. Jessica Nowlin for GIS data management of the project. Thanks to the lab crew consisting of Mikaela Razo and Jason Perez, who identified and created the initial artifact catalog. Lab Director, Cynthia Munoz and Mikaela curated the artifacts and records of the project. The production of this document would not have been possible without the input of Dr. Mary Whisenhunt and Peggy Wall, who edited and formatted the final document. Dr. Kevin Hanselka provided macrobotanical identifications. Thanks again to Camp Swift personnel, SGT Benavidez, MSG Rambikur, and LTC Kost who kept us out of harm's way.

Finally, a special thanks to Kristen Mt. Joy, formerly the Cultural Resources Program Manager for the Texas Military Department. She has moved up to better things, but without her, this, and other publications on the Texas Military Department lands would look very different. Her support of research is, in our experience, all too rare. Thank you, Kristen.

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Chapter 1: Introduction and Project Description

Raymond Mauldin and Leonard Kemp

The Center for Archaeological Research (CAR) at The University of Texas at San Antonio conducted National Register of Historic Places (NRHP) eligibility testing of three archaeological sites on Camp Swift, a military training facility located in Bastrop County in the southeastern portion of central Texas. Operated by the Texas Military Department (TMD), the facility is 7 km south of the City of Elgin, 14 km north of the City of Bastrop (Figure 1-1) and is on the Lake Bastrop and Elgin East Texas USGS 7.5-minute quadrangle

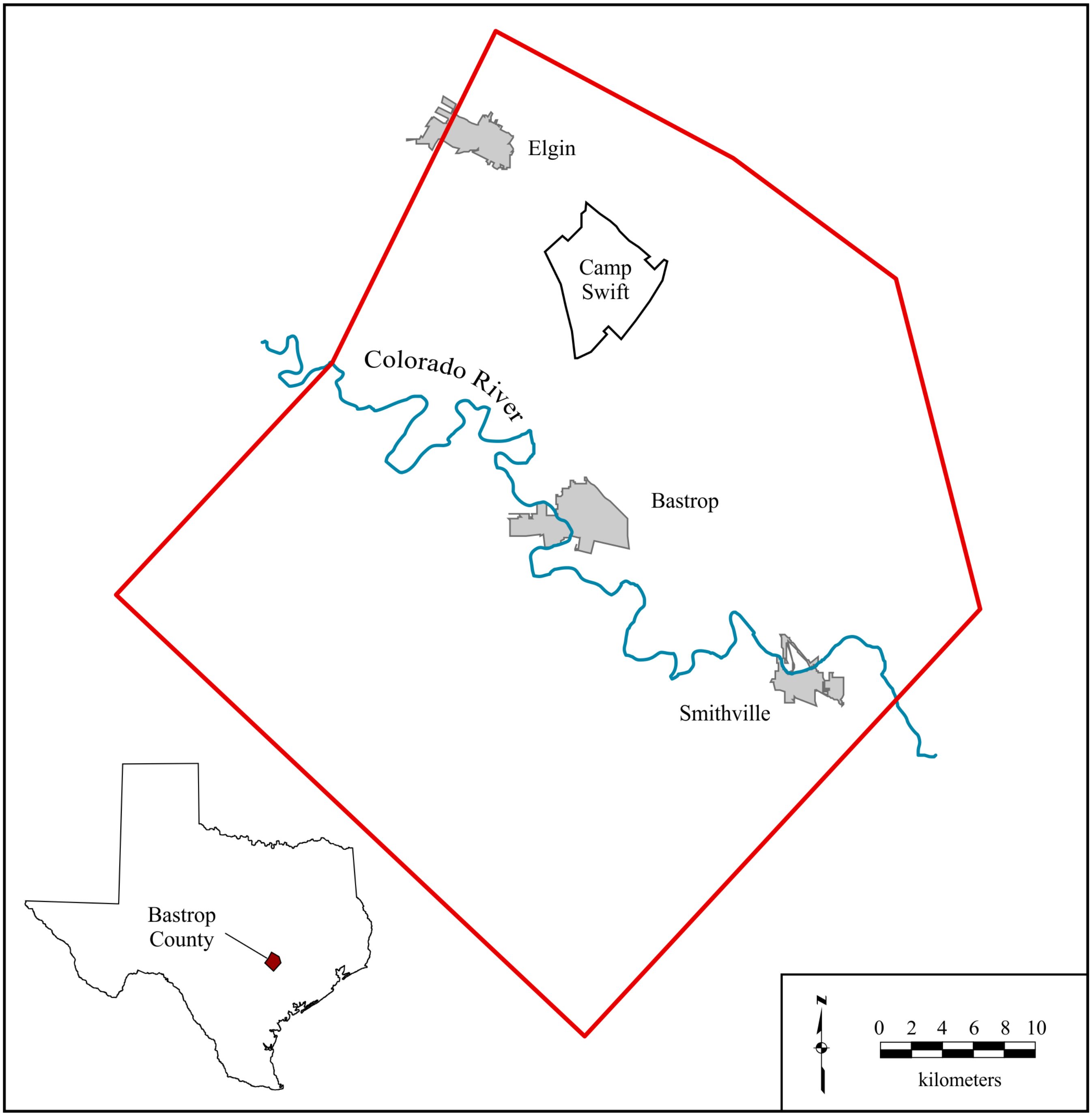

Figure 1-1. The location of Camp Swift within Bastrop County, Texas.

maps. The Colorado River is located about 10 km to the southwest (Figure 1-1).

CAR, under the direction of the TMD, carried out work on three prehistoric sites, 41BP471, 41BP477, and 41BP666, on Camp Swift. These sites lie in the extreme northern portion of the 11,500-acre facility (Figure 1-2). Conducted in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, the eligibility testing of the three sites supports regulatory compliance required by the NRHP, as well as the Camp Swift section of the TMD's Installation Cultural Resource Management Plan (ICRMP). While not accomplished under a Texas Antiquities Permit, the investigation of the three sites was conducted in a manner consistent with the requirements of the Antiquities Code of Texas. The testing was performed under Interagency Cooperation Agreement TX17-2053-ENV, with Dr. Raymond Mauldin serving as Principal Investigator and Leonard Kemp serving as Project Archaeologist in the field. Mr. Kemp, along with Dr. Lynn Kim, oversaw the analysis and compilation of this document.

The archaeological testing of the three sites reported here was done during the months of October and November in 2020. CAR excavated fourteen 1-x-1 m units and screened approximately 18.5 m^3 of deposits. CAR recovered a low density of chipped stone debitage, several tools, including one Middle Archaic projectile point, and just under 200 pieces of fire-cracked rock (FCR). We documented two features and acquired and submitted five radiocarbon samples for dating. Laboratory work, including analysis, occurred during 2021, and this report was written and compiled at various points in late 2021 and into 2022. Following laboratory processing and analysis, and in consultation with the TMD, selected items that had no remaining scientific value were discarded. This discard conformed to THC guidelines. All remaining archaeological samples, associated artifacts, documents, notes, and photographs were prepared for curation according to THC guidelines and are permanently curated at CAR at UTSA under accession #2471.

Research Perspective

The current project involves NRHP testing of three sites to determine their eligibility status. The NRHP is maintained by the National Parks Service (NPS), and criteria for eligibility determination are identified in Title 36, Code of Federal Regulations (CFR) 60.4 (NPS 2016). There are four criteria, A-D, that were developed to assess "the quality of significance" in a variety of areas, including precontact archaeology (NPS 2016). Criterion D, which states that archaeological sites that possess integrity and that "have yielded, or may be likely to yield, information important in prehistory or history" are eligible for inclusion on the NRHP (NPS 2016). This criterion is frequently referenced in assessments of prehistoric sites. In previous work at Camp Swift, Mauldin et al. (2018) focused on three research domains identified as site integrity, chronology, and content to operationalize Criterion D requirements for several prehistoric sites. This report will use these same three domains and associated evaluation methods to determine the NRHP status of the three sites discussed in this report. For integrity considerations, CAR will couple information on the vertical distribution of artifacts with data on magnetic soil susceptibility (MSS) values to evaluate whether a site maintains sufficient integrity for further research. There is a dearth of dated components on Camp Swift (see Bousman et al. 2010; Mauldin et al. 2018; Nickels 2008). Trying to develop an understanding of what happened in the past, in most cases, requires placing artifacts, features, and sites in a temporal framework. Consequently, our second domain focuses on chronological placement of material using both temporally diagnostic artifacts and radiocarbon dating. The last domain concerns the assemblage content of a site, with a focus on artifact, raw material, and feature diversity. The range of questions that a given site or component can effectively address is limited when the site content is limited. In contrast, assemblages with greater content diversity are likely to be relevant for considering a wider variety of questions. Assemblages with greater diversity are, generally, also assemblages with more items. While this introduces a bias against smaller assemblages, given what we do not know about the region, a focus on larger assemblages is likely to be the most efficient strategy, at present.

Report Organization

This report contains 11 chapters and three appendices. Following this introduction, Chapter 2 provides an overview of the modern and paleoenvironment of Camp Swift. Chapter 3 presents the cultural history of Camp Swift and archaeological background coupled with research questions focused on the archaeological record of Camp Swift. Chapter 4 explores several regional archaeological patterns that are beginning to emerge based, in part, on previous investigations on Camp Swift (see Kemp et al. 2019; Mauldin et al. 2018; Nickels 2008). That chapter provides a framework for current, and potentially future, archaeological investigations in the Camp Swift area. Chapter 5 describes the field and laboratory methods

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Figure 1-2. The three sites tested for eligibility are 41BP471, 41BP477, and 41BP666.

used on the project, while Chapter 6 provides a detailed account of each site, including information on the work accomplished and a summary of the materials recovered. Chapter 7 is the first of three chapters that summarize the three research domains explored to determine NRHP eligibility. The chapter assesses the chronological potential of each site. Chapter 8 reports on site integrity, and includes discussions of bioturbation, the distributional patterns of debitage, and magnetic susceptibility patterning at each site. Chapter 9 presents information on site content, including data on lithic density, variety, and other assemblage, feature, and raw material characteristics. Chapter 10 presents additional research focused on aspects of the lithic assemblage at the three tested sites. These include exploration of burned rock and characterization of raw material use. Chapter 11 provides a summary of the project, including recommendations for the NRHP eligibility of the three sites. Based on the current testing and considering previous investigations at these sites, CAR recommends that all three be determined eligible for listing on the NRHP under criterion D in that they have chronological potential, sufficient integrity, and are likely to yield information important in prehistory. Three appendices are included in this volume. Appendix A presents details on regional radiocarbon dates used in Chapter 4. The magnetic susceptibility data are presented in Appendix B. Appendix C provides details on the chipped stone analysis.

Chapter 2: Project Environment

Raymond Mauldin, Lynn Kim, and Leonard Kemp

This chapter provides an overview of the environment of Camp Swift and the surrounding area. It includes a brief discussion on the topography, hydrology, geology, soils, modern climate, and a summary of the flora and fauna. The chapter closes with a review of paleoenvironmental data for the region.

Topography and Hydrology

Located in north-central Bastrop County within Blair's Texan biotic province (Blair 1950), Camp Swift is characterized by gentle to moderate sloping terrain dissected by streams and drainages. The Balcones Escarpment is roughly 30 km (ca. 18.6 miles) to the west, and the Colorado River is about 10 km (6.2 mi.) to the southwest (Munoz 2012). Within the camp boundaries, elevation ranges from roughly 113 to 176 m (371-577 ft.) above mean sea level (Figure 2-1). Figure 2-1 also shows the hydrology on the camp. The major drainage is Big Sandy Creek. Associated tributaries including Dogwood Creek, Dogwood Branch, and McLaughlin Creek. The system eventually flows into the Colorado River to the southwest.

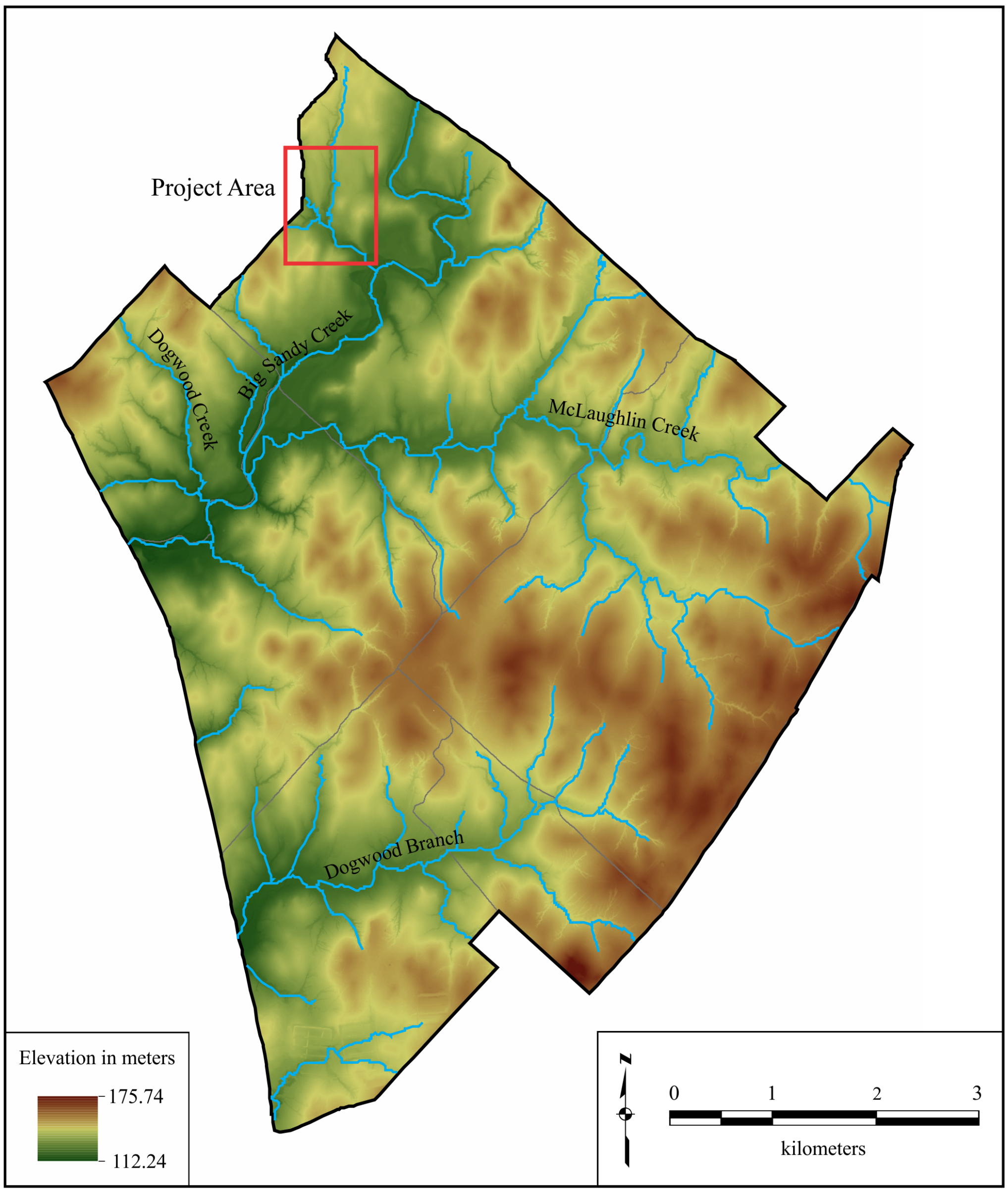

Figure 2-1. LiDAR map showing elevations and major drainages of Camp Swift with an insert of the Project Area.

Geology and Soils

Camp Swift lies in the Calvert Bluff Formation of Wilcox Group. The Calvert Bluff formation overlies the Simsboro formation and is mostly composed of mudstone and claystone with sandstones and incidental lignite (Middleton and Luppens 1995). Both formations were formed in the Eocene. Uvalde Gravels overlie the Calvert Bluff Formation and date to the development of the Colorado River drainage (Byrd 1971; Robinson et al. 2001). On Camp Swift, Uvalde deposits are found in the summits and ridges as well as the lower reaches of the Big Sandy Creek (Robinson et al. 2001). The deposits are composed of chert, quartz, quartzite, jasper, limestone, and silicified wood. It has been noted that the Uvalde deposits are of poor quality for knapping (see Kay and Tomka 2001; Kelly and Roemer 1981; Mauldin et al. 2018; Skelton and Freeman 1979). Higher quality Edwards chert can be found along the Colorado River south of Camp Swift and on the Balcones Escarpment to the west.

Camp Swift is in the Southern Post Oak Savanna which typically has an ustic soil moisture system with sandy and sandy loam surfaces that formed on top of Miocene, Oligocene, Eocene, and Paleocene sediments (USGS 2021). Table 2-1, which summarizes soil coverage for Camp Swift, clearly shows that most of the soils are fine sandy loams and loamy sand. The camp is within the Sandy Mantle formation, a formation composed of sand overlain on a reddish argillic Bt horizon. As discussed in Chapter 7, the nature and relationship of the overlying sand sheets with the Bt clay is an ongoing question, the resolution of which has direct implications for the integrity of archaeological deposits (see Ahr et al. 2012; Bateman et al. 2007; Boulter et al. 2010; Bruseth and Martin 2001; Frederick et al. 2002).

Modern Climate

The climate of Bastrop County is characterized as humid and subtropical with hot summers and cool winters (Marks 2010). Using data from Elgin, 14 km (9 mi.) to the northwest of Camp Swift, average annual precipitation is 87.45 cm (34.43 in.; US Climate Data 2021). As shown in Figure 2-2, rainfall is bimodal with a major peak in May (10.90 cm, 4.29 in.) and June (10.24 cm, 4.03 in.), and a secondary peak in October (10.34 cm, 4.07 in.). The summer months of July and August are the driest with mean rainfall totals of 50.8 mm (2.0 in.) and 52.07 mm (2.05 in.), respectively.

Figure 2-3 presents rainfall totals at a regional level from 1940 through 2020. The data are from the Texas Water Development Board (TWDB 2022) and are for quadrangle unit 710, an area of roughly 10,000 km^2 that includes portions of Bastrop, Travis, and Williamson counties. There is substantial year to year variability shown in the data. The driest years occurred in 1954 (34.11 cm; 13.4 in.), 1956 (40.06 cm; 15.8 in.), 1963 (44.25 cm; 17.4 in.), and 2011 (39.88 cm; 15.7 in.). The four wettest years have all occurred within the last few decades, with 1991 (129.57 cm; 51 in.), 2004 (132.36 cm; 52.1 in.), 2007 (126.37 cm; 49.75 in.), and 2015 (131.65 cm; 51.8 in.) having the highest totals. The average rainfall for the region over the 81 years shown in Figure 2-3 is 84.32 cm (33.2 in.).

Average temperature at Elgin is 20.1°C (68.25°F), with an average growing season of 270 days (US Climate 2021; Marks 2010). The coldest month is January with an average monthly low of 3.9°C (39°F). The summer months of July and August are the hottest months of the year with average monthly temperatures of 28.9°C (84°F) and 29.45°C (85°F), respectively (U.S. Climate 2021). As shown in Figure 2-2, they are typically the months with the lowest rainfall totals.

Table 2-1. Soil Series Coverage on Camp Swift (after Munoz 2012; Baker 1979)

Soil Series	Symbols	Composition	Acres	Percent Coverage	Common Landform
Edge	AfC, AfC2, AfE2	fine sandy loam	4591	40%	uplands/ridges/summit
Robco	DeC	loamy sand	1742	15%	uplands/ridges/foot slopes
Crockett	CfB, CsC2, CsD3, CsE2	fine sandy loam	1357	12%	uplands/ridges/summit
Padina	PaE	fine sand	1158	10%	uplands/ridges/slopes/ high terraces
Tabor series	TfB	sandy loam	962	8%	stream terraces
Sayers series	Sa	fine sandy loam,	605	5%	flood plains
Silstid series	SkC	loamy fine sand	534	5%	uplands/ridges/shoulder
Uhland soils	Uh	clay loam	373	3%	flood plains
Wilson	WsB	clay loam	96	1%	stream terrace
Jedd stoney soils	JeF	gravelly fine sandy loam	81	1%	ridges/backslopes

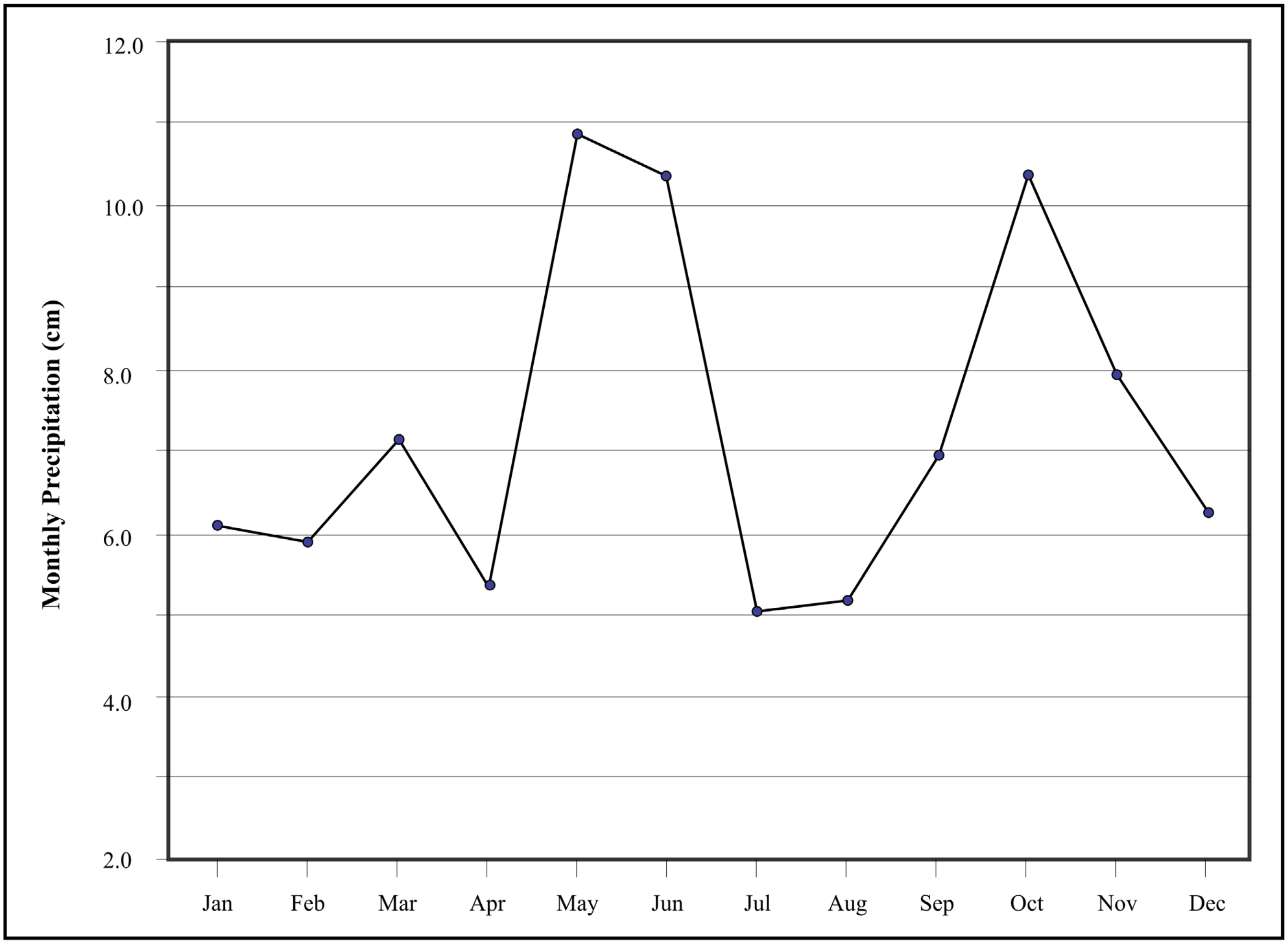

Figure 2-2. The monthly average rainfall totals from Elgin, Texas (US Climate Data 2021a).

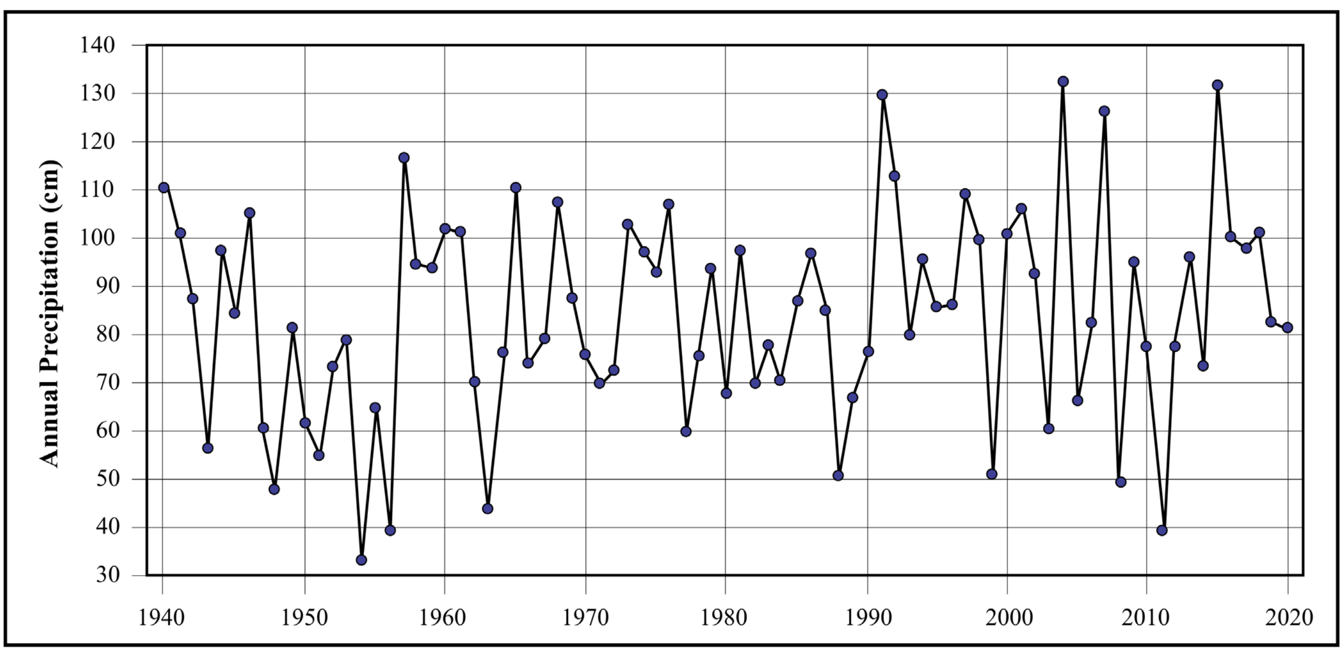

Figure 2-3. Yearly precipitation in cm from 1940 through 2020. The totals are for quadrangle 710, which includes portions of Williamson, Travis, and Bastrop counties (TWDB 2022).

This results in a substantial water deficit during the late summer, as can be seen in Figure 2-4. The figure plots the net water balance for the region, defined here as the water loss from a surface body of water (evaporation), minus the precipitation. Positive values reflect a moisture surplus during a typical month, while negative values reflect a deficit. The combined impacts of high temperatures and low rainfall for the summer months is clearly visible. This water deficit, in turn, has implications for both floral and faunal resources.

Flora and Fauna of the Post Oak Savannah

Camp Swift is in the Southern Post Oak Savannah part of the East Central Texas Plains. In the past, the Southern Post Oak Savannah landscape would have been filled mostly with hardwoods, largely post oaks (*Quercus stellata*) and blackjack oaks (*Quercus marilandica*), with areas of grasslands and sandy exposures (TMD 2010; USGS 2021). The region around Camp Swift is dominated more by Post Oak Savanna Grasslands (composed mostly of little bluestem [*Schizachyrium scoparium*], Indian grass [*Sorghastrum nutans*], and switchgrass [*Panicum virgatum*], Elliot 2014; TPWD 2021). Camp Swift also has a dense shrub layer largely composed of yaupon (*Ilex vomitoria*). The overstory is composed of eastern red cedar (*Juniperus viriginiana*), post oak (*Quercus stellata*), blackjack oaks (*Quercus marilandica*), and loblolly pine (*Pinus taeda*; Elliot 2014; TPWD 2021). The Camp Swift Integrated Natural Resources Management Plan (INRMP) describes four major plant communities that make up the Camp Swift vegetation. The Oak-Eastern red cedar forest covers roughly 74% of the facility, and is composed primarily of eastern red cedar, post oak, blackjack oaks and yaupon.

Previous studies accomplished by CAR (see Mauldin et al. 2018; Thompson et al. 2012) have suggested a limited diversity of plants and animals in the Post Oak Savannah setting. A comparison study of the plant species in Texas (Hatch et al. 1990) to the Native American Ethnobotany database (Moerman 2021) found that the Post Oak had 145 plants that were used for food by ethnographic groups (Kemp et al. 2019; Mauldin et al. 2018). From these 145 food plants, Native Americans may have used 179 different plant components for food, including 44 different species of greens, 38 different species of roots, hearts, and tubers, and 10 different nut species. In contrast, the Edwards Plateau contained 220 food plants with 267 different uses.

The limited plant diversity in the Post Oak Savannah is also reflected in the reduced mammalian diversity. A study on distribution of species (Thompson et al. 2012) showed that the Post Oak Savannah region had some of the lowest diversity of prey species in the state. Following the ecological framework of Owen and Schmidly (1986) and breaking the state into 189 quadrangles, each roughly 64 km on a side, Mauldin and Figueroa (2006; see also Thompson et al. 2012) used mammal distribution maps in Davis and Schmidly (1997) and historic data to look at the diversity of mammals in each quad. Mammals were partitioned by body weight into four groups, with 73 species in the small weight range (.005 to .95 kg), 21 species in the medium group (1.25 to 19 kg), seven

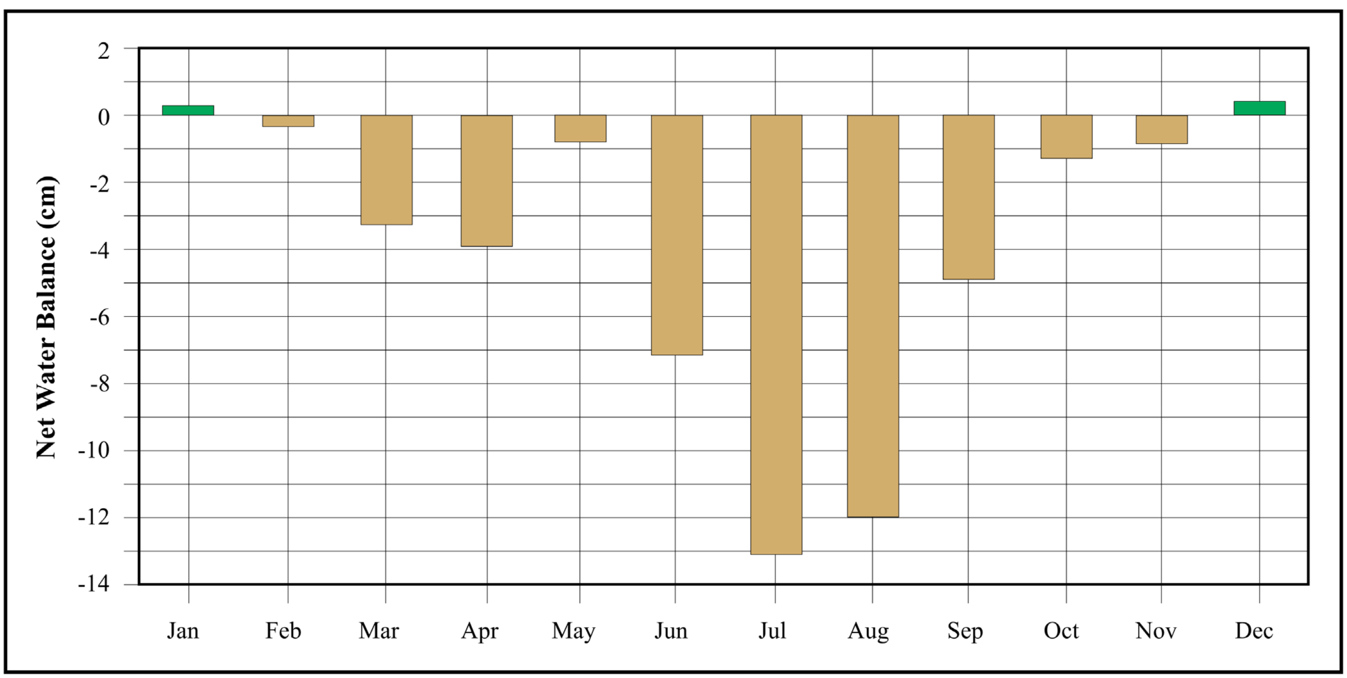

Figure 2-4. Net water balance for TWDB quadrangle 70 by month using data from 1954 through 2020 (TWDB 2022).

in the large group (46.7 to 275 kg), and a single animal, bison (ca. 835 kg), in the very large class. Looking at the state level, the average number of small mammal species in a quad is 25.25, with a range of 18 to 41 species. The average number for medium weight mammal species is 13.98, with a range from 11 to 18, and the number of large mammal species in a typical quad is 3.5, with a range from 2 to 7. Quad 129 centers on Camp Swift, and lists 19 small species, 12 medium species, and 3 large species. All of these are below the state average and all fall on the low side of their respective weight class ranges.

Blair (1950) provides additonal information on potential faunal resources. Camp Swift falls within his Texan biotic province where he records 49 species of mammals, including white-tailed deer (*Odocoileus virginianus*), eastern cottontail rabbit (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and fox squirrel (*Sciurus niger)*. Bird species are common including the northern bobwhite (*Colinus virginianus*), eastern meadowlark (*Sturnella magna*), mourning dove (*Zenaida macroura*), killdeer (*Charadrius vociferous*), field sparrow (*Spizella pusilla*), red-tailed hawk (*Buteo jamaicensis*), and belted kingfisher (*Ceryle alcyon*). Blair (1950) also notes 57 species of reptiles and 23 species of amphibians in the Texan province.

Paleoenvironment

Paleoenvironmental studies aid in understanding how human behavior responds to changing environments over time, and Collins (1995), Johnson and Goode (1994), and Bousman (1998) provide regional summaries, among others. Much of our knowledge about paleoenvironmental conditions in Central Texas in the Holocene is derived from proxy data, including studies of pollen (e.g., Bousman 1998; Cordova and Johnson 2019), isotopic shifts in bison (Lohse et al. 2014), snails (Paul and Mauldin 2013), isotopic shifts in soils (e.g., Boutton et al. 1998; Nordt et al. 1994), erosional/deposition events (e.g., Cooke 2005; Cooke et al. 2003), tree-rings (e.g., Cleaveland et al. 2011), and shifts in the faunal remains (Toomey 1993; Johnson and Goode 1994). These proxies often operate at radically different spatial and temporal scales, from shifts in frequencies of shrew species to changes in regional pollen rain. Wong et al. (2015) provide a recent summary of multiple proxies to develop a general paleoclimate record for Texas. While the various proxies are not always in agreement, the pattern does suggest that from 8000 to 6000 cal BP, warm and dry conditions dominated, with a wet interval following between 6000 to 4000 cal BP. A warm dry period is present between 3000 to 2000 cal BP, with the 2000-350 cal BP period characterized as cool and wet (Wong et al. 2015).

Although these general climate characterizations are useful, research at Camp Swift has increasingly focused on questions related to land use and occupation patterns over time. Research into these questions, discussed further in Chapter 4 of this report, would benefit from more detailed climate information, including data that may be useful for resource estimates. Previous investigations (e.g., Munoz and Mauldin 2012) have explored Macrophysical Climate Model (MCM) for Camp Swift. MCMs were developed by Bryson and Bryson as a complement to more general climate simulation models (1997; Bryson and DeWall 2007; Bryson and Goodman 1986). Here we turn to more recent modeling efforts using PaleoView (Version 1.5.1), a software package developed by Fordham and others (2017) that uses data generated by Community Climate Systems Model, version 3 (CCSM3). PaleoView models climate data, including temperature and precipitation, at a 2.5 by 2.5-degree spatial resolution over the last 21,000 years. As outlined by Fordham and others (2017), PaleoView was developed to allow researchers to assess biotic responses to short-term climate change at regional scales.

In PaleoView, the 2.5-x-2.5° grid system is predetermined. While ideally Camp Swift would fall in the center of a grid square, Figure 2-5 shows that this is not the case. The Camp is in the southwest corner of a square with a southwest quadrate at 30° north latitude, and 97.5° west longitude. As rainfall in Texas decreases from east to west, the quadrate average would underestimate Camp Swift precipitation. To compensate for this, we added a second grid square to the west. Figure 2-5 shows the modeled location as the center point of the two grids. Average annual temperature should increase from north to south, and so the center point should underestimate the Camp Swift temperature. Compensation here is not attempted, as the grid squares below Camp Swift include portions of the Texas Coast, which likely introduces additional complications.

Using the two grid squares in Figure 2-5, we then modeled rainfall and temperature at 50-year intervals back to 10,000 BP. Figure 2-6 presents the modeled annual rainfall (mm) while 2-7 plots the modeled annual temperature °C. For comparison, recall that the current annual temperature and rainfall figures for Elgin, just to the north of Camp Swift, are 20.1°C and 874.5 mm. The modeled data predictions are slightly wetter and cooler than these current values.

At a general level, between 10,000 and 7,000 BP, modeled annual rainfall fluctuates between 800 and 850 mm. Over the next 1000 years, annual rainfall increases to around 900 mm where it remains, with fluctuations, until a rapid drop to around 820 mm between 1450 and 1350 BP. Modeled rainfall then begins to increase, with totals sometimes topping 950 mm (Figure 2-6).

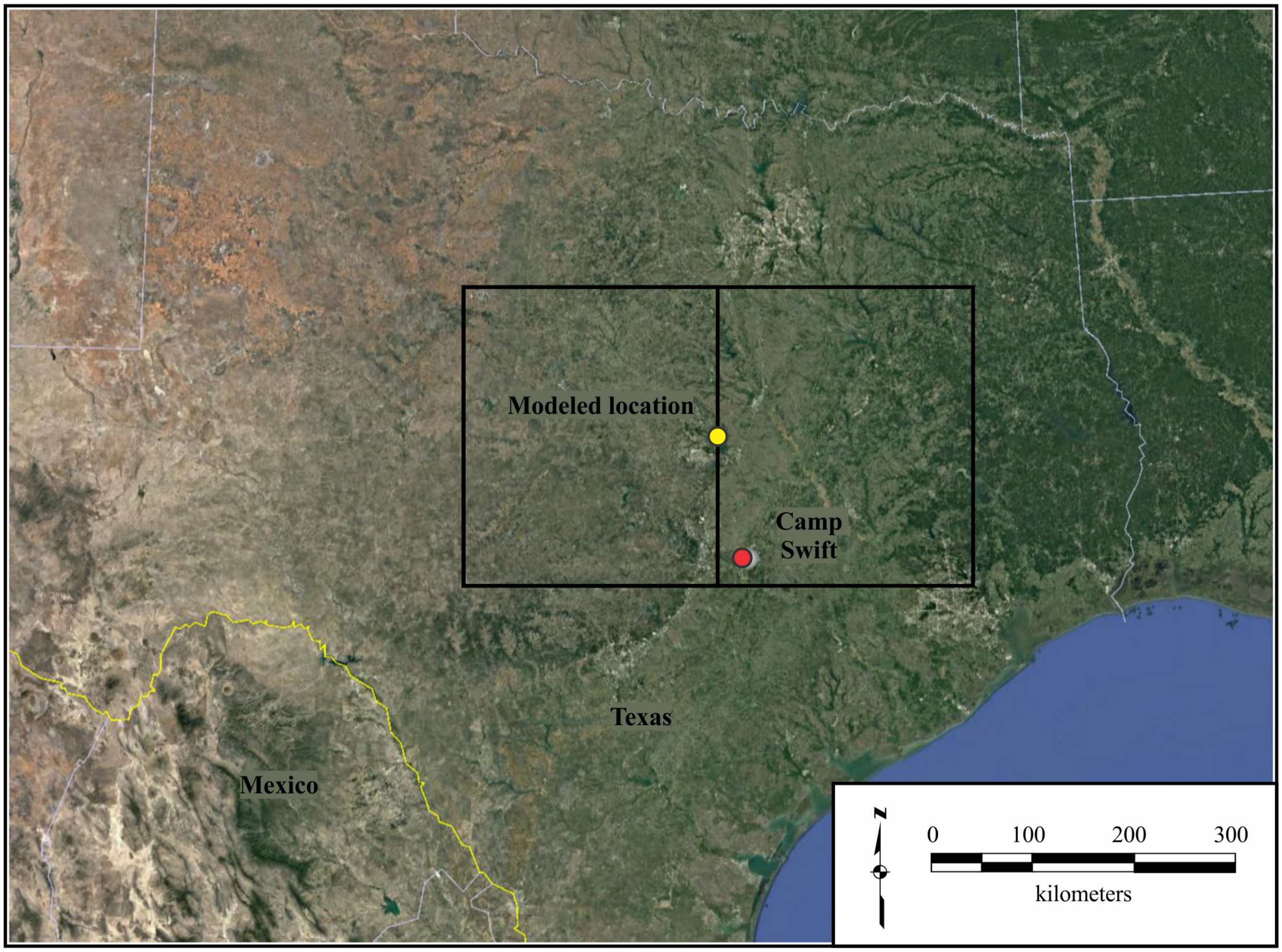

Figure 2-5. Camp Swift and the two grids used in the PaleoView model.

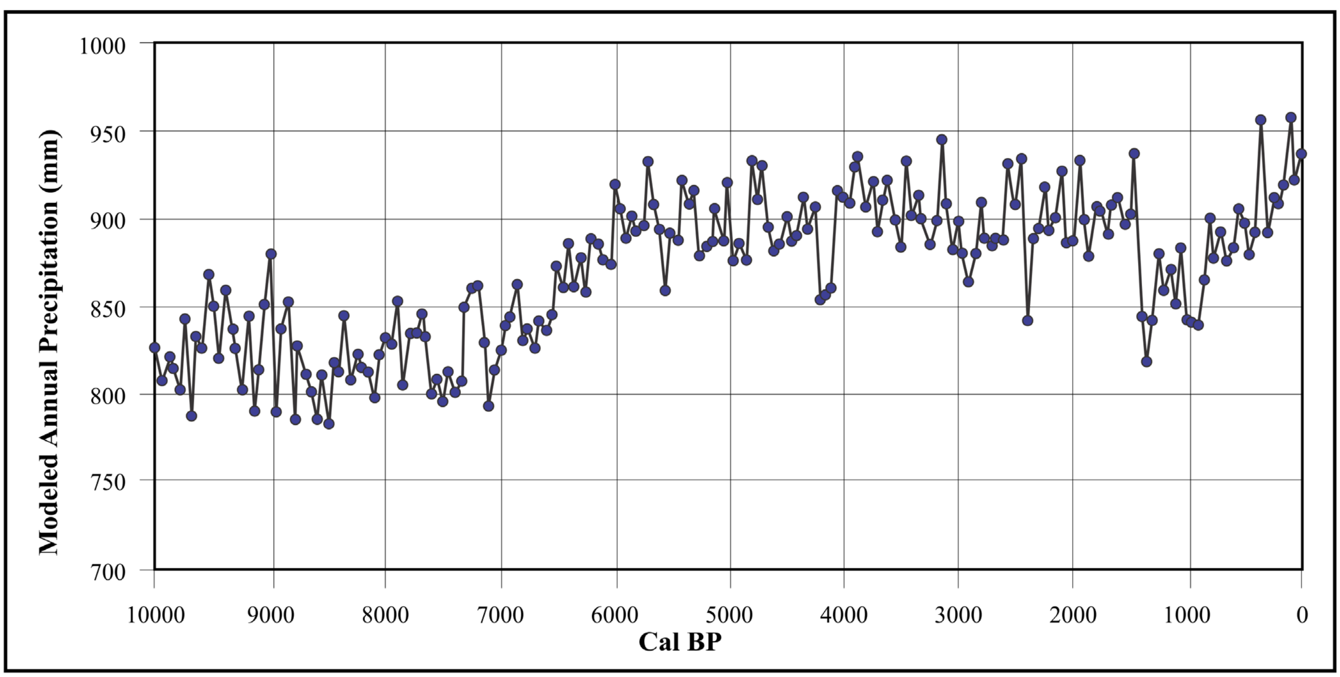

Figure 2-6. Modeled annual rainfall for Central Texas.

Prior to 8000 BP, Figure 2-7 shows that modeled annual temperatures were variable, with ranges between 17.6 and 18.3°C. At 8050 BP, modeled temperatures were 17.87°C. By 7850 BP temperatures had increased rapidly to around 18.4°C. Over the next 5,000 years, model temperatures show a slow warming trend, peaking in 2900 BP at 18.76°C. Annual temperatures then decline, and by 2400 BP temperatures are modeled as reaching 18.16°C. Temperatures begin to rebound, and by 1250 BP, they model as 18.73°C. They fluctuate, but decline, and at the close of the prehistoric sequence (350 BP), the value is 18.32°C.

The patterns of temperature and precipitation shown in Figures 2-7 and 2-6 were used to create estimates of net primary production (NPP) using the "Miami Model" proposed by Lieth (1973). NPP, a measure of the energy stored in biomass by plants, is expressed in that investigation as grams of dry matter per m^2 per year (gDM/m^2/year). NPP has been used as a rough approximation of resource abundance in an environment, including resources used by hunter-gatherers (see Tallavaara et al. 2018). The model assumes that increases in temperature and rainfall increase NPP. These two variables also are seen as limiting NPP such that in some settings, a lack of rainfall limits growth, while in others, low temperatures are the limiting factor. Grieser et al. (2006) provide additional details, including model equations. Figure 2-8 presents the results using the 2-6 and 2-7 data. The line represents a 2 point (100 year) moving average. To place these values in context, modern temperature and precipitation data for El Paso (US Climate 2022a in the Chihuahuan Desert and for Beaumont (US Climate 2022b) near the Louisiana border yield NPP values of 453 and 1917 gDM/m^2/year, respectively.

The Figure 2-8 pattern is, in this case, closely related to the pattern of rainfall, suggesting that precipitation and not temperature is a limiting factor for the NPP estimate in the Figure 2-5 area. Four different NPP patterns are defined in the plot as periods of long-term stability, increase, or decrease. Between 10,000 and 7200 BP, NPP fluctuates around 1250 gDM/m^2/year. NPP then gradually increases to around 1350 g/m^2 at around 6000 BP, where it remains until 1450 BP. Over the next 100 years, a significant drop occurs, with a gradual increase through the end of the sequence.

Summary

Camp Swift currently has a long growing season. While running a water deficit during much of the year, the camp does have water resources available in several intermittent streams, and adequate, though variable, rainfall. While lithic resources are limited to low-quality Uvalde Gravels, high quality cherts are available to the south and west. Regarding resources available to hunter-gatherers, the area currently has a low variety of edible plants, and the diversity of mammals is also limited when compared to other locations in Central Texas. Paleoenvironmental

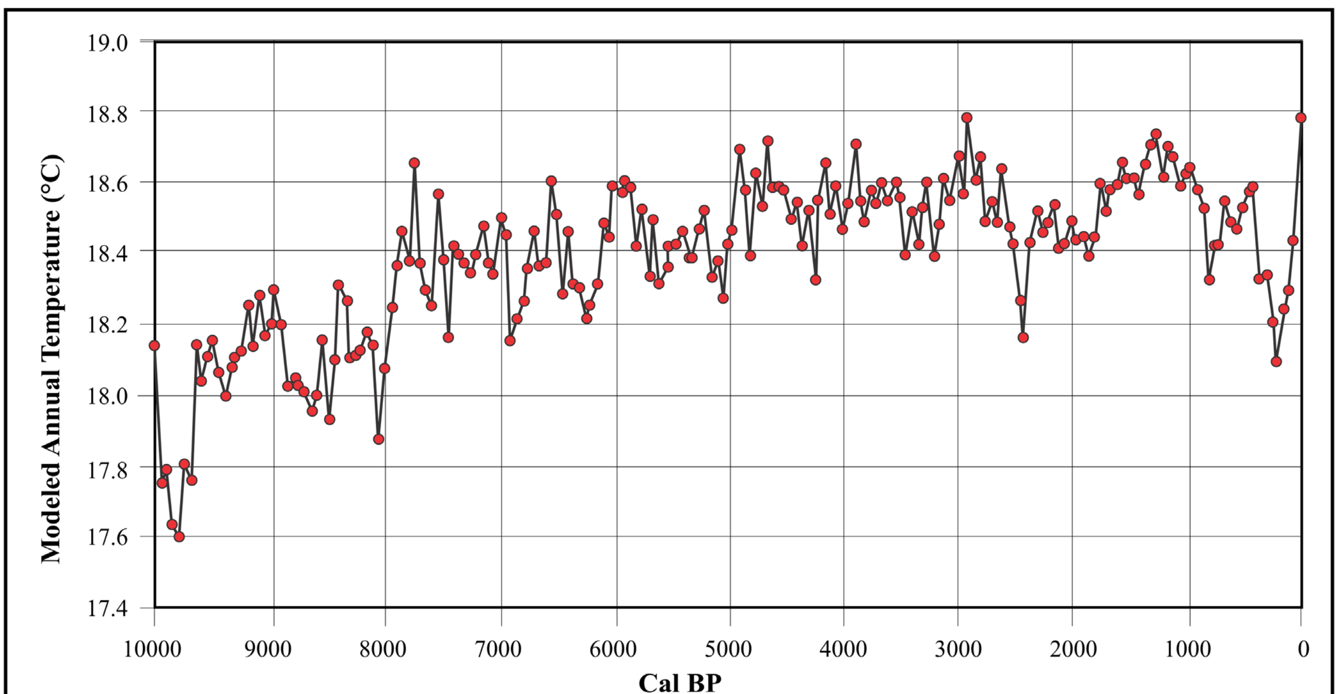

Figure 2-7. Modeled annual temperature.

data is limited. Our modeling suggests that, at least for hunters and gatherers, the current conditions for rainfall, temperature, and NPP likely represent above average conditions over the last 10,000 years.

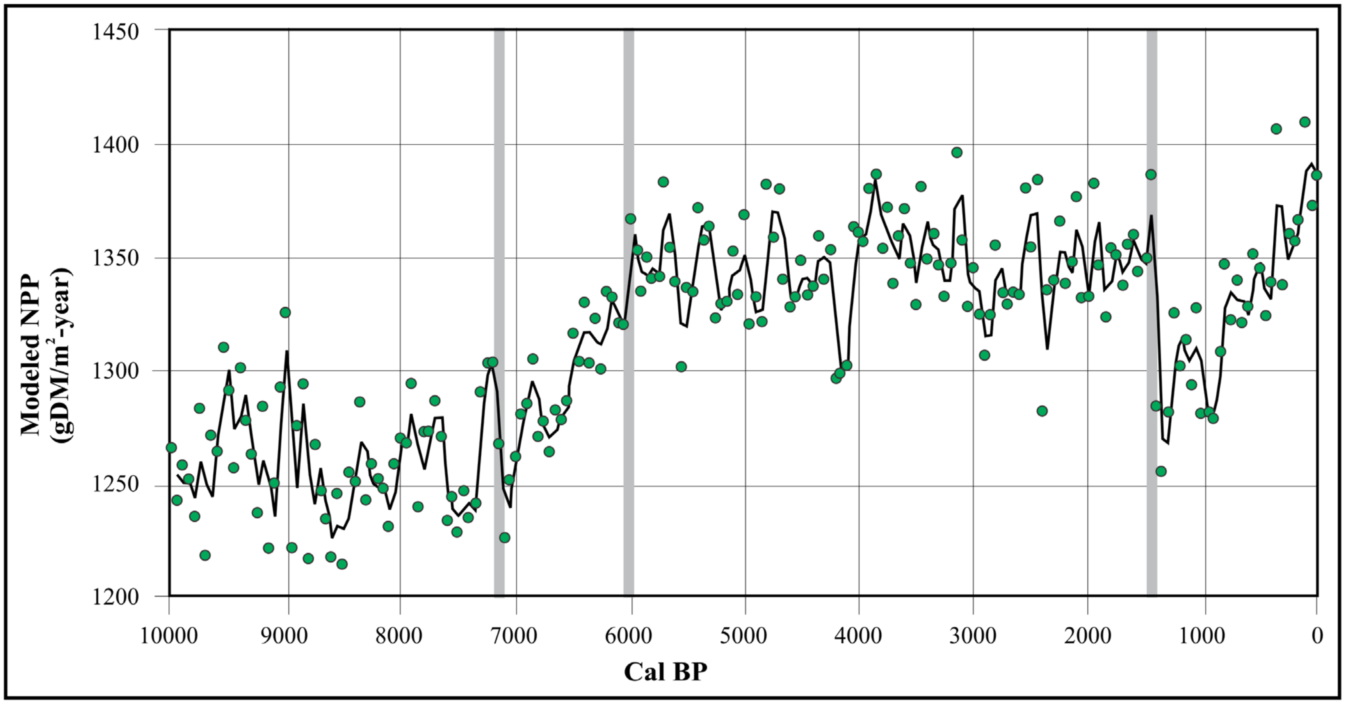

Figure 2-8. Modeled Net Primary Productivity (NPP). Vertical lines identify shift in the smoothed curve.

Chapter 3: Cultural History and Archaeological Background

Lynn Kim, Raymond Mauldin, Leonard Kemp, and Cynthia Munoz

This chapter provides a brief review of regional cultural history, with an emphasis on Camp Swift. A review of sites on the facility completes the chapter.

Cultural History of the Camp Swift Area

Located in Bastrop County, the Camp Swift area is often described as a transition zone (Fields 2004; Nickels 2008; Robinson et al. 2001) that incorporates aspects of the Upper Gulf Coast and Central Texas archaeological record. In this chapter, we will frame the study area as falling within the Central Texas cultural region and rely on primarily on the works of Collins (2004), Black (1989), and Johnson and Goode (1994). For this discussion, the prehistoric occupation is divided into three broad periods, the Paleoindian, Archaic, and Late Prehistoric, each of which is divided into finer temporal divisions. These smaller divisions are based primarily on shifts in tools, primarily projectile point styles; specialized chipped stone tools such as gouges; and, at the end of the sequence, the occurrence of ceramics. As these temporal periods are increasingly supported by radiocarbon dates, we provide both the calibrated (cal BP) and radiocarbon years before present (RCYBP) ranges for the Paleoindian and the Archaic periods. There is no significant difference between the two temporal scales in the Late Prehistoric period.

Paleoindian Period (13,500-10,000 cal BP; 11,500-8800 RCYBP)

Beginning near the close of the Pleistocene, the Paleoindian Period is divided into an Early (13,500- 11,500 cal BP) and a Late (11,500-10,000 cal BP) sub-period (e.g., Bousman et al. 2004). While claims for earlier occupations in Central Texas are increasingly well supported (see Collins 2003; Waters et al. 2011), Clovis material is considered here to reflect the earliest occupation.

Diagnostic projectile points from this Early Period include fluted Clovis and Folsom forms (see Bousman et al. 2004; Collins 2004). Clovis points have a wide distribution. Bever and Meltzer (2007) note that over 500 Clovis points have been recovered in Texas, many of which are isolated artifacts. There are, however, several larger Clovis sites, including Aubrey in north Texas (Ferring 2001), Pavo Real in Bexar County (Collins et al. 2003), and the Gault site in Central Texas (Collins 2003, 1999; Goebel et al. 2008; see also Jennings 2012). Clovis adaptations originally were thought to reflect a specialized, highly mobile system focus on hunting megafauna (e.g., Wormington 1957), though recent faunal data suggest the exploitation of a greater diversity of small and medium sized mammals and reptiles (e.g., Collins 2003). Folsom occupations follow Clovis and appear to be a more specialized adaptation focused on the exploitation of bison (*Bison antiquus*). Folsom components have a limited spatial distribution in or near grasslands and in basin and range settings (see Andrews et al. 2008). Largent (1995; see also Largent et al. 1991) reports the recovery of 345 Folsom points in Texas with most found in the panhandle and in south and west Texas. Bonfire Shelter (Bement 1986; Dibble and Lorrain 1968) and Pavo Real (Collins et al. 2003) in South Texas, Lubbock Lake (Johnson and Holliday 1989), Lipscomb (Hofman 1995), and the Plainview site (Speer 1990) in the Panhandle region (see Bousman et al. 2004), and the Debra L. Friedkin site (Jennings 2012; Waters et al. 2011) in Central Texas all contain Folsom material.

Late Paleoindian points including lanceolate-shaped, unfluted points (e.g., Golondrina, Barber, Dalton, Scottsbluff, and St. Mary's Hall) and several stemmed forms, including Wilson, San Patrice, Berclair, and Big Sandy Late Paleoindian types, tentatively dated from 11,500 to 10,000 cal BP (see Bousman et al. 2004). Angostura points are sometimes associated with the close of the Late Paleoindian period, though some researchers consider this form to be present in the Early Archaic (Collins 2004).

Late Paleoindian faunal material from the Wilson-Leonard site, to the east of Camp Swift in Williams County (Collins 1998), seems to suggest a more diverse diet. Other well-known sites with Late Paleoindian material include Angostura projectile points from the Richard Beene site in south Texas (Thoms et al. 1996), lower deposits from Baker Cave in the Lower Pecos area (Chadderdon 1983; Hester 1983), and faunal material from the Horace River (41HH23) site in the Texas Panhandle (Mallouf and Mandel 1997).

At Camp Swift, evidence of Paleoindian occupation is minimal. A single Clovis preform was recovered from 41BP495 (Nickels et al. 2005:75), though the context and a radiocarbon date suggest that it is likely not direct evidence of Paleoindian occupation in the area (Nickels et al. 2005:E-1, Beta-183903). In addition, at site 41BP485, the base of what appears to be an Angostura point was collected (Nickels et al. 2005:75; Kay and Tomka 2001:121-222).

Archaic Period (10,000-1200 cal BP; 8800-1100 RCYBP)

Relative to the preceding Paleoindian Period, the roughly 8,800-year Archaic Period reflects increased population, an overall intensification of hunting and gathering, less mobility, and an associated focus on the use of increasingly local resources. In the Central Texas area, a variety of technological changes, some of which are clearly related to subsistence and a shifting resource structure, appear during this period. These include the extensive use of rocks as heating elements in cooking hearths (see Black and McGraw 1985; Collins 1995, 2004), the expansion of ground stone technology, and continued diversification and specialization in chipped stone technology (Collins 2004; Johnson and Goode 1994; Turner and Hester 1999; Turner et al. 2011). Researchers commonly divide the Archaic into three broad, arbitrary sub-periods designated Early, Middle, and Late (e.g., Collins 2004; see also Johnson and Goode 1994).

Early Archaic (10,000-6800 cal BP; 8800-6000 RCYBP)

The Early Archaic is defined by several new point types, including Early Split Stem/Early Triangular, Gower, Martindale, and Uvalde styles (Collins 2004; Turner et al. 2011), as well as specialized tools, such as Guadalupe bifaces and Clear Fork gouges (Turner et al. 2011). Well-known sites that contribute directly to our understanding of the Early Archaic include the Richard Beene site (Thoms et al. 1996), the Wilson-Leonard site (Collins 1998), the Sleeper site (Johnson 1991), the Gatlin site (Houk et al. 2009; Oksanen 2008), the Vargas site (Quigg et al. 2008), and the Buckeye Knoll site (Ricklis et al. 2012). Cave and shelter sites, primarily from the Lower Pecos, also have added critical data, especially in terms of resource use (see Riley 2008, 2012; Turpin 2004). Early Archaic groups are thought to have been highly mobile and organized in small groups, with low population densities (Story 1985; Weir 1976). Evidence suggests that subsistence resources included bison, deer, rabbits, rodents, and fish, as well prickly pear, agave, and geophytes (Collins 2004; Hester 2004).

Evidence of Early Archaic occupation at Camp Swift is limited. An Early Triangular point (potentially a beveled knife, see Black and McGraw 1985) was found at site 41BP728 (Nickels et al. 2010; Turner et al. 2011). In addition, Nickels (2008) reports a radiocarbon date of 5980 ± 40 at Swift site 41BP529. This calibrates to the end of the Early Archaic and into the beginning of the Middle Archaic.

Middle Archaic (6800-4450 cal BP; 6000–4000 RCYBP)

The Middle Archaic (6800 to 4450 Cal BP) is marked by the appearance of Bell, Andice, Calf Creek, Taylor, Nolan, and Travis projectile points (Turner et al. 2011). It is argued that bison hunting was part of the subsistence practice in the early part of the Middle Archaic, but due to a more xeric environment in the later Middle Archaic, there was a decline in bison populations and bison hunting (Bousman 1998; Collins 2004; Dillehay 1974; Johnson and Goode 1994). Throughout the Middle Archaic people were consuming deer and a variety of plant resources (Black et al. 1997; Munoz et al. 2013). Burned rock middens are increasingly common during this sub-period (Acuña 2006; Black 1989; Johnson and Goode 1994). Weir (1976; see also Story 1985) suggests that an increasing number of Middle Archaic components indicates population growth, though Collins (2004) suggests this may be related to shifts in mobility. Sites that have shaped the understanding of Middle Archaic adaptations include the Landslide site (Sorrow et al. 1967), the Gatlin site (Houk et al. 2009; Oksanen 2008), the Jonas Terrace site (Johnson 1995), and the Granberg site (Munoz et al. 2011; Wigley 2018)

An Andice point is reported at site 41BP390 (Nickels et al. 2005). While no other Middle Archaic diagnostic have been identified for Camp Swift (Nickels et al. 2005: Table 6-2), CAR uncovered a dart point on site 41BP471 that is consistent with a Nolan form (see Chapters 8 and 9 of this report). In addition, as noted above, a radiocarbon date on 41BP529 calibrates to the end of the Early Archaic and the start of the Middle Archaic.

Late Archaic (4450-1200 cal BP; 4000-1100 RCYBP)

The Late Archaic sub-period is defined by a wide variety of dart point styles including Bulverde, Kinney, Pedernales, Williams, Marshall, Castroville, Montell, Marcos, Fairland, Frio, Ensor, and Darl (Collins 2004). In addition, corner-tanged knives, biface caches, marine shell ornaments, and cylindrical stone pipes characterize the sub-period (Collins 2004; Hall 1981; Hester 2005). Key sites associated with this sub-period include Anthon (Goode 2002), Loeve-Fox (Prewitt 1974), Panther Springs (Black and McGraw 1985), Bessie Kruze (Johnson 2000), Onion Creek (Ricklis and Collins 1994), and sites in the Lower Pecos (Turpin 2004) such as Bonfire Shelter (see Dibble 1965; Dibble and Lorrain 1968). Large cemeteries become increasingly common in Central and South Texas, including Loma Sandia in South Texas (Taylor and Highley 1995) and 41BX1 (Lukowski 1988) in Bexar County. These cemeteries may indicate larger, growing populations and the establishment of territories (Black and McGraw 1985; Dockall et al. 2006; Hester 2004:136-142; Story 1985). However, there is no consensus on the patterns of population growth during this time (see Black 1989, Prewitt 1981, 1985; Weir 1976). Subsistence patterns show the exploitation of a variety of local plants and animals, including bison, deer, mussel, and turtle in the Central Texas region (Acuña 2006; Black 1989). Burned rock middens are increasingly common during the Late Archaic (Collins 1995), and bison are clearly present (Collins 2004; Dillehay 1974).

Diagnostic artifacts and radiocarbon dates demonstrate an increase in the occupation of Camp Swift during the Late Archaic. Projectile points dating to the Late Archaic, including Pedernales, Ensor, Frio, and Ellis forms, were found (Nickels et al. 2003; Robinson et al. 2001). Eight sites have radiocarbon dates that fall in this period, including 41BP471 and 41BP477, radiocarbon dated during the current project (see Chapter 7; Maudlin et al. 2018; Nickels 2008).

Late Prehistoric Period (1200-350 cal BP)

The Late Prehistoric is defined primarily by the introduction of the bow and arrow and associated shifts in projectile point forms (Black 1986; Collins 2004; Hester 2004). The period is traditionally divided into an early sub-period termed Austin (1200-700 BP) and a late interval Toyah sub-period (700-350 BP). Austin is often seen as an extension of the Late Archaic pattern (see Johnson and Goode 1994), while Toyah is viewed by many as a radically different adaptive pattern, possibly linked to an influx of a new group of people following returning bison herds (see Johnson 1994; Shafer 1977). Each interval is discussed below, though in the case of Camp Swift, we combine the two intervals into a single Late Prehistoric period.

Austin Interval (1200-700 BP)

The Austin Interval is defined primarily by the presence of Scallorn and Edwards arrow points (see Collins 2004; Johnson and Goode 1994; Prewitt 1981). Austin lithic technology is little changed from forms used in the Late Archaic (Johnson and Goode 1994; Prewitt 1981). Cemeteries are present during this period (see Prewitt 1974; Greer and Benfer 1975), and indicators of violent death seem to increase, with several cases of Scallorn points embedded in burial bone (e.g., Prewitt 1974:46). Burned rock midden use peaked during this period (Acuña 2006; Black and Creel 1997; Mauldin et al. 2003). Deer seem to be a resource focus during this period, possibly in response to what most researchers see as an absence, or a dramatic decline, in bison availability relative to the Late Archaic (Collins 2004; Dillehay 1974; see also Lohse et al. 2014; Mauldin et al. 2012).

Toyah Interval (700-350 BP)

The Toyah Interval is defined by the first widespread occurrence of pottery (bone tempered brown ware), a flake/blade lithic technology, Perdiz and Cliffton arrow points, beveled knives, gravers, drills, and end scrapers (Black 1989a; Johnson 1994; Kenmotsu and Boyd 2012). Most researchers suggest that populations increased relative to earlier periods (Black 1989a). In addition, Collins (2004) suggests that mobility during this period was extremely high. He infers high mobility given the assumption that populations during this period were dependent on bison. Because of the frequent co-occurrence of a new set of lithic artifacts (Perdiz points, beveled knives, end scrapers) with bison remains, researchers have long suggested that Toyah material reflected an association with bison, which were thought to have returned to Texas at roughly the same time as Toyah appeared (e.g., Dillehay 1974; Greer 1976; Hester 1975; Huebner 1991; Prewitt 1981). Bison are widely exploited during Toyah, but deer, along with other animals, were also common, as were plant remains (Black 1986). After a review of multiple components, Dering (2008) concludes that Toyah subsistence was "based on a broad suite of plant and animal resources" (Dering 2008:59; see also Karbula 2003).

On Camp Swift, occupations during the Late Prehistoric clearly increase relative to earlier periods. In a review conducted in 2012, 14 prehistoric components on Camp Swift were assigned to the Late Prehistoric Period, encompassing both Austin and Toyah Intervals (TxANG Data Base 2012; see also Munoz 2012). These temporal assignments were made based on radiocarbon dates obtained from features, as well as the recovery of Scallorn, Perdiz, and fragments of various arrow points from sites on the facility. Testing of eight sites reported by Mauldin and others (2018:61) identified Late Prehistoric diagnostics on three of the sites, with two radiocarbon dates defining a Late prehistoric and a Late Archaic/Late Prehistoric occupation on two other sites. As summarized in Chapter 7, radiocarbon dates recovered from sites 41BP471 and 41BP477 on the current project also fall in the Late Prehistoric. Relative to earlier periods, there appears to be a significant Late Prehistoric use of the Camp Swift area.

While no historic period materials were recovered during the current project, there are 123 sites with some type of occupation attributed to the historic period in Bastrop County. Several authors (see Haefner and Vaughan 2012; Marks 2010) review the history of Bastrop County, and Leffler

(2001; see also Sitton 2006; Skelton and Freeman 1979) provides a detailed account of the history of the Camp Swift area, including the creation of the camp in the early 1940s.

Archaeology at Camp Swift

Multiple archaeological investigations have been completed on facility property. Details of most previous investigations at the camp, which include surveys and testing projects, are provided in Munoz (2012; see also Nickels et al. 2010; Robinson et al. 2001). All the 11,500-acre facility has been surveyed, though at variable intensity. Large surveys include Skelton and Freeman's survey of 4,000 acres (Skelton and Freeman 1979), a 5,000-acre survey by Texas Military Department conducted in 1996 and 1997 (Robinson et al. 2001), and the recent survey by Nickels and others (2010) of 3,475 acres. Intensive shovel testing, backhoe, and testing projects include the evaluation of 39 sites by Nickels et al. (2003), as well as 20 sites reported by Nickels and Lehman (2004; see also Lohse and Bousman 2006). The most extensive testing project was conducted by the Center for Archaeological Studies (CAS) on 20 sites in 2002 (Nickels 2008). CAR has conducted and completed several projects on the camp, including work by Munoz (2010, 2012), testing projects reported by Mauldin and others (2018) and Kemp and others (2019), and photo-point monitoring on eligible sites (Munoz 2012).

These projects, and numerous other small surveys and testing efforts, have documented 306 archaeological sites at Camp Swift (THC 2021), with prehistoric components present on 209 sites. Prior to our current work, 19 sites on Camp Swift were recommended as eligible for listing on the NRHP. These are 41BP138, 41BP145, 41BP146, 41BP170, 41BP382, 41BP392, 41BP485, 41BP488, 41BP495, 41BP505, 41BP521, 41BP529, 41BP854, 41BP913 (Munoz 2014), 41BP487, 41BP801, 41BP802 (Mauldin et al. 2018), 41BP859, and 41BP865 (Kemp et al. 2019).

Summary

This chapter reviewed the cultural history of the Camp Swift region, and briefly discussed previous investigations. The review suggests the Camp Swift area had little or no occupation during the Paleoindian Period, with a Clovis point and the base of what may be an Angostura point recovered. A single diagnostic point can be attributed to the Early Archaic subperiod, and one to the Middle Archaic. In addition, a radiocarbon date from a feature straddles the end of the Early Archaic and the start of the Middle Archaic. There are, then, five diagnostic indicators for approximately 9,000 years. Not surprisingly, indications of Late Archaic use are more common. Multiple diagnostic artifacts and radiocarbon dates associated with the Late Prehistoric period suggest increased use late in the sequence.

Chapter 4: Exploring Regional Archaeological Patterns

Lynn Kim, Raymond Mauldin, and Leonard Kemp

As noted in the previous chapter, the prehistoric archeological record on Camp Swift suggests that the area was not intensively occupied (Bousman et al. 2010; Kemp et al. 2019; Mauldin et al. 2018). On most of Camp Swift, sites tend to be small, low-density scatters. Sites frequently lack features, charcoal, or diagnostic artifacts (see Kemp et al. 2019; Mauldin et al. 2018; Munoz 2012; Nickels 2008; Nickels et al. 2010; Robinson et al. 2001). Prior to the Late Archaic, there is minimal evidence of use at the camp, and most diagnostic artifacts and almost all radiocarbon dates calibrate to the Late Archaic and Late Prehistoric occupations. This chapter explores larger scale occupation patterns to assess if these Camp Swift patterns are reflected elsewhere in the region. The investigation relies on summed probability distribution (SPD) curves of radiocarbon dates. SPD curves provide a way to monitor occupation trends and intensity within a given area (see Crema 2022; Crema et al. 2017; Kelly et al. 2013; Shennan et al. 2013; Zahid et al. 2016). CAR collected radiocarbon dates within a 60-km radius of Camp Swift. These were then used to create regional, as well as vegetation specific, SPD curves. While interpretations are limited by sample size and the use of modern vegetation distributions, the resulting SPD curves suggest that Camp Swift may reflect a larger pattern in which there is minimal occupation of the Southern Post Oak setting prior to 3000 cal BP. In addition, the larger patterns are consistent with a dramatic, short-term decline in dates at the close of the Late Archaic originally seen in Bastrop County dates (Kemp and Mauldin 2018). This decline occurs at around 1400 cal BP, roughly the same time as a regional drop in NPP seen previously in Figure 2-8.

Regional Pattern of Occupation

This chapter uses SPD curves of radiocarbon dates to monitor large scale patterns of occupation. SPD curves, in which multiple radiocarbon dates from a region are calibrated and their individual probability distributions are summed to provide a larger scale perspective. The use of SPD curves is increasingly common in archaeological research (see Bamforth and Grund 2012; Crema 2022; Crema et al. 2017; see also Rick 1987). The resulting probability curve is often used as a proxy for population levels within a region (see Peros et al. 2010; Torfing 2015; Williams 2012). For the current investigation, we simply argue that higher frequencies of dates reflect higher frequencies of use, referenced as intensity. The argument assumes a relationship between the number of people, or the type of activities, and the generation of organic material that can be sampled for radiocarbon dating. While there are multiple complications with the use of SPD curves for these types of estimates (see Crema 2022; Crema et al. 2017; Torfing 2015), including sampling, research bias, taphonomic loss, and impacts associated with calibration, SPD curves can provide an aggregate measure of use intensity that is temporally grounded.

As noted in the previous chapter, sites on Camp Swift have a low frequency of diagnostic artifacts, few features, and even fewer opportunities for radiocarbon dates (see Mauldin et al. 2018; Nickels 2008). A review by Kemp and Mauldin (2019) found only 16 radiocarbon dates from Camp Swift. To increase that sample size and identify regional scale patterns, they reviewed radiocarbon dates from Bastrop County, increasing the sample to 35 radiocarbon dates from 14 sites. Figure 4-1, reproduced from Kemp and Mauldin (2019:16), presents the resulting SPD curve from the sample of 35 radiocarbon dates. While clearly preliminary given the low number of dates, the figure suggests an initial use at the close of the Early Archaic and the beginning of the Middle Archaic. There are no dates for the next 3,200 years. At 3000 cal BP, use is again reflected, with fluctuating but increasing occupation through the Late Archaic. A short gap is then present. Use peaks around 600 BP, with rapid fall off after that date.

While these patterns are intriguing, the small sample size undercuts confidence in the results. To further investigate these initial patterns, CAR collected radiocarbon dates from an approximately 60-km radius around the center of Camp Swift, a roughly 11,310 km^2 area. We focused on dates on charcoal, as well as bone. Dates taken from sediments and non-charred organics were removed from the study, as were dates with standard deviations greater than or equal to 200 years. The resulting sample size of 410 radiocarbon dates come from 61 different sites. Figure 4-2 shows the location of the dates relative to Camp Swift and Texas counties. The dates themselves are listed in Appendix A.

Also shown in Figure 4-2 are a series of ecoregions. These are geographical areas defined by relatively similar environmental resources, such as soils, vegetation, hydrology, climate, land use, wildlife, and geology. The ecoregions correspond to the Texas Park and Wildlife Department (TPWD) vegetation types (see McMahon et al. 2001; Omernik 2004; Omernik and Griffith 2014). We grouped radiocarbon dates by the three largest ecoregions within the 60-km radius circle, the Balcones Canyonlands (126 dates across 11 sites), the Northern Blackland Prairie

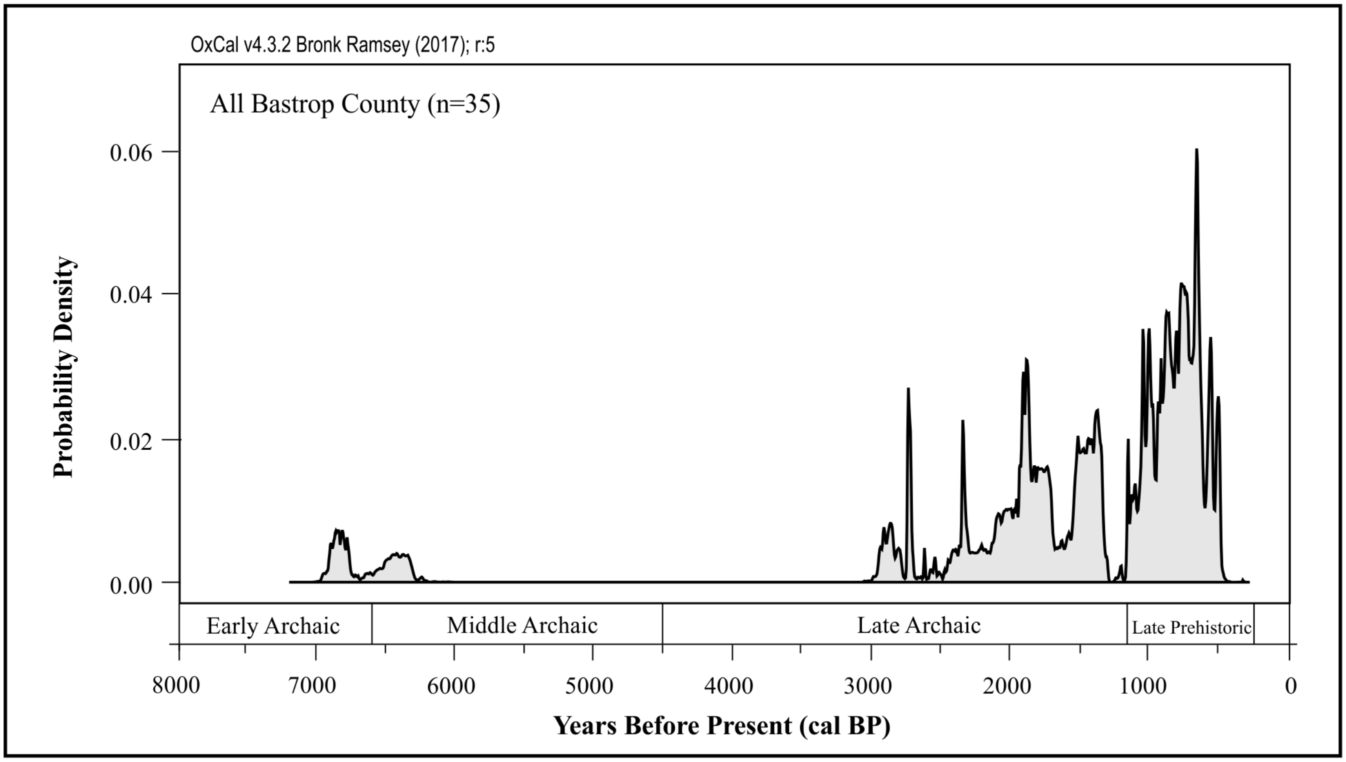

Figure 4-1. The summed probability distribution curve of 35 radiocarbon dates from Bastrop County (Kemp and Mauldin 2019:Figure 4-2).

(208 dates across 27 sites), and the Southern Post Oak Savannah (76 dates across 23 sites). Radiocarbon dates situated in the Floodplains and Low Terraces ecoregion were attributed to the larger surrounding ecoregion. This resulted in one date attributed to the Northern Blackland Prairie and twelve dates, from three sites, being assigned to the Southern Post Oak Savannah (Appendix A).

Figure 4-3 shows the SPD curves for all 410 dates. Figures 4-4, 4-5, and 4-6 show curves for each of the three larger grouped ecoregions. These SPD curves are based on data from OxCal (Version 4.4; Bronk Ramsey 2021). No taphonomic loss adjustment was applied to any of the curves. The lines in each plot represents a 100-year running mean, with plots stretching back to 11,000 cal BP in all four figures.

Prior to around 2750 cal BP, the SPD curve in Figure 4-3 reflects a constant, but low-level pattern of use. There are two periods, one centered around 8800 cal BP and a second at 6100 cal BP, that reflect short-term increases. An abrupt increase at 2750 cal BP suggests a greater intensity of use in the region. There is a gradual increase until roughly 600 cal BP, at which point the curve falls off through the rest of the sequence. The late fall off, common in SPD curves, likely results primarily from research decisions not to radiocarbon date material from the historic period where other, more accurate and less costly alternatives, are available, as well as actual declines in populations because of impacts associated with cooling temperatures (see Ladurie 1972) and increased disease (e.g., Ramenofsky 1988).

Figure 4-4 shows the SPD curve for the Balcones Canyonlands, the first of three plots of SPD curves relative to modern vegetation regimes (see Figure 4-2). The Balcones Canyonlands, within the Edwards Plateau, was home to several mammals, including bison (*Bos bison*), white-tailed deer (*Odocoileus virginianus*), pronghorn (*Antilocapra americana*), and mountain lions (*Felis concolor*; Davis and Schmidly 1994). Compared to other parts of the Edwards Plateau the Balcones Canyonlands has a higher representation of deciduous woodlands (USGS 2021). The flora is mostly composed of juniper trees, including Ashe juniper (*Juniperus ashei*) and redberry juniper (*Juniperus pinchotii*). Ashe juniper has a long-time presence throughout the Edwards Plateau, greater than 200 years based on carbon isotope study (McMahon et al. 2001; Omernik 2004; Omernick and Griffith 2014). The juniper trees form "breaks" that open to oak and prairie landscapes. Oak trees found in the region include plateau live oak (*Quercus fusiformis*), Texas oak (*Quercus buckleyi*), white shin oak (*Quercus sinuata var. breviloba*), Vasey shin oak (*Quercus vaseyana*), and Lacey oak (*Quercus laceyi*). Other vegetation in the area includes cedar elm (*Ulmus crassifolia*), hackberry (*Celtis* spp.), agarito (*Mahonia trifoliolata*), black cherry (*Prunus*

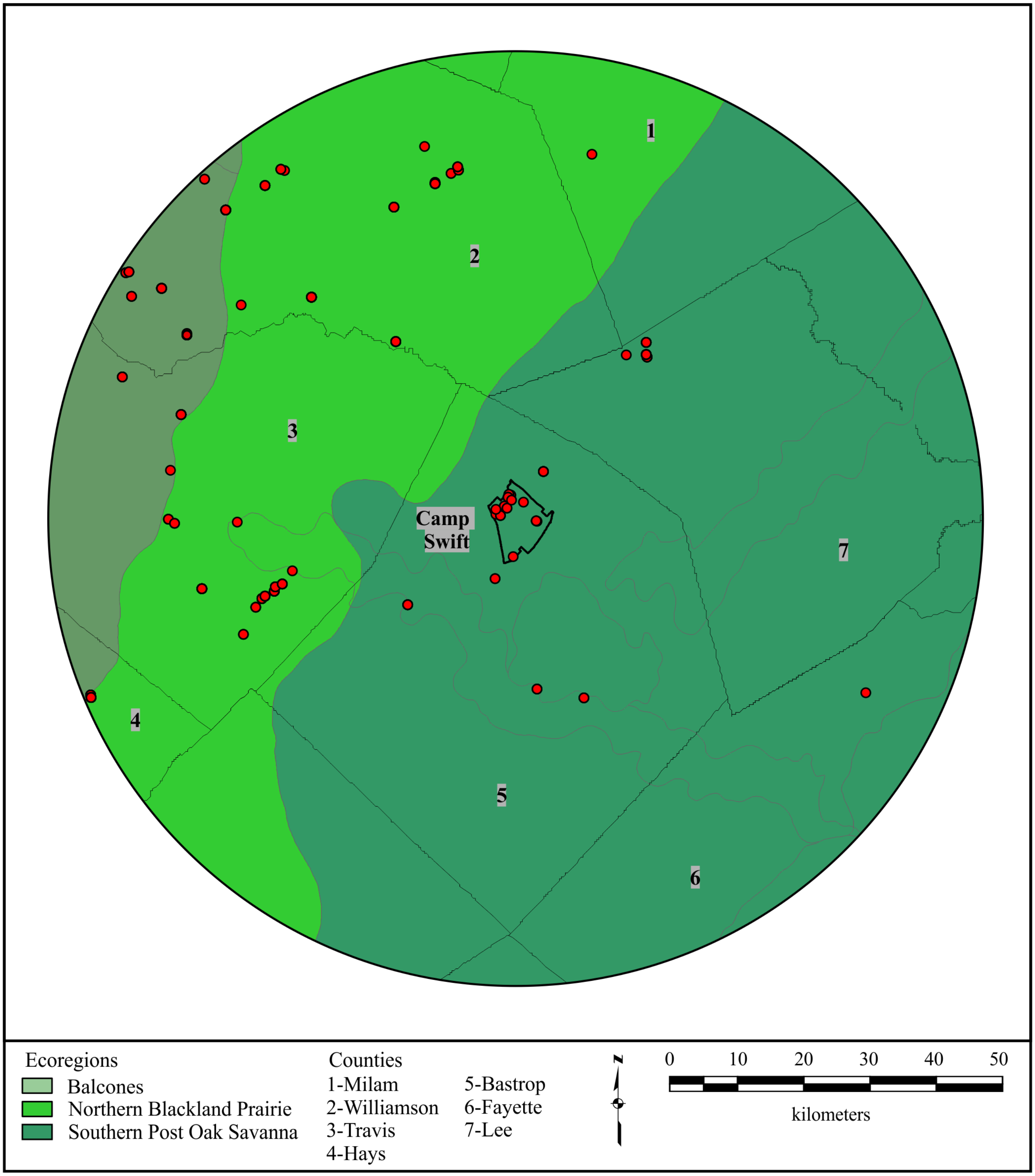

Figure 4-2. The location of archaeological sites used in the current radiocarbon analysis over the ecoregions.

serotina), Texas mountain laurel (*Sophora secundiflora*), madrone (*Arbutus xalapensis)*, Carolina basswood (*Tilia caroliniana*), and Texas persimmon (*Diospyros texana*). On dry slopes juniper grows along with honey mesquite (*Prosopis glandulosa*), sumac (*Rhus lanceolate*), Texas sotol (*Dasylirion texanum*), acacia (*Acacia roemeriana*), and ceniza (*Leucophyllum frutescens*; Aggie Horticulture 2021; Edmonson 2013; Elliot 2014; USGS 2021).

The 126 Balcones Canyonland dates used in Figure 4-4 come from 11 sites. The Balcones Canyonlands SPD suggests some level of potential use from 11,000 through

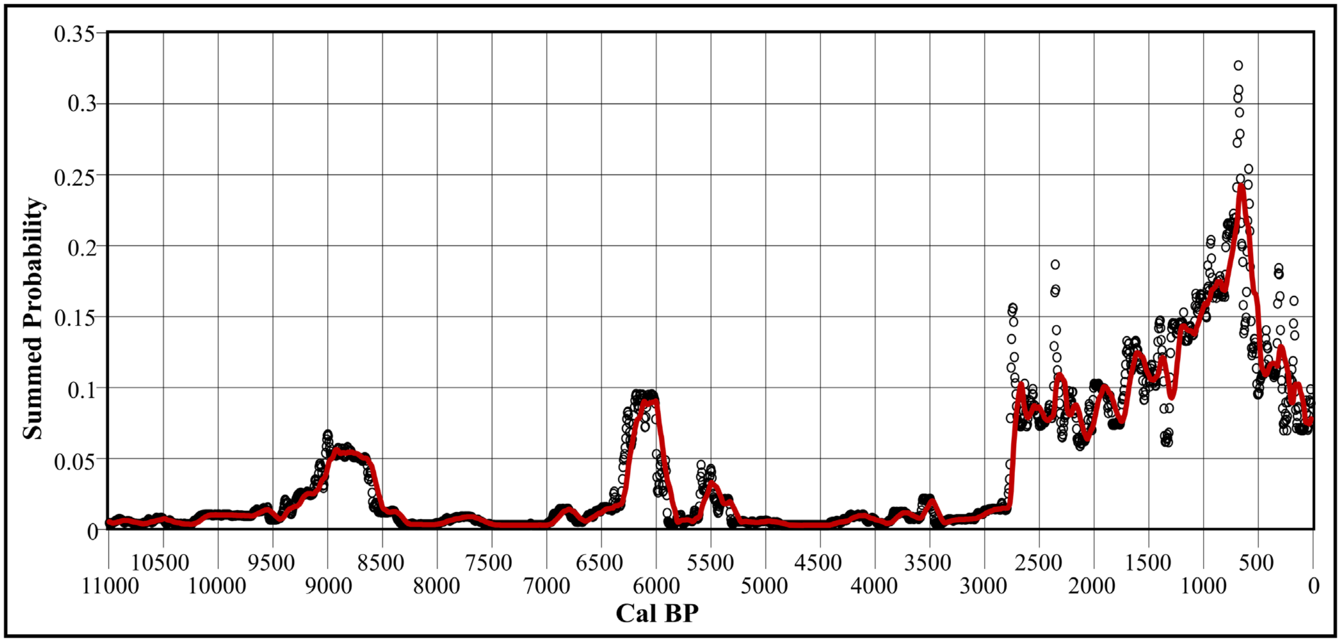

Figure 4-3. The summed probability distribution of all 410 dates in the approximately 60-km radius from center of Camp Swift using the OxCal v4. 4.4 software (Bronk Ramsey 2021).

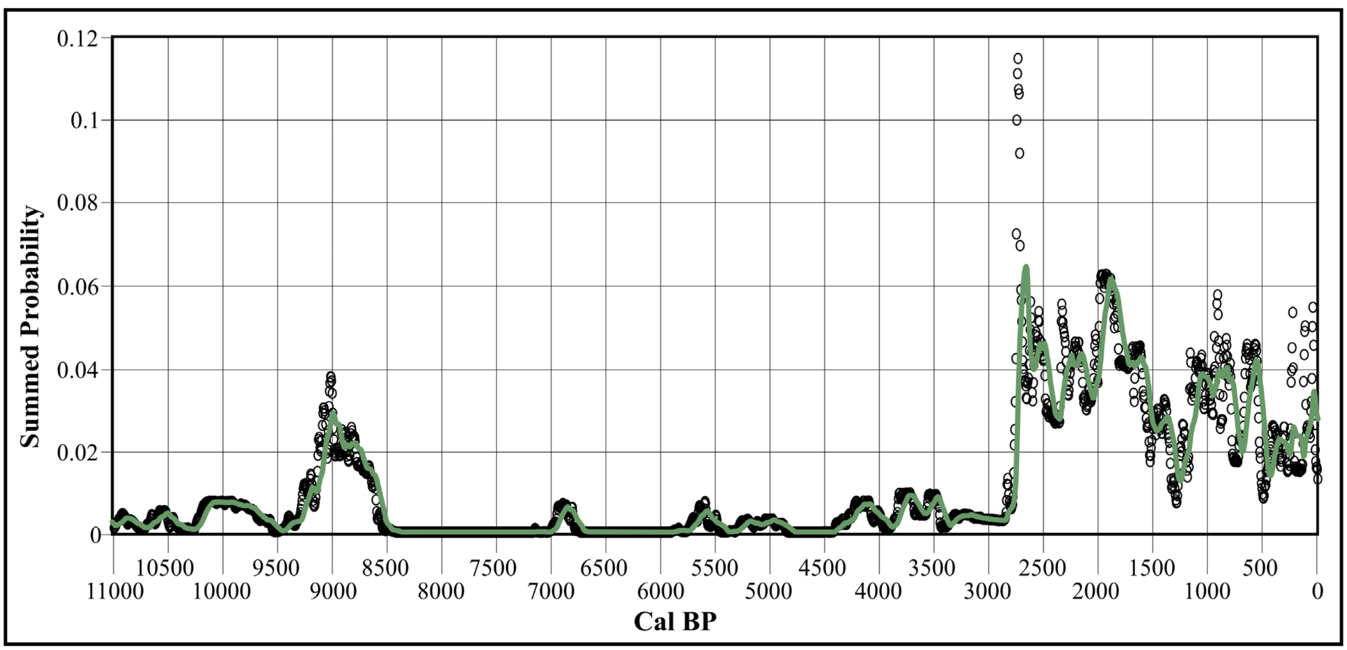

Figure 4-4. The summed probability distribution of 126 radiocarbon dates in the Balcones Canyonlands ecoregion created using the OxCal v4. 4.4 software (Bronk Ramsey 2021).

ca. 8350 cal BP, with more intensive use reflected around 9000. Several periods without any probability reflected are then present, including between about 8400 and 7200 cal BP, and 6650 and 5950 cal BP. Use is again suggested through the remaining sequence, with a dramatic increase at around 2750 cal BP. After that date, the curve reflects a fluctuating but declining use, with a dramatic fall initiated at around 1900 and terminating at around 1300 cal BP. Use then appears to fluctuate into the modern era.

The SPD curve for the Northern Blackland Prairie ecoregion (Figure 4-2) is shown in Figure 4-5. This ecoregion is largely composed of grasses, including little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), and tall dropseed (*Sporobolus asper var. asper*; USGS 2021). Closer to Camp Swift the region is habituated by Texas wintergrass (*Nassella leucotricha*), hairy grama (*Bouteloua hirsuta*), threeawn plants (*Aristida* spp.), and

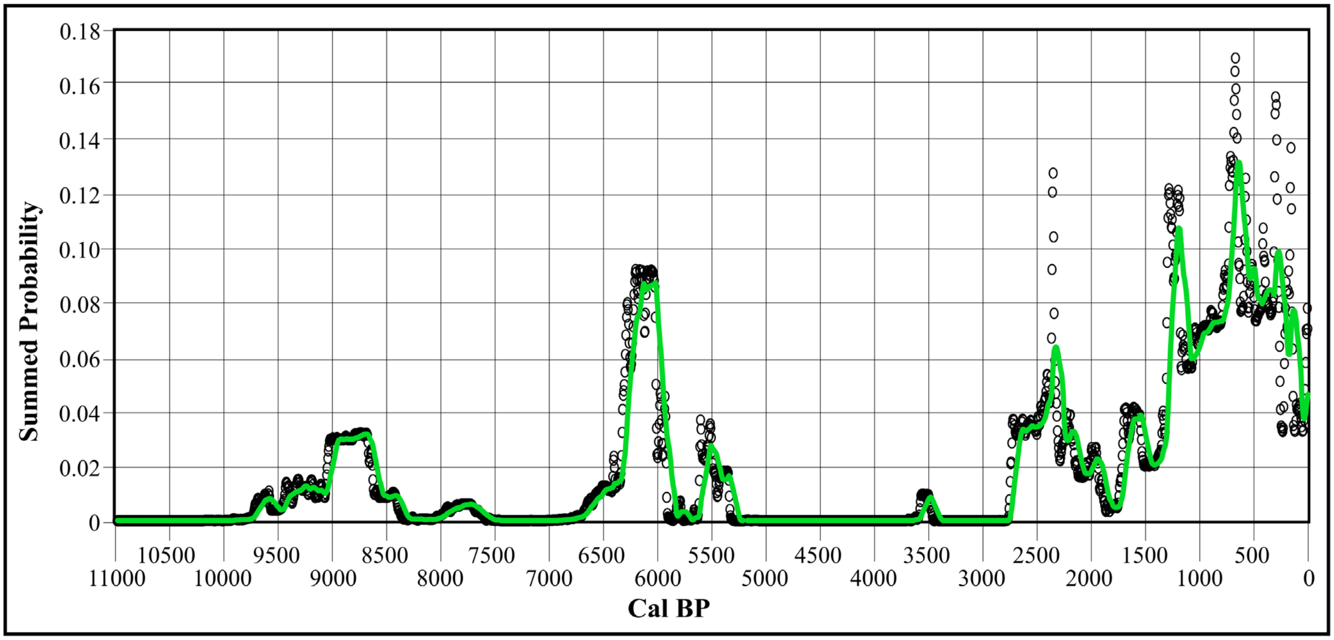

Figure 4-5. The summed probability distribution of 208 radiocarbon dates in the Northern Blackland Prairie ecoregion created using the OxCal v4. 4.4 software (Bronk Ramsey 2021).

silver bluestem (*Bothriochloa laguroides ssp. torreyana*). Along creeks in floodplains and low terraces were forested areas, typically containing bur oak (*Quercus macrocarpa*), Shumard oak (*Quercus shumardii*), sugar hackberry (*Celtis laevigata*), elm (*Ulmus crassifolia*), ash (*Fraxinus pennsylvanica*), eastern cottonwood (*Populus deltoides var. deltoides*), and pecan (*Carya illinoinensis*). The Blackland Prairie is home to a variety of animal species, including the Elliot's short-tailed shrew (*Blarina hylophaga plumblea*), Attwaters pocket gopher (*Geomys attwateri*), black-tailed prairie dog (*Cynomys ludovicianus*) and the black-tailed jackrabbit (*Lepus californicus*; TPWD 2021). Historically, grey and red wolf (*Canis* sp.), black bear (*Ursus americanus*), and pronghorn antelope (*Antilocapra americana*) were present, along with bison (*Bison bison*; Schmidly and Bradley 2016).

The Figure 4-5 SPD curve was created from 208 radiocarbon dates from 27 sites. The curve suggests no use in this area prior to about 10,000 cal BP. Consistent with the Balcones Canyonlands SPD (Figure 4-4), a period of more intensive use is reflected around 9000 cal BP. There is a dramatic increase in use beginning at 6750 cal BP, with a peak at around 6250, and a fall off to around 5250 cal BP. Low or no use is then suggested through around 2750 cal BP, when another dramatic increase begins. This is the same general time frame seen in the Balcones Canyonlands data, though the peak period of use is slightly later at about 2350 cal BP. The curve then declines reaching a low around 1800 cal BP. Use is again suggested to increase, with a surge between 1300 and 1200 cal BP. This is the inverse of the curve for the Canyonlands. Overall, the Northern Blackland Prairie curve suggests peak use at around 670 cal BP, and fluctuating, but declining use throughout the rest of the sequence.

Figure 4-6 shows the SPD curve for the Southern Post Oak ecoregion (see Figure 4-2). As outlined in Chapter 2, this ecoregion, which includes Camp Swift, is dominated by post oaks (*Quercus stellata*), blackjack oaks (*Quercus marilandica*), eastern redcedar (*Juniperus virginiana*), and loblolly pine (*Pinus taeda*), with grasslands composed of little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*; Elliot 2014; TPWD 2021). The oak mast crops support white-tailed deer (*Odocoileus virginianus*) and a variety of birds including wild turkey (*Meleagris gallopavo*). Small mammals include the eastern cottontail rabbit (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), fox squirrel (*Sciurus niger*), and a variety of rodents (Blair 1950; Wilkins and Broussard 2000).

There are 76 radiocarbon dates from 23 sites underlying the Figure 4-6 SPD, including five radiocarbon dates from CAR's current work at 41BP471 and 41BP477 (see Chapter 8). The SPD curve for the 76 dates in the Southern Post Oak looks like Figure 4-1, developed previously for Bastrop County using 35 dates, and is distinctive from the other ecoregion curves. No use is indicated prior to around 7000 cal BP, when a small blip, like that shown for the Balcones Canyonlands in Figure 4-4, is present. After roughly 6650 cal BP, no use is indicated until 3300 cal BP. At 3300 cal BP, the SPD curve begins a slow, gradual increase, peaking at around 1380 cal BP. A dramatic decline then occurs, with use falling until 1300. A gradual increase then follows, with peak use

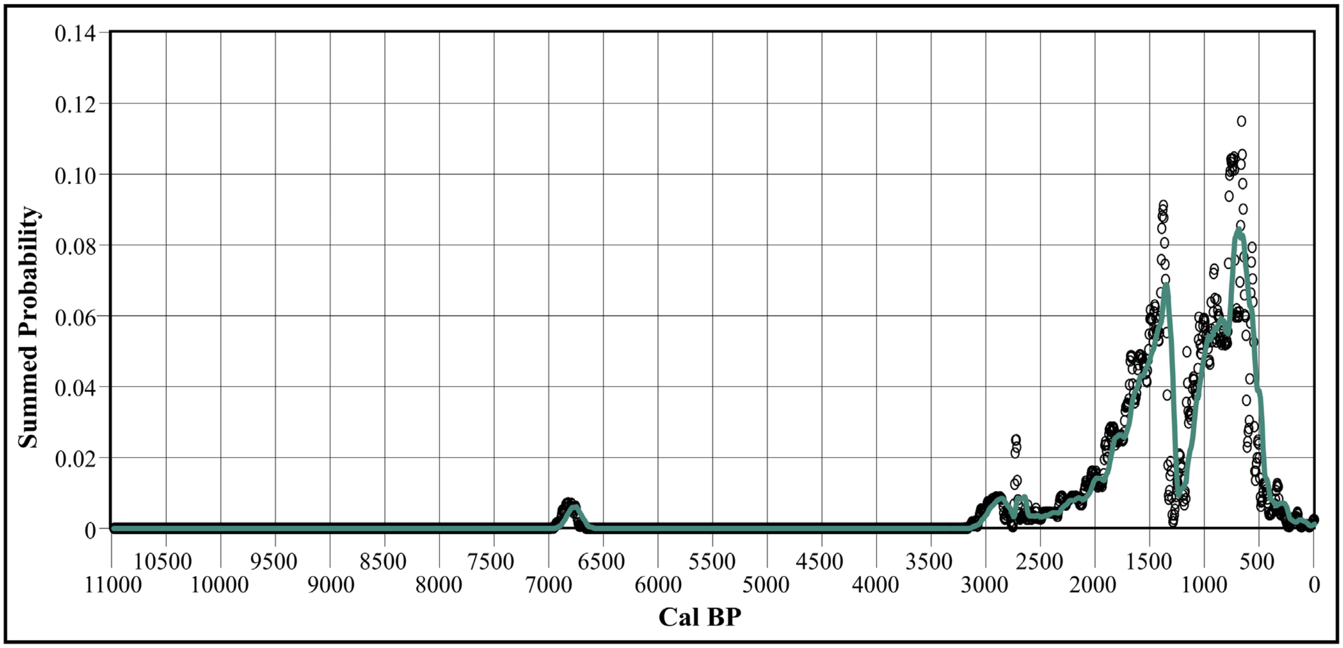

Figure 4-6. The summed probability distribution of 76 radiocarbon dates in the Southern Post Oak ecoregion created using the OxCal v4. 4.4 software (Bronk Ramsey 2021).

likely happening around 750 cal BP. The curve then rapidly declines, with little use indicated after 400 cal BP.

Relative to the other two ecoregions, the SPD curve for the Southern Post Oak suggests two dramatic differences. First, the ecoregion appears to show minimal use in the area for roughly 8,000 years. While the number of radiocarbon dates used in the SPD is low, they are all that could be located within the 6,800 km^2 shown for this ecoregion in Figure 4-2. New dates may alter the interpretation in critical ways but based on the current data, the Southern Post Oak ecoregion in this portion of Central Texas appears to have little occupation prior to the Late Archaic. The second difference is present at the end of the sequence. Figure 4-7, which focuses on the

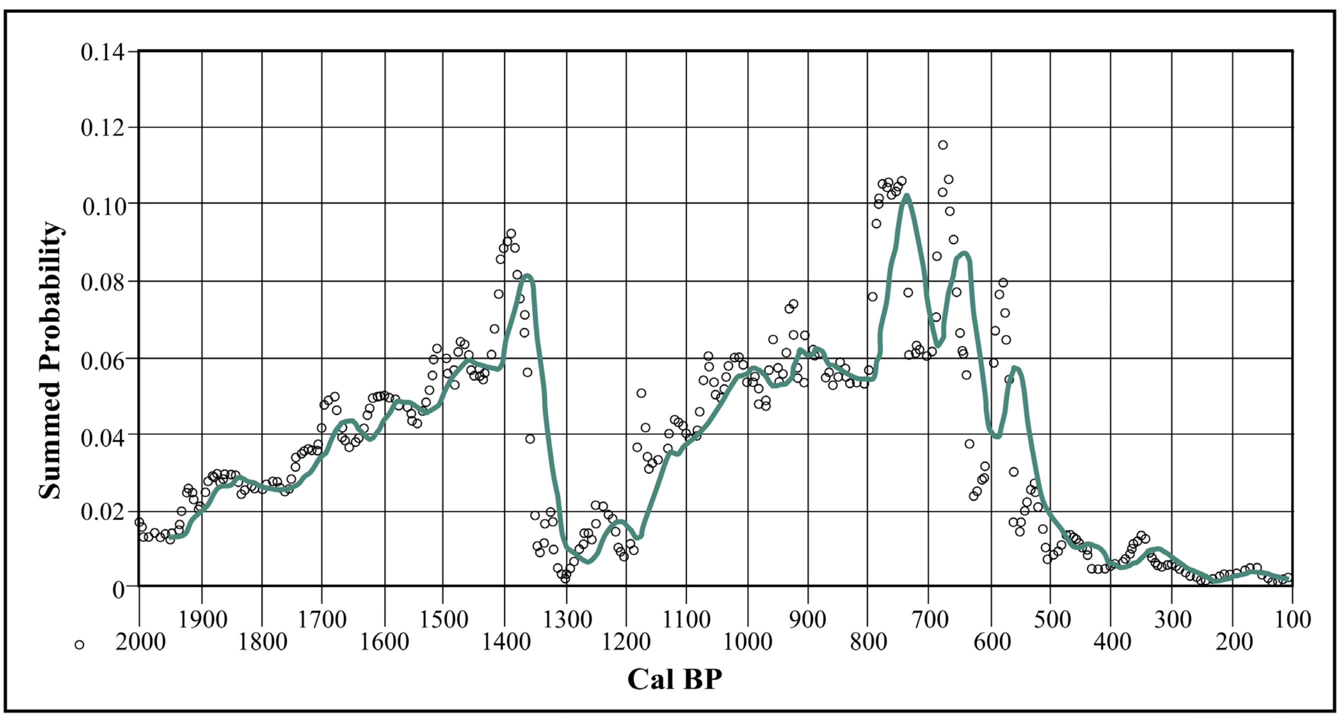

Figure 4-7. The summed probability distribution showing a 50-year moving average over 2000 years in the Southern Post Oak ecoregion created using the OxCal v4. 4.4 software (Bronk Ramsey 2021).

last 2,000 years of occupation in the Southern Post Oak, highlights the significant drop in use between around 1400 and 1300 cal BP, with low use continuing through 1200 cal BP, the beginning of the Late Prehistoric, after which use increased. Although starting earlier at around 2000 cal BP, a similar decline is present in the Balcones Canyonlands sequence (see Figure 4-4). In contrast, the Blackland Prairie shows a rapid increase at this same general time frame (see Figure 4-5).

There is a significant drop in modeled NPP, likely related to lower rainfall estimates, between 1450 and 1300 cal BP. The possible climate shift, shown previously in Figures 2-6 and 2-7, is regional in nature, and would impact all three of the ecoregions under consideration here. However, as the specific ecoregions have different resource structures, and different use histories, the impact of the shift would not be uniform. Declines in rainfall, especially in areas that likely had a net water deficit during most months of the year, could be especially problematic for resource production. While it would be easy to over interpret the decline in use and the suggested shifts in the climate data, previous research has suggested that the Southern Post Oak has low floral and faunal diversity and is depleted in resources likely targeted by hunters and gatherers (see Chapter 2; Munoz et al. 2018). A rapid decline in production in such settings could have a significant impact on use history.

Summary

This chapter situates the limited occupation of Camp Swift into larger ecoregional trends. The SPD curves derived from radiocarbon dates show that occupation trends seen in Camp Swift and Bastrop County, where there is little to no use until roughly 3000 cal BP in the Late Archaic, may also be present in the surrounding Southern Post Oak ecoregion. In contrast, there is evidence that occupation occurred early in both the Balcones Canyonlands and the Northern Blackland Prairie ecoregions. The low level of use in the Southern Post Oak may be related to the low diversity of commonly targeted plants and animals in this ecoregion. In addition, a significant drop in use of the region, which occurs at the end of the Late Archaic, may be related, in part, to lower net primary production suggested by climate modeling in Chapter 2.

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Chapter 5: Field and Laboratory Methods

Leonard Kemp

The CAR used standard archaeological methods during the NRHP eligibility testing of 41B471, 41BP477, and 41BP666 at Camp Swift. This chapter describes the field and laboratory methods, as well as the curation strategy used on this project.

Methods

Pre-Field

Prior to the start of fieldwork, the Principal Investigator and Project Archaeologist reviewed reports of previous investigations (Kemp et al. 2019; Lohse and Bousman 2006; Mauldin et al. 2018; Nickels and Lehman 2004; Nickels et al. 2005, Robinson et al. 2001), topographic maps, site maps, and aerial photographs to evaluate the project area and to aid in the placement of test units. For the initial testing of the three sites the CAR assessed the artifact density and overall depth of deposits. It was determined that fourteen 1-x-1 m test units (TUs) should be excavated to the terminal clay level, if possible. Five TUs were designated for site 41BP471, five at 41BP666, and four units at 41BP477. Test unit locations were selected based on artifact density and depth from the previously dug backhoe trenches, shovel tests, and artifact scatters.

Testing

The investigations consisted of two stages: 1) test unit placement and mapping using a Trimble Juno GPS unit, and 2) the subsequent hand-excavations of the units. From June 22 through June 24, 2022, the principal investigator and project archaeologist set up the initial eleven test units using a Trimble GPS unit and transit with the spatial data downloaded into ArcGIS software. A crew of CAR staff archaeologists, under the supervision of the project archaeologist, performed all work involved in the testing over three five-day and one two-day sessions (Figure 5-1). From October 5 through November 10, 2017, eleven 1-x-1 m test units and three 1-x-0.5 m units were excavated.

Figure 5-1. CAR archaeologists working at 41BP477 on Camp Swift.

Each test unit was excavated in arbitrary 10-cm levels referenced to the unit datum. In most cases, the first level was excavated to the nearest even 10-cm increment, resulting in a partial level. Excavations then proceeded in 10-cm increments for subsequent levels. Excavation was performed using shovel skimming with troweling when necessary to expose features and in situ artifacts. The collected sediment from each level was sifted through ¼-inch hardware cloth. Artifacts found in the screen were collected, labeled by provenience, given a unique identifier, and recorded in a field log. A standardized test unit form was completed for each level. When artifacts were found in situ, they were drawn on the unit grid on the excavation form. All units were photographed at the completion of each level. A color analysis of a soil sample from each level was compared using Munsell Soil Color Charts. All cultural material encountered in test units was collected and returned to the CAR laboratory for processing and analysis.

Magnetic soil susceptibility (MSS) samples were taken as a sample column from a wall profile of each test unit upon completion of the unit's excavation. Plastic vials were inserted into a 1-m board with holes drilled at 5-cm increments. The board was placed against the profile wall, and the vials were tapped into the profile. The vials were carefully removed from the test unit wall, labeled, and placed into separate bags for each unit. In addition, two pits were excavated outside of the site boundary of 41BP471 and 41BP666 to act as a control for the MSS samples. All excavations were backfilled upon completion of each session.

Laboratory

Upon completion of fieldwork all recovered artifacts, sediment samples, and organic samples were transported to the CAR laboratory for processing. Proveniences for the materials were double-checked by comparing the unique field number to the field log. Prior to analysis, artifacts were washed, air-dried, and placed into zip-locking, archival-quality bags. Each bag contained a label with provenience information and a corresponding lot number. The artifacts were then separated into appropriate categories (e.g., debitage, tools, burned rock) for analysis.

Analysis

Lithic artifacts recovered from the site consisted of moderate quantities of debitage, a small number of lithic tools, and small quantities of non-feature burned rock. Debitage was analyzed using a hierarchical approach that combined color, texture, evidence of heating, and overall finish. The maximum size of each piece of debitage was recorded in addition to the estimate of the dorsal cortex cover (0%, 1-50%, 51-99%, 100%) to provide basic information on site use and raw material use. This analysis is reported in Chapter 9 with the analyzed debitage attributes presented in Appendix C. A projectile point and other lithic tools were identified using a variety of sources including typology guides (Turner and Hester 1999; Turner et al. 2011) and regional reports (Bement 1984; Carpenter et al. 2006; Ensor and Mueller-Wille 1988; Sherman et al. 2015). The projectile point is discussed in Chapter 8. The remaining lithic tools, other than the points, are discussed in Chapter 9.

Magnetic Soil Susceptibility (MSS) Analysis

MSS analysis measures the potential magnetic signature of a sediment sample, with higher values suggesting greater magnetic potential. In this study, MSS analysis can provide information on the overall integrity of a site as well as to infer buried cultural surfaces.

In the CAR lab, the MSS samples were air dried and packed into a pre-weighed 10-cm^3 plastic vial. The sample was weighed with the sample mass recorded less the weight of the empty vial. The sample was then placed into a Bartington MS2 frequency sensor attached to a MS2 magnetic susceptibility meter. Low frequency volume susceptibility (kappa, κ) was measured on each sample with two readings taken and the results averaged. The mass corrected magnetic susceptibility (chi, χ) values were then calculated using the sample mass (see Dearing 1999). These results are discussed in Chapter 7, and MSS data are presented in Appendix B.

Flotation

Flotation samples were taken from the fill of the one feature defined in the field. Previous testing of float procedures with unburned poppy seeds indicates a recovery rate of approximately 90%. Table 5-1 lists the sites, features, provenience, amount of sample collected, and material collected from the light and heavy fractions. The material consisted of charcoal, burned rock, and micro debitage. The size of charcoal samples from the feature was insufficient to date the feature. The debitage was added to the artifact counts but was not included in the analysis due to the small size.

Macrobotanical and Radiocarbon Analyses

Five macrobotanical samples assumed to be charred nut were submitted to Dr. Kevin Hanselka for identification. Four of the five samples were determined to be nut fragments and belong to the Juglandaceae or the walnut and hickory family with the remaining sample identified as tree

Table 5-1. Flotation Samples Collected during the Present Project

Site	Feature	Provenience (Test Unit and Level)	Depth (cmbd)	Amount Floated (liters)	Recovered Material
41BP666	1	TU 1- Level 5	52-60	1.990	burned rock; 14C
41BP666	1	TU 1- Level 6	60-70	13.940	debitage, burned rock and 14C
41BP666	1	TU 1- Level 9	90-100	11.720	debitage and 14C

bark. All samples were pretreated by CAR and submitted to DirectAMS for radiocarbon dating. The results of this analysis are discussed in Chapter 8 with additional data found in Appendix A. The remaining charcoal samples were placed in aluminum foil and curated.

Curation

All 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 and placed in Accession File 2471. The materials were curated in accordance with current CAR guidelines. Artifacts were stored in archival-quality bags with acid-free labels including a provenience and corresponding lot number. Materials needing extra support were double-bagged. Paper labels were applied to all tools using a clear coat of acrylic with an additional coat applied to protect the label. In addition, 50% of unmodified debitage greater than 25 mm from each lot was labeled with the appropriate provenience data. All artifacts were stored in acid-free boxes.

Digital photographs were printed on acid-free paper, labeled with archival 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, placed in archival folders, and stored in acid-free boxes. A copy of this report and all computer media pertaining to the investigation were stored in an archival box and curated with the field notes and documents.

Following analyses and quantification, artifacts associated with this project possessing little scientific value will be discarded pursuant to Chapter 26.27(g)(2) of the Antiquities Code of Texas and in consultation with both the TMD and the THC. The only artifact class to be discarded specific to this project was non-feature burned rock, modern items, and processed MSS samples. These items were documented with counts and are included in curation documentation.

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Chapter 6: Site Descriptions, Current Investigation, and Material Recovered

Leonard Kemp and Lynn Kim

Archaeological testing was performed on sites 41BP471, 41BP477, and 41BP666. All three are in the northwest portion of Camp Swift (Figure 6-1). This chapter presents an overview of these sites, including previous investigations, and discusses the work accomplished during this investigation. A summary of recovered material is also provided.

Redacted Image

Figure 6-1. Locations of the three tested sites, 41BP471, 41BP477, and 41BP666 on an Esri aerial photo.

Figure 6-2 shows the soils on and around the three sites investigated. All the soils in the area are alfisols and well drained. The sites are primarily located in the Padina series, a group that is very deep and moderately permeable. These are soils derived from the sandy residuum from sandstone (PaE, formerly in the Patilo Complex). Site 41BP471 has only PaE soils. A small northern portion of site 41BP477 has Edge fine sandy loam, 2 to 5% slopes (AfC2). The Edge series developed from loamy and clayey residuum from the sandstone and mudstone (Baker 1979; NRCS 2021). Site 41BP666 has PaE, AfC2, as well as Robco-Tanglewood complex, 1 to 5% slopes (DeC, formerly the Demona series, Figure 6-2).

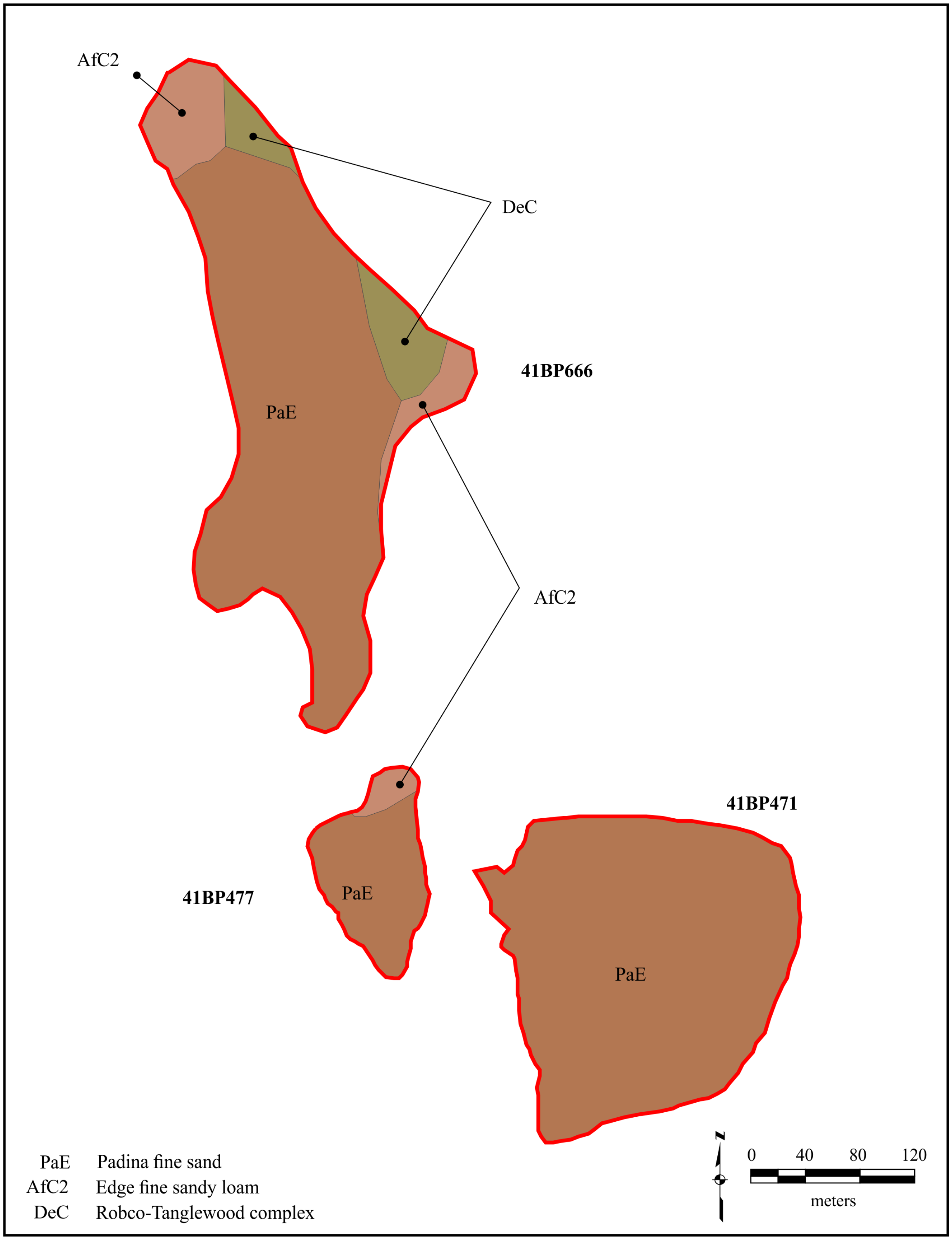

Figure 6-2. Soil map of the three sites: 41BP471, 41BP477, and 41BP666.

Figure 6-3 shows the current vegetation at the three sites shown in the Camp Swift Integrated Natural Resources Management Plan (INRMP; TMD 2020:Appendix G]). It shows that Little Bluestem Grassland is found on all three sites to some degree and is the dominate vegetation on site 41BP471. Camp Swift fire and brush management appear to have caused the expansion of a savannah that includes Little Bluestem (*Schizachyrium scoparium*) and native Indiangrass (*Sorghastrum nutans*) on the facility (TMD 2020:G-16). Site 41BP477 has three vegetation communities: the Little Bluestem grassland; Green Ash-American Elm Forest, and Oak-Woodland-Red Cedar Forest. The latter

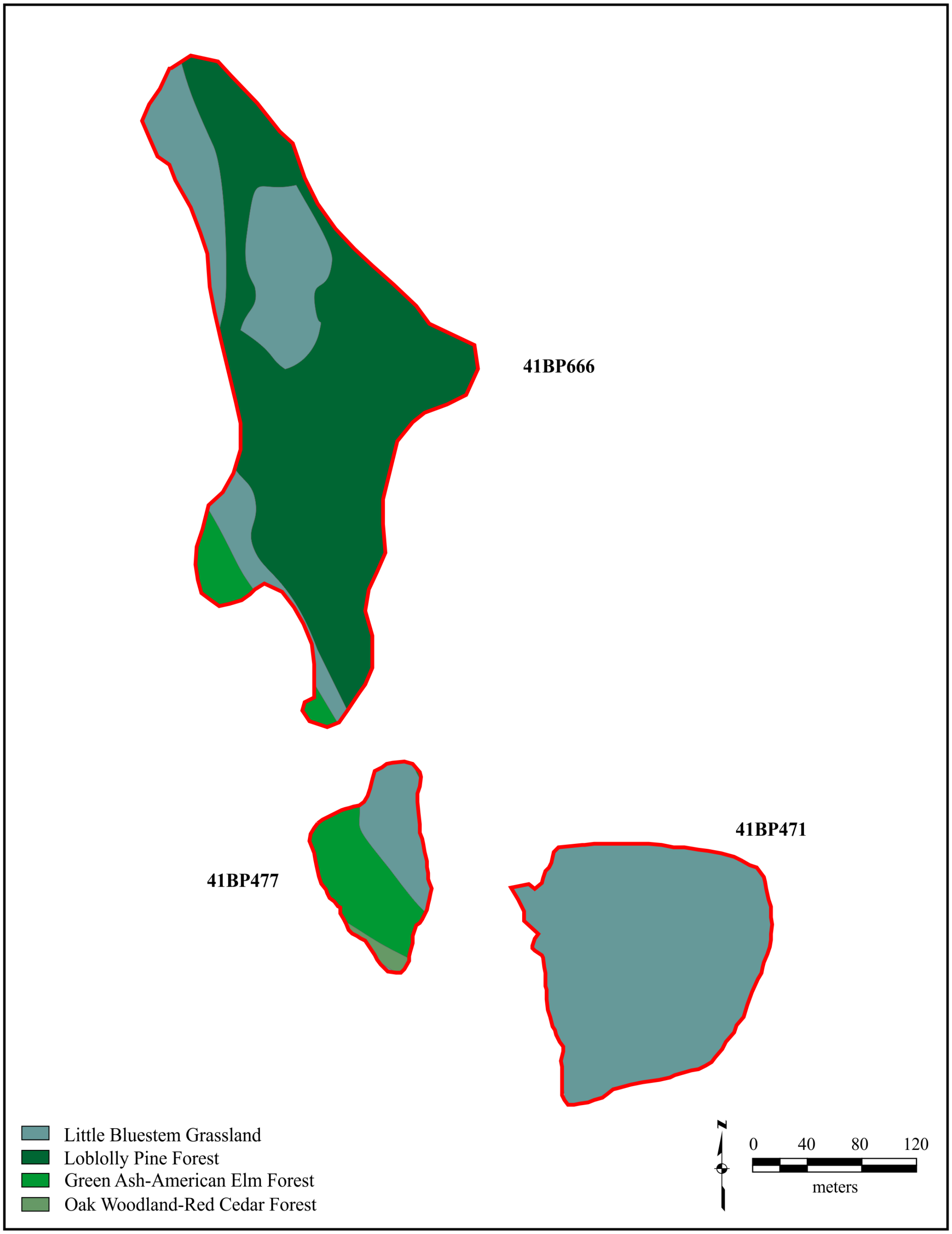

Figure 6-3. Map showing the current vegetation for the Project Area as described in the Camp Swift INRMP 2020 (Figure G-7).

two communities are riparian woodlands found on the southern half of 41BP477. Site 41BP666 contains the Little Bluestem grassland, Green Ash-American Elm Forest, and is dominated by the Loblolly Pine Forest. The Loblolly Pine (*Pinus taeda*) may have been introduced during the mid- to late-twentieth century (TMD 2020:G-16). This assertion, and the presence of Loblolly pine, is supported by Nickels et al. (2005) finding a twentieth century farmstead in the northern portion of 41BP666. Nickels et al. (2005:57) suggest that the landform was cultivated due to the productivity of the PaE soils that would support grasses, legumes, grain, and seed crops.

41BP471

Site 41BP471 lies east of an unnamed north-south intermittent drainage of Big Sandy Creek, just west of Wine Cellar Road, and 60 m north of Spring Branch Creek. It is an open field that sits on a side slope below a knoll (Figure 6-4). It ranges in elevation from approximately 135 to 137 meters above sea level. As shown in Figures 6-2 and 6-3, soil on the site is a deep sand of the Padina complex supporting tall grasses, forbs, and prickly pear. Where vegetation did not obstruct visibility, rodent burrows were observed frequently.

Background

Sullo and Wormser (1996) recorded site 41BP471. They recovered ten flakes from four of their thirteen shovel tests. In 2002, the Center for Archaeological Studies (CAS) returned to the sites, excavating 26 shovel tests, 21 of which were positive for cultural material (Figure 6-5; Nickels and Lehman 2004:61). Artifacts included large and small pieces of fire-cracked rock (FCR), a hammerstone, edge modified flakes, flakes, shatter, miscellaneous metal, a bullet, and charcoal. Prehistoric artifacts were found as deep as 130 cm below surface. Nickels and Lehman (2004) characterized the site as a prehistoric open campsite covering 25,693 m^2.

In 2005, CAS excavated five trenches on the site (Figure 6-5; Lohse and Bousman 2006). Trench excavations ranged from 80 to 240 cmbs with the shallowest (Trench 5) in the northern portion of the site and the deepest (Trench 2) in the southern portion (Lohse and Bousman 2006:Table 3-6). Trench 1 was excavated outside the site boundary. In Trench 2, CAS documented FCR at two distinct depths (50 to 80 cmbs; 130 to 150 cmbs) suggesting two stratified components (Lohse and Bousman 2006:49-50). A piece of burned chert was also recorded in the lower strata. In Trench 5, an FCR feature approximately 80 cm in length was documented at 60 cmbs. The feature continued into the south trench wall. In the northern portion of the trench at 60 cmbs, CAS documented a discolored sand that was described as a burn stain. Two flakes were found adjacent to the possible stain. In addition to these findings, CAS documented three FCR in Trench 1 at 40 cmbs and in Trench 4, a large chert flake was found at 50 cmbs and FCR at 50 to 60 cmbs. CAS recommended 41BP471 as likely eligible for listing to the NRHP under criterion D and suggested additional investigation.

Current Investigation

CAR excavated five 1-x-1 m test units between October 12 and October 15, 2020. Figure 6-5 shows the locations of the units relative to the work conducted by CAS. TU 1 and 2 were placed south and north of Trench 2 to investigate the two separate prehistoric components documented by CAS. They are at the southern edge of the site and the lowest in elevation. CAR placed TU 3 in the central part of the site east of Trench 3 and between two positive shovel tests containing FCR. CAR located TU 4 about 17 m east of Trench 5, and TU 5 was placed 5 meters to the southeast.

Figure 6-4. View to the west of 41BP471 in June 2020 from Scott Falls Road.

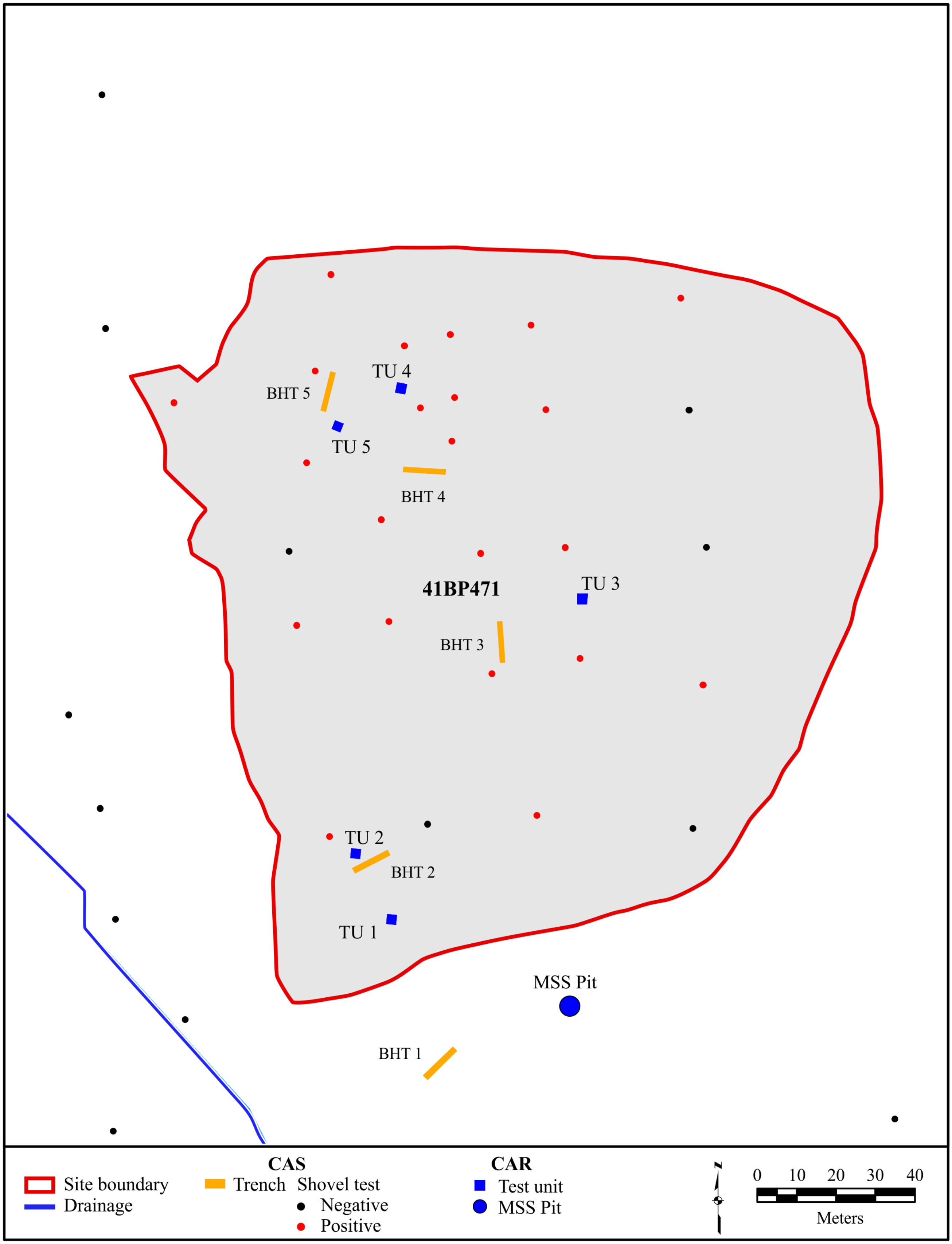

Figure 6-5. Site map of 41BP471 showing previous and current archaeological work.

This trench contained a feature at 60 cmbs. These units were at the northwest end of the site.

Excavated soils in the TUSs were described as 10YR6/3 to 10YR6/4, loose to soft sand, with less than 1% gravels. Test Units 1, 2, and 3 terminated at 160 cmbd with a sand matrix. Units 3 and 5 terminated with a clay/sand or clay matrix respectively. Table 6-1 summarizes the excavation effort.

The five units produced a dart point, a medial biface fragment, an edge modified flake, 133 pieces of debitage, 2,527 g of burned rock, an ochre fragment, charred nut fragments, and charcoal. Three charred nut fragments were submitted to DirectAMS for radiocarbon dating. The results, which will be discussed in Chapter 8, suggest occupation during the Late Archaic and Late Prehistoric periods. The projectile point described as Nolan-like was found in Level 5 of TU 5 (Figure 6-6). A small quantity of historic material was collected including two bullets and two fragments of clear glass. No features were recorded during this investigation. Table 6-2 summarizes the artifacts recovered from 41BP471. Magnetic soil susceptibility (MSS) samples were collected from each of the five units.

Table 6-1. Summary of Test Units Excavations at 41BP471

Test Unit	Number of Levels Excavated	Maximum Terminal Depth below Datum (cmbd)	Total of m^3 Sediments Excavated
1	15	160	1.51
2	15	160	1.51
3	15	153	1.45
4	15	160	1.50
5	13	139	1.29

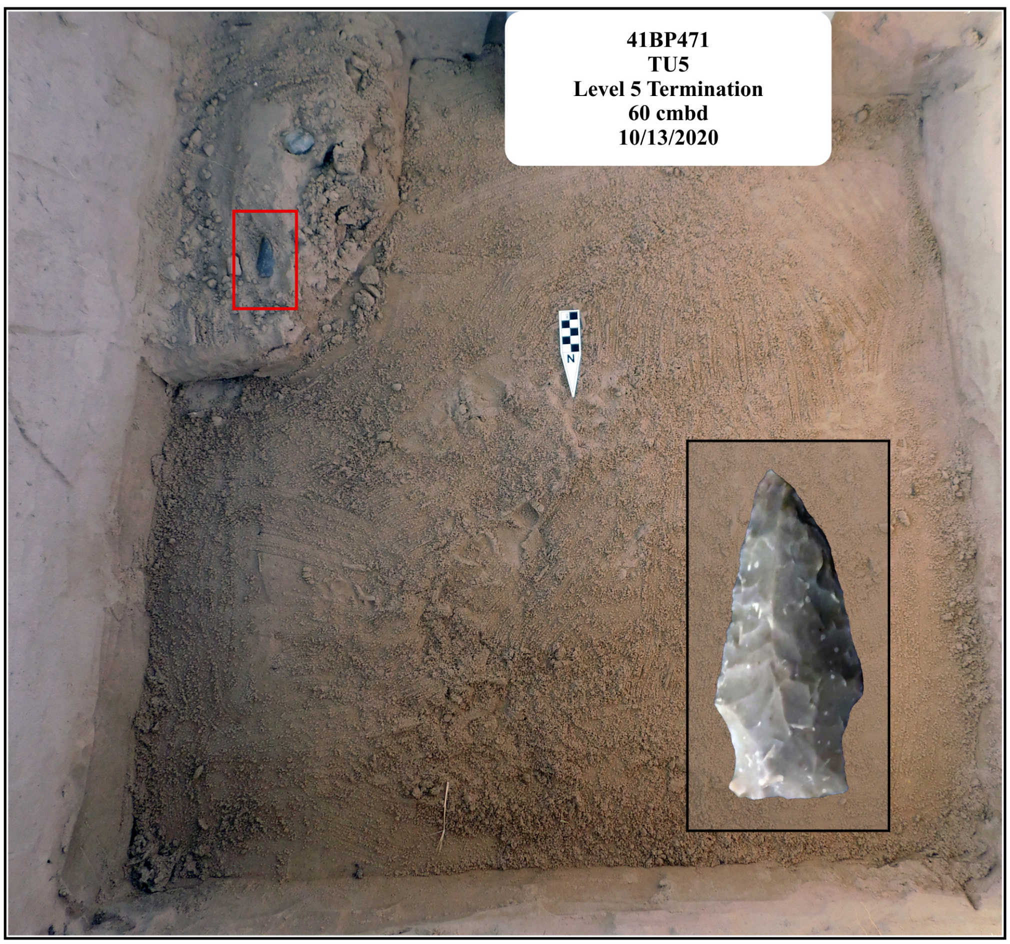

Figure 6-6. A Nolan-like point was found in situ at Level 5 in TU 5 on 41BP471 with its location shown in the red box. The inset shows the point.

Table 6-2. Summary of Artifacts by Unit and Level from 41BP471

Level	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 4	Test Unit 5
1	debitage (1)	burned rock (3.25 g)	null	debitage (1); burned rock (0.95 g)	debitage (1); burned rock (66.35 g)
2	debitage (2); ^{14}C	burned rock (0.31 g)	debitage (1)	burned rock (9.18 g)	debitage (6); burned rock (0.32 g)
3	debitage (1); burned rock (1.5 g)	debitage (1); burned rock (7.19 g); ^{14}C; glass fragment	debitage (2); burned rock (0.31 g)	debitage (3); bullet	debitage (5); burned rock (6.11 g)
4	debitage (2); burned rock (11.31 g)	burned rock (57.5 g); ^{14}C; bullet	debitage (1); burned rock (0.3 g)	debitage (3); burned rock (0.18 g)	debitage (8); burned rock (93.36 g)
5	burned rock (63.37 g); ^{14}C	burned rock (0.47 g); ^{14}C	burned rock (0.24 g); ^{14}C; glass fragment	debitage (4); burned rock (0.63 g)	Nolan dart point; debitage (8); burned rock (73.44 g); ^{14}C
6	debitage (2); burned rock (30.81 g); ^{14}C	burned rock (1.45 g); ^{14}C	null	debitage (1); burned rock (12.54 g)	debitage (3); burned rock (108.87 g); ^{14}C; ochre
7	debitage (2); burned rock (155.2 g); ^{14}C; charred nut	debitage (2); burned rock (0.8 g)	burned rock (0.2 g)	debitage (4); burned rock (138.15 g); ^{14}C; charred nut	debitage (1); burned rock (66.21 g); ^{14}C
8	debitage (3); burned rock (210.28 g); ^{14}C; charred nut	debitage (2); burned rock (0.98 g)	debitage (3)	debitage (2); burned rock (55.06 g); ^{14}C	debitage (8); burned rock (138.66 g); ^{14}C
9	debitage (3); burned rock (52.12 g); ^{14}C	debitage (2); burned rock (56.09 g)	debitage (3); burned rock (4.96 g)	debitage (2); burned rock (30.12 g); ^{14}C	debitage (2); burned rock (8.73 g)
10	debitage (2); burned rock (74.1 g); ^{14}C	burned rock (25.6 g)	debitage (2)	debitage (3); burned rock (13.93 g); ^{14}C	debitage (2); burned rock (124.61 g); ^{14}C
11	debitage (2); burned rock (82.39 g);^{14}C	burned rock (10.93 g)	debitage (1); burned rock (5.17 g)	burned rock (129.34 g); ^{14}C includes charred nut	debitage (1); burned rock (126.71 g)
12	debitage (1); burned rock (69.55 g)	debitage (3); burned rock (10.56 g); ^{14}C	burned rock (27.51 g)	debitage (3); burned rock (0.72 g); ^{14}C	edge modified tool; debitage (5); burned rock (96.87 g)
13	burned rock (42.99 g); ^{14}C	debitage (1); burned rock (20.19 g); ^{14}C	debitage (3); burned rock (13.64 g)	debitage (3); burned rock (67.16 g); ^{14}C; charred nut	burned rock (17.07 g)
14	burned rock (21.75 g)	burned rock (5.42 g)	debitage (2); burned rock (1.04 g)	burned rock (81.77 g); ^{14}C	null
15	burned rock (0.83 g)	burned rock (66.95 g)	burned rock (3.08 g)	debitage (1); burned rock (66.34 g); charred nut	null

41BP477

Site 41BP477 lies just west of 41BP471, separated from that site by the same north-south drainage. 41BP477 is east of another unnamed north-south intermittent drainage, and north of its confluence with Spring Branch Creek. Archaeological material is in an open field on a finger ridge that gradually slopes toward the drainage confluence (Figure 6-7:6-8). Elevation ranges from 135 to 131 m amsl. Soil is a deep sand of the Padina complex supporting oak and cedar, woody brush, and tall grasses (see Figure 6-2 and 6-3). In the northern portion of the site, the sand has eroded revealing a red clay substrate. In the southern portion of the site, CAS recorded water in one of their shovel tests (Nickels et al. 2002:Table 4-19).

Figure 6-7. View to the north/ northwest of 41BP477 from the Test Unit 3 of the current investigation.

Background

Site 41BP477 was recorded in 1996 during an early survey of Camp Swift (Figure 6-8; Robinson et al. 2001). Fourteen shovel tests were excavated, eleven of which were positive for cultural material (Robinson et al. 2001:48). A medial chert biface fragment was found on the surface and eighty-six artifacts were found in shovel tests (Robinson et al. 2001:48). These artifacts included a Late Prehistoric Scallorn point, flakes (n=29), FCR (n=55), a tested cobble, a possible bison tooth, and two charcoal samples. The site is 4,104 m^2 in size based on this testing and is characterized as an open campsite. Robinson and colleagues (2001:186) recommended the site as likely eligible for inclusion to the NRHP under criterion D and suggested additional investigation.

CAS tested 41BP477 in 2002 (Figure 6-8; Nickels and Lehman 2004). CAS excavated eighteen shovel tests with all but four positive for cultural material. Two features were recorded in two different shovel tests with both found at depths of 50 to 60 cmbs. In addition to the two features, an edge-modified flake, flakes (n=22), FCR (n=64), and a bullet were documented (Nickels and Lehman 2004:64-65). Nickels and Lehman (2004:67; Table 4-20) suggested potential intact deposits between 40 to 100 cmbs based on the 1996 and 2002 recovery of FCR and flakes.

Current Investigation

CAR excavated four 1-x-1 m TUs between October 5 and October 8, 2020. The TUs are in the south-central portion of the site based on the 2002 testing (Figure 6-8). TU 1 was placed near a shovel test that contained a biface and in which charcoal was found. TU 2 was placed to the east of TU 1 near a shovel test containing FCR and flakes documented in Levels 1 through 9. TU 3 was placed south of TU 1 in the vicinity of a shovel test in which FCR and flakes were found in Levels 2-7. TU 4 was placed near a shovel test containing a hearth as documented in Nickels and Lehman (2004).

Site 41BP477 sits between two converging drainages resulting in deep deposits of sand as recorded by CAS in 2002 (Nickels and Lehman 2004:Table 4-19). Soils are described as loose sand (10YR6/3) over a more compact sand (10YR6/3 and 6/4, 10YR 7/4). The testing of TU 1 terminated at approximately 165 cmbd at a dry, compact sand horizon. The floor was probed with a chaining pin to determine depth and when no resistance was met, it was augered to gley and yellow colored sandy clay mix at 250 cmbs. TU 2 was relatively shallow, terminating at the clay horizon approximately 95 to 99 cmbd. TU 3 was excavated to 160 cmbd and augered to clay 4 cm below this terminal level. TU 4 terminated at clay 148 cmbd. CAR excavated approximately 5.32 m^3 of sediment at 41BP477. Table 6-3 summarizes numbers of levels, terminal depth of excavation, and volume (m^3) of sediments excavated.

The four excavated units produced a biface fragment that is likely a distal portion of a projectile point, an edge modified flake, a core, 139 pieces of debitage, 5,182 g of burned rock, 27.58 g of ochre, charred nut fragments, and charcoal. In addition, three non-diagnostic faunal fragments were found in TU 1, Levels 2, 9, and 14. The specimen from Level 14 was burned. A charred nut fragment and a fragment of charred bark were submitted to DirectAMS for radiocarbon dating suggesting that the site was occupied during the Late Archaic and Late Prehistoric periods (see Chapter 7 for analysis). Several modern artifacts were collected including a glass jar lid, glass fragments, a fence staple, and unidentified metal. Table 6-4 summarizes the artifacts recovered from 41BP477. MSS samples were collected from each of the four units.

A portion of a burned rock feature was identified in the northeast corner of TU 4 in Level 8 at 80 to 85 cmbd (Figure 6-9, left). It consisted of five burned and fire-cracked rocks

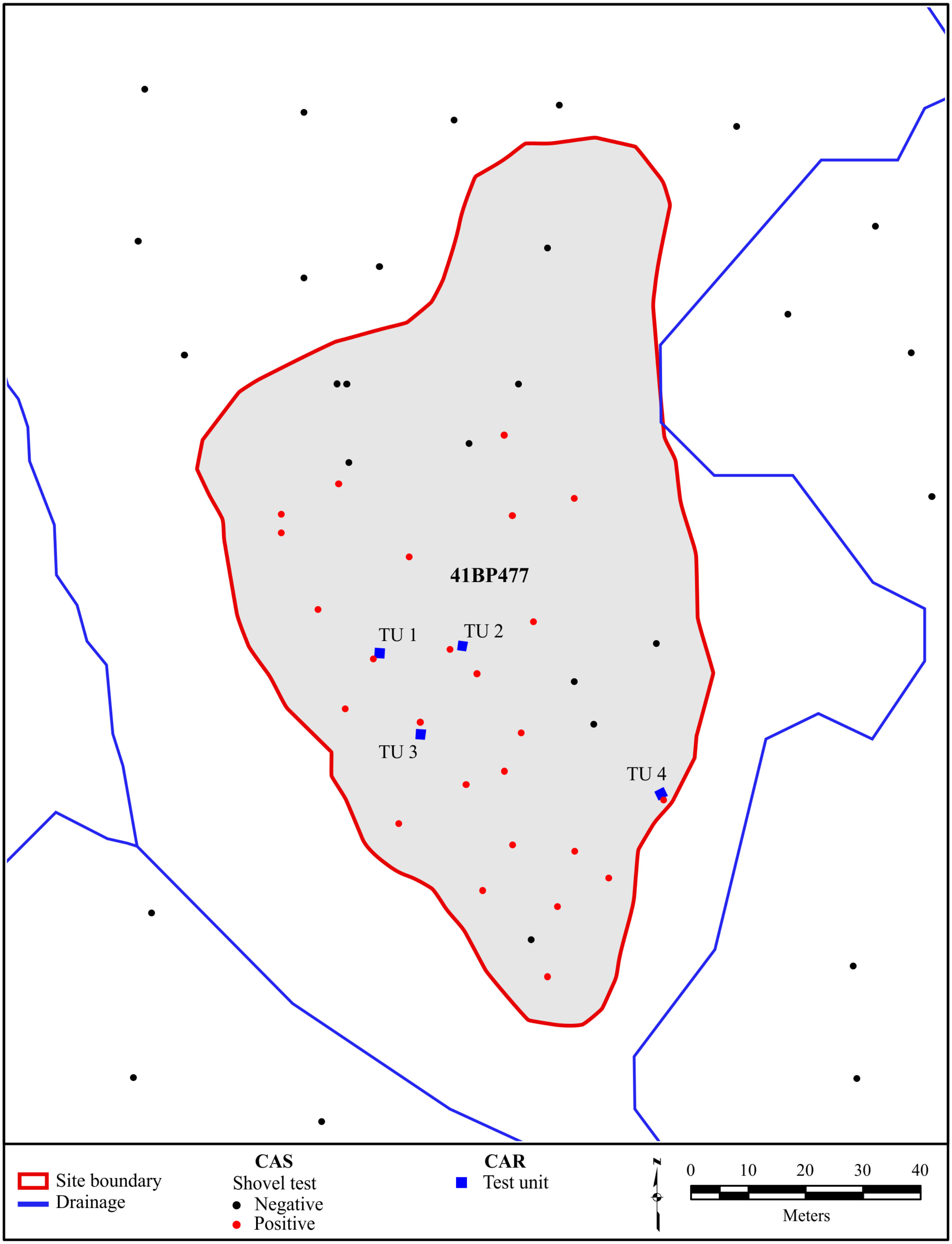

Figure 6-8. Site map of 41BP477 showing previous and current archaeological work.

Table 6-3. Summary of Test Units Excavations at 41BP477

Test Unit	Number of Levels Excavated	Maximum Terminal Depth below Datum (cmbd)	Total of m^3 Sediments Excavated
1	15	165	1.55
2	9	99	0.89
3	15	160	1.50
4	14	148	1.38

Table 6-4. Summary of Artifacts by Unit and Level from 41BP477

Level	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 4
1	null	null	debitage (3); burned rock (1.01 g); jar lid	null
2	debitage (4); faunal bone; ^{14}C; glass fragment; unknown metal	debitage (8); burned rock (71.03 g); ochre	debitage (3); burned rock (35.87 g); ^{14}C	debitage (1)
3	debitage (4); burned rock (3.82 g); ^{14}C; glass fragment; unknown metal	debitage (7); burned rock (252.78 g); ^{14}C	debitage (3); burned rock (455.73 g); ^{14}C; glass fragment	debitage (1); burned rock (3.36 g)
4	debitage (3); burned rock (26.25 g)	debitage (3); burned rock (390.24 g); glass fragment	debitage (9); burned rock (64.61 g); ^{14}C	burned rock (43.69 g)
5	debitage (4); burned rock (45.59 g)	debitage (2); burned rock (218.63 g); ^{14}C; unknown metal	debitage (2); burned rock (17.43 g); ^{14}C	burned rock (0.8 g)
6	debitage (2); burned rock (1.08 g)	debitage (2); burned rock (42.12 g); ^{14}C	core; debitage (7); burned rock (233.15 g); ^{14}C; ochre	burned rock (43.07 g)
7	debitage (6); burned rock (0.56 g); unknown metal	debitage (1); burned rock (132.05 g); ^{14}C	debitage (4); burned rock (38.13 g); ^{14}C	burned rock (43.42 g)
8	debitage (3); burned rock (23.28 g)	debitage (6); burned rock (126.53 g); charred nut	debitage (1); burned rock (108.86 g); ^{14}C	Feature 1; burned rock (913.02 g)
9	debitage (4); burned rock (104.77 g); faunal bone	edge modified tool; debitage (3); burned rock (28.06 g); ^{14}C	debitage (2); burned rock (156.83 g)	debitage (1); burned rock (59.59 g)
10	debitage (6); burned rock (43.5 g); faunal bone; glass fragment; possible ochre	not excavated	burned rock (297.63 g); ^{14}C; charred nut	burned rock (41.8 g)
11	debitage (3); burned rock (21.6 g)	not excavated	debitage (3); burned rock (39.24 g); ^{14}C	burned rock (61.05 g)
12	debitage (5); burned rock (98.91 g)	not excavated	debitage (1); burned rock (178.08 g)	burned rock (82.81 g); Ochre
13	biface fragment; debitage (9); burned rock (30.79 g); ^{14}C; ochre	not excavated	burned rock (58.69 g)	burned rock (6.98 g)
14	debitage (6); burned rock (156.07 g); burned faunal bone	not excavated	debitage (1); burned rock (119.76 g)	burned rock (54.52 g)
15	debitage (5); burned rock (189.96 g); ^{14}C	not excavated	debitage (1); burned rock (42.91 g)	not excavated

weighing 778 g. Four of the rocks are quartzite and the other is petrified wood. Five burned and fire-cracked rocks, petrified wood (n=3), quartzite (n=1), and chert (n=1) were found in the screen weighing a total of approximately 67 g. A burned quartzite nodule weighing 68 g was also plotted along the southern edge of the unit. No charcoal was associated with the feature, nor was any staining or discoloration observed during excavation. While the shape of the feature appears amorphous and the quantity of burned rock small, a graph of burned rock shows a significant spike in Level 8 compared to other levels of the unit. The burned rock spike and the previous investigation's (Nickels and Lehman 2004) findings of a hearth in the area suggests that it is likely the remnant of a feature. The feature likely continues to the northeast.

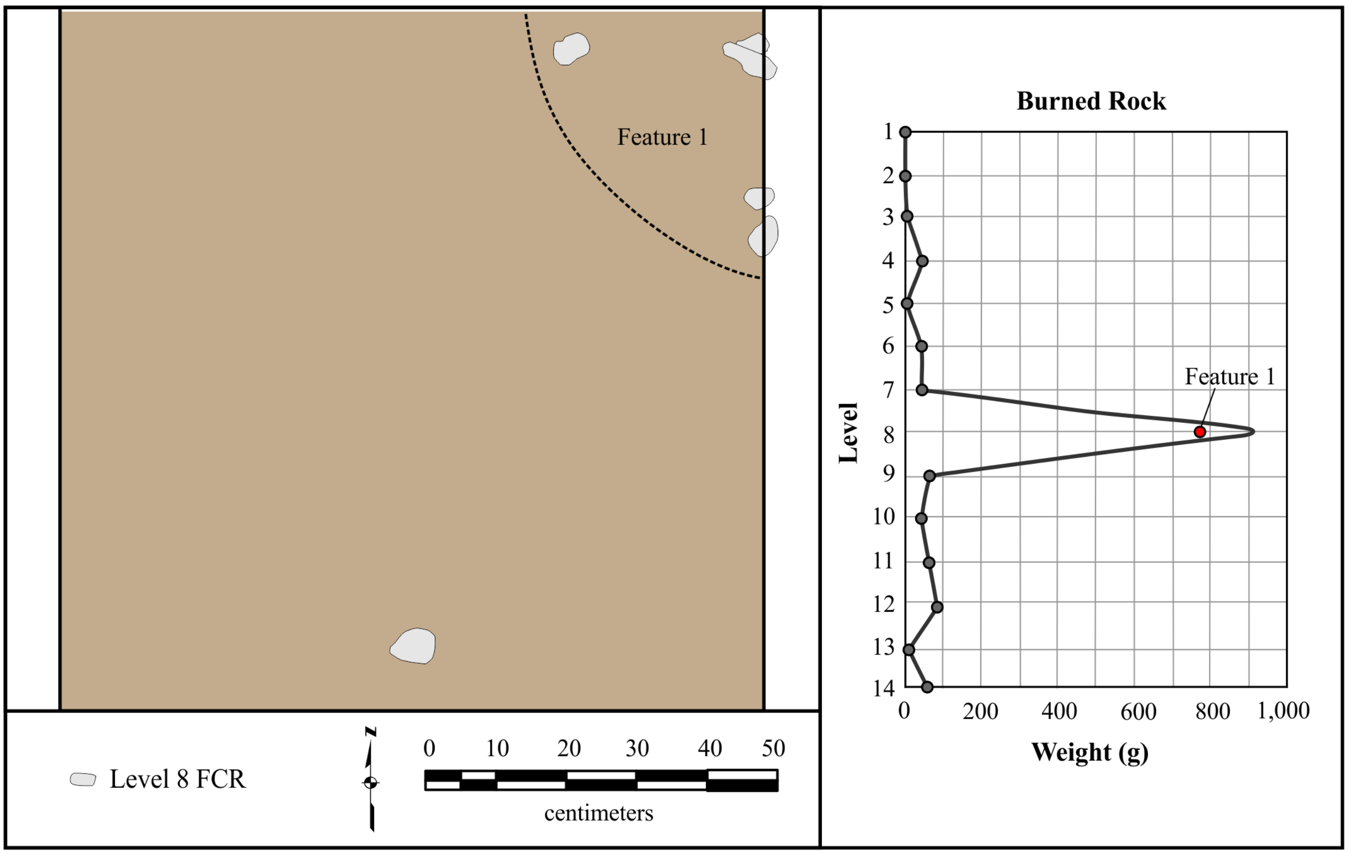

Figure 6-9. Plan view of possible feature in TU4, Level 8 at 41BP477. The graph shows the total burned rock recovered from each level. Feature 1 is shown by the red dot indicating the weight of burned rock found in situ in the northeast corner of Level 8.

41BP666

Site 41BP666 is just east of Scott Falls Road and north of 41BP477 in the north central portion of Camp Swift. The site sits on a long, broad north-south trending ridge with two drainages, Spring Branch to the west and an unnamed intermittent drainage to the east. Soils are sand, loamy sand of the Patilo-Demona-Silstid association (Figure 6-2) and support a large stand of pine. In addition, oak, elm, and woody brush were observed during testing (Figure 6-10; see also Figure 6-3).

CAS recorded 41BP666 in 2003 as an open campsite and historic farmstead (Nickels et al. 2005). The site covers approximately 51,714 m^2. CAS excavated forty-five shovel tests with all but four of these positive for cultural material (Figure 6-11; Nickels et al. 2005:40). Cultural material recovered from shovel tests included a mano, a smoothing stone, a biface, two unifaces, five edge modified flakes, flakes (n=52), lithic shatter (n=9), burned rock, and two samples of burned clay (Nickels et al. 2005:Tables 5-6 and 5-7).

Nickels and colleagues (2005) speculated that the site had been plowed resulting in disturbance to at least 30 cm below surface. However, an analysis of FCR and chipped stone suggests that beneath the 30 cm plow zone, deposits may be intact. They recommended a minimum of nine trenches that focused on positive shovel tests (Nickels et al. 2005:43). These shovel tests contained FCR, flakes, or both at depths below 30 cm.

Current Investigation

The focus of the current CAR investigation is solely on the prehistoric components at 41BP666. CAR excavated four 1-x-1 m TUs between October 16 and October 21, 2020, with

Figure 6-10. View to the north from TU 4 of 41BP666.

a fifth unit excavated November 9 and 10, 2020 (Figure 6-11). The first four shovel tests were placed in the northern portion of the site with TU 1 near a shovel test that contained a moderate amount of FCR and a flake found between 60 to 110 cmbs. TU 2 was located near a shovel test that contained FCR, flakes and a hammerstone between 50 to 100 cmbs. TU 3 was placed east of a line of positive shovel tests. TU 4 was placed in the center of three positive shovel tests, all of which contained charcoal and FCR. CAR placed TU 5 in the southern portion of the site near a shovel test that contained FCR.

Site 41BP666 is located north of 41BP477 in an upland-like setting. Soils are described as loose sand (10YR6/3) over a more compact sand (10YR6/3 and 6/4,10YR7/4) terminating generally at a sandy clay or clay. TU 1 testing terminated at approximately 140 cmbd with a dry, very hard sandy clay. TU 2 was excavated to 160 cmbd, terminating at a compact, mottled sand horizon with sandstone nodules. TU 3 terminated at sandy clay with ferrous and sandstone nodules at 110 cmbd. TU 4 also terminated at 110 cmbd with a hard sand with ferrous and clay nodules. TU 5 terminated at a sandy clay with ferrous nodules at 121 cmbd. CAR excavated approximately 6.0 m^3 of sediment at 41BP666. Table 6-5 summarizes excavation details.

The five excavated units produced a limited amount of cultural material. This included a biface fragment, 158 pieces of debitage, 14,575 g of burned rock, 1.92 g of ochre, and charcoal. A small amount of modern material was collected including glass fragments, a bullet, and unidentified metal. Table 6-6 summarizes the artifacts recovered from 41BP666. MSS samples were collected from each of the five units. CAR excavated an MSS pit just west of the site to provide control samples (see Figure 6-11).

TU 1 contained a burned rock feature (Feature 1). The feature was first defined at 52 cmbd and continued to approximately 100 cmbd. Figure 6-12 (left) is a composite image of plotted feature burned rock from Levels 5 through 9. It was composed of 11,889 g of burned rock consisting of multiple raw materials. Quartzite dominates the assemblage with 56% of the total, followed by chert (32.8%), petrified wood (6.4%) and other unidentified rock (4.8%). A small amount of charcoal was found in the floated matrix although the amount was insufficient to radiocarbon date.

The vertical distribution of burned rock weight in TU 1 is shown to characterize the feature (Figure 6-12 right). It shows spikes in burned rock weight (wt.=3905 g) in

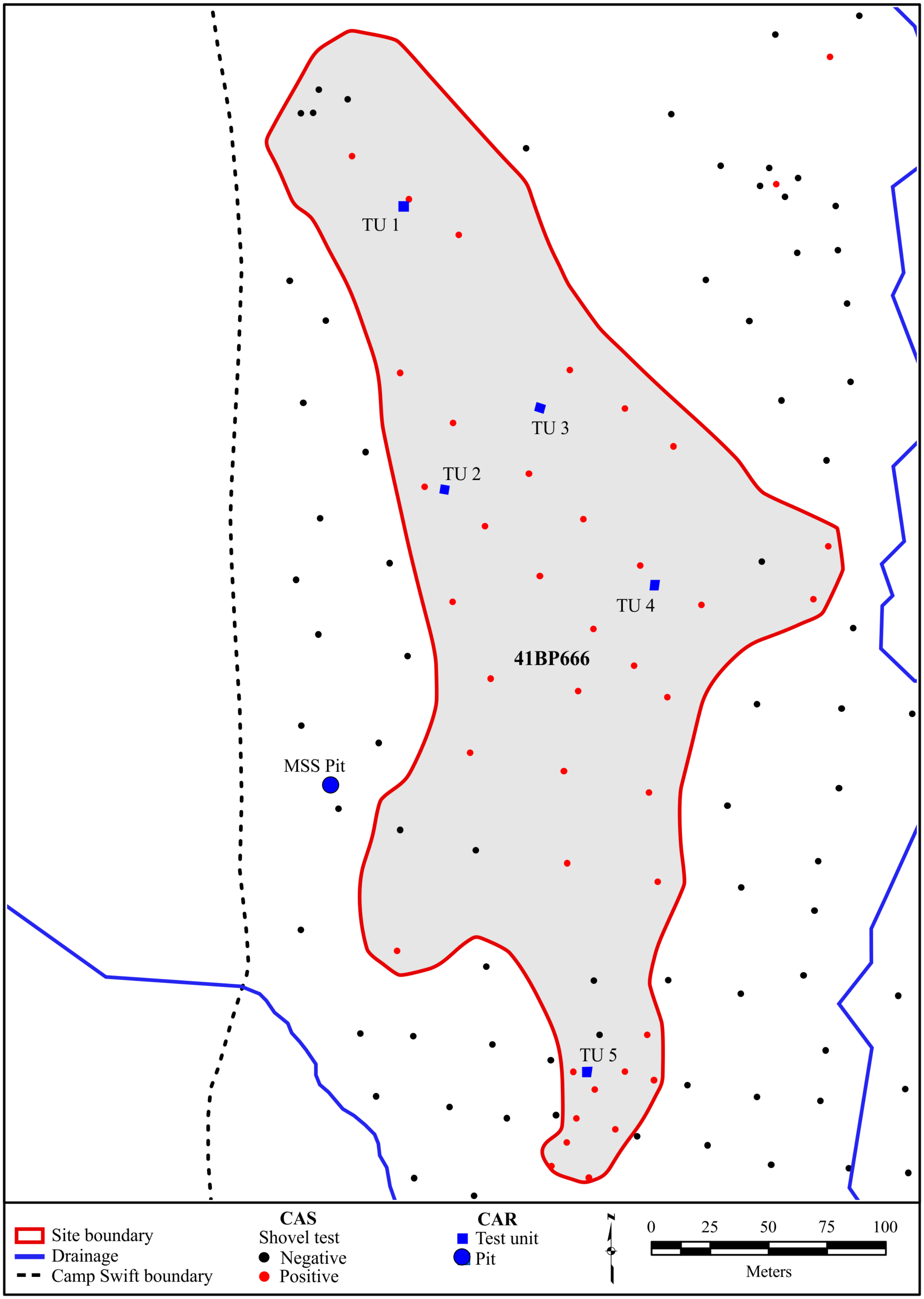

Figure 6-11. Site map of 41BP466 showing previous and current archaeological work.

Table 6-5. Summary of Test Units Excavations at 41BP666

Test Unit	Number of Levels Excavated	Maximum Terminal Depth below Datum (cmbd)	Total of m^3 Sediments Excavated
1	13	138	1.30
2	15	160	1.50
3	10	110	1.00
4	10	110	1.00
5	11	120	1.13

Table 6-6. Summary of Artifacts by Unit and Level from 41BP666

Level	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 4	Test Unit 5
1	debitage (4)	debitage (9); burned rock (1.84 g); unknown metal	null	null	debitage (1)
2	debitage (6); burned rock (1.62 g); ^{14}C	debitage (6); burned rock (0.97 g); ochre	debitage (2); burned rock (3.33 g)	null	debitage (4); burned rock (6.77 g)
3	debitage (2); burned rock (10.49 g); ^{14}C; unknown metal	debitage (9); burned rock (1.75 g); ^{14}C	debitage (2); burned rock (68.19 g)	^{14}C	debitage (3); burned rock (4.23 g)
4	debitage (2)	debitage (9); burned rock (15.59 g); ^{14}C; glass fragment	debitage (1)	null	debitage (3); burned rock (1.8 g)
5	Feature 1; debitage (5); burned rock (3925.42 g); ^{14}C	burned rock (56.53 g); ^{14}C includes charred nut	burned rock (3.08 g)	null	burned rock (3.4 g)
6	Feature 1; debitage (8); burned rock (799.15 g); ^{14}C	biface fragment; debitage (5); burned rock (10.59 g); ^{14}C	debitage (1); burned rock (0.67 g); ^{14}C	burned rock (43.97 g)	debitage (2); burned rock (0.43 g)
7	Feature 1; debitage (8); burned rock (17.85 g); ^{14}C	debitage (5); burned rock (132.65 g); ^{14}C; ochre	debitage (4); burned rock (3.26 g)	debitage (2); burned rock (14.11 g); ^{14}C	debitage (1)
8	Feature 1; debitage (2); burned rock (17.85 g)	debitage (4); burned rock (109.51 g); ^{14}C	debitage (1); burned rock (67.92 g)	null	debitage (2); burned rock (0.29 g)
9	Feature 1; debitage (5); burned rock (6782.3 g)	debitage (6); burned rock (279.37 g); ^{14}C; bullet; unknown metal	burned rock (0.74 g)	burned rock (65.09 g)	null
10	debitage (3); burned rock (530.28 g)	debitage (5); burned rock (154.6 g); ^{14}C	burned rock (3.96 g)	burned rock (45.06 g)	debitage (1); burned rock (132.1 g)
11	burned rock (17.31 g)	debitage (6); burned rock (114.87 g)	not excavated	not excavated	debitage (1); burned rock (39.64 g)
12	null	debitage (1); burned rock (117.23 g)	not excavated	not excavated	not excavated
13	charred stick	debitage (2); burned rock (656.51 g); ^{14}C	not excavated	not excavated	not excavated
14	not excavated	debitage (4); burned rock (207.35 g); ^{14}C	not excavated	not excavated	not excavated
15	not excavated	debitage (9); burned rock (42.89 g)	not excavated	not excavated	not excavated

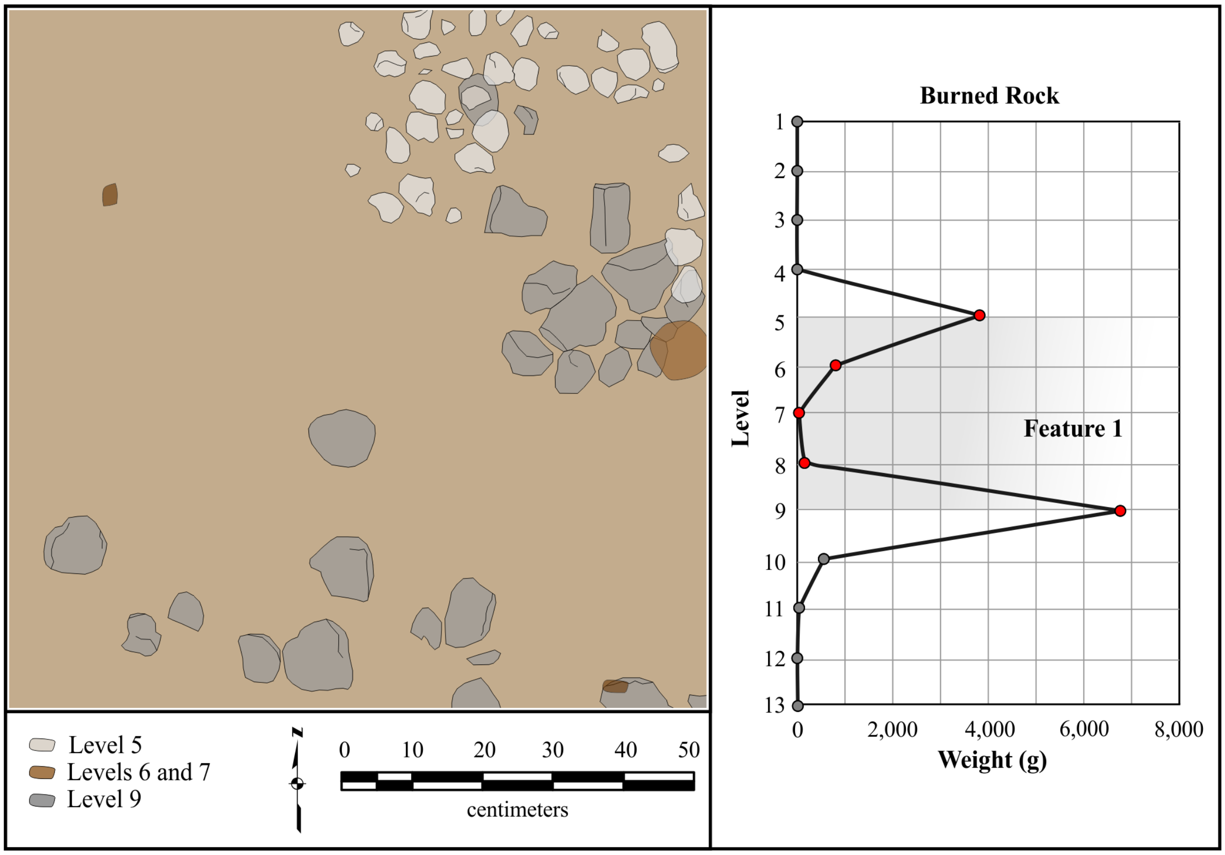

Figure 6-12. Feature 1 plan view of plotted burned rock in Level 5 through 9. On the right is a graph of burned rock by weight for each level.

Levels 5 and a larger spike in Level 9 (wt.=7273 g) with a significantly smaller amount of burned rock between these two levels (Levels 6, 7, and 8; wt.=711 g).

The low frequency of burned rock in Levels 6 through 8 led initially to the identification of two separate features. However, on further consideration of the burned rock spatial distribution and size sorting of the burned rock, we suggest that it is likely one feature. Figure 6-13 shows Feature 1 at Levels 5 and 9. While speculative, the burned rock of Level 9 appears to fit within the southeast portion of the burned rock concentration shown in Level 5.

Figure 6-13. Spatial distribution of burned rock in Levels 5 and 9. The distribution of burned rock in Level 9 appears to fit in the southwest portion of the Level 5 burned rock.

Summary

This chapter summarized the findings from current and past investigations of sites 41BP471, 41BP477, and 41BP666. CAR archaeologists excavated 14 test units and screened 18.5 m^3 of excavated sediment. Overall, the quantity of cultural artifacts from each of the three sites is low with only 429 pieces of debitage, 22 kg of burned rock (inclusive of feature burned rock), four lithic tools, a core, and one diagnostic point (a Nolan-like point), as well as a small quantity of modern items. Charcoal that included charred nut fragments were also recovered. Five samples (4 charred nut fragments and one charred bark) from 41BP471 and 41BP477 were submitted to DirectAMS for radiocarbon dating and returned calibrated dates falling in the Late Archaic and Late Prehistoric periods. A burned rock feature was identified at 41BP666 and a probable burned rock feature was recorded at 41BP477. Table 6-7 summarizes levels of effort and results from current and previous investigations at the three sites.

Table 6-7. Summary of the Previous and Current Investigations

Sites	Previous Investigations			Current Investigation		
	Level of Work	Features	Artifacts	Level of Work	Features	Artifacts
41BP471	shovel tests (n=39), trenches (n=5)	1	hammerstone (2), edge modified flake (2), debitage (43), shatter (2), burned rock, charcoal	Test Units (n=5)	0	Nolan-like projectile point (1), edge modified flake (1), debitage (133), burned rock, charcoal-radiocarbon dates (3)
41BP477	shovel tests (n=47)	2	Scallorn point (1), biface (1), edge modified flake (6), debitage (48), tested cobble (1), burned rock, charcoal	Test Units (n=4)	1	biface (1), edge modified flake (1), debitage (139), core (1), burned rock, charcoal-radiocarbon dates (2), faunal bone, ochre
41BP666	shovel tests (n=45)	0	mano (1), biface (1), uniface (2), edge modified flake (5), debitage (52), shatter (9) smoothing stone (1), burned rock, burned clay, charcoal	Test Units (n=5)	1	biface (1), debitage (157), burned rock, charcoal, ochre

Chapter 7: Chronological Potential

Leonard Kemp

This chapter, the first of three chapters that consider NRHP eligibility criteria used for the project, focuses on establishing a chronological framework for deposits. As discussed in several earlier chapters, prehistoric sites on Camp Swift often lack temporal diagnostics or radiocarbon dates. A review by Mauldin and others (2018) noted that 180 of the 209 prehistoric components, roughly 86%, lacked temporally diagnostic artifacts or radiocarbon dates, and an earlier review by Bousman and others (2010:370-374) found that only 34 temporally diagnostic artifacts were collected from all of Camp Swift. Comparing the percentage of temporally unknown sites at Camp Swift with other TMD facilities shows that the 86% figure for temporally unknown sites is noticeably higher than at Camp Bowie (66.3%), Camp Maxey (69.2%), or at Ft. Wolters (56.2%; Mauldin et al. 2018; see also TMD 2015). Consequently, the number of sites lacking chronological assignment limits the number and type of research questions. As such, identifying Camp Swift sites that have temporally diagnostic artifacts, radiocarbon dates, or have a moderate to high potential for radiocarbon dates, are important component of eligibility determination. This chapter discusses chronology at 41BP471, 41BP477, and 41BP666, including the presence of temporal diagnostic artifacts, radiocarbon dates, and the potential for additional chronometric placement of material.

Temporal Diagnostics

During the current investigation, a Nolan-like dart point was found *in situ* in TU 5 in Level 5 (53 cmbd) of 41BP471 (Figure 7-1; Turner et al. 2011). The point is made of a fine-grained, grayish chert. The chert fluoresces orange and yellow/orange, suggesting that it is likely created from Edwards chert. If this point is a Nolan, then it reflects use during the Middle Archaic. As discussed in Chapter 3, the Middle Archaic period dates between 6800 and 4450 cal BP. Nolan points fall near the end of that interval. Middle Archaic points are generally absent from Camp Swift (see Nickels et al. 2010:Table 11-6), and there are no radiocarbon dates attributed to the close of the Middle Archaic in the Southern Post Oak sample (see Figure 4-6).

At site 41BP477, Robinson and colleagues (2001:49) reported that a Scallorn point, less the distal end, was recovered in a shovel test. During subsequent testing by CAS, no additional projectile points were found (Lohse and Bousman 2006; Nickels and Lehman 2004). No temporally diagnostic artifacts were recovered during the current investigations. In addition, no temporal diagnostics were found at 41BP666 during this or past testing efforts.

Radiocarbon Dates and Potential Radiocarbon Samples

Charcoal was found at all sites and in most of the units excavated on those sites. Table 7-1 shows the presence of charcoal found at and below Level 4 by site and unit. Potentially, charcoal

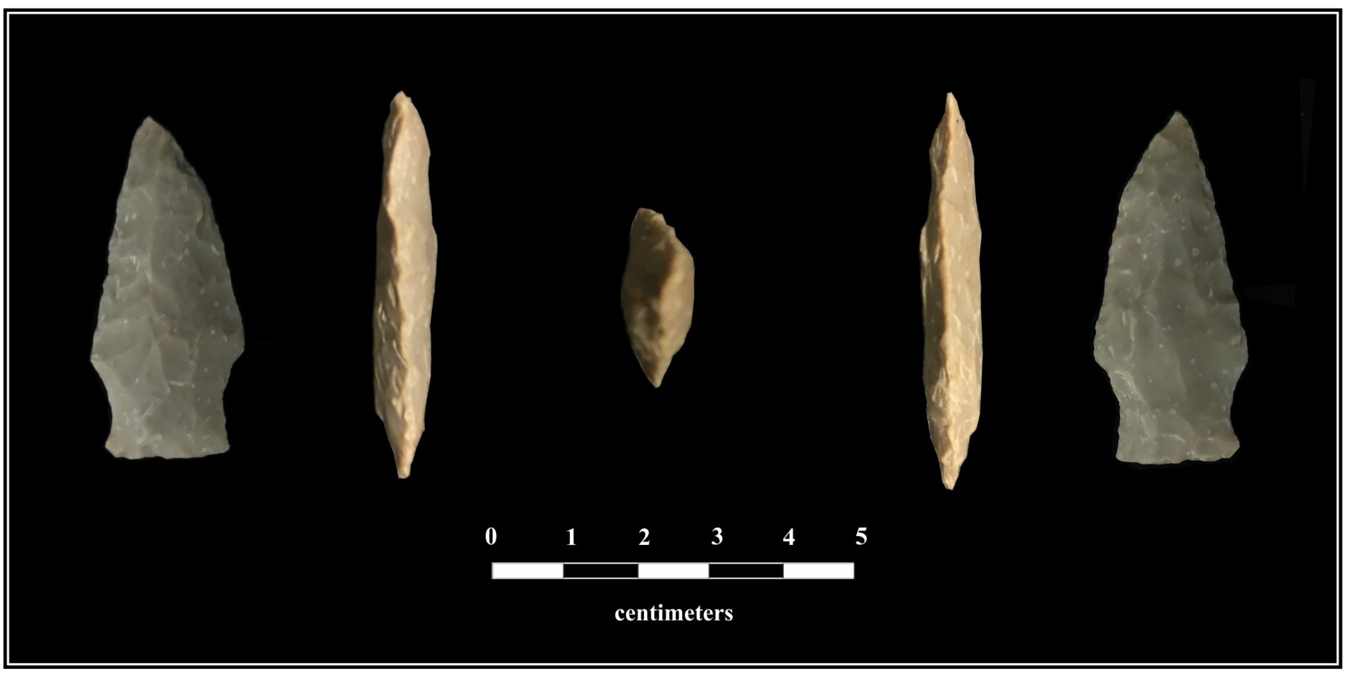

Figure 7-1. Nolan-like projectile point found at 41BP477.

samples at and below this depth would be less likely to be disturbed by bioturbation.

Two features were found during the current testing with one at 41BP477 and another at 41BP666. While charcoal was present in the area, neither feature contained sufficient charcoal to be dated. However, an examination of charred material recovered from 41BP471 and 41BP477 suggested that some of that material may be carbonized nut fragments. While not in a feature context, they were found at sufficient depth to suggest they were not subject to modern bioturbation and could provide dates for those sites.

Five samples were pulled from the collection and analyzed by Dr. Kevin Hanselka. Table 7-2 is a summary of that analysis with the provenance of the five samples. Hanselka (personal communication Feb 16, 2021) suggests that based on the morphology of a smooth, thick shell, four of the samples may likely be Black hickory (*Carya texana*) shell fragments. Black hickory is currently found on Camp Swift (TMD 2020: Appendix H-1). Controlled burns and brush management on Camp Swift is restoring patches of the Post Oak-Blackjack Oak-Black Hickory Forest that was replaced by Post Oak-Blackjack Oak-Eastern Red Cedar Forest (TMD 2020: Appendix G-16). A conservative identification of the four samples places them in the Juglandaceae or the walnut and hickory family. One sample was identified as tree bark and its identification could not be defined further.

Following processing by CAR, the five samples were submitted to the Direct-AMS for radiocarbon dating using accelerated mass spectrometry. The results of the raw data, the calibrated dates from this analysis using OxCal, version 4.4 online program (Bronk Ramsey 2021), and associated time periods are presented in Table 7-3. The calibrated radiocarbon dates fall within the Late Archaic and Late Prehistoric periods as is common for radiocarbon dates from Camp Swift and the surrounding region (see Chapter 4 and Kemp et al. 2019).

Summary

There is a lack of chronological data for Camp Swift sites. Table 7-4 summarizes the chronological data present on the three individual sites and provides an assessment of the site's potential for contributing additional data. Only one diagnostic, a Middle Archaic Nolan-like point was found at 41BP471 during this testing. A Late Prehistoric Scallorn point was recorded during the initial survey of 41BP477. No temporal diagnostics were found at 41BP666 during the survey or testing phases. While charcoal was found at all sites, there was an insufficient quantity of charcoal to date

Table 7-1. Presence of Charcoal by Site and Units at and below Level 4

Site 41BP…	TU 1	TU 2	TU 3	TU 4	TU 5
471	yes	yes	yes	yes	yes
477	yes	yes	yes	none	
666	yes	yes	yes	yes	none

Table 7-2. Macrobotanical Summary of Five Samples from Sites 41BP471 and 41BP477

41BP …	Test Unit	Level (cmbd)	Weight (mg)	Part	Scientific Name	Comments
471	1	8 (80- 90)	63.3	nutshell	Juglandaceae	Likely thick-shelled variety of hickory: *Carya* sp. (not pecan)
	4	7 (70- 80)	101.4	nutshell	Juglandaceae	Likely thick-shelled variety of hickory: *Carya* sp. (not pecan)
	4	13 (130- 140)	263.1	nutshell	Juglandaceae	Likely thick-shelled variety of hickory: *Carya* sp. (not pecan)
477	2	8 (80- 90)	318.3	nutshell	Juglandaceae	Likely thick-shelled variety of hickory: *Carya* sp. (not pecan)
	3	10 (100-110	360.8	tree bark	unknown	Unidentifiable, no diagnostic structure

Table 7-3. Radiocarbon Results from 41BP471 and 41BP477

D-AMS #	Site	Provenience	Material	RCYBP/ Standard Error	Date Range (cal BP)	Median Date (cal BP)	Time Period
041425	41BP471	TU 1, Level 8	charred nut	894 ± 21	904-731	782	Late Prehistoric
041423	41BP471	TU 4, Level 7	charred nut	861 ± 21	794-695	757	Late Prehistoric
041424	41BP471	TU 4, Level 13	charred nut	1514 ± 21	1466-1345	1381	Late Archaic
041427	41BP477	TU 2, Level 8	charred nut	1150 ± 21	1178-973	1033	Late Prehistoric
041426	41BP477	TU 3, Level 10	charred bark	1727 ± 21	1700-1544	1612	Late Archaic

Table 7-4. Chronological Potential of Tested Sites

Site(41BP…)	Diagnostics	Charcoal	Bone	# of Radiocarbon Dates	Chronological Potential
471	yes	yes	yes	three	high
477	yes	yes	no	two	high
666	no	yes	no	none	moderate

the sole feature documented at 41BP666. While charcoal samples outside of a feature context are not commonly dated, an analysis of five macrobotanical samples from the lower levels of test excavations at 41BP471 and 41BP477 suggested four of these were fragments of nutshell, while a fifth was a sample of burned bark. Given the depth, and the fact that concerns with old wood dates should be minimal, all five were subsequently radiocarbon dated. They returned dates in the Late Archaic and Late Prehistoric periods. As such, CAR suggests that both 41BP471 and 41BP477 have high potential for chronological placement based on the presence of temporal diagnostics and charcoal, as well as producing samples that have been radiocarbon dated. Site 41BP666 has low to moderate potential for chronological data as evidenced by the lack of diagnostics and radiocarbon dates. Nevertheless, while the samples were judged to be too small for identification and dating, charcoal was observed at depths at or below Level 4 in four of the five excavated units at this site. With additional excavation, there is a moderate chance that appropriate samples will be recovered.

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Chapter 8: Site Integrity

Leonard Kemp

This chapter focuses on the integrity of deposits. An assessment of the integrity of deposits is a critical step to determine whether an archaeological site warrants additional investigation and/or protection and is an integral part of determining National Register eligibility status. However, the process of determining an archaeological site's integrity has a degree of subjectivity. This is exacerbated by the location of Camp Swift within the Sandy Mantle formation of Texas as there are competing interpretations of how the formation developed. These interpretations are briefly discussed in the first section of this chapter. The chapter then focuses on three methods to assess a site's integrity developed and used in earlier CAR work at Camp Swift (see Kemp et al. 2019; Mauldin et al. 2018).

Assessing Site Integrity on Camp Swift

As noted in earlier discussions, Camp Swift is located within the Gulf Coastal Plain of North America, an area consisting of sandy A-E horizon over clayey (Bt) horizons, commonly known as the Sandy Mantle formation. Figure 8-1a shows an idealized stratigraphy in which the A-E horizon of sand sits on top of a terminal clay level. Also note that the upper levels of the unit have been impacted by bioturbation as discussed in the following section. The formation of the Sandy Mantle has been an ongoing debate, with two conflicting models, each having different implications for archaeological concerns regarding integrity (Ahr et al. 2012). The pedogenic model of Bruseth and Martin (2001) argues that the landform was formed prior to Holocene age occupation of humans. In this model, archaeological deposits are in secondary contexts due to bioturbation and have no integrity (Figure 8-1, b). The geomorphic model (Bousman and Fields 1991; Frederick and Bateman 2001) suggests that the landform was formed during the Holocene by eolian and colluvial deposition. In this model, archaeological deposits can potentially be in primary contexts in some settings and therefore may possess integrity (Figure 8-1, c).

Past investigation on Camp Swift (Kemp et al. 2019; Mauldin et al. 2018; Nickels 2008, Nickels et al. 2010) have found sites that exhibit characteristics of both models. Consequently, integrity needs to be assessed on a site-by-site basis. Three different methods are used to document post-depositional disturbance. The first documents bioturbation in the field within a given level, unit, and site. The second method analyzes the distribution and size of artifacts, in this case debitage, within a unit. The final method relies on magnetic soil susceptibility (MSS) values for each of the excavated units from the three sites. Each section summarizes by unit the degree of its integrity. Units with high integrity are characterized as having no disturbance, moderate as having some disturbance but still retaining some integrity, and low as having minimal or no integrity. The classification of unknown is used in cases of insufficient data.

Bioturbation

While eolian process are likely in operation, the principal concerns on integrity on Camp Swift are related to bioturbation, the disruption of sediments by plants and animals (see Kemp et al. 2019; Mauldin et al. 2018). Artifacts and features are especially susceptible to turbation in sandy unconsolidated sediments, like those on Camp Swift, where material can be displaced through a variety of processes (see Waters 1992: 306-316). Plant growth and decay can mix sediments and associated artifacts through tree falls, tree sway, root growth, and root decay, displacing artifacts both horizontally and vertically, disrupting features, and create opportunities for unrelated artifacts to be associated (see Schiffer 1987; Waters 1992; Wood and Johnson 1978). The major impacts at Camp Swift are likely associated with fossorial mammals. Pocket gophers (*Geomys attwateri*), common in Bastrop County (Davis and Schmidly 1994; Schmidly and Bradley 2016), are the most likely animal to cause significant faunalturbation. Bocek (1986) found that gophers will create burrows and tunnels that can affect archaeological deposits, especially at depths to 30 cm below an existing surface. Without rapid burial of a surface to a depth exceeding 30 cm, gophers and other rodents can have a significant impact on sediments and artifacts and features deposited on that surface. Examples of the impact of burrowing rodents on the Camp Swift landscape can be seen in Figure 8-2.

Bioturbation was observed at all three sites and at each of the test units. Observations made by the crew state that all units contained roots to varying degrees at the three sites. The degree of impacts from roots is related to the depth of the unit, with shallow units having less integrity due to their smaller volume. The size of roots is also a factor, with larger roots displacing greater amounts of the matrix. Figure 8-3 (left) shows TU 4 on 41BP477 with roots visible through the entirety of unit. Rodent burrows/tunnels were conspicuous on 41BP471 and 41BP666 as shown on the right in Figure 8-3. In addition, ant mounds and tunnels were also noted in some of the units on the

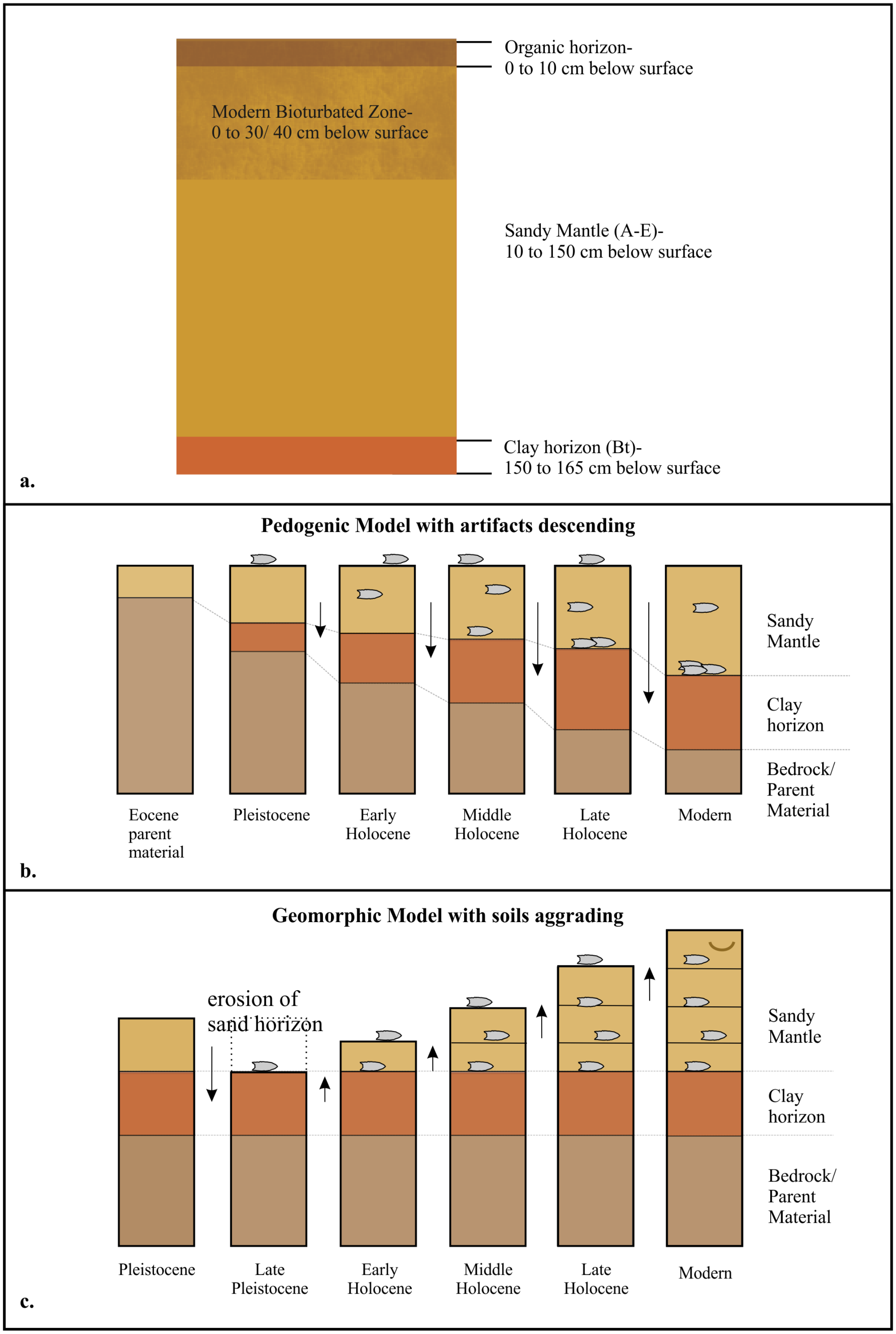

Figure 8-1. Profile of idealized test unit found in the Sandy Mantle, the argillic horizon, and the bioturbation zone (a). Below shows the models of pedogenic (b) and geomorphic (c) formation process for the Sandy Mantle (Ahr et al. 2012:Figures 2.2 and 2.3).

Figure 8-2. Examples of sediment displacement by rodents on Camp Swift. Top image shows new rodent burrows in a field shortly after a 2017 controlled burn. Bottom images are of TU 1 at site 41BP802 showing rodent impact before (left) and after (right) a 30-minute lunch break (after Mauldin et al. 2018).

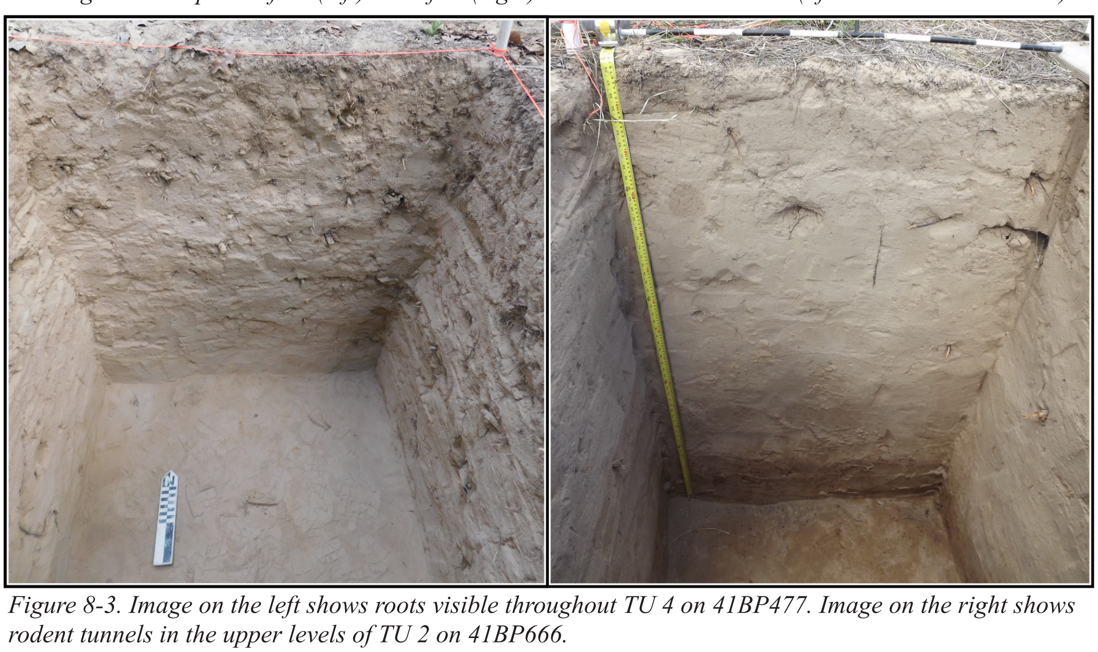

Figure 8-3. Image on the left shows roots visible throughout TU 4 on 41BP477. Image on the right shows rodent tunnels in the upper levels of TU 2 on 41BP666.

three sites. Table 8-1 summarizes these impacts based on observations by the archaeologists excavating the units and post-field analysis of test unit photographs.

Debitage and Burned Rock Distribution

This section examines the vertical distribution of debitage and burned rock in each excavation unit as one of several measures designed to assess unit and site integrity. Debitage is characterized by counts while burned rock is assessed by weight. This analysis assumes that in sediments such as Camp Swift, increased turbation will tend to displace more material to the terminal clay level. Conversely, units that have less turbation may preserve artifacts at or near the occupation surfaces resulting in isolated peaks in debitage and burned rock. Figure 8-4 illustrates these two scenarios using debitage counts. The distribution shown in red would potentially reflect two occupations with integrity, while the blue distribution would reflect high levels of disturbance (Figure 8-4). Most assemblages will not reflect these extreme examples, and there are varieties of processes that can produce clustering of material that would mimic the distribution highlighted in red and still lack integrity.

Table 8-2 provides summary data used in this and subsequent analysis in this chapter. In the current excavations, clay, or indications that clay was imminent such as clay nodules observed at the bottom of a level, were not always encountered. Artifacts settling on the clay can play a role in our interpretation. We include these in our analysis but identify the terminal sediment encountered and our estimate of depth to clay, if known, in Table 8-2. In addition, several excavation units have small samples sizes of debitage and burned rock that can skew the interpretations. These cells, shaded in Table 8-2, are not included in the analysis performed in this section.

41BP471

The debitage and/or burned rock from TUs 1, 3, 4 and 5 excavated on 41BP471 were of sufficient quantity to allow an assessment of integrity. TU 2 contained insufficient quantities of both chipped stone and burned rock to conduct an assessment. Two units, 3 and 5 were excavated to a clay matrix, and three units, 1, 2, and 4 contained sand at the terminal level. Figure 8-5 shows the distribution of chipped stone and/or burned rock on 41BP471.

The amount of chipped stone in TU 1 peaks in Levels 8 and 9 with no chipped stone found in the last three levels. The weight of burned rock peaks in Levels 7 and 8, declining through the remaining levels. TU 1 appears to have moderate integrity based on the peaks of chipped stone and burned rock in Levels 7 through 9 and the relative lack of material below those peaks.

TU 3 contained insufficient burned rock to assess its integrity. While the overall amount of chipped stone is small, the increasing amount of chipped stone found in the lower levels of the TU 3 suggest the unit has low integrity. There is no meaningful clustering of either chipped stone or burned rock in TU 4. Based on this observation, TU 4 has relatively low integrity based on the accumulation of burned rock towards the lower levels of the unit and the lack of any artifact patterning. TU 5 shows peaks in the amount of chipped stone in Levels 4 and 5 and another peak in Level 8. The weight of burned rock also increases in Levels 4 through 8. TU 5 is classified as having moderate integrity based on the peaks of chipped stone and burned rock in Levels 4 through 8.

41BP477

The debitage and/or burned rock from all the test units excavated on 41BP477 contained enough to allow an assessment of integrity. The excavation of TU 1 terminated at Level 15 in sand and augered to clay at approximately 260 cmbd. The remaining three units, 2, 3 and 4 terminated in clay. Figure 8-6 shows the distribution of chipped stone and/or burned rock on 41BP477.

TU 1 has an increasing trend in the amounts of chipped stone and weight of burned rock towards the bottom of the unit. This trend suggests that TU 1 has relatively low integrity. The weight of burned rock appears to peak in Levels 3 through 5 and then decreases through the remaining levels in TU 2. Chipped stone peaks in Levels 2 and 3. TU 2 has moderate integrity based on the peaks found in the upper levels.

Table 8-1. Summary of Observed Bioturbation by Test Unit

Test Unit	41BP471	41BP477	41BP666
1	roots	roots/insect	roots
2	roots/burrows	roots/burrows	roots/ burrows/insects
3	roots/burrows	roots/insects	roots/ burrows/insects
4	roots/burrows	roots	roots
5	roots/insects		roots

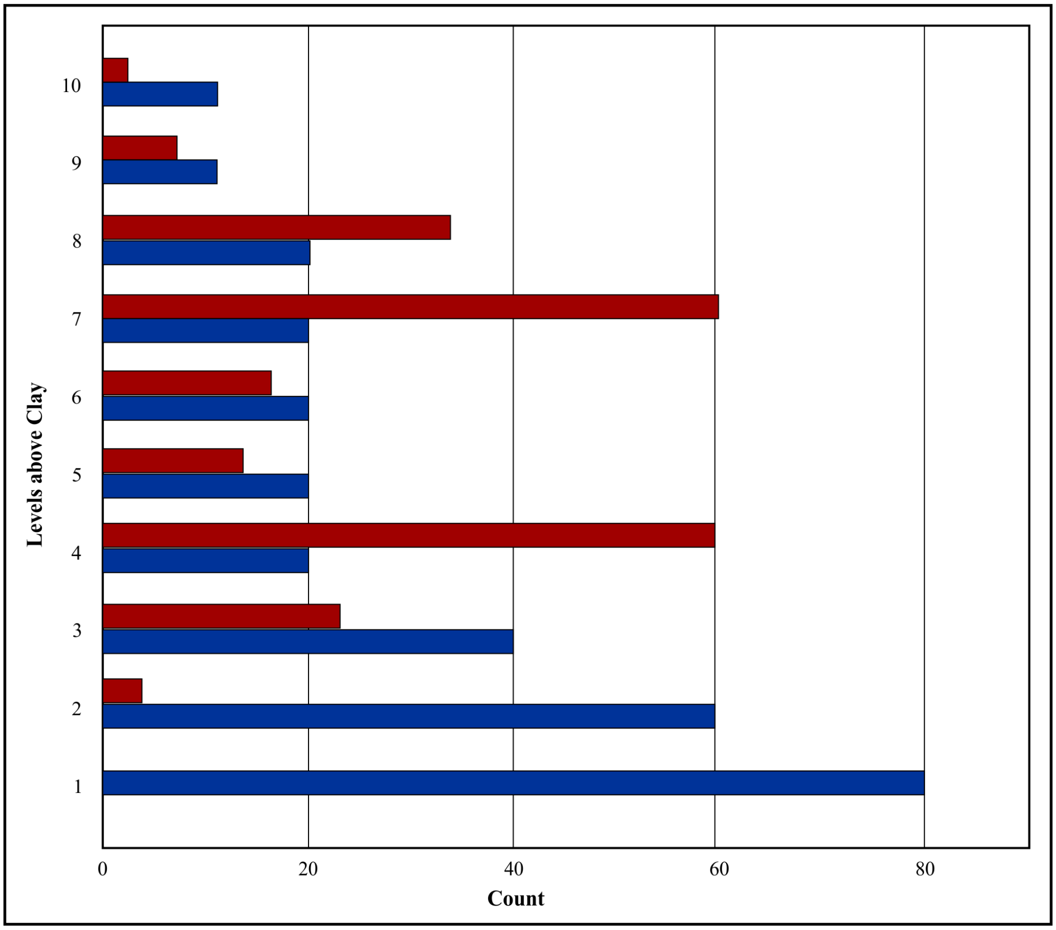

Figure 8-4. Two scenarios of debitage distribution by site at Camp Swift. In blue, artifacts cluster at the bottom of the units near the clay floor suggesting that these artifacts are in secondary contexts and have low integrity. The other pattern in red indicates some degree of integrity where two peaks are represented suggesting two occupations.

Table 8-2. Summary of Test Units Excavated at 41BP471, 41BP477, and 41BP666

Site (41BP xxx)	Unit	Number of Levels	Chipped Stone (count)	Burned Rock (weight in g)	Terminal Sediment	Clay Depth (cmbd)
471	1	15	21	816.5	compact sand	unknown
471	2	15	11	267.1	compact sand	unknown
471	3	15	18	56.5	clay/sand	160
471	4	15	30	506.1	sand	unknown
471	5	13	55	881.6	clay	139
477	1	15	65	747.1	sand	260 (auger)
477	2	9	33	1261.4	clay	99
477	3	15	41	1988.5	clay/sand	164
477	4	14	3	1354.5	clay	148
666	1	13	37	12252.9	clay	140
666	2	15	90	1902.3	sand	unknown
666	3	10	11	151.2	clay	110
666	4	10	2	168.2	clay	112
666	5	11	18	188.7	clay	123

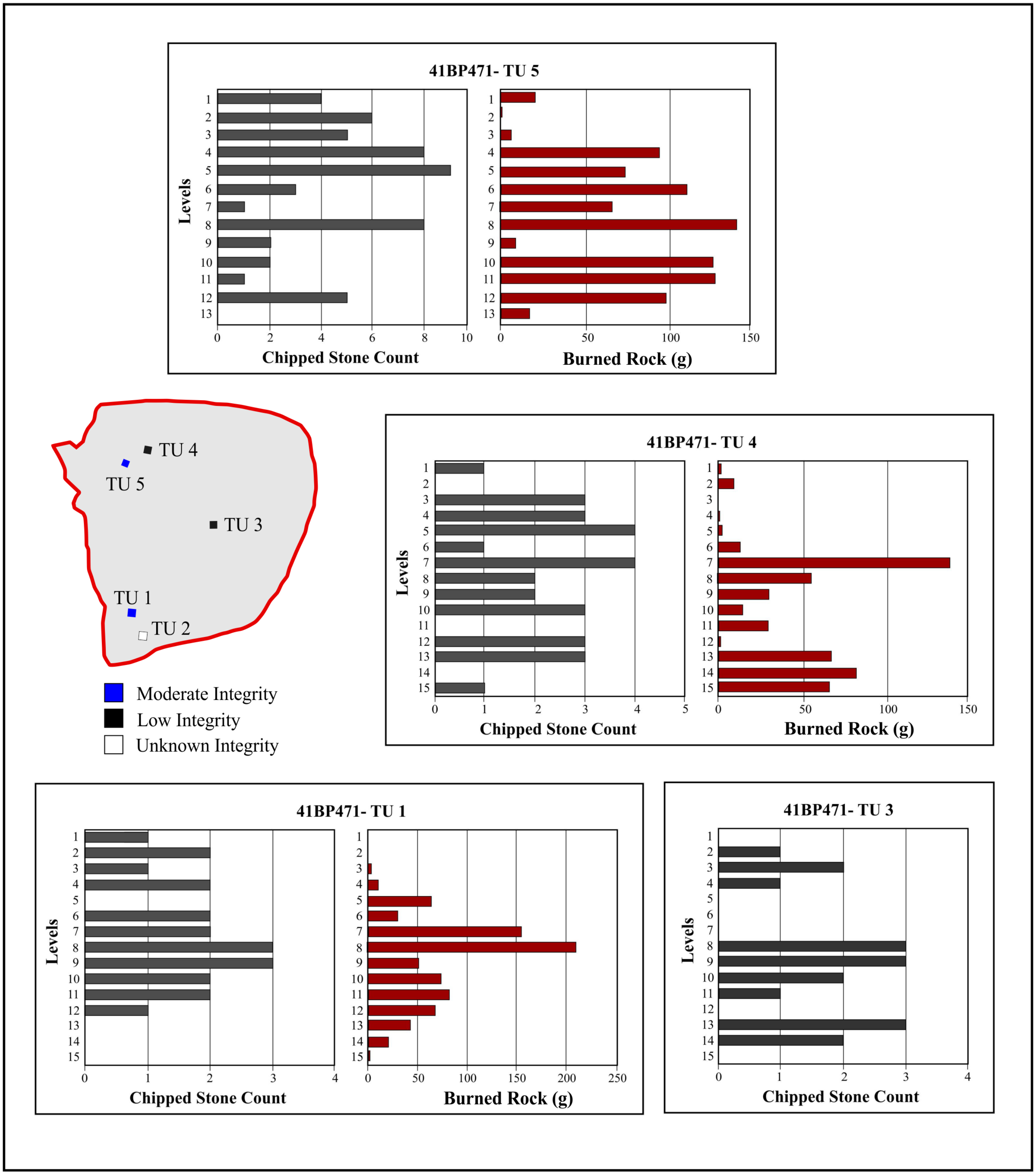

Figure 8-5. The distribution of chipped stone and/or burned rock per level for 41BP471 TUs 1, 3, 4, and 5.

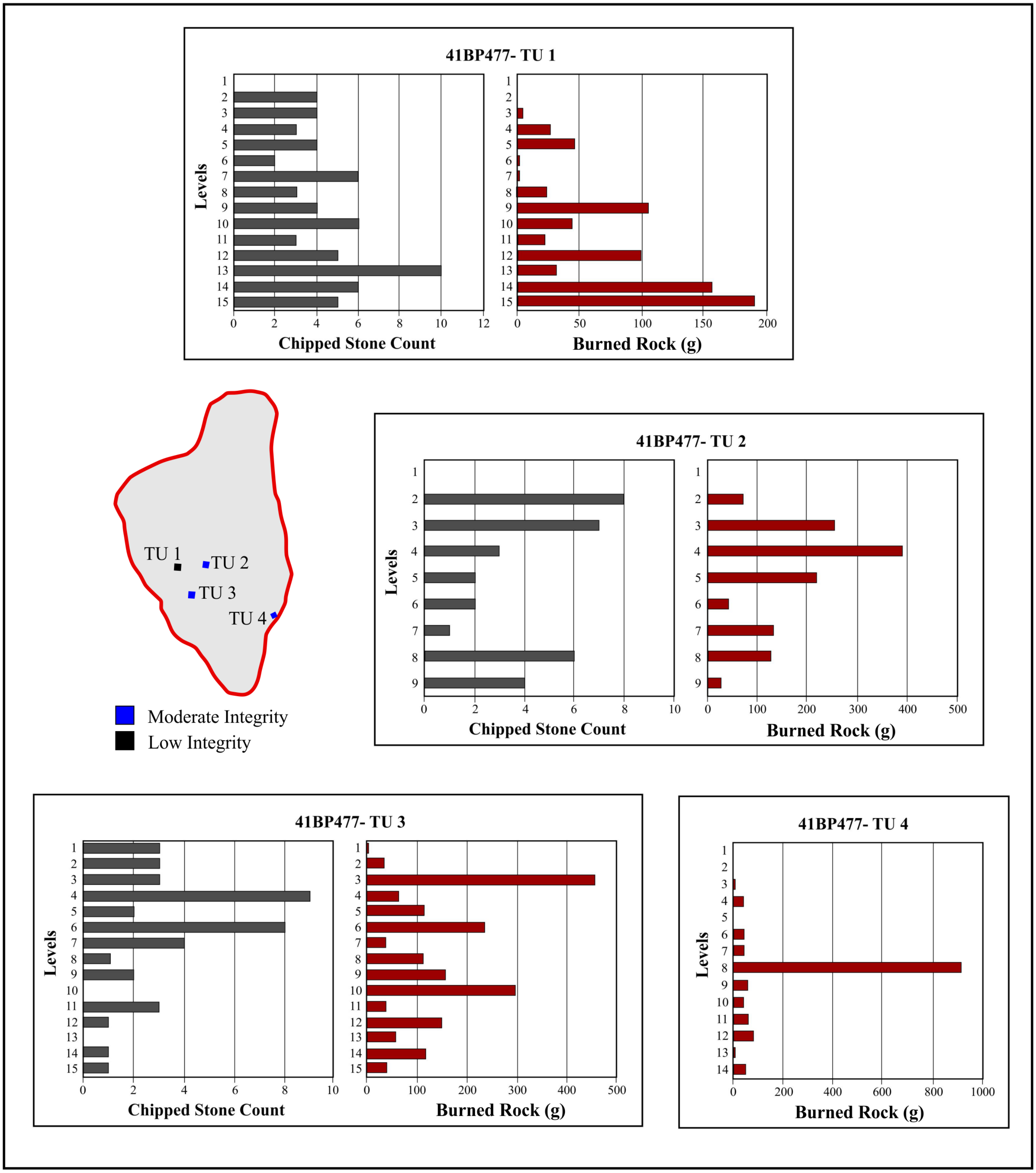

Figure 8-6. The distribution of chipped stone and/or burned rock per level for 41BP477 TUs 1, 2, 3, and 4.

The amount of chipped stone in TU 3 peaks in Levels 4 and 6 with a decrease in chipped stone throughout the remaining levels. The weight of burned rock peaks in Levels 3, 6, and 10. TU 3 may have moderate integrity based on the peaks of chipped stone and burned rock found Levels 3 through 6. TU 4 had insufficient amounts of chipped stone to conduct any analysis. However, there is a significant spike in the weight of burned rock in Level 8. This spike likely represents a burned rock feature as noted in Chapter 6. There is a decrease of burned rock weight through the remaining levels suggesting TU 4 has moderate integrity.

41BP666

The debitage and/or burned rock from TUs 1, 2, and 5 excavated on 41BP666 were of sufficient quantity to allow an assessment of integrity. TUs 3 and 4 contained insufficient quantities of both chipped stone and burned rock to assess their integrity. TUs 1 and 5 terminated at clay. TU 2 terminated in a sand matrix with the final depth of clay unknown. Figure 8-7 shows the distribution of chipped stone and/or burned rock on 41BP666.

TU 1 included a burned rock feature with spikes in burned rock weight in Levels 5 and 9 and a peak in chipped stone in Levels 5 and 6. This scenario suggests a buried surface that begins in Level 5 or 6 that may have been impacted by bioturbation displacing a portion of the feature to Level 9. However, the lack of chipped stone and burned rock in the lower levels still suggests moderate integrity.

TU 2 had relatively good counts of chipped stone and weight of burned rock. The upper levels (1- 5) of the unit contained most of the chipped stone. The distribution of burned rock shows a downward trend and coupled with an increase in chipped stone in the lowest level suggests the unit has low integrity.

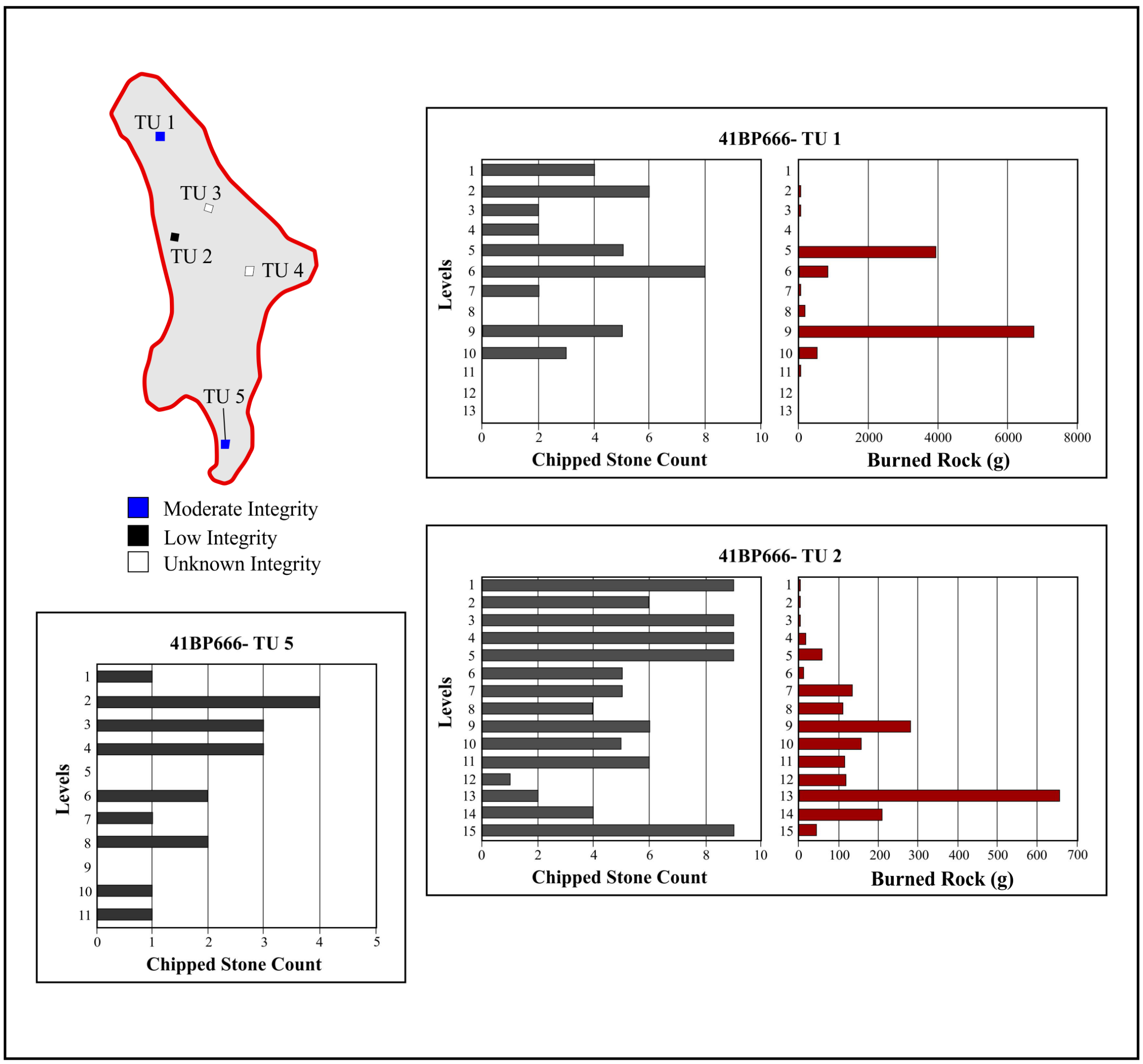

Figure 8-7. The distribution of chipped stone and/or burned rock per level for 41BP666 TUs 1, 2, and 5.

TU 5 contained an insufficient amount of burned rock to make any determination. Chipped stone in the upper levels appear to cluster in Levels 2 through 4 and decline in the subsequent levels. This scenario suggests TU 5 may have moderate integrity.

Summary

Table 8-3 summarizes the degree of integrity using the count of chipped stone and weight of burned rock distributed through the unit. Two units on site 41BP471 have moderate integrity with two units having low integrity. The fifth unit on 41BP471 had insufficient data to make an assessment. Three of the four units excavated on 41BP477 have moderate integrity. Site 41BP666 also had two units that were classified as moderate with two units listed as unknown due to insufficient data. One unit was classified as having low integrity.

Debitage Size Distribution

The second analysis focused on debitage size (area) to infer intact deposits and/or turbation. Bocek (1986) suggests that artifacts can be size-sorted up and down a profile due to faunal turbation. In the first process, small artifacts will be displaced up the unit profile in the spoil pile of a rodent's excavation. In the second, large artifacts are displaced downwards when undercut by rodent burrowing (Bocek 1986). To measure artifact area, debitage from each level was digitally photographed with an object(s) of known area (Figure 8-8). The area of each piece of debitage was then

Table 8-3. Summary of Test Unit Integrity Determination Based on Chipped Stone and Burned Rock Distribution

Test Unit	41BP471	41BP477	41BP666
1	moderate	low	moderate
2	unknown	moderate	low
3	low	moderate	unknown
4	low	moderate	unknown
5	moderate		moderate

Figure 8-8. Layout of debitage from Level 4 on 41BP471 for the SigmaScan© Pro with two objects (a US penny and a red disk), with known areas. The upper box shows the results for each piece of debitage in cm² calculated from the image.

calculated in square cm using SigmaScan© Pro (version 5.0; Kemp et al. 2019; Mauldin et al. 2018).

41BP471

Figure 8-9 shows the distribution of artifact area per level of debitage from 41BP471, TUs 1, 3, 4, and 5. TU 2 was excluded from this analysis due to the small amount of chipped stone. TU 1 has a mix of different sizes suggesting a possible buried surface in Levels 8 and 9. Level 9 of TU 3 has a similar mix of different size chipped stone also suggesting a possible surface. Both TUs 1 and 3 are classified as having moderate integrity. Test Unit 4 shows chipped stone of similar size distributed evenly throughout the unit suggesting bioturbation and low integrity. Test Unit 5 shows increasing debitage size in the lower levels suggesting that larger debitage is sinking to the bottom of the unit, suggesting low integrity.

41BP477

Figure 8-10 shows the distribution of chipped stone size for 41BP477 TUs 1, 2 and 3. TU 4 was excluded from this analysis due to the small amount of chipped stone recovered from the unit. Test Unit 1 shows chipped stone of similar size distributed evenly throughout Levels 6 through 15 suggesting bioturbation and low integrity. In TU 2, there is a general trend towards larger sized and more debitage towards the floor of the unit suggesting no stable surfaces and low integrity. TU 3 shows an increase in chipped stone size in Levels 6 and 7 below the bioturbated zone that may represent a surface. This scenario suggests TU 3 has moderate integrity.

41BP666

Figure 8-11 shows the distribution of chipped stone size for 41BP666 TUs 1, 2, and 5. TUs 3 and 4 were excluded from this analysis due to the small amount of debitage recovered from each of the units. TU 1 has a peak in counts in Levels 6 and 9 that corresponds with a burned rock feature. It suggests that there is a buried surface beginning in Level 6 that may have been impacted by bioturbation in the lower levels of the feature. TU 2 contains a large amount of debitage (n=25) in Levels 6 through 11 with a mix of small and larger debitage perhaps representing a buried surface or surfaces. There is then a trend of larger and more debitage in the lower levels (13-15). TU 5 has a trend of larger debitage towards the unit floor, but both TUs 1 and 5 have a small sample size, which makes any assessment questionable.

Summary

Table 8-4 summarizes the degree of integrity using the size of chipped stone. Two units on 41BP471 have moderate integrity and two have low integrity. The fifth unit on 41BP471 had insufficient data to make an assessment. Only one unit on 41BP477 is classified as having moderate integrity with two units described as having low integrity. One unit on 41BP477 also contained insufficient data to make an assessment. Site 41BP666 also had two units that were classified as moderate with two units listed as unknown due to insufficient data. One unit was classified as having low integrity.

Magnetic Soil Susceptibility

The final element used in the current investigation to assess integrity is MSS analysis. MSS values are primarily a function of the concentration and grain size of ferro and ferromagnetic minerals such as iron, magnetite, maghemite, and other iron oxides (Dearing 1999). As such, MSS values are tied to the mineralogy and geological history of an area. Beyond the basic mineralogy, MSS values in sediment can be enhanced by a variety of processes. These include human activity, such as the creation of cooking fires or the deposition of organic debris on a surface (see Bellomo 1993; Crowther 2003; Mauldin and Figueroa 2006; McClean and Kean 1993), as well as geomorphic and pedogenic processes, including organic decay and microbial activity (see Crockford and Willett 2001; Reynolds and King 1995; Singer et al. 1996).

The plethora of processes makes interpretations difficult, as the same MSS values can be produced by a variety of different processes that are difficult to separate based on sample values alone. Here, our concern is primarily with identifying general patterns that have broad implications for site integrity, such as identifying buried surfaces with some stability, and recognizing processes such as bioturbation and erosion. To aid in interpretation, Kemp and others (2019) reviewed previous MSS studies to create Figure 8-12. The figure shows four hypothetical patterns of MSS values down a profile that resulted from different processes. The MSS profile in the upper left (8-12, A) is one that likely reflects consistent sediment deposition with recent stability, indicated by increased values just below the surface. Consistent deposition below the modern surface would suggest that any given surface was not exposed for sufficient time to accumulate organic debris. Archaeological material in this setting could possess good integrity, though the density of material associated with any given level would be low. Figure 8-12, B shows a similar situation but with indicators of two surfaces, the modern ground surface, and a buried surface. The buried

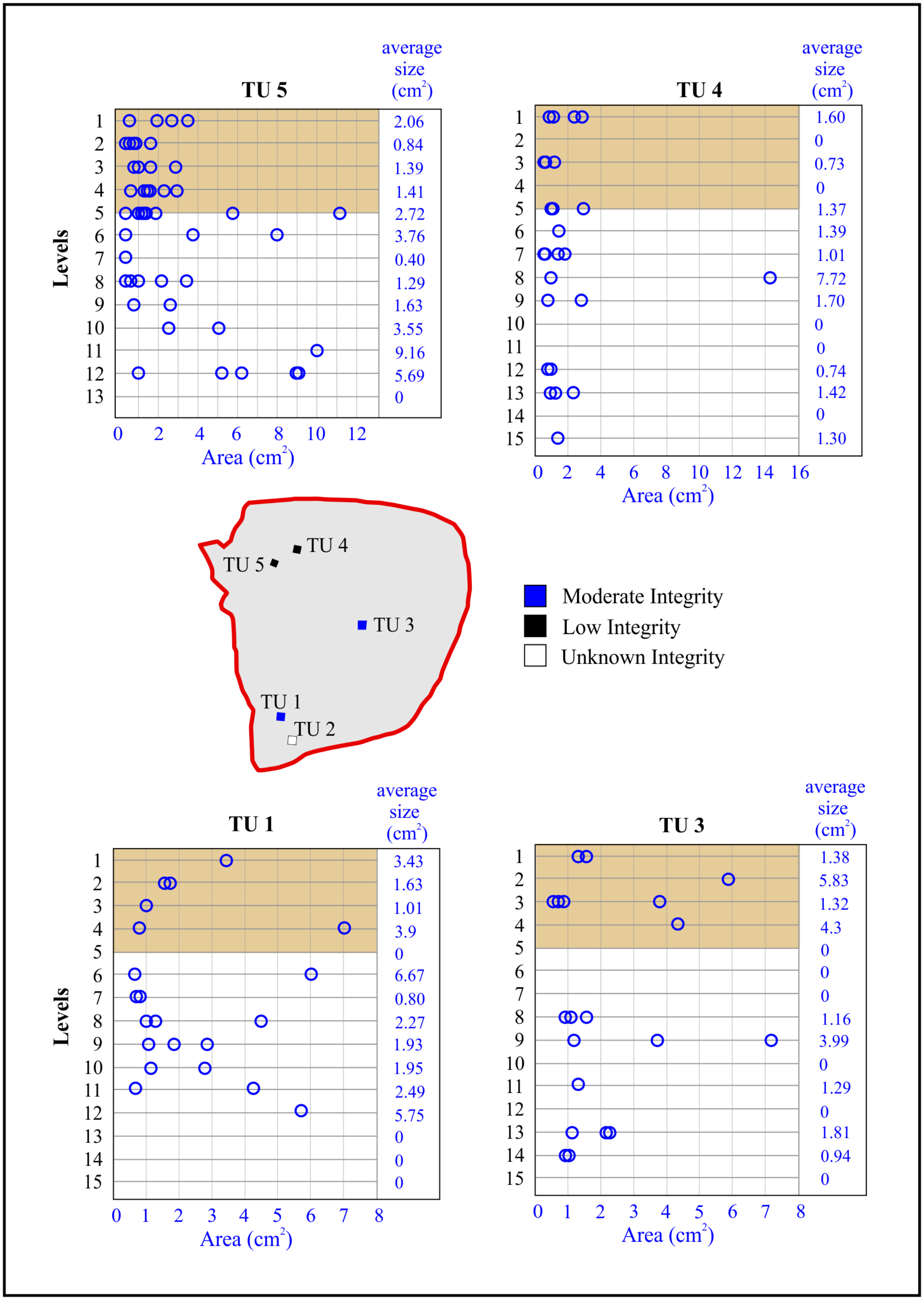

Figure 8-9. The distribution of debitage by size per level for 41BP471 TUs 1, 3, 4, and 5. The bioturbated zone is shown in light tan.

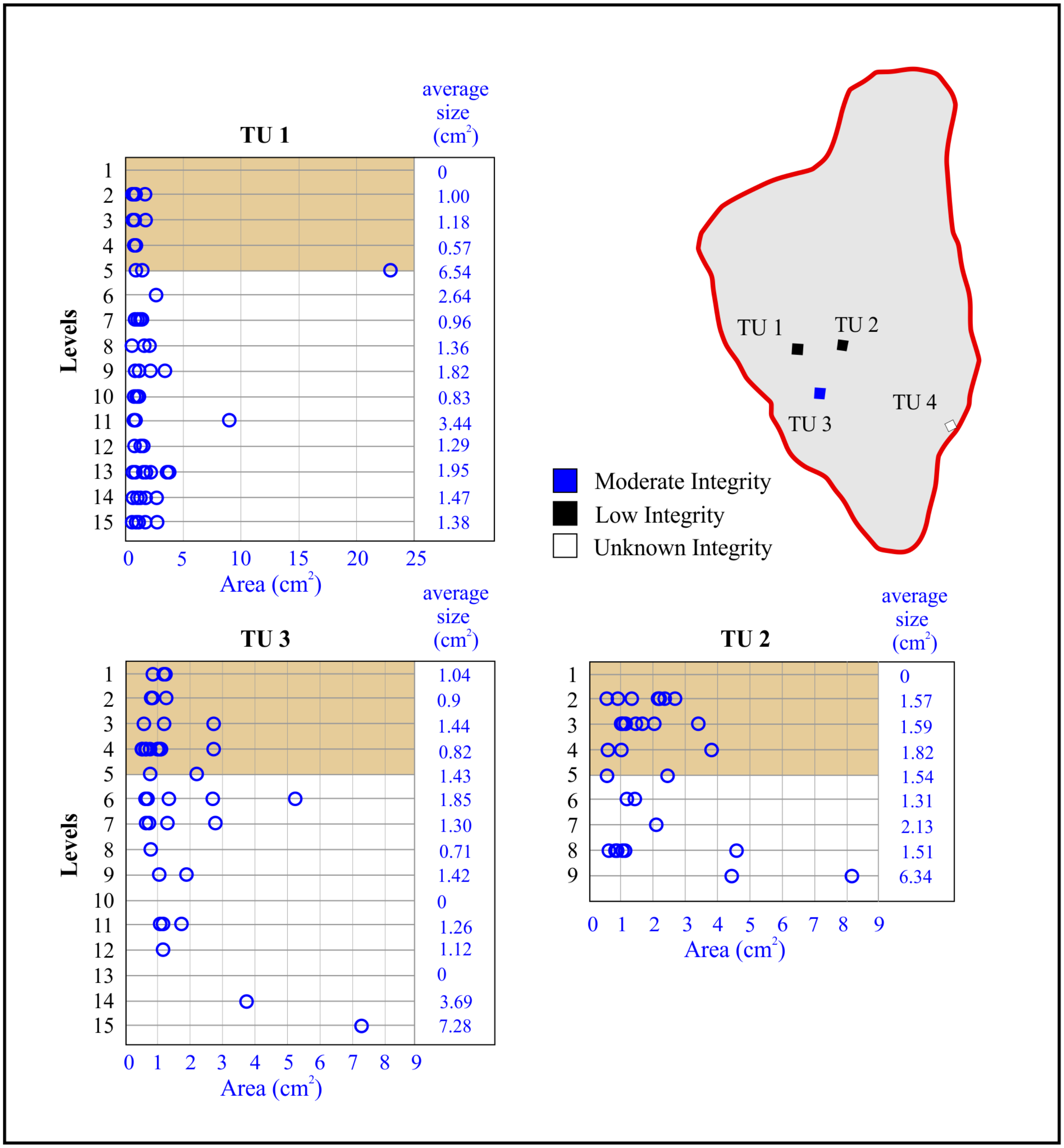

Figure 8-10. The distribution of debitage by size and count per level for 41BP477 TUs 1, 2, and 3. The bioturbated zone is shown in light tan.

surface, which would have been exposed for sufficient time for organic material to accumulate, has potential for intact deposits. The pattern in plot C of 8-12 may be produced by extensive bioturbation, essentially diffusing any organic signature, and degrading any higher MSS values. The integrity of archaeological material present along this profile would be suspect. Plot D in Figure 8-12 shows several extremely high values that are associated with a single sample. This may reflect contamination, and in the case of Camp Swift, it likely reflects small particles of iron oxides, such as hematite, in the individual sample. These particles have moderate-to-strong positive susceptibility (see Dearing 1999:36-38). A profile characterized by the pattern shown in Plot D results from erosional events

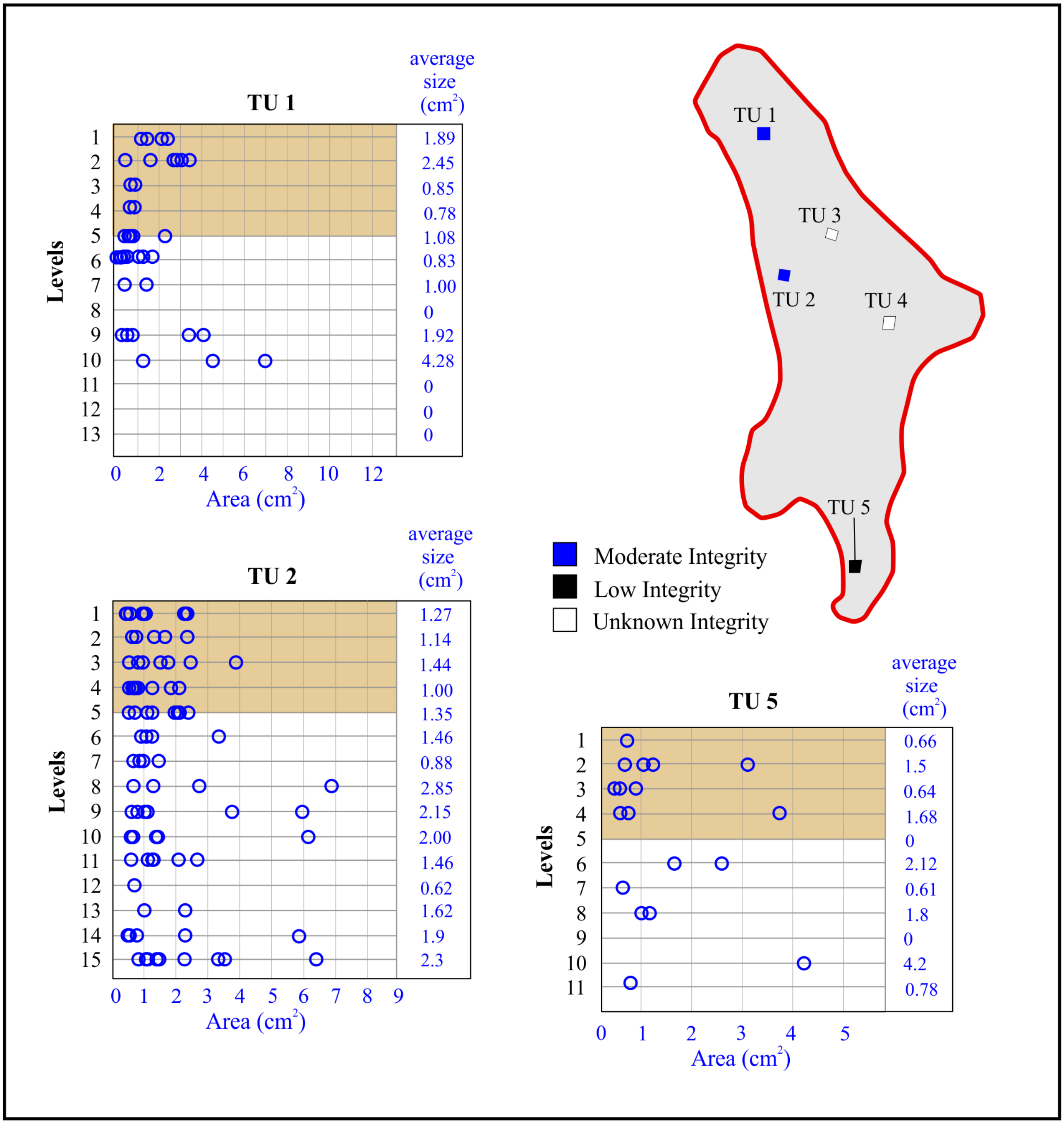

Figure 8-11. The distribution of debitage by size and count at a unit level for 41BP666 TUs 1, 2, and 5. The bioturbated zone is shown in light tan and the clay horizon in red brown.

Table 8-4. Summary of Test Unit Integrity Determination Based on Chipped Stone Size (area) by Test Unit

Test Unit	41BP471	41BP477	41BP666
1	moderate	low	moderate
2	unknown	low	moderate
3	moderate	moderate	unknown
4	low	unknown	unknown
5	low		low

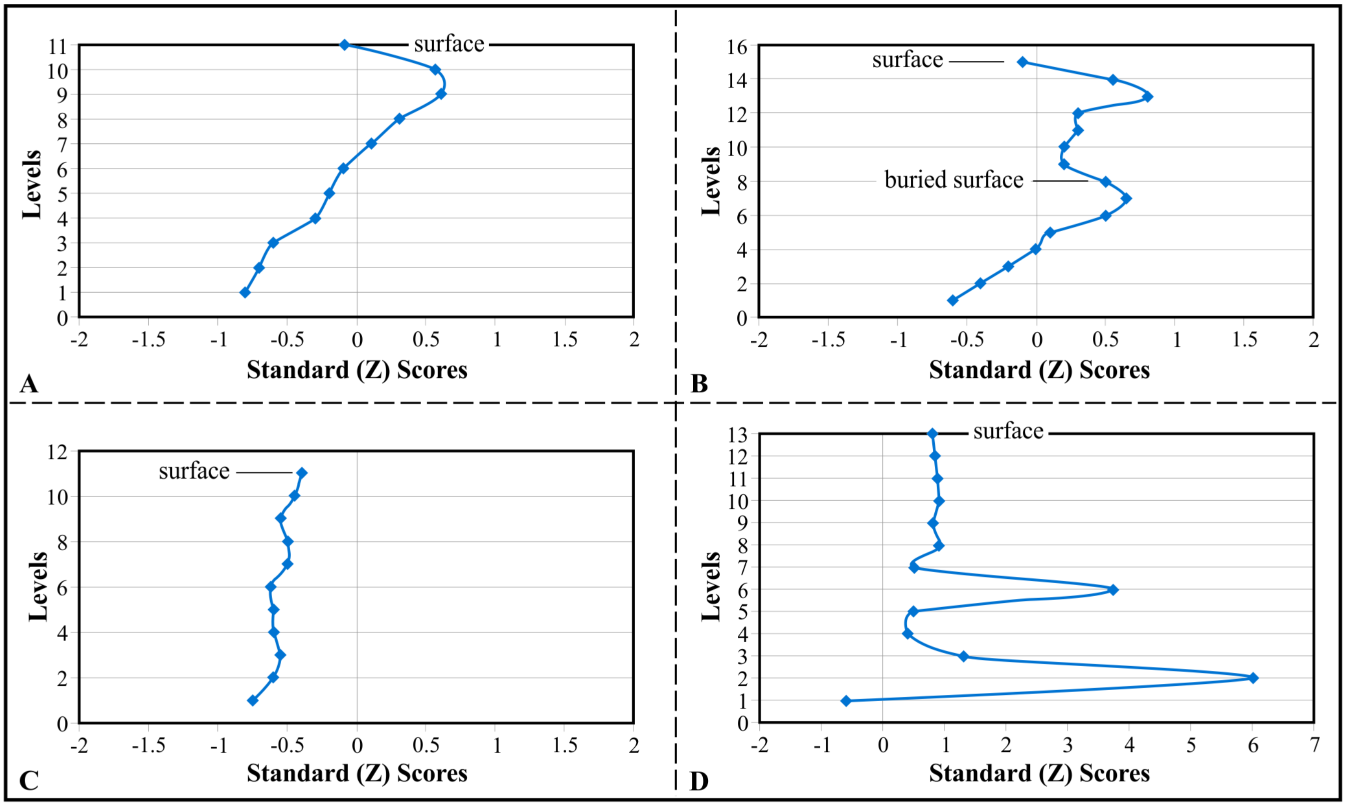

Figure 8-12. Four hypothetical patterns of MSS values (after Kemp et al. 2019). Plots are idealized representations of specific interpretations. A given profile can have components of all of these, as well as several other patterns that are not easily interpreted.

where heavier iron oxide particles are concentrated through the removal of lighter sand, or it may simply reflect the presence of these particles in the sediments.

On the current project, 361 sediment samples were processed from 14 units excavated on the three sites. In addition, 49 sediment samples were collected as a control from two pits excavated to the west of 41BP666 and to the southeast of 41BP471 (Figure 8-13). Both control pits share characteristics that are found at the three sites. The first similarity is the relatively low MSS values and frequent variability from the collected samples. A similar pattern of low values and variability was reported in Mauldin and colleagues (2018) and Kemp and colleagues (2019). Secondly, MSS values exhibit a near vertical column that may suggest bioturbation. This pattern is observed in the many of the units from the

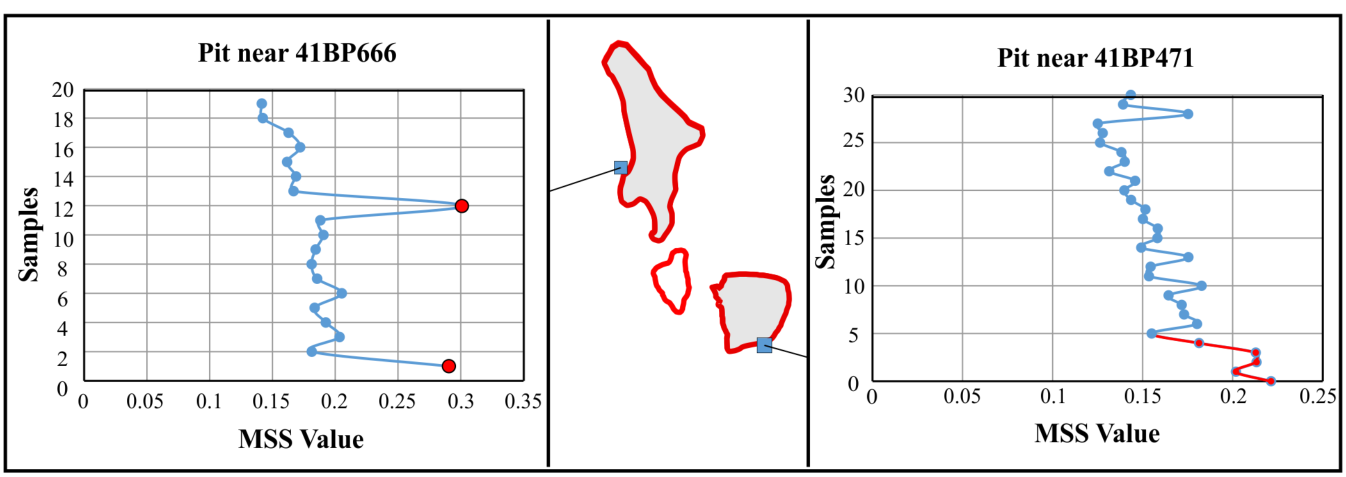

Figure 8-13. MSS values and locations of two control pits sampled near 41BP666 and 41BP471. The red circles represent a spike in MSS values.

three sites. The pit near 41BP666 also show a singular MSS value spike that suggests a high magnetized deposit, possibly related to the pattern suggested previously in Figure 8-12 D (see also Dearing 1999:36-38). Finally, and generally not common, both pits have values that increase in the lower profiles. This pattern is also seen in 41BP471 TU 4 and 41BP666 TU 1. The following section interprets the MSS values at the unit level to assess the integrity of the site. The raw data and additional information on MSS samples used in the test unit discussions are presented in Appendix B.

41BP471

MSS samples were taken from the five TUs excavated at 41BP471 (Figure 8-14). The MSS signature from all units on this site suggests that bioturbation affected not only the upper levels but to some degree the lower levels. The mixed and near vertical values from TU 1, TU 2, TU 3, and TU 5 reflect a fluctuating pattern that suggests mixing, likely due to bioturbation throughout the units. TUs 2 and 3 show singular spikes (samples 6 and 4 respectively) which may suggest a surface but more likely represent higher iron content near the terminal level. TUs 1, 2, 3, and 5 have low integrity due to bioturbation. TU 4 shows increasing values from samples 16 through 20 that may suggest a surface followed by a mixed pattern that would suggest bioturbation. However, the terminal clay level was not encountered and there is a possibility of deeper intact deposits in TU 4. The unit is classified as having moderate integrity.

41BP477

Figure 8-15 presents the MSS values for four units at 41BP477. TU 1 was terminated at 150 cmbs within a soft sand matrix; as such the MSS values reflect only the excavated levels. The values of TU 1 suggest bioturbation in the upper levels in samples 29 to 14. However, samples 15 through 10 show increasing values that may represent a stable surface or surfaces that suggest moderate integrity. It is followed by fluctuating values with two spikes that may represent surfaces or an increase in the ferrous content of the soil. Both TUs 2 and 3 exhibit a near vertical pattern of MSS values with one spike each at sample 11 and sample 18, respectively. These values suggest bioturbation throughout both units and low integrity. TU 4 shows increases in MSS values between samples 17 through 9 (approximately 40 to 80 cmbs) that may represent a surface or series of surfaces. A possible buried surface is also indicated in sample 9 of TU 4 (approximately 85 cmbs) where a burned rock feature was identified in the northeast corner of the unit. This scenario suggests that TU 4 has moderate integrity. Previous testing by CAS encountered a hearth at 50 to 70 cmbs (Nickels and Lehman 2004:Table 4-19).

41BP666

Figure 8-16 presents the MSS values for five units at 41BP666. In TU 1, samples 18 through 10 have relatively higher MSS values in the upper and lower levels. These are the same levels in which a burned rock feature (Feature 1) was identified. TU 2 shows a high signature peak between samples 17 through 9 in which approximately 1264 g of burned rock were recovered. The values associated with the burned rock suggest a possible occupation surface. Both TUs 3 and 4 have low MSS values and have essentially a near vertical pattern indicating bioturbation through the two units. The MSS value from TU 5 increases between samples 15 and 16 may suggest a stable surface or series of surfaces. TUs 1, 2 and 5 have moderate integrity based on possible relatively intact surfaces. TUs 3 and 4 have low integrity due to extensive bioturbation.

Summary

The final method used to assess integrity relied on patterning in MSS samples from profiles at a site with Table 8-5 summarizing the findings. The results suggest that 41BP471 has little overall integrity with four of the five units having low integrity. The MSS values from 41BP477 and 41BP666 (TU 1, 2, and 5) are marginal but suggest there are areas within each site that may have buried surfaces (specifically 41BP477TU 1 and 4; 41BP666 TU 1, 2, and 5). Both sites 41BP477 and 41BP666 are classified as having moderate integrity.

Conclusions

This chapter attempted to address the integrity of archaeological sites, a significant criterion for NRHP eligibility determinations. CAR acknowledge that this assessment is still qualitative to some degree despite quantitative measures used to characterize site integrity. The analysis of the integrity of each site was based upon four methods previously used to assess sites on Camp Swift. These methods are 1) archaeological observations; 2) chipped stone and burned rock distribution; 3) chipped stone size; and 4) MSS. Each unit was then classified as having high, moderate, or low integrity based on that analysis. Units having insufficient data were classified as unknown. None were classified as having high integrity.

The first approach used the archaeologist's field assessment and a post-field analysis of test unit photographs of bioturbation. All three sites exhibited evidence of bioturbation, with roots having the primary impact. Turbation by rodents and insects (ants) was observed at all three sites. Table 8-6 summarizes these observations at a site

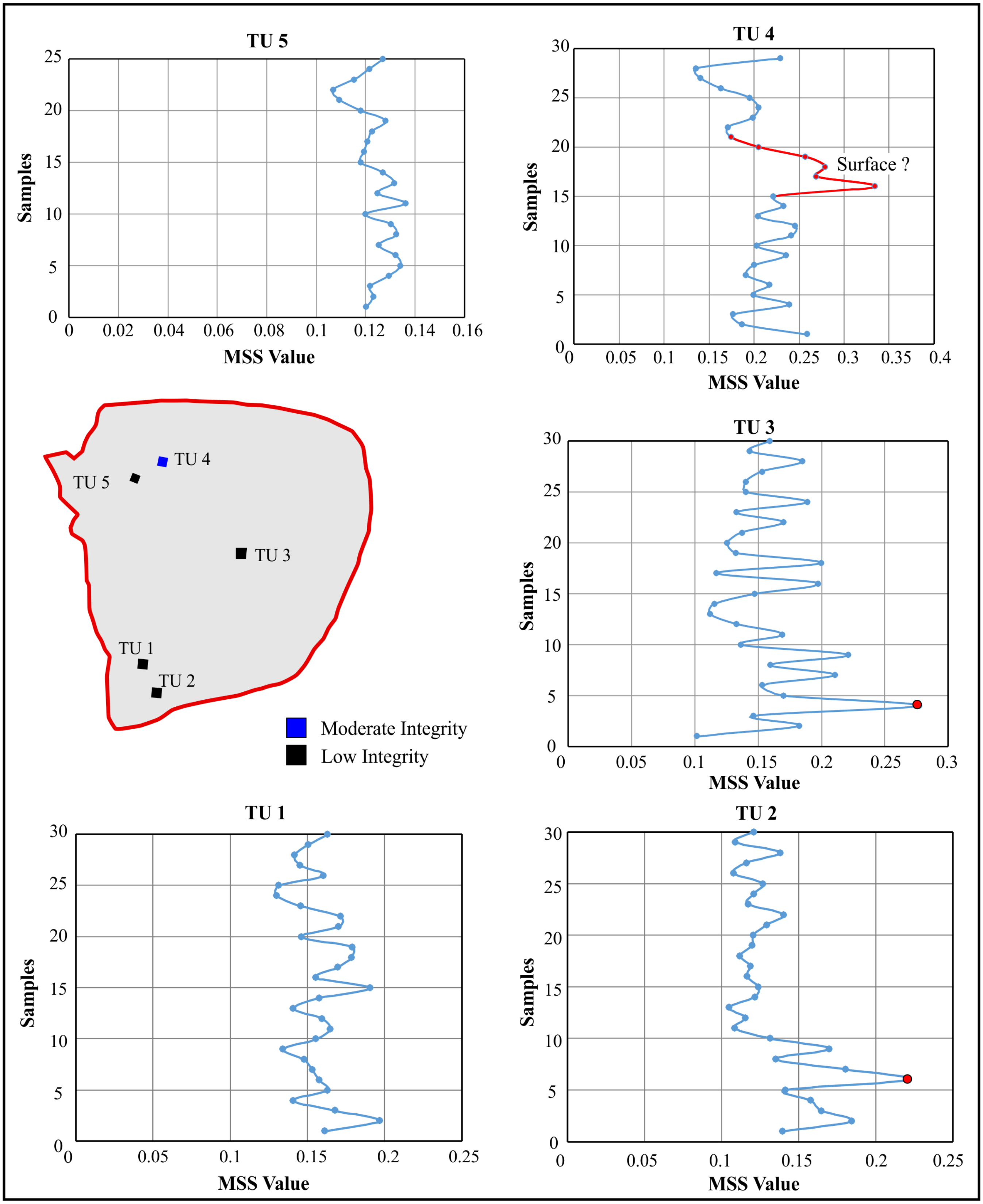

Figure 8-14. MSS values and locations of test units sampled at 41BP471.

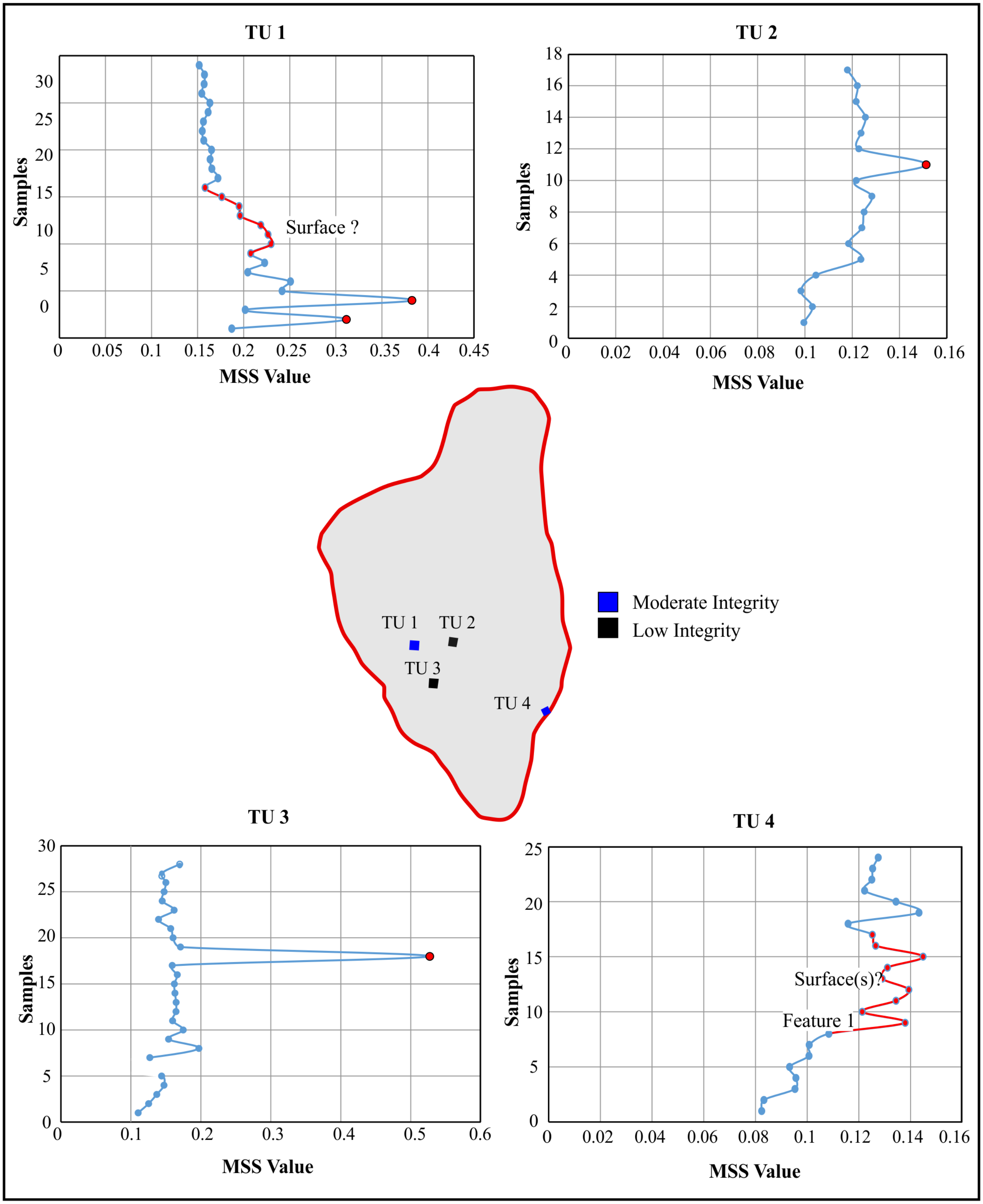

Figure 8-15. MSS values and locations of test units sampled at 41BP477.

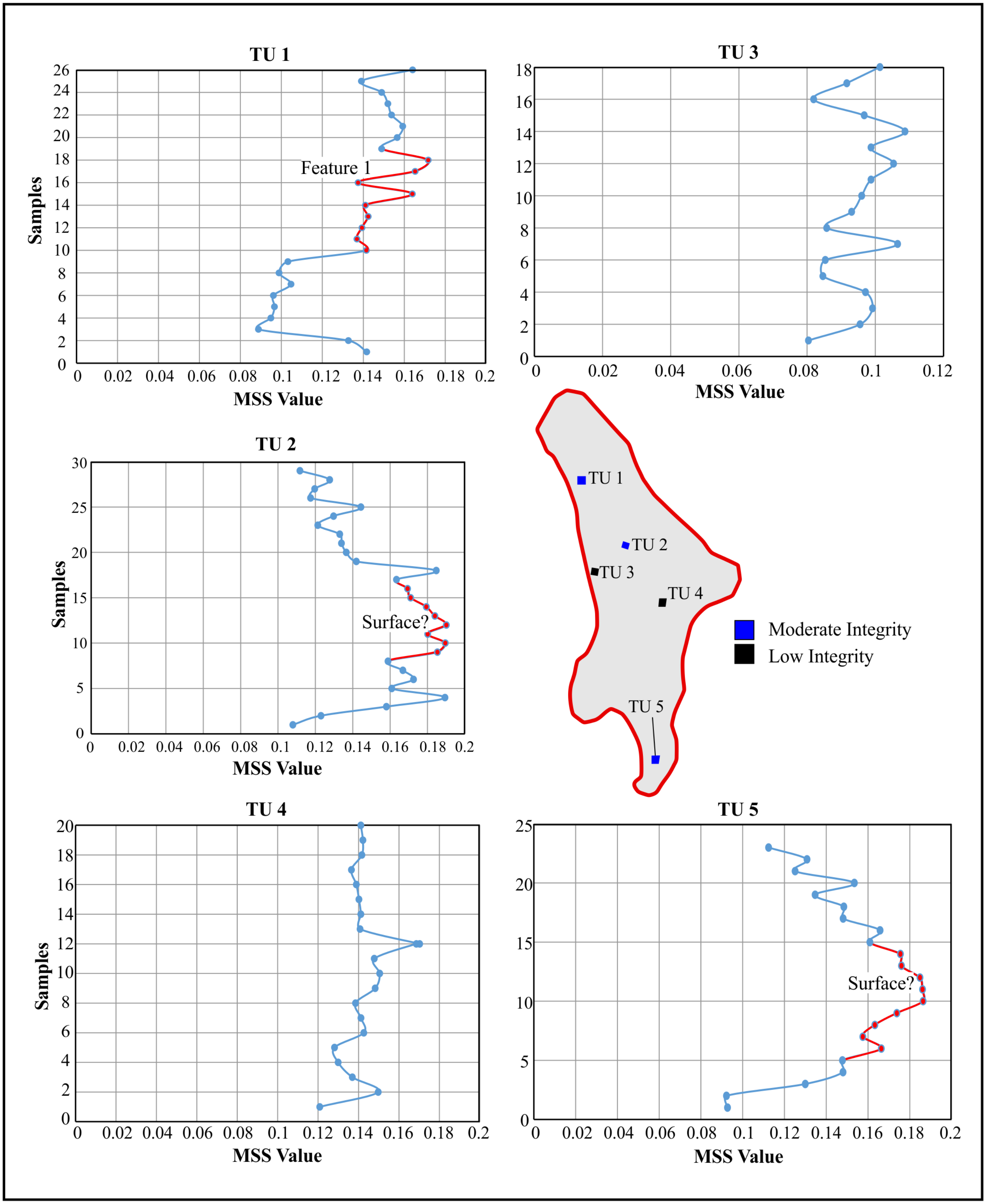

Figure 8-16. MSS values and locations of test units sampled at 41BP666.

Table 8-5. Summary of Test Unit Integrity Determination Based on MSS Analysis

Test Unit	41BP471	41BP477	41BP666
1	low	moderate	moderate
2	low	low	moderate
3	low	low	low
4	moderate	moderate	low
5	low		moderate

Table 8-6. Turbation Observations Summary Data from Unit Profiles

Sites	Number Excavated	Number of Units Assessed	Percentage with Moderate Integrity	Percentage with Low Integrity	Overall Site Integrity Assessment
41BP471	5	5	40	60	low
41BP477	4	4	50	50	moderate
41BP666	5	5	20	80	low

level. Sites 41BP471 and 41BP666 are classified as having low integrity due to the combination of multiple impacts from roots, rodents, and insect turbation. 41BP477 has relatively less impact from these factors with approximately 50% of the units having only root and/or insect turbation. This site is assessed as having moderate integrity.

The remaining three approaches are more quantitative. The first approach, using the distribution of the amount of chipped stone and weight of burned rock, was used to discern patterns that may suggest intact surfaces (Table 8-7). There appears to be a buried surface in 41BP471 TUs 1 and 5, 41BP477 TUs 2, 3, and 4, and 41BP666 TU 1 and 5. Approximately 50% of the test units reflect a lack of integrity (low) or were inconclusive due to the small sample size. However, the overall ranking of sites suggests that portions of all three sites have a moderate degree of integrity.

The second approach, using the distribution of chipped stone size, suggests that there are buried surfaces in 41BP471 TUs 1 and 3, 41BP477 TU 3, and 41BP666 TUs 1 and 2 (Table 8-8). None of the 14 units had either low integrity or insufficient data to create an assessment. The overall ranking of sites suggests that two, 41BP47 and 41BP666 have moderate integrity. Site 41BP477 has low integrity in part due to the small of debitage.

The final method, using MSS, suggests buried surfaces may be present in 41BP471 TU 4, 41BP477 TUs 1 and 4, and 41BP666 TUs 1, 2 and 3 (Table 8-9). Site 41BP471 contained

Table 8-7. Chipped Stone and Burned Rock Site Summary Data from Unit Profiles

Sites	Number Excavated	Number of Units Assessed	Percentage with Moderate Integrity	Percentage with Low Integrity	Overall Site Integrity Assessment
41BP471	5	4	50	50	moderate
41BP477	4	4	75	25	moderate
41BP666	5	3	66.6	33.3	moderate

Table 8-8. Area of Chipped Stone Summary Data from Unit Profiles

Sites	Number Excavated	Number of Units Assessed	Percentage with Moderate Integrity	Percentage with Low Integrity	Overall Site Integrity Assessment
41BP471	5	4	50	50	moderate
41BP477	4	3	33.3	66.6	low
41BP666	5	4	50	50	moderate

Table 8-9. MSS Site Summary Data from Unit Profiles

Sites	Number of Units Assessed	Percentage with Moderate Integrity	Percentage with Low Integrity	Overall Site Integrity Assessment
41BP471	5	20	80	low
41BP477	4	50	50	moderate
41BP666	5	60	40	moderate

only one unit that had moderate integrity with the remaining four units classified as low. The overall ranking suggests that two sites, 41BP477 and 41BP666 have moderate integrity with one site, 41BP471having low integrity.

Addressing site integrity is never a straightforward affair although this determination is fundamental to the question of site eligibility. To reiterate, all sites have turbation to some degree with each site having areas that may have more integrity than other areas of the site. It appears based on these analyses that site 41BP666 contains areas having moderate integrity in TUs 1, 2, and 5. Site 41BP477 may contain two possible areas of moderate integrity in TUs 3 and 4. The only area on 41BP471 that may have integrity is TU 1 based on these analyses.

Chapter 9: Site Content

Lynn Kim, Raymond Mauldin, and Leonard Kemp

This chapter considers the final eligibility criteria by focusing on the artifact assemblage at a site level. The CAR applied the same criterion to the current three sites as we have in our previous studies of Camp Swift. The criterion includes the number and density of artifacts, the diversity of tools and debitage, the evenness of raw material, and the intensity of site use. The underlying assumption is that the greater the number, density, and variety of artifacts and features within a site, the greater the potential of that assemblage to answer research questions. The sites tested here are evaluated in the context of earlier studies on Camp Swift, including previous investigations by CAR (see Kemp et al. 2019, Mauldin et al. 2018; Munoz 2012) and CAS (e.g., Nickels 2008; Nickels et al. 2003; Nickels et al. 2010).

Site Artifact Summaries and Lithic Density Patterns

Table 9-1 presents a summary of artifacts recovered from the three sites. Burned rock and debitage make up most items on the sites, with only five tools and a single core recovered from the three sites on the current project. There is minimal variation between sites, except for burned rock weights where site 41BP666 accounts for 68% of this category. This is a function of the recovery of Feature 1 at this site. A feature was also noted at 41BP477, the site with the second highest weight, although it is likely that the 41BP477 feature continues outside of the excavation unit.

The low number of cores (n=1) and tools (n=5) provides limited data for research questions related to lithic tool procurement, production, and use. A Nolan-like dart point, likely dating late in the Middle Archaic, was found at site 41BP471 and was discussed in Chapter 7 (Figure 7-1). In addition, Figure 9-1 shows an edge-modified flake recovered from this site. Site 41BP477 included a core (Figure 9-2), a modified edge flake (Figure 9-3), and a biface tip (Figure 9-4). CAR also recovered a biface edge from site 41BP666 (Figure 9-5).

In addition to the lithic material detailed in Table 9-1, charcoal was present at all sites. Small amounts of faunal material (1.46 g), some of which was burned, were also collected from three different locations on 41BP477.

Table 9-2 presents site level densities for debitage, tools and cores, all burned rock, and weight of burned rock from non-feature contexts. Debitage densities were highest at both 41BP477 and 41BP666, with slightly lower density at 41BP471. Figure 9-6 places the debitage density figures in context using estimates from three previous testing projects (Kemp et al. 2019; Mauldin et al. 2018; Nickels 2008). The three sites in the current investigation trend toward the lower end of debitage density per site. Densities of tools and cores are also low (Table 9-2). Of the 11 sites previously tested by CAR, only site 41BP778, which lacked any tools or cores, had lower densities (see Kemp et al. 2019:54; Mauldin et al. 2018:82). Based on the assumption that sites that have a greater density of debitage, cores, and tools would be able to address a larger number of research questions, the three sites have low potential for investigations based on these aspects of chipped stone.

Maximum Level Density of Debitage

Measurements of site density depend both on the number of items recovered and the amount of excavation. The Maximum Level Density (MLD) was developed to provide a density comparison not significantly impacted by excavation strategies (see Kemp et al. 2019). The MLD equalizes the amount of excavation matrix by comparing the average of the five highest totals recovered from levels excavated on a site, with all levels standardized to a 0.1 m^3 volume. Excavation levels that do not have any recovery are effectively eliminated by this approach. The figure provides a second measure of density that is more easily compared. It may also prove useful as a measure of occupational intensity.

The five highest level counts of debitage for the three sites investigated here are listed in Table 9-3, along with the MLD.

Table 9-1. The Number and Type of Lithic Artifacts across Sites. Burned Rock Weight is also Provided

Sites	Cores	Points	Biface/ Uniface	Edge Modified	Debitage	Burned Rock	Burned Rock Weight (g)
41BP471		1		1	133	303	2,384.6
41BP477	1		1	1	139	501	5,163.8
41BP666			1		157	471	15,940
Total	1	1	2	2	429	1275	23,488

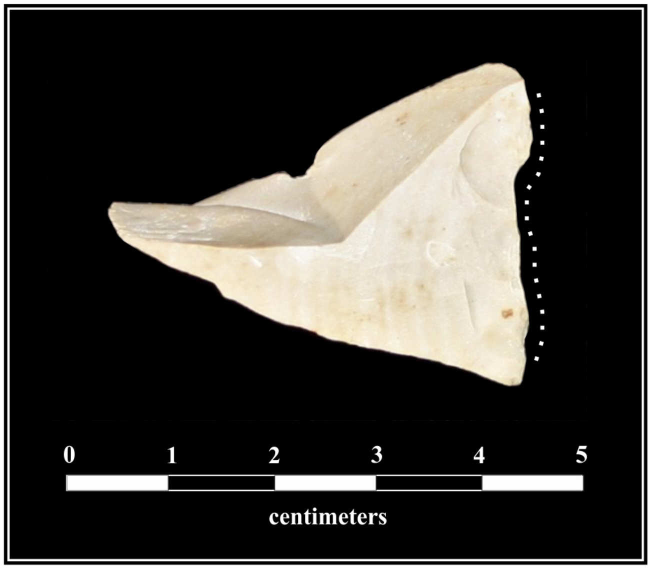

Figure 9-1. An edge modified tool found on site 41BP471. The modified edge is marked by the series of white dots.

Figure 9-2. The core found on site 41BP477.

Figure 9-7 plots the debitage MLD average against the site level debitage density for the three sites, shown in red, along with data from 27 previously excavated Camp Swift sites shown in orange. Sites 41BP471, 41BP477, and 41BP666 all fall in the low MLD area of the plot suggesting that the low site level densities are an accurate reflection of debitage densities regardless of excavation strategy.

Other Material

Surprisingly given the low-density figures for chipped stone debitage, tools, and cores, burned rock densities overall and in non-feature contexts are high relative to the 11 previously excavated sites (Kemp et al. 2019:54; Mauldin et al. 2018). Only sites 41BP801 (141.4 burned rock per m^3) and 41BP859 (103.1) exceeded the 41BP477 and 41BP666 density totals for rock number, and the 0.8 kg per m^3 for non-feature burned rock on 41BP477 was second only to the 1.86 kg per m^3 reported for 41BP801. The 41BP471 figures for burned rock count and weight densities (Table 9-2) fall in the middle of the previously recorded CAR ranges.

Tool Stone Material Groups

Following previous CAR investigations on Camp Swift (Kemp et al. 2019; Mauldin et al. 2018), tool stone material groups were created by focusing on four descriptive variables. These were a) finish (1=matte; 2=translucent), b) evidence of heating (1=present; 0=absent), c) grain of the item (1=fine; 2=coarse), and d) color of the item (e.g., 0=purple; 1=black; etc.). Each raw material, then, has a four-digit description. For example, 1012 has a matte finish

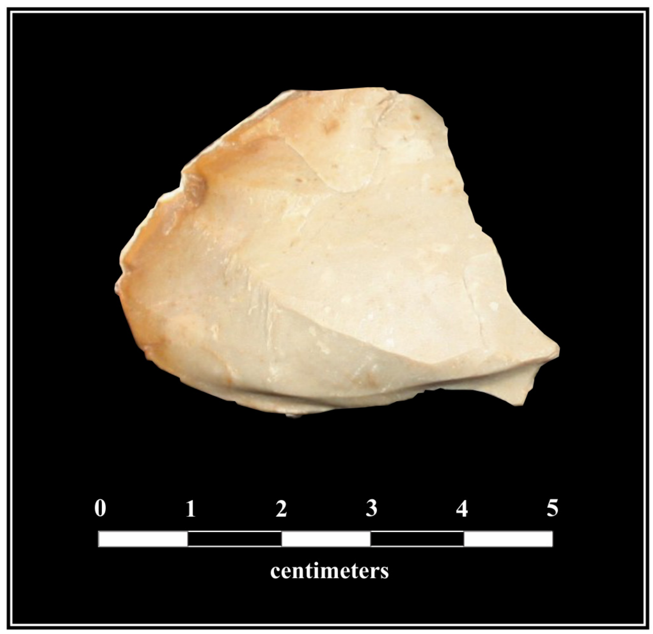

Figure 9-3. The edge modified flake found on site 41BP477.

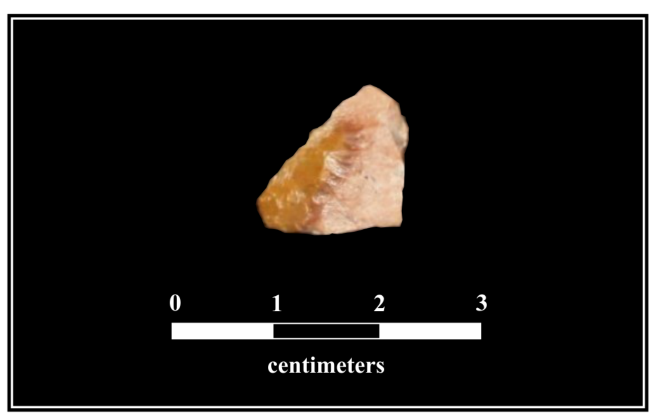

Figure 9-4. The biface tip found on site 41BP477.

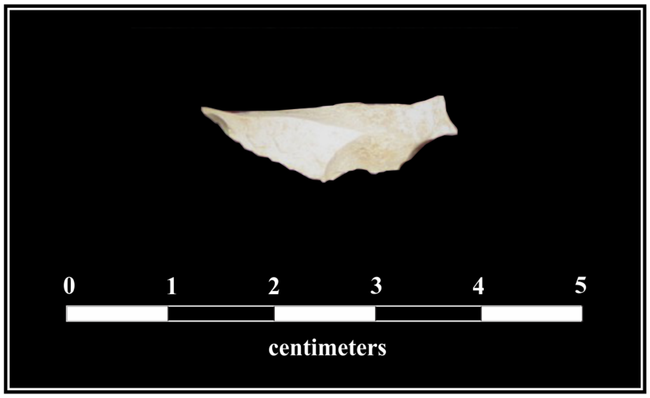

Figure 9-5. The biface edge found on site 41BP666.

(1), with no evidence of heating (0), a fine-grained surface (1), and is moderate to dark brown in color (2). CAR analyzed 429 pieces of chipped stone debitage from the three sites in the Project Area using this system (Table 9-4). On the current project, 50 material groups were identified, and the maximum number that can exist in the system is 80. Appendix C presents these data. As with earlier results (see Kay and Tomka 2001; Kemp et al. 2019; Mauldin et al. 2018) non-cortical debitage dominated these assemblages, with some evidence of heating present. Most material was characterized as fine-grained.

Figure 9-8 plots the number of raw material groups (Y-axis) against the number of debitage with the totals from the 11 previously recorded sites tested by CAR on Camp Swift (orange) and the three new sites tested here (red). The line describing the relationship is a logarithmic fit developed from the previous 11 sites. The plot and line suggest that as sample size increases, the number of new raw material groups in the assemblage also increases, but at a slower rate. Cases that fall below the line have lower diversity relative to sample size while those above have higher diversity. The three new sites, with 31 material groups on 41BP471 and 36 groups on both 41BP666 and 41BP477, clearly have higher

Table 9-2. Lithic Artifact Densities

Site	Debitage/m³	Number of Tools and Cores/m³	Number of Burned Rock/m³	Weight (kg) of Non-feature Burned Rock/m³
41BP471	18.3	0.28	41.7	0.33
41BP477	26.1	0.56	94.2	0.80
41BP666	26.5	0.17	78.4	0.74

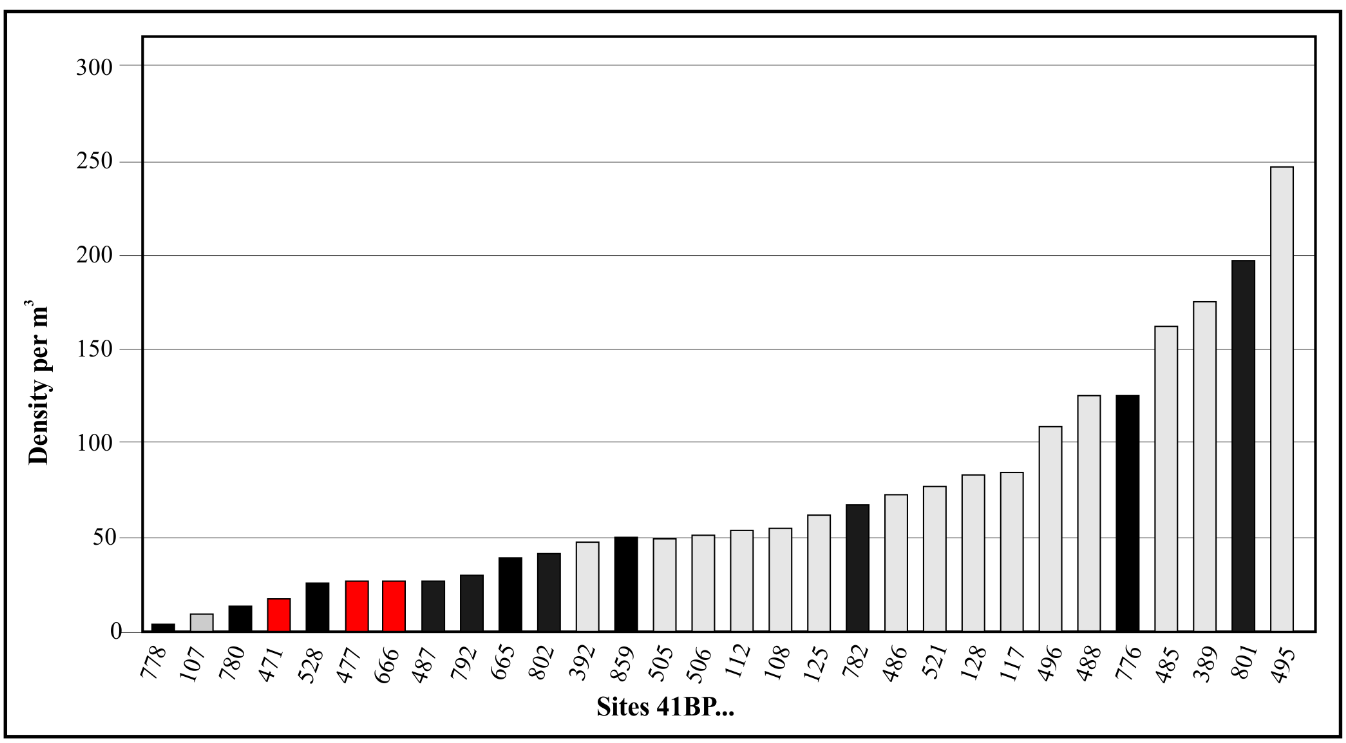

Figure 9-6. The density of chipped stone per cubic meter of all tested Camp Swift sites. In red are the three current sites tested by CAR and in black the previously tested sites by CAR. Sites tested by CAS are shown in gray (Nickels 2008).

Table 9-3. Maximum Level of Density of Debitage for the Three Sites in the Project Area

Site	Highest Level Count	Second Highest Level Count	Third Highest Level Count	Fourth Highest Level Count	Fifth Highest Level Count	Total for All Five Highest Levels at Site	MLD Average
41BP471	8	8	7	6	5	34	6.8
41BP477	9	9	8	7	6	39	7.8
41BP666	9	9	9	9	9	45	9.0

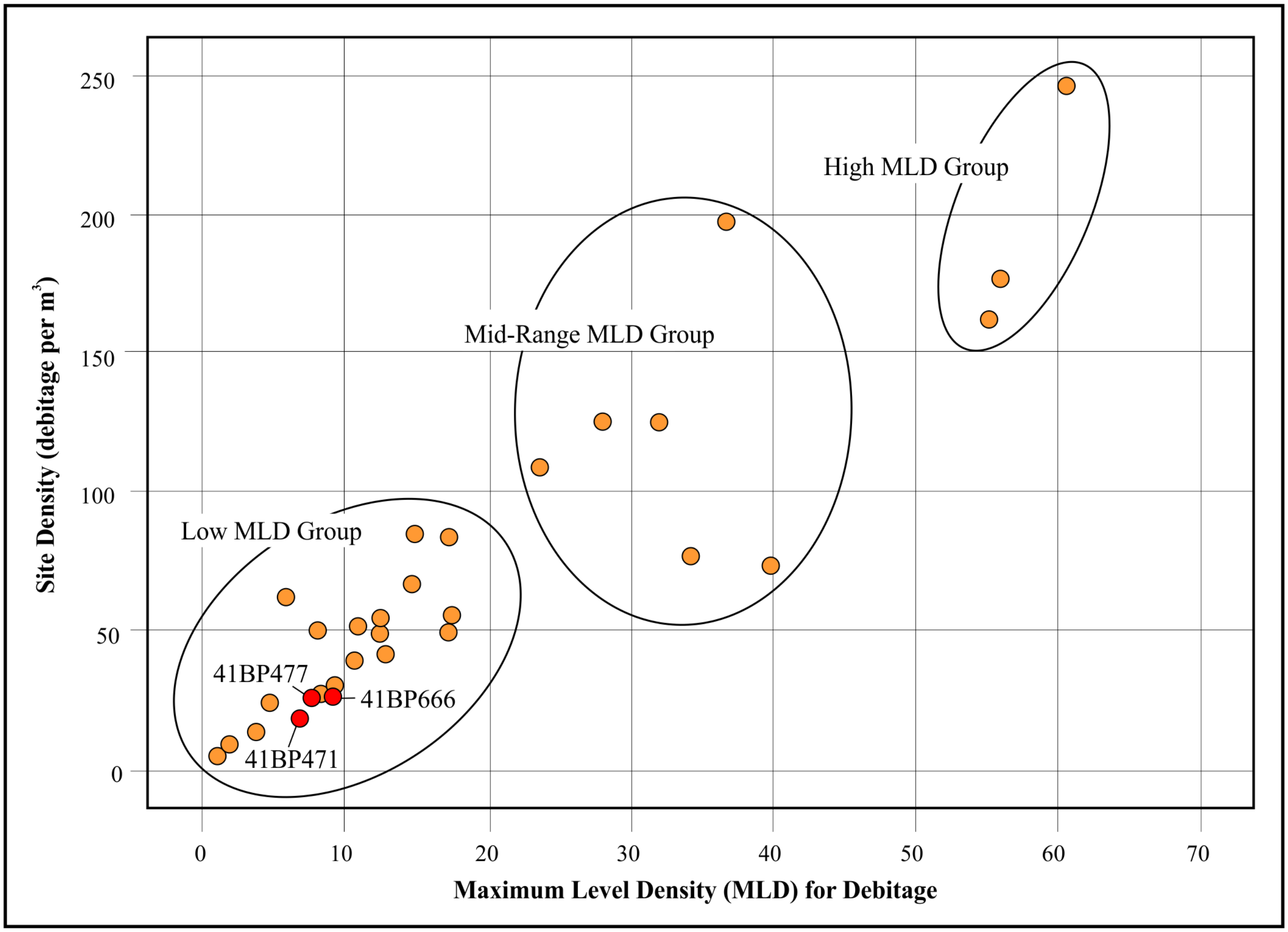

Figure 9-7. Scatter plot of the MLD relative to site density for debitage on 27 previously tested Camp Swift sites, shown in orange (Kemp et al. 2019:60), and the current sites 41BP471, 41BP477, and 41BP666, shown in red.

Table 9-4. Chipped Stone Debitage by Site

Site	Debitage	Non-Cortical (0)	Heated (1)	Fine Grained (1)	Mean Flake Length (mm)
41BP471	133	66.92%	30.83%	91.73%	19.36
41BP477	139	70.50%	57.55%	86.33%	17.54
41BP666	157	76.43%	45.86%	90.45%	16.87
Total	429	71.56%	44.99%	89.98%	17.86

than expected raw material diversity given their sample sizes. The predicted sample sizes for the sites are 21.9 (41BP471), 22.3 (41BP477), and 23.1 (41BP466). There are, on average, roughly 12 more groups than expected based on the previous sample size and tool stone group relationships.

The previous 11 sites reflected occupations from multiple areas across Camp Swift, though most (n=7) are in the southern portion of the camp. All three new sites are in the far norther section of the camp. CAR has not tested sites in this area. While it is unclear what is causing the increased diversity seen in the new sites in Figure 9-8, the pattern has not been seen previously.

Patterns in Raw Material Sourcing and Use

In previous studies (Kemp et al. 2019; Mauldin et al. 2018), CAR used glow patterns from ultraviolet (UV) light as a screening method to identify local, Edwards, and other non-local material groups. A similar approach is used here. Chipped stone was exposed to a Raytech UV light operating in short wave (2500 wavelength-angstrom units) and long wave (mean of 3500 wavelength-angstrom units) modes, and glow patterns in each mode were recorded. Edwards chert has an amber-orange-yellow glow under either the short or long wave UV light (Hoffman et al. 1991:302; Newlander and Speth 2009:49; Wall 2020; Wigley 2018). Materials that fluoresced brown, purple-red, dark red, purple, or no reaction under both the short wave and long wave were identified as part of the local group. Those that glowed yellow under both short wave and long wave were also classified as local based on previous characterizations of cherts from Uvalde gravels (Mauldin et al. 2018). Finally, material that glowed green or yellow green in either short or long wave, and debitage that did not conform to the Edwards or Local material fluorescence, were characterized as non-local.

Table 9-5 presents the breakdown by site based on the UV glow patterns on the three sites. Edwards chert is the principal

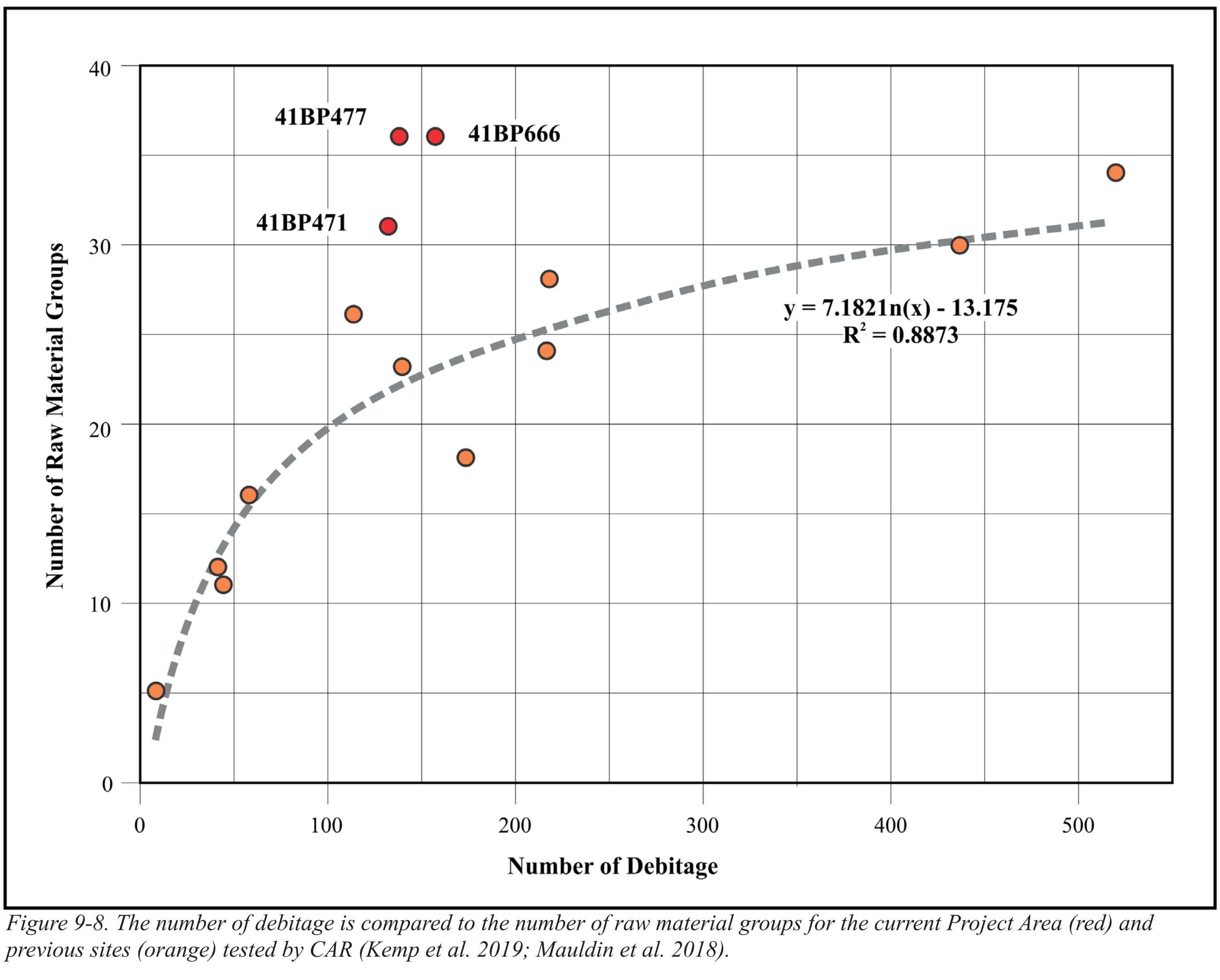

Figure 9-8. The number of debitage is compared to the number of raw material groups for the current Project Area (red) and previous sites (orange) tested by CAR (Kemp et al. 2019; Mauldin et al. 2018).

Table 9-5. Edwards, Local, and Non-local Debitage across Sites Based on UV Glow Patterns

Site	Edwards	Local	Non-Local
41BP471	76	48	9
41BP477	59	77	3
41BP666	87	42	28
Total	222	167	40

material source on sites 41BP471 (57%) and 41BP666 (55%). Site 41BP666 also has 28 items (17.8%) that did not fit either the Local or Edwards pattern and were classified as non-local. Edwards chert comprises only 42% of the 41BP477 assemblage, with 55% of the assemblage designated as local.

The 11 sites previously tested by CAR had low frequencies of local tool stone. Uvalde gravels are abundant on Camp Swift but are primarily composed of quartzite. While chert is present, it is of variable quality for knapping (Robinson and Meade 2001). Previous studies suggest Camp Swift populations relied to some extent on Edwards chert (Mauldin et al. 2018), available as secondary sources to the southwest of Camp Swift along the Colorado River and as primary sources to the west on the Edwards Plateau. Only 289 of 1975 chipped stone items (14.6%) on the previously tested sites were thought to reflect local materials. Material defined as Edwards made up most of these assemblages. Figure 9-9 shows the percentage of Edwards, local, and non-local materials for the three new sites. On previously assessed sites with sample sizes over 100 items, non-local material accounted for between 78.4% and 92.5% (see Kemp et al. 2019; Mauldin et al. 2018). The percentages of non-local materials identified on sites 41BP471, 41BP477, and 41BP666 are significantly lower, with 41BP477 having less than 50%.

Table 9-6 shows that those materials classified as local tend to be coarse grained, are more often heated, and have the lowest frequency of non-cortical designations (63.4%). Items designated as local account for 56.7% of the debitage with seventy-five percent cortex, and 90% of debitage with 100% cortical coverage. Local material would be more likely to have cortex, both because the source is close and Camp Swift gravels are smaller in size. In contrast, non-local materials, including Edwards chert, may have been reduced prior to

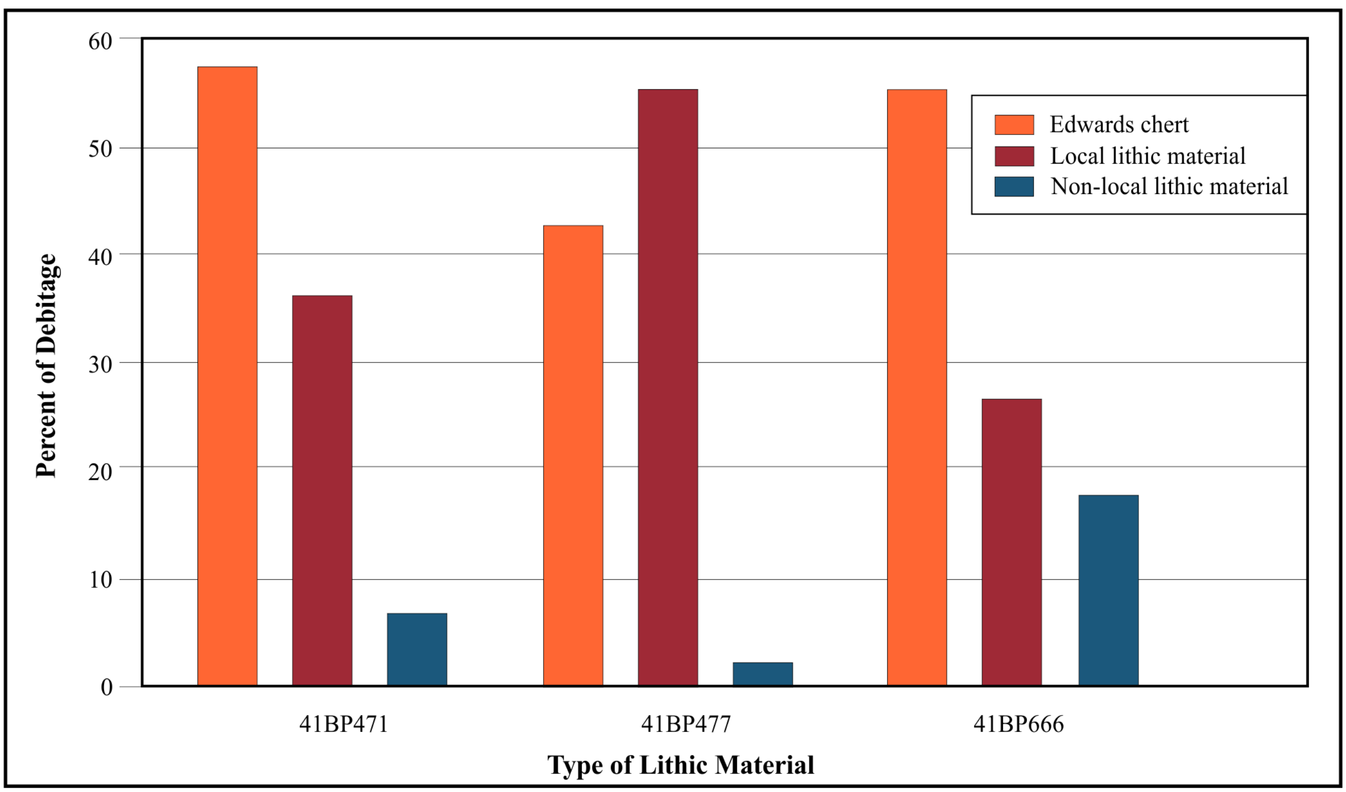

Figure 9-9. The distribution of Edwards, local, and non-local debitage, as identified by UV fluorescence, across the three sites of the Project Area.

Table 9-6. Chipped Stone Debitage by UVF lithic material type

Lithic Material	Debitage	Non-Cortical (0)	Heated (1)	Fine Grained (1)
Edwards	222	76.13%	37.84%	95.95%
Local	167	63.47%	52.69%	82.04%
Non-Local	40	80.00%	52.50%	90.00%
Total	429	71.56%	44.99%	89.98%

entering Camp Swift, removing much of the cortex. Edwards chert and non-local material both have more than seventy-five percent non-cortical debitage.

These cortical patterns are consistent with previous work by Mauldin and Figueroa (2006). In an extensive review of cortex patterns and raw material access in Central Texas, they found that chipped stone assemblages in areas of high stone availability had high percentages of non-cortical flakes, with most cases having over 80% non-cortical debitage. Areas characterized as having moderate tool stone availability had lower percentages of non-cortical flakes. Assemblages with low material availability tended to have, on average, the lowest frequency of non-cortical flakes. Mauldin and Figueroa (2006) suggest that this is a function, in part, of material size. The production of tools starting with larger initial cores will produce more interior, non-cortical, flakes than the production of tools with smaller cores. However, two distinct patterns were present in sites with low material availability. In most cases, assemblages had high cortex percentages, suggesting a dominance of local sources, but in others, it appears that materials were transported in with cortex having been previously removed. Using data from nine previously excavated sites on Camp Swift with assemblages greater than 50 items (Kemp et al. 2019; Mauldin et al. 2018) and sites 41BP666, 41BP777, and 41BP471, Figure 9-10 contrasts the percentage of non-cortical flakes and non-cortical flake length. Following the arguments of Maudlin and Figueroa (2006), assemblages dominated by local materials should have lower percentages of non-cortical flakes and, as the local material tends to occur in smaller nodules, their flakes should be smaller. In contrast, assemblages dominated by non-local materials, especially when that material is transported into an area in a finished or near finished state, should have little or no cortex. Sizes of non-cortical items from non-local sources will be variable, but should tend to be larger, especially when contrasted with patterns in local material. The clustering of

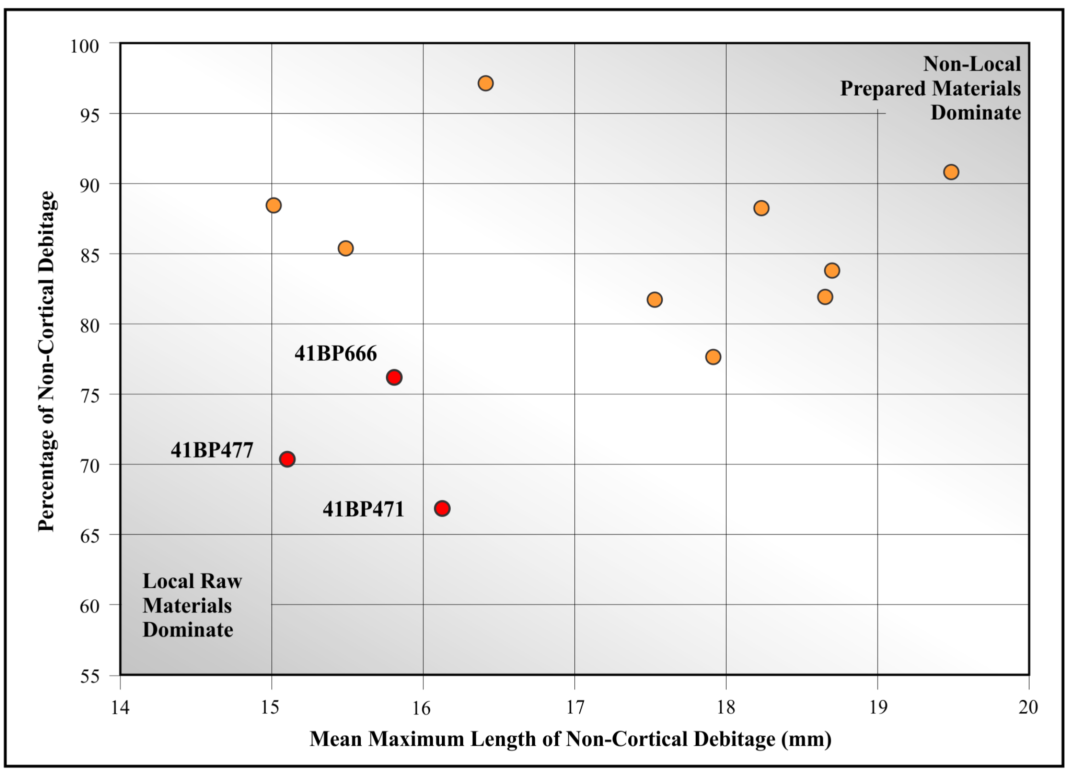

Figure 9-10. Percentage of non-cortical flakes and non-cortical flake length for nine previous excavated Camp Swift sites with more than 50 items (orange) and sites 41BP666, 41BP477, and 41BP471, shown in red.

the three new sites in the lower left section of Figure 9-10 is consistent with the patterns seen in the relative frequency of local sources using the UV glow patterns. These sites appear to have patterns of raw material use not identified in our previous Camp Swift testing.

Figure 9-11 shows the evenness of the raw material distribution by examining the occurrence of the five most common material groups for each of the three new sites relative to previous patterns developed by CAR (Kemp et al. 2019: 56; Mauldin et al. 2018: 85). A site in which a single raw material group dominates the assemblage likely can address a more limited range of questions when compared to a site with a more even distribution. In the figure, the skewed distribution, shown by the green line, is defined by a single site (41BP780) where over 40% of the assemblage is made up of one raw material group. The blue line is the average of five previously tested sites (41BP478, 41BP782, 41BP802, 41BP859, 41BP865) and defines a moderate distribution, with the top two groups making up roughly 26% and 20.25%. The red line, made up of sites 41BP779, 41BP792, and 41BP801 reflects an even distribution, with the top three raw material groups accounting for 13.9%, 11.5% and 10.2% of the total assemblage. The three new sites all have assemblages that are evenly distributed, suggesting that their assemblages have the potential to address a variety of research questions.

Summary

This chapter considers artifact assemblage characteristics at a site level as the final eligibility criteria for sites 41BP471, 41BP477, and 41BP666. During the current investigation, two of the sites include features. Charcoal, some of which has been identified as burned nuts, was recovered from all three sites, and small quantities of faunal material were collected from 41BP477. Our assemblage level summaries were consistent with previous investigations on Camp Swift. Assemblages that were larger and had higher densities of material, a wider variety of artifacts, and a more even distribution of material had an increased likelihood of yielding significant information. We placed the results from the three new sites in the context of previous testing on Camp Swift conducted both by CAR (see Kemp et al. 2019; Mauldin et al. 2018) and by CAS where data was available (e.g., Nickels 2008). Results from the three new sites, summarized in Table 9-7, were mixed. Debitage, tool, and core densities are low, as are the variety of tools

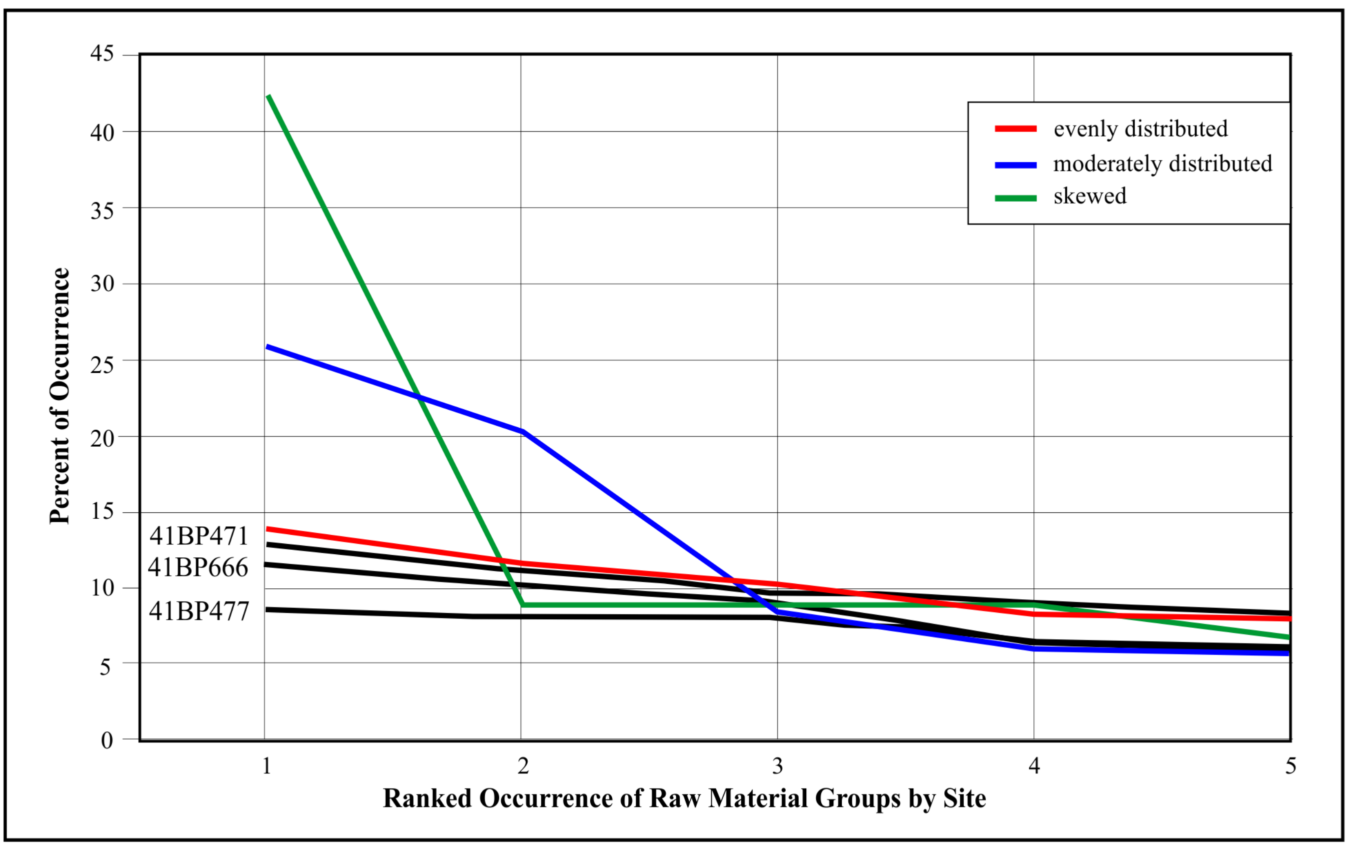

Figure 9-11. The relative frequency of the top five debitage material groups present across the sites tested by CAR. In the currently tested sites, solid black lines have even distributions of material groups.

Table 9-7. Summary of Site-level Content Analysis

Site 41BP…	Chipped Stone Densities	Tool and Core Variety	Burned Rock Densities	Raw Material Variety	Raw Material Sources	Raw Material Evenness
471	low	low	moderate	high	local	even
477	low	low	high	high	local	even
666	low	low	high	high	mixed	even

and cores. The sites have little to contribute to research in those areas. Conversely, burned rock density is moderate to high, as are measures of raw material variety relative to sample size. In addition, all three sites have new raw material patterns, with higher frequencies of local stone than seen previously. This is especially the case with sites 41BP477 and 41BP471. In addition, all three also have an even distribution of raw materials. These patterns suggest that the assemblages have some potential to address concerns of raw material access and use.

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Chapter 10: Additional Lithic Investigations

Raymond Mauldin, Lynn Kim, and Leonard Kemp

Multiple diverse data sets from Camp Swift appear to be consistent with a model of limited or special purpose prehistoric use that occurred late in time. As presented by several researchers (see Bousman et al. 2010; Kemp et al. 2019; Mauldin et al. 2018; Munoz 2012; see also Chapter 2), these data sets include a relatively limited regional resource structure, a low frequency of temporal diagnostics, a limited temporal range, generally small site size, a high frequency of non-local decorticated tool stone, and low intensity of use as measured by densities of chipped stone and burned rock features. Considering this past work, the results from the previous chapter highlight an apparent contradiction between high density of non-feature burned rock and both the low number of burned rock features and the low density of debitage and tools. What accounts for the relatively high burned rock densities from non-feature contexts on these three sites?

Burned Rock

The most common material recovered from the current investigation was burned rock, with 1275 items collected at the three sites. Burned rock, also termed fire-cracked rock, is often a biproduct of the use of stone in thermal features, either in food preparation (Bean and Saubel 1972; Buskirk 1987; Castetter and Opler 1936; Wandsnider 1997) or in heating shelters (see Odgaard 2003). Research in Texas has focused on the use of rock in ovens (Acuña 2006; Black 2003; Black and Thoms 2014; Thoms 2008a; McAuliffe et al. 2022), where rock serves as a heat-sink in earth covered pits, often to cook complex carbohydrates (Dering 2003; Thoms 2008b). Regardless of what is being processed, as features are used and as rock is repeatedly heated and cooled, thermal stress will produce fractures and breaks, increasing rock surface area. This, in turn, results in rapid heat dissipation. To maintain thermal efficiency, new unbroken rock is added to features, and fractured rock is often removed (Black et al. 1997a; Gilby and Plaza 2009; Johnson 2000; Mauldin and Tomka 2010). There should, then, be a relationship between rock size and relative frequency. While the resulting pattern will be complicated by potentially cleaning out of a feature and by fracturing characteristics of different rock types, as a feature is reused, a higher relative frequency of smaller rock should be produced, and multiple size modes should be created as new rock is introduced to replace fractured rock.

Figure 10-1 provides a hypothetical example of this process. The initial distribution (black line, far right) is dominated by larger rock with a single mode. As reuse occurs, and rock fractures, smaller rock increasingly dominate, even if larger, replacement rocks are added. The rock distribution represented by the dashed red line reflects multiple instances of reuse and is dominated by smaller-sized rock (after Thompson et al. 2012:Figure 12-14). These patterns may be further complicated by cleaning out of features, with smaller rock and matrix pushed to the sides or removed.

Figure 10-2 provides a more concrete example from earlier work on Camp Swift. The figure, based on data from Kemp et al. (2019), contrasts a histogram of rock size recovered from a previously tested feature on 41BP865 (right) with a sample of collected unburned rock from multiple areas across Camp Swift (left). This unburned distribution approximates the rock sizes available in the Camp Swift environment. Dominated by quartzite, but containing petrified wood, iron stone, chert, and sandstone, the unburned rock has an average length of 9.28 cm. The Feature 2 burned rock averaged 6.64 cm in length. In addition, only three rocks were more than the mean of the unburned rock sample, and 68% of the Feature 2 rock is below the 7 cm size. While we do not know the original, starting rock sizes for Feature 2, some level of reuse is consistent with the distribution, especially considering the unburned histogram. If reuse continued, even with replacement, the smaller size ranges would dominate the distribution.

Feature and Non-Feature Burned Rock

Using the above discussion, repeated use of features should produce a range of rock sizes, with clusters of larger rock identified as features and other, smaller burned rock, potentially reflecting maintenance activities, present in both feature and non-feature contexts. Feature rock should also have a higher percentage of unbroken cobbles, while non-feature associated rock should be dominated by rock with breaks. As noted in the previous chapters, the burned rock recovered on the current project is frequent and small, and only two features were recorded. Burned rock was found in 64 of the 73 excavated levels (87.7%) on site 41BP471. On 41BP477, burned rock increased to 90.6% (48 out the 53 excavated levels), and on 41BP666 74.6% or 44 of the 59 of the excavated levels contained burned rock.

The average maximum length of all 1275 burned rock is less than 2.5 cm with an average weight of 18.4 g. Quartzite dominates the burned rock, comprising 48% of all stone and accounting for between 41% and 54% of material on individual sites (Table 10-1). Chert, petrified wood, and

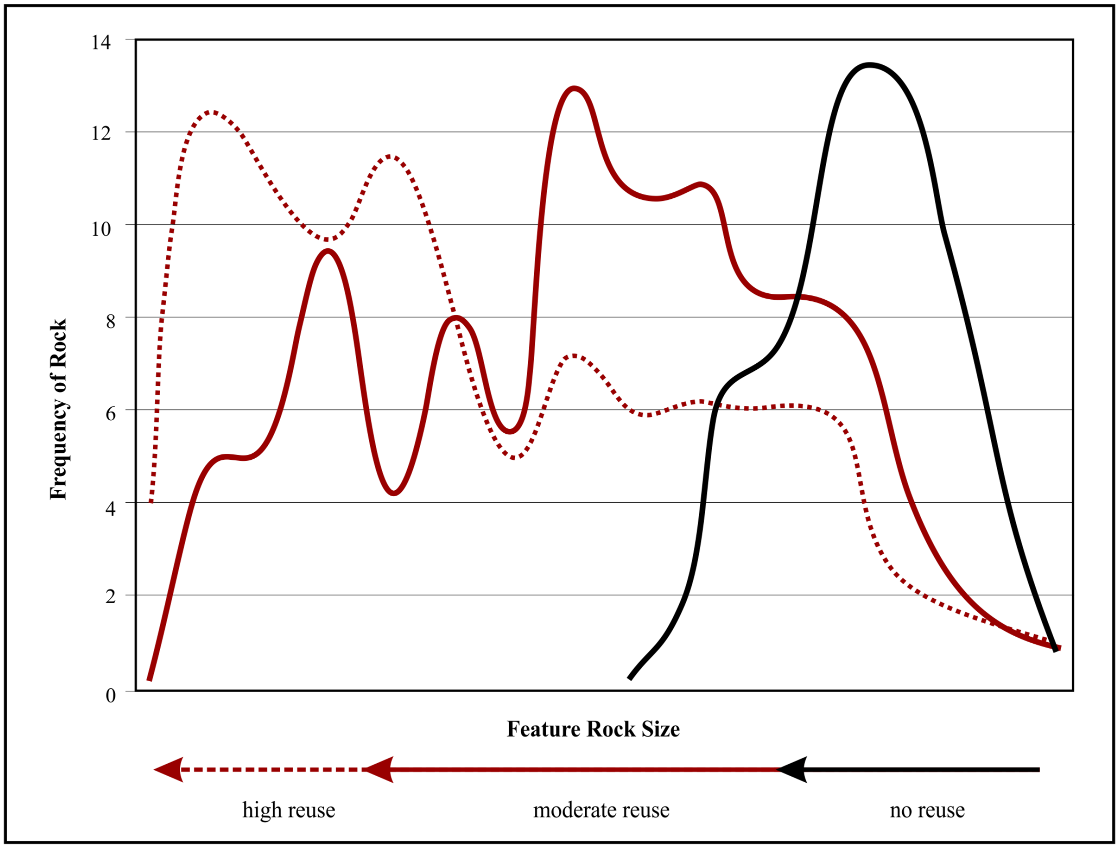

Figure 10-1. The anticipated impacts of rock frequency and size with feature reuse. As reuse frequency increases, breakage, even with replacement, produces a higher proportion of smaller rock (after Thompson et al. 2012:Figure 12-14).

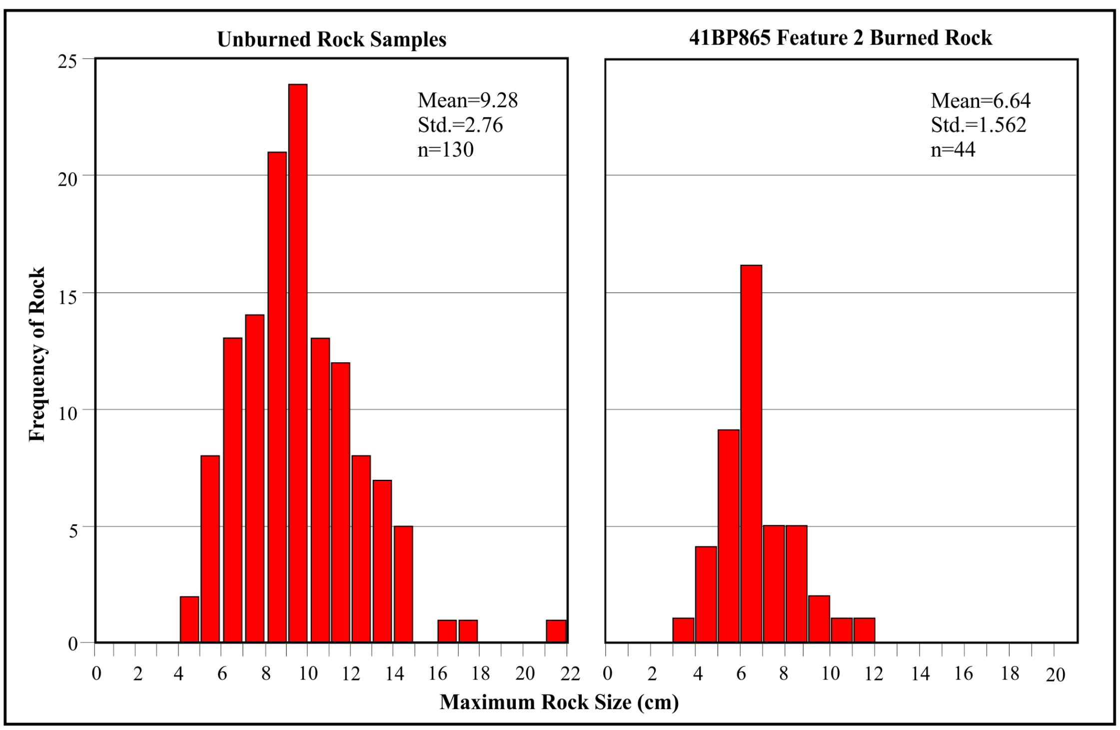

Figure 10-2. On the left is a histogram of unburned rock collected from Camp Swift while the right shows the distribution of rock in Feature 2 on 41BP865 (after Kemp et al. 2019).

Table 10-1. The Distribution of Burned Rock Across the Three Sites

Site	Chert	Other	Petrified Wood	Quartzite	Total
41BP471	41	67	40	155	303
41BP477	121	76	35	269	501
41BP666	154	65	61	191	471
Total	316	208	136	615	1275

small amounts of ironstone, sandstone, and unidentified rock, grouped as "other" in Table 10-1, were also recorded. These materials likely reflect locally available stone, as samples from gravel deposits on terraces, ridges, and along creeks on Camp Swift contain the same range of materials and are dominated by quartzite (see Kemp et al. 2019).

Figure 10-3 presents size distributions for burned rock by site, contrasting non-feature rock for the three sites with the distribution of stone recovered from Feature 1 on 41BP666. The feature from site 41BP477 was partially excavated, with only 6 mapped stones and an additional 5 stones likely associated but recovered from the screen. Given the small sample size, this feature is not considered further in this chapter. Feature 1 on 41BP666 consisted of 78 rocks recovered from Levels 5 through 9 in TU 1, with a total weight of 1.48 kg. There are 1186 items, not associated with features, shown in Figure 10-3. These weigh 11.1 kg.

The feature and non-feature rock size distributions follow the anticipated patterns, with non-feature rock averaging 9.36 g, with a mean length of 2.2 cm. Figure 10-3 shows that 85.7% of these rocks are less than 3.5 cm. in length. In contrast, average rock weight in Feature 1 on 41BP666 is 147.2 g, with an average length of 5.77 cm. Only 9% of this rock is less than 3.5 cm in size. In addition, 1156 pieces of non-feature rock (97%) were identified as broken. Breakage was noted on only 65% of the 78 rocks associated with Feature 1 on 41BP666.

The rock size and breakage patterns on these sites are consistent with a scenario involving significantly higher levels of feature use and site maintenance than suggested simply by the number

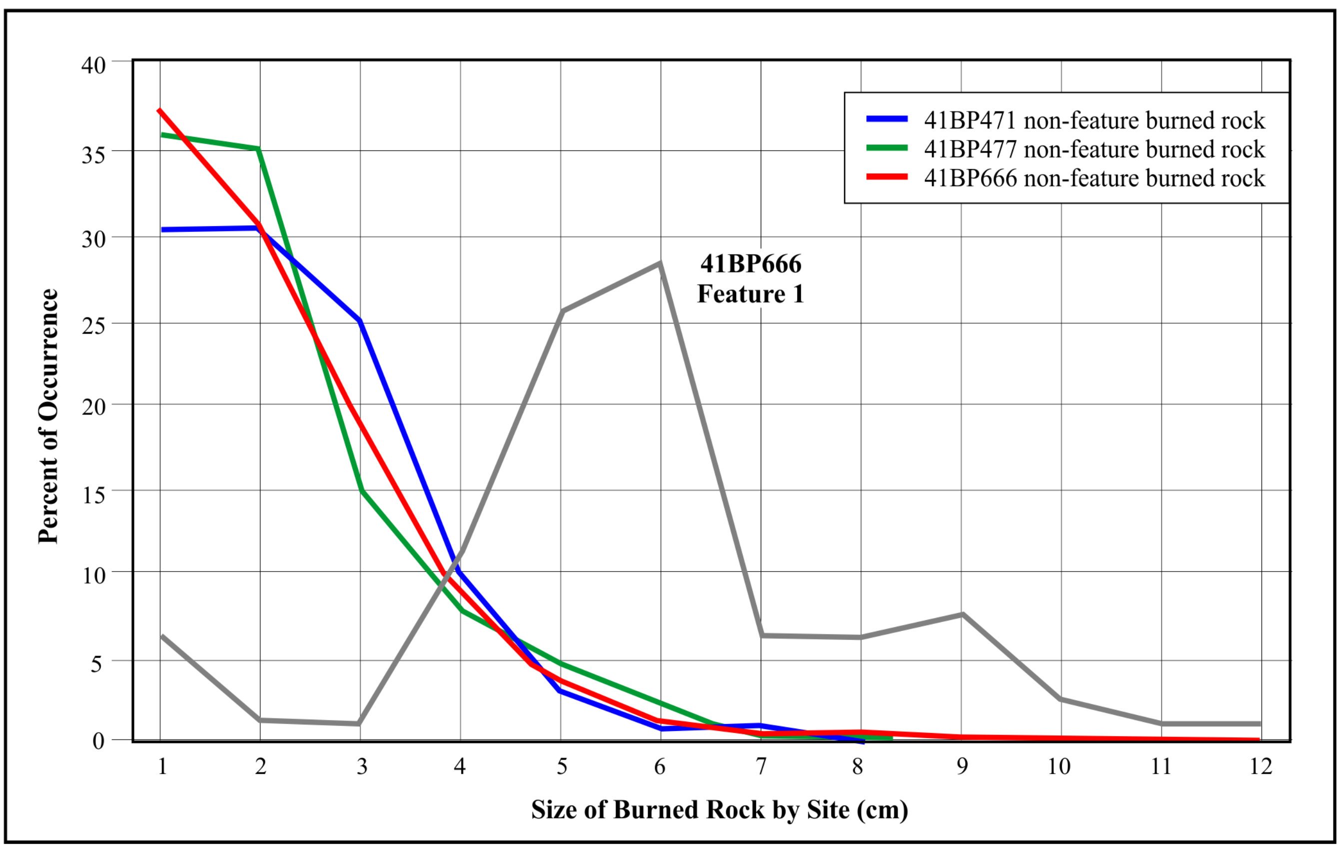

Figure 10-3. Burned rock size distribution. Non-feature rock for 41BP471 (n=303), 41BP477(n=490), and 41BP666 (n=393) is contrasted with rock from Feature 1 on 41BP666 (n=78).

of features. Noticeably higher use intensity at these locations also conflicts with low site and MLD densities focused on chipped stone, and few tools. While it seems unlikely that natural fires, controlled burns, or intentional burns in the past could account for these patterns, Figure 10-4 shows a section of the Camp Swift landscape shortly after an intense wildfire in 2011. Visible in the picture is a high density of cobbles exposed by the fire along one ridge, including quartzite, petrified wood, chert, and other stone. While the unburied portions of stones are frequently discolored, spalling or cracking was not common. However, the inset does show a single quartzite nodule with an associated heat spall, and it is possible that internal fractures in other stones were initiated, making these more likely to fracture in the future. The photo demonstrates that although frequently fast moving, natural fires in the area can impact surface stone on Camp Swift (see also Deal 2012; Oster et al. 2012; Hanson 2019).

However, despite the 10-4 evidence, it seems unlikely that even with repeated fires and significant time depth, the size distribution of stones resulting from this type of fracturing would mimic the consistently small size and spatial distribution seen for non-feature burned rock. Burned rock on these sites approach ubiquity as it was noted in all 14 test units on all three sites. Burned rock was recovered from 156 of the 185 excavation levels (84%) at the sites, including 119 of 129 levels (92%) below the upper turbation zone. While deposits were not screened in either of the off-site test pits excavated for MSS control samples (see Chapter 8), burned rock was not observed in these site adjacent pits. In addition, most debitage (55%) lacked evidence of heating, and potlids and crazing, characteristics of heating in debitage that would be expected from uncontrolled fire exposure, was uncommon. If natural fires were producing or significantly impacting burn rock distributions, we would expect that debitage would be impacted as well. That is not the case.

Additionally, if non-feature burned rock represents feature maintenance, charcoal should also be common in these deposits. Natural burns, as well as controlled burns, will result in a high density of charcoal on a surface, and given the impacts of rodents and roots (see Chapter 8), charcoal should be expected, especially in the upper 30 to 40 cm. Figure 10-5 shows the presence of charcoal samples by level

Figure 10-4. A section of Camp Swift following the 2011 fire. Inset shows a quartzite nodule and associated heat spall in the distribution.

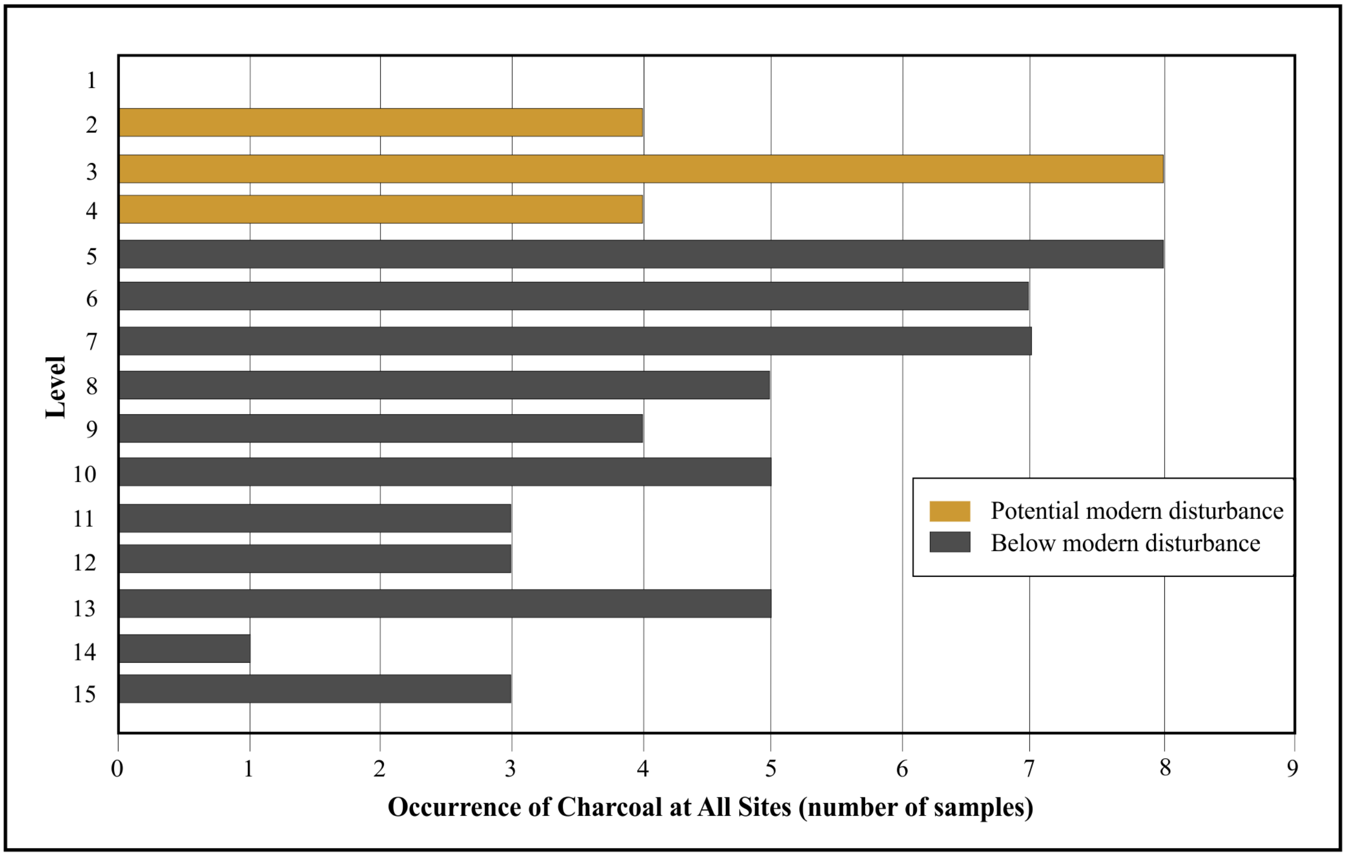

Figure 10-5. Distribution of charcoal samples by level from testing at 41BP471, 41BP477, and 41BP666.

for all three excavations. Discounting the upper, potentially turbated zones, 51 different samples were collected, five of which were dated. As discussed in Chapter 7, all dated to the prehistoric period. Using the median dates for comparison, a Level 7 sample produced a median date of 757 Cal BP, with dates of 782 and 1033 Cal BP from Level 8, a date of 1612 Cal BP from Level 10, and a median date of 1381 Cal BP from Level 13. While only 10% of the 51 samples below the modern disturbance level were dated, the lack of historic or modern dates and the vertical distribution of the dates, lend support to the possibility that charcoal from the lower levels is associated with feature use, as are the non-feature burned rock recovered from the three sites. This, in turn, suggests that additional features are likely present on all three sites. That possibility is supported by previous investigations at 41BP471, 41BP477, and 41BP666 where, based on shovel testing and/or trenching, features were suspected, as summarized at the end of Chapter 6 in Table 6-7 (Lohse and Bousman 2006; Nickels and Lehman 2004; Nickels et al. 2005).

Summary

Multiple diverse data sets from Camp Swift appear to be consistent with a model of limited or special purpose prehistoric use that occurred late in time. As presented by several researchers (see Bousman et al. 2010; Kemp et al. 2019; Mauldin et al. 2018; Munoz 2012; see also Chapter 2), these data sets include a relatively limited regional resource structure, a low frequency of temporal diagnostics, a limited temporal range, generally small site size, a high frequency of non-local decorticated tool stone, and low intensity of use as measured by densities of chipped stone and burned rock features. It also suggests that our previous assumption that chipped stone densities and feature use would be correlated, was, in some cases, unwarranted. Data sets from these three sites suggest the possibility of relatively intense activities that involve repeated feature use, but do not involve intensive chipped stone tool production or refurbishing, may have occurred in some sections of Camp Swift.

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Chapter 11: Summary and Recommendations

Leonard Kemp, Raymond Mauldin, and Lynn Kim

The Center for Archaeological Research (CAR) at The University of Texas at San Antonio (UTSA) conducted fieldwork associated with National Register Eligibility Testing of three prehistoric sites, 41BP471, 41BP477, and 41BP666, located on Camp Swift in Bastrop County, Texas. CAR carried out the work in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966. The archaeological testing was conducted in October and November of 2020. During these investigations, CAR excavated 14 1-x-1 m test units and screened roughly 18.5 m^3 of deposits from the three sites. CAR identified two burned rock features, one at site 41BP477 and another at site 41BP666. CAR collected 429 pieces of chipped stone debitage, a core, and a small number of chipped stone tools (n=5) including bifaces, edge modified flakes, and a projectile point during the current investigation. In addition, CAR collected 1275 pieces of burned rock weighing approximately 23,488 g. Three radiocarbon samples from 41BP471 and two samples from site 41BP477 were submitted to DirectAMS. Previous data reported by Lohse and Bousman (2006), Nickels and Lehman (2004), Nickels et al. (2005), and Robinson et al. (2001) were also used in the determination of the three sites' eligibility to the National Register of Historic Places (NRHP).

Recommendations

CAR's recommendations regarding eligibility for inclusion to the NRHP hinges on sites having significance under criteria d of 36 CFR 60.4. Under this criteria, a site would have significance if it has "integrity of location…setting, materials,…and association" and has yielded, "or may be likely to yield, information important to prehistory…" (NPS 2016). To assist with that determination, CAR focused on three interrelated research domains: the chronological potential of a site discussed in Chapter 7, the integrity of a site, discussed in Chapter 8, and the content of a site, discussed in Chapters 9 and 10. These three criteria were first used in Mauldin et al. (2018) and again in Kemp et al. (2019) to determine NRHP eligibility for eleven Camp Swift sites.

Table 11-1 summarizes the findings of each of these domains, as well as CAR's eligibility recommendation. Highlighted cells identify those elements positively (green) or negatively (orange) to the three criteria, as well as the overall eligibility determination for the site. After reviewing these sections, CAR recommends that the three sites, 41BP471, 41BP477, and 41BP666, should be considered as eligible for listing on the NRHP.

Temporal diagnostics were found on sites 41BP471 and 41BP477, a Nolan and Scallorn projectile point, respectively. The presence of the Nolan point dates to the Middle Archaic period and is only the second Middle Archaic point found on Camp Swift. The Scallorn point found on 41BP477 is typical of the Late Prehistoric occupation found on Camp Swift sites. Five radiocarbon samples collected during this investigation also date sites 41BP471 and 41BP477 to the Late Archaic/

Table 11-1. Summary of Archaeological Sites and NRHP Eligibility Recommendations

Site (41BP…)	Site Size (ha)	Test Units Excavated	Amount Excavated (m^3)	Temporal Diagnostics	Number of Radiocarbon Dates/ Potential	Artifact Patterning	MSS Assessment of Integrity	Number of Tools; Variety of Tool Type	Raw Material Groups-Number and Evenness	Debitage Density (m^3)	Number of Features; Burned Rock Density (m^3)	NRHP Eligibility Recommendation
471	2.56	5	7.26	yes	3, high	moderate	low	6, low	high, even	18.3	1, moderate	eligible
477	0.41	4	5.32	yes	2, high	moderate	moderate	11, low	high, even	26.1	3, high	eligible
666	5.17	5	6.01	no	0, moderate	moderate	moderate	13, low	high, even	26.1	1, high	eligible

Late Prehistoric periods. While no diagnostics were found on site BP666, it has moderate potential for radiocarbon sampling based on the high quantity of charcoal found in test unit levels below the bioturbated levels.

All three sites exhibited signs of bioturbation as is common on Camp Swift sites. However, there appeared to be buried surfaces and integrity at all three sites as determined by artifact patterning that included the distribution of chipped stone/burned rock and the size of chipped stone. The MSS analysis suggests that both 41BP477 and 41BP666 have moderate integrity with multiple units having potential surfaces. On site 41BP471, only one of the four units contained a potential surface with the other units having low integrity due to bioturbation.

The third criteria, that of site content, suggests that sites that have large and diverse number of artifacts are able to address a wider range of research questions. The three tested sites in this study all fall within the lower range of previously analyzed sites for the number and variety of tools, as well as the density of chipped stone. However, two data sets, that of higher burned rock densities and raw material described as moderate to high, coupled with the even distribution of raw materials suggest that these sites can potentially address research questions involving raw material access and use. The final sub criteria suggests that there are possibly a greater number of features (n=5) than indicated by this and past investigations of the three sites. In Chapter 10, CAR reported on the large number of and percentage by site of burned rock at the three sites. The quantity of burned rock, as well as the small size of rock coupled with the ubiquity of charcoal may suggest greater intensity of use at these sites than suggested by chipped stone production and/or refurbishing. This scenario may be a future avenue of research.

In CAR's view, all three sites meet and surpass the minimum criteria that warrant their eligibility to the NRHP to address research questions pertinent to the prehistory of the region. If the TMD, the consulted tribal nations, and the THC support these recommendations, then these three sites should be considered in any future development or activities that have the potential to cause primary or secondary impacts to the archaeological material. The sites should be avoided if possible and if avoidance is not possible, then additional excavation may be warranted.

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Appendix A: Radiocarbon Dates Used in Chapter 4

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Shoppa Site	41BP191	TX-4953	1690	80	Bement 1984
Shoppa Site	41BP191	TX-4980	900	220	Bement 1984
Bull Pen	41BP280	Beta-19972	1900	80	Ensor and Mueller-Wille 1988
Bull Pen	41BP280	Beta-19974	2225	85	Ensor and Mueller-Wille 1988
Bull Pen	41BP280	Beta-19973	770	70	Ensor and Mueller-Wille 1988
None	41BP392	Beta-183895	870	40	Nickels 2008
	41BP471	D-AMS 041424	1514	21	This Report
	41BP471	D-AMS 041423	861	21	This Report
	41BP471	D-AMS 041425	894	21	This Report
	41BP477	D-AMS 041426	1727	27	This Report
	41BP477	D-AMS 041427	1150	21	This Report
None	41BP485	Beta-183896	2430	40	Nickels 2008
None	41BP485	Beta-183897	490	40	Nickels 2008
None	41BP487	D-AMS 019862	1515	36	Mauldin et al. 2018
None	41BP487	D-AMS 019863	1131	29	Mauldin et al. 2018
None	41BP488	Beta-183900	640	40	Nickels 2008
None	41BP488	Beta-183899	740	40	Nickels 2008
None	41BP488	Beta-183898	910	40	Nickels 2008
None	41BP495	Beta-189904	1620	40	Nickels 2008
None	41BP495	Beta-183902	640	40	Nickels 2008
None	41BP495	Beta-183901	910	40	Nickels 2008
None	41BP495	Beta-183903	930	40	Nickels 2008
None	41BP505	Beta-183904	1840	40	Nickels 2008
None	41BP521	Beta-183905	1180	40	Nickels 2008
None	41BP529	Beta-183906	5980	40	Nickels 2008
None	41BP595	Beta-351135	1500	30	Sherman et al. 2015
None	41BP595	Beta-351137	1590	30	Sherman et al. 2015
None	41BP595	Beta-361626	1950	30	Sherman et al. 2015
None	41BP595	Beta-361629	1950	30	Sherman et al. 2015
None	41BP595	Beta-351136	2570	30	Sherman et al. 2015
None	41BP595	Beta-361628	2780	40	Sherman et al. 2015
None	41BP595	Beta-361627	850	30	Sherman et al. 2015
None	41BP595	Beta-351134	1020	30	Sherman et al. 2015
McKinney Roughs	41BP627	Beta-195850	1220	40	Carpenter et al. 2006
McKinney Roughs	41BP627	Beta-195849	1840	40	Carpenter et al. 2006
McKinney Roughs	41BP627	Beta-169225	2080	40	Carpenter et al. 2006
McKinney Roughs	41BP627	Beta-195848	720	40	Carpenter et al. 2006
McKinney Roughs	41BP627	Beta-195847	940	70	Carpenter et al. 2006

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
McKinney Roughs	41BP627	Beta-169225	850	110	Carpenter et al. 2006
None	41BP66	TX5284	1670	70	Robinson 1987
None	41BP66	TX5285	1160	340	Robinson 1987
None	41BP66	TX5283	640	50	Robinson 1987
None	41BP802	Beta-362162	1100	30	Mauldin et al. 2018
None	41BP859	D-AMS 026723	870	22	Kemp et al. 2019
None	41BP865	D-AMS 026724	366	21	Kemp et al. 2019
None	41BP865	D-AMS 026726	618	23	Kemp et al. 2019
None	41BP865	D-AMS 026725	984	23	Kemp et al. 2019
None	41FY252	Beta-11092	1250	80	Nightengale and Turpin 1985
Barton site	41HY202	Beta 34221	1450	80	Ricklis and Collins 1994
Barton site	41HY202	GX-15542 G-AMS	1832	71	Ricklis and Collins 1994
Barton site	41HY202	GX-15539 G-AMS	1903	96	Ricklis and Collins 1994
Barton site	41HY202	GX-15541 G-AMS	2011	86	Ricklis and Collins 1994
Barton site	41HY202	GX-15540 G-AMS	2196	95	Ricklis and Collins 1994
Barton site	41HY202	GX-15538 G-AMS	990	210	Ricklis and Collins 1994
Barton site	41HY202	Beta 34220	290	60	Ricklis and Collins 1994
Barton site	41HY202	Beta 37275	10	60	Ricklis and Collins 1994
Barton site	41HY202	Beta 34222	150	70	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37277	270	70	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15753-G	305	115	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37284	310	50	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15752-G	310	70	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15758-G-AMS	312	74	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15754-A	375	115	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37287	380	50	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15755 G-AMS	383	70	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15752-A	415	120	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37285	630	70	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37281	640	80	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-15756-G-AMS	645	89	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37276	650	70	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37286	660	50	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37280	790	50	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37279	900	50	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37282	1070	50	Ricklis and Collins 1994
Mustang Branch	41HY209	GX-17575-G-AMS	1097	70	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37283	1400	140	Ricklis and Collins 1994
Mustang Branch	41HY209	Beta 37278	2080	80	Ricklis and Collins 1994
None	41LE120	Beta-98766	1550	40	Rogers. 1997
None	41LE120	Beta-98774	1540	50	Rogers. 1997

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
None	41LE120	Beta-98768	1930	60	Rogers. 1997
None	41LE120	Beta-98767	2870	40	Rogers. 1997
None	41LE120	Beta-98772	1130	50	Rogers. 1997
None	41LE120	Beta-98771	1080	60	Rogers. 1997
None	41LE120	Beta-98769	1160	50	Rogers. 1997
None	41LE120	Beta-98770	1210	60	Rogers. 1997
None	41LE120	Beta-98773	840	60	Rogers. 1997
None	41LE120	Beta-98765	990	40	Rogers. 1997
None	41LE177	Beta-139275	250	70	Ricklis and Frederick 2001
Walleye Creek	41LE57	Beta-96208	1540	40	Rogers et al. 1999
Walleye Creek	41LE57	Beta-96210	1570	60	Rogers et al. 1999
Walleye Creek	41LE57	Beta-116308	1660	50	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97290	1710	40	Rogers et al. 1999
Walleye Creek	41LE57	Beta-96211	1750	60	Rogers et al. 1999
Walleye Creek	41LE57	Beta-99450	1780	60	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97291	2070	40	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97007	2250	60	Rogers et al. 1999
Walleye Creek	41LE57	Beta-116307	1020	50	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97289	700	40	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97009	720	60	Rogers et al. 1999
Walleye Creek	41LE57	Beta-96209	740	50	Rogers et al. 1999
Walleye Creek	41LE57	Beta-97008	860	60	Rogers et al. 1999
Chesser Site	41LE59	Beta-80619	1540	50	Rogers and Kotter 1995
Chesser Site	41LE59	Beta-80616	1540	60	Rogers and Kotter 1995
Chesser Site	41LE59	Beta-80617	1690	60	Rogers and Kotter 1995
Chesser Site	41LE59	Beta-80615	1770	60	Rogers and Kotter 1995
Chesser Site	41LE59	Beta-80614	1050	50	Rogers and Kotter 1995
Chesser Site	41LE59	Beta-80618	1210	50	Rogers and Kotter 1995
None	41MM328	Beta 324468	3310	30	Quigg et al. 2014
Vara Daniel	41TV1364	Beta-180680	1810	40	Nash et al. 2008
Vara Daniel	41TV1364	Beta-190804	2020	40	Nash et al. 2008
Vara Daniel	41TV1364	TX7572	4760	90	Takac et al. 1992
Millican Bench	41TV163	UGA-12303	1520	40	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12307	1590	40	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12304	1610	100	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12302	1270	40	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12305	580	40	Mauldin et al. 2004
Millican Bench	41TV163	TX-1511	500	80	Valastro et al. 1977
Millican Bench	41TV163	UGA-12306	20	40	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12308	60	40	Mauldin et al. 2004
Millican Bench	41TV163	UGA-12301	2840	110	Mauldin et al. 2004

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Millican Bench	41TV163	UGA-12300	3050	80	Mauldin et al. 2004
None	41TV1667	Beta-172805	3500	40	Jones et al. 2003
None	41TV2125	UGAMS-5044	8250	30	Figueroa et al. 2011
None	41TV2125	UGAMS-5045	8290	30	Figueroa et al. 2011
None	41TV2125	UGA-?, Sample 45	7606	66	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 42	7736	70	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 49	7854	56	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 43	7878	68	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 67	7904	68	Karbula et al. 2011
None	41TV2125	Beta-?, Sample 65	7910	40	Karbula et al. 2011
None	41TV2125	Beta-?, Sample 48	7910	40	Karbula et al. 2011
None	41TV2125	Beta-?, Sample 45	7920	40	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 68	7925	64	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 59	7955	64	Karbula et al. 2011
None	41TV2125	Beta-?, Sample 49	8010	40	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 65	8026	68	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 47	8026	63	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 60	8065	79	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 48	8066	57	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 66	8103	66	Karbula et al. 2011
None	41TV2125	UGA-?, Sample 5	8291	66	Karbula et al. 2011
Big Hole	41TV2161	Beta-398653	5320	50	Quigg et al. 2016
Big Hole	41TV2161	Beta-398638	5340	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398655	5340	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398656	5340	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398643	5370	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398657	5370	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398639	5390	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398651	5410	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-216375	5440	40	Quigg et al. 2016
Big Hole	41TV2161	Beta-398640	5450	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398650	5510	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398652	5260	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398642	5280	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-398646	5280	30	Quigg et al. 2016
Big Hole	41TV2161	Beta-216376	5290	40	Quigg et al. 2016
Big Hole	41TV2161	Beta-398648	5290	30	Quigg et al. 2016
None	41TV2162	Beta-220552	5540	50	Karbula and Campbell 2008
None	41TV2162	Beta-220555	5690	70	Karbula and Campbell 2008
None	41TV2162	Beta-216656	5700	60	Karbula and Campbell 2008
None	41TV2265	Beta-229557	730	40	Brownlow et al. 2007

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
None	41TV2265	Beta-229553	940	40	Brownlow et al. 2007
None	41TV383	Beta-?	2140	110	McCormick and Alderson 1983
None	41TV410	Beta-216439	2180	40	Figueroa et al. 2011
None	41TV410	Beta-216436	2220	40	Figueroa et al. 2011
None	41TV410	Beta-209895	4660	40	Figueroa et al. 2011
None	41TV410	Beta-216438	4700	40	Figueroa et al. 2011
None	41TV410	Beta-216434	4760	40	Figueroa et al. 2011
None	41TV410	Beta-216440	4820	40	Figueroa et al. 2011
None	41TV410	Beta-216435	4830	40	Figueroa et al. 2011
None	41TV410	Beta-216441	5170	40	Figueroa et al. 2011
None	41TV42	TX-504	200	70	Valastro and Davis 1970a
None	41TV42	TX-22	210	70	Tamers et al. 1964
None	41TV42	TX-510	220	70	Valastro and Davis 1970a
None	41TV42	TX-21	240	140	Tamers et al. 1964
None	41TV42	TX-509	240	70	Valastro and Davis 1970a
None	41TV42	TX-505	370	70	Valastro and Davis 1970a
None	41TV42	TX-514	450	70	Valastro and Davis 1970a
None	41TV42	TX-508	490	80	Valastro and Davis 1970a
None	41TV42	TX-25	540	140	Tamers et al. 1964
None	41TV42	TX-24	585	85	Tamers et al. 1964
None	41TV42	TX-513	680	80	Valastro and Davis 1970a
None	41TV42	TX-23	705	115	Tamers et al. 1964
None	41TV42	TX-26	705	95	Tamers et al. 1964
None	41TV42	TX-516	740	80	Valastro and Davis 1970a
None	41TV42	TX-507	800	50	Valastro and Davis 1970a
None	41TV42	TX-518	830	70	Valastro and Davis 1970a
None	41TV42	TX-511	930	80	Valastro and Davis 1970a
None	41TV42	TX-512	930	60	Valastro and Davis 1970a
None	41TV42	TX-506	940	80	Valastro and Davis 1970a
None	41TV42	TX-515	1120	80	Valastro and Davis 1970a
None	41TV42	TX-28	1165	120	Tamers et al. 1964
None	41TV42	TX-27	1180	210	Tamers et al. 1964
Toyah Bluff	41TV441	Beta-130036	190	40	Karbula et al. 2001
Toyah Bluff	41TV441	Beta-131111	520	60	Karbula et al. 2001
Toyah Bluff	41TV441	Beta-131109	710	50	Karbula et al. 2001
Toyah Bluff	41TV441	Beta-131108	800	60	Karbula et al. 2001
Toyah Bluff	41TV441	Beta-131110	800	50	Karbula et al. 2001
None	41TV461	TX-3871	1370	60	Valastro et al. 1988
None	41TV540	Beta-212809	5240	40	Figueroa et al. 2011
None	41TV540	Beta-212810	5300	40	Figueroa et al. 2011
None	41TV540	Beta-209897	5310	40	Figueroa et al. 2011

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
None	41TV540	Beta-209899	5310	40	Figueroa et al. 2011
None	41TV540	Beta-212816	5310	40	Figueroa et al. 2011
None	41TV540	Beta-212808	5320	40	Figueroa et al. 2011
None	41TV540	Beta-212815	5320	40	Figueroa et al. 2011
None	41TV540	Beta-216442	5320	40	Figueroa et al. 2011
None	41TV540	Beta-209898	5350	40	Figueroa et al. 2011
None	41TV540	Beta-209896	5400	40	Figueroa et al. 2011
None	41TV742	TX-5292	1660	230	Coffman et al. 1986
None	41TV742	TX-5289	970	70	Coffman et al. 1986
None	41TV742	TX-5290	750	70	Coffman et al. 1986
None	41TV742	TX-5291	800	80	Coffman et al. 1986
None	41TV742	TX-5288	900	70	Coffman et al. 1986
None	41TV87	TX-74	1040	120	Tamers et al. 1964
None	41TV87	TX-73	3480	1060	Tamers et al. 1964
Shepherd Site	41WM1010	Beta-176584	500	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-176583	710	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-168468	800	60	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175167	890	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-176585	950	50	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-169079	960	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175168	1010	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175156	1030	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175166	1080	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175161	1110	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175165	1130	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175172	1130	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-168245	1160	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175155	1190	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175164	1190	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-169081	1240	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175160	1250	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175157	1260	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175169	1260	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175154	1270	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175174	1280	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-169240	1300	40	Dixon and Rogers 2006
hepherd Site	41WM1010	Beta-169242	1300	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-169241	1310	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175159	1310	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175162	1330	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175158	1360	40	Dixon and Rogers 2006

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Shepherd Site	41WM1010	Beta-176582	1370	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175630	1510	60	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-169267	1650	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-168147	1720	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175176	1730	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175171	1760	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175163	2020	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175170	2060	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	Beta-175173	2170	40	Dixon and Rogers 2006
Shepherd Site	41WM1010	UGA-13047	2380	40	Karbula, et al. 2004
None	41WM1012	Beta-196131	30	40	Rogers et al. 2008
None	41WM1012	Beta-182331	130	40	Rogers et al. 2008
None	41WM1012	Beta-196130	130	40	Rogers et al. 2008
None	41WM1012	Beta-196129	150	40	Rogers et al. 2008
None	41WM1012	Beta-196128	160	40	Rogers et al. 2008
None	41WM1012	Beta-196132	170	40	Rogers et al. 2008
None	41WM1012	Beta-196133	190	40	Rogers et al. 2008
None	41WM1012	Beta-182180	200	40	Rogers et al. 2008
None	41WM1012	Beta-178619	220	30	Rogers et al. 2008
None	41WM1012	Beta-182330	270	40	Rogers et al. 2008
Pecan Branch	41WM1063	Beta-245519	440	40	Bradle et al. 2008
Siren Site	41WM1126	Beta-299325	6040	40	Carpenter and Miller 2013
Siren Site	41WM1126	Beta-250553	1730	40	Carpenter and Miller 2013
Siren Site	41WM1126	Beta-250557	1260	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215913	1550	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-299315	1750	30	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250580	1800	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250569	1810	50	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250558	1890	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250559	1900	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-299317	1930	30	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250556	1970	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250565	1970	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207244	2000	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207245	2000	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207246	2000	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-299314	2050	30	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-299316	2080	30	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215919	2090	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250561	2180	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250575	2180	40	Carpenter and Houk 2012

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Siren Site	41WM1126	Beta-215917	2190	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250577	2230	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250578	2230	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250573	2260	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250563	2270	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250571	2310	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250564	2330	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-299318	2400	30	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215918	2430	50	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215916	2460	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250567	2470	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207241	2480	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250572	2480	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250568	2490	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207243	2510	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250579	2530	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207242	2550	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207240	2560	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215920	2590	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250562	2590	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250570	2600	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250574	2610	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250560	1090	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207239	1150	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250554	1130	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215914	1170	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-250555	1190	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-215915	980	40	Carpenter and Houk 2012
Siren Site	41WM1126	Beta-207247	990	40	Carpenter and Houk 2012
None	41WM118	TX-806	770	70	Valastro and Davis 1970b
None	41WM118	TX-804	1350	70	Valastro and Davis 1970b
None	41WM130	TX-2730	700	60	Bond 1978
None	41WM130	TX-2729	800	70	Bond 1978
None	41WM130	TX-2868	1360	640	Bond 1978
None	41WM130	TX-2731	1740	100	Bond 1978
None	41WM133	TX-805	6900	110	Valastro and Davis 1970b
None	41WM133	TX-802	7000	160	Valastro and Davis 1970b
None	41WM133	TX-2675	8500	130	Valastro et al. 1978
Merrell Site	41WM2	Beta-149122	8660	40	Rogers 2000
Loeve-Fox Site	41WM230	TX-1765	850	100	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1925	870	60	Prewitt 1974

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Loeve-Fox Site	41WM230	TX-1923	940	60	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1764	1080	60	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1926	1300	60	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1767	1480	170	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1927	1480	80	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1766	1600	110	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1922	1670	100	Prewitt 1974
Loeve-Fox Site	41WM230	TX-1924	2100	880	Prewitt 1974
Wilson-Leonard	41WM235	TX-4798	7470	230	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13840	7870	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13841	7890	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13844	7890	80	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-08355	7990	60	Collins et al. 1998
Wilson-Leonard	41WM235	Beta-79698	1990	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-18639	1990	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13025	3440	80	Collins et al. 1998
Wilson-Leonard	41WM235	Beta-81106	3780	70	Collins et al. 1998
Wilson-Leonard	41WM235	ETH-14115	3780	70	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10196	4440	60	Collins et al. 1998
Wilson-Leonard	41WM235	Beta-79803	4880	70	Collins et al. 1998
Wilson-Leonard	41WM235	TX-4784a	8820	120	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10207	8830	90	Collins et al. 1998
Wilson-Leonard	41WM235	TX-4784c	8860	150	Collins et al. 1998
Wilson-Leonard	41WM235	TX-4784b	8940	100	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-18640	9340	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-07560	9650	80	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13842	9750	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10195	9990	70	Collins et al. 1998
Wilson-Leonard	41WM235	AA-171	13000	3000	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-18375	8250	80	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10206	8420	200	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13512	8010	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13513	8030	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10201	8080	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13514	8080	70	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-07207	8090	70	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10194	8110	70	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-10197	8130	60	Collins et al. 1998
Wilson-Leonard	41WM235	CAMS-13509	8130	70	Collins et al. 1998
None	41WM258	UGA-2477	510	80	Hays 1982
Cervenka Site	41WM267	R1-1087	4907	267	Hays 1982

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
Cervenka Site	41WM267	R1-1086	4970	436	Hays 1982
Cervenka Site	41WM267	TX-3684	5738	139	Hays 1982
Cervenka Site	41WM267	UCIAMS-129248	5135	20	Lohse et al. 2014
Rowe Valley	41WM437	D-AMS 5608	189	25	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5611	215	28	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5612	246	23	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5614	257	24	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5613	285	24	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5610	287	24	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5609	340	23	Rush et al. 2015
Rowe Valley	41WM437	D-AMS 5615	363	24	Rush et al. 2015
None	41WM53	TX-2539	1620	70	Valastro et al. 1978
None	41WM53	UGA-2484	1238	158	Black et al. 1997b
None	41WM620	Beta-?	30	40	Keetley et al. 1999
None	41WM620	Beta-?	150	50	Keetley et al. 1999
None	41WM620	Beta-?	190	50	Keetley et al. 1999
None	41WM632	Beta-?	1730	60	Keetley et al. 1999
None	41WM632	Beta-?	590	60	Keetley et al. 1999
None	41WM632	Beta-?	670	60	Keetley et al. 1999
None	41WM632	Beta-?	710	60	Keetley et al. 1999
None	41WM632	Beta-?	950	50	Keetley et al. 1999
None	41WM650	Beta-190221	1180	40	Brownlow et al. 2004
None	41WM650	Beta-190223	1020	40	Brownlow et al. 2004
None	41WM650	Beta-190222	1000	40	Brownlow et al. 2004
None	41WM815	Beta-135978	2240	50	Brownlow et al. 2004
None	41WM815	Beta-135974	2260	40	Brownlow et al. 2004
None	41WM815	Beta-135976	2320	40	Brownlow et al. 2004
None	41WM815	Beta-135975	2330	40	Brownlow et al. 2004
None	41WM815	Beta-135977	2330	40	Brownlow et al. 2004
None	41WM815	Beta-135985	2330	40	Brownlow et al. 2004
None	41WM815	Beta-135980	2340	40	Brownlow et al. 2004
None	41WM815	Beta-135983	2370	50	Brownlow et al. 2004
None	41WM815	Beta-135972	2410	40	Brownlow et al. 2004
None	41WM815	Beta-135973	2420	40	Brownlow et al. 2004
None	41WM815	Beta-135981	2430	80	Brownlow et al. 2004
None	41WM815	Beta-135982	2450	40	Brownlow et al. 2004
None	41WM815	Beta-135969	2530	40	Brownlow et al. 2004
None	41WM815	Beta-135970	2530	40	Brownlow et al. 2004
None	41WM815	Beta-135971	2530	40	Brownlow et al. 2004
None	41WM815	Beta-135979	2540	50	Brownlow et al. 2004
None	41WM828	Beta-160704	1710	40	Karbula 2004

Site Name	Trinomial	Assay Number	Radiocarbon Date	Std. Dev.	Reference
None	41WM828	Beta-160702	2420	60	Karbula 2004
None	41WM828	Beta-160703	2490	40	Karbula 2004
None	41WM828	Beta-160701	2520	50	Karbula 2004
None	41WM989	Beta-165020-Bt	1840	40	Karbula et al. 2007
None	41WM989	Beta-197217	2050	40	Karbula et al. 2007
None	41WM989	Beta-197201	2150	40	Karbula et al. 2007
None	41WM989	Beta-165021-A	1200	40	Karbula et al. 2007
None	41WM989	Beta-165019-A/Bt	650	40	Karbula et al. 2007
None	41WM989	Beta-165023	280	40	Karbula et al. 2007
None	41WM989	Beta-165024	310	40	Karbula et al. 2007
None	41WM989	Beta-165025	360	40	Karbula et al. 2007
None	41WM989	Beta-197200	2450	40	Karbula et al. 2007
None	41WM989	Beta-197199	2470	40	Karbula et al. 2007
None	41WM989	Beta-197203	2660	40	Karbula et al. 2007
None	41WM989	Beta-165022	3300	40	Karbula et al. 2007

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Appendix B: MSS Sampling Information and Data Used in Chapter 8

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP471	1	1	10.76	12.1	12.6	12.35	7.66	0.161227
41BP471	1	2	7.83	9.3	9.3	9.3	4.73	0.196617
41BP471	1	3	10.55	12	13	12.5	7.45	0.167785
41BP471	1	4	14.43	16	15.9	15.95	11.33	0.140777
41BP471	1	5	9.46	10.4	10.3	10.35	6.36	0.162736
41BP471	1	6	11.55	13.2	13.4	13.3	8.45	0.157396
41BP471	1	7	12.51	14.9	13.9	14.4	9.41	0.153029
41BP471	1	8	12.58	14	14	14	9.48	0.147679
41BP471	1	9	13.18	13.4	13.6	13.5	10.08	0.133929
41BP471	1	10	12.36	14.7	14.1	14.4	9.26	0.155508
41BP471	1	11	10.69	12.5	12.5	12.5	7.59	0.16469
41BP471	1	12	10.7	12.1	12.1	12.1	7.6	0.159211
41BP471	1	13	12.76	13.2	14	13.6	9.66	0.140787
41BP471	1	14	11.07	12.6	12.5	12.55	7.97	0.157465
41BP471	1	15	8.11	9.7	9.4	9.55	5.01	0.190619
41BP471	1	16	11.75	13.4	13.5	13.45	8.65	0.155491
41BP471	1	17	10.12	12.1	11.7	11.9	7.02	0.169516
41BP471	1	18	7.81	8.4	8.4	8.4	4.71	0.178344
41BP471	1	19	8.24	9.1	9.3	9.2	5.14	0.178988
41BP471	1	20	13.55	15.1	15.4	15.25	10.45	0.145933
41BP471	1	21	9.8	11.4	11.4	11.4	6.7	0.170149
41BP471	1	22	8.21	8.7	8.8	8.75	5.11	0.171233
41BP471	1	23	11.49	12.3	12.1	12.2	8.39	0.145411
41BP471	1	24	14.53	14.7	15	14.85	11.43	0.129921
41BP471	1	25	13.18	13.1	13.4	13.25	10.08	0.131448
41BP471	1	26	8.99	9.4	9.5	9.45	5.89	0.160441
41BP471	1	27	13.95	15.6	15.9	15.75	10.85	0.145161
41BP471	1	28	12.77	13.7	13.7	13.7	9.67	0.141675
41BP471	1	29	11.87	12.9	13.5	13.2	8.77	0.150513
41BP471	1	30	8.53	8.7	9	8.85	5.43	0.162983
41BP471	2	1	13.62	15	14.3	14.65	10.52	0.139259
41BP471	2	2	9.86	12.5	12.4	12.45	6.76	0.184172
41BP471	2	3	13.01	16.3	16.3	16.3	9.91	0.16448
41BP471	2	4	10.94	12.4	12.3	12.35	7.84	0.157526
41BP471	2	5	10.47	10.1	10.7	10.4	7.37	0.141113
41BP471	2	6	5.97	6.2	6.5	6.35	2.87	0.221254
41BP471	2	7	8.26	9.7	8.9	9.3	5.16	0.180233
41BP471	2	8	14.82	15.7	15.9	15.8	11.72	0.134812
41BP471	2	9	8.05	8.8	8	8.4	4.95	0.169697

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP471	2	10	12.02	11.7	11.7	11.7	8.92	0.131166
41BP471	2	11	16.72	14.8	14.7	14.75	13.62	0.108297
41BP471	2	12	15.93	14.7	14.9	14.8	12.83	0.115355
41BP471	2	13	15.47	13.4	12.5	12.95	12.37	0.104689
41BP471	2	14	14.4	13.6	13.8	13.7	11.3	0.121239
41BP471	2	15	11.51	10.5	10.3	10.4	8.41	0.123662
41BP471	2	16	14.38	13.1	13.1	13.1	11.28	0.116135
41BP471	2	17	14.17	13.1	13.1	13.1	11.07	0.118338
41BP471	2	18	14.96	13.3	13.2	13.25	11.86	0.11172
41BP471	2	19	15.84	15.5	15	15.25	12.74	0.119702
41BP471	2	20	14.18	13.4	13.3	13.35	11.08	0.120487
41BP471	2	21	10.92	10.2	10	10.1	7.82	0.129156
41BP471	2	22	9.45	9	8.8	8.9	6.35	0.140157
41BP471	2	23	14.52	13.3	13.4	13.35	11.42	0.1169
41BP471	2	24	10.43	8.8	8.9	8.85	7.33	0.120737
41BP471	2	25	10.37	9.2	9.2	9.2	7.27	0.126547
41BP471	2	26	14.22	11.8	12.1	11.95	11.12	0.107464
41BP471	2	27	14.78	13.6	13.5	13.55	11.68	0.11601
41BP471	2	28	9.49	8.8	8.8	8.8	6.39	0.137715
41BP471	2	29	14.38	12.2	12.3	12.25	11.28	0.108599
41BP471	2	30	13.72	13	12.6	12.8	10.62	0.120527
41BP471	3	1	15.9	13	13	13	12.8	0.101563
41BP471	3	2	6.97	7.1	7	7.05	3.87	0.182171
41BP471	3	3	10.21	10.7	10.1	10.4	7.11	0.146273
41BP471	3	4	5.32	6.2	6.1	6.15	2.22	0.277027
41BP471	3	5	7.78	7.7	8.2	7.95	4.68	0.169872
41BP471	3	6	11.49	12.7	13	12.85	8.39	0.153159
41BP471	3	7	6.4	6.9	7	6.95	3.3	0.210606
41BP471	3	8	9.28	9.7	10	9.85	6.18	0.159385
41BP471	3	9	5.79	5.6	6.3	5.95	2.69	0.22119
41BP471	3	10	10.15	9.5	9.7	9.6	7.05	0.13617
41BP471	3	11	7.69	7.6	7.9	7.75	4.59	0.168845
41BP471	3	12	14.94	15.7	15.7	15.7	11.84	0.132601
41BP471	3	13	15.76	13.9	14.4	14.15	12.66	0.111769
41BP471	3	14	14.58	12.9	13.6	13.25	11.48	0.115418
41BP471	3	15	8.94	8.3	8.9	8.6	5.84	0.14726
41BP471	3	16	6.32	6.3	6.4	6.35	3.22	0.197205
41BP471	3	17	14.76	13.6	13.7	13.65	11.66	0.117067
41BP471	3	18	6.23	6.2	6.3	6.25	3.13	0.199681
41BP471	3	19	12.4	12.3	12.3	12.3	9.3	0.132258
41BP471	3	20	15.51	15.6	15.5	15.55	12.41	0.125302
41BP471	3	21	14.25	15.1	15.5	15.3	11.15	0.13722

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP471	3	22	8.9	9.9	9.8	9.85	5.8	0.169828
41BP471	3	23	11.84	11.4	11.8	11.6	8.74	0.132723
41BP471	3	24	6.89	7	7.3	7.15	3.79	0.188654
41BP471	3	25	12.78	13.3	13.8	13.55	9.68	0.139979
41BP471	3	26	11.69	11.9	12.2	12.05	8.59	0.140279
41BP471	3	27	9.57	9.5	10.3	9.9	6.47	0.153014
41BP471	3	28	7	7	7.4	7.2	3.9	0.184615
41BP471	3	29	15.08	17	17.3	17.15	11.98	0.143155
41BP471	3	30	11.09	12.6	12.8	12.7	7.99	0.158949
41BP471	4	1	7.69	12	11.8	11.9	4.6	0.258696
41BP471	4	2	16.48	24.9	25.1	25	13.39	0.186706
41BP471	4	3	16.67	24	23.9	23.95	13.58	0.176362
41BP471	4	4	10.22	16.9	17.2	17.05	7.13	0.23913
41BP471	4	5	15.1	24.1	23.8	23.95	12.01	0.199417
41BP471	4	6	16.62	29.3	29.4	29.35	13.53	0.216925
41BP471	4	7	16.49	25.5	25.7	25.6	13.4	0.191045
41BP471	4	8	16.54	27	26.8	26.9	13.45	0.2
41BP471	4	9	12.6	22.4	22.4	22.4	9.51	0.235542
41BP471	4	10	15.81	25.8	25.8	25.8	12.72	0.20283
41BP471	4	11	10.48	17.6	18	17.8	7.39	0.240866
41BP471	4	12	13.51	25.2	26	25.6	10.42	0.245681
41BP471	4	13	15.91	26.1	26.2	26.15	12.82	0.203978
41BP471	4	14	8.72	13.4	12.8	13.1	5.63	0.232682
41BP471	4	15	12.75	21.5	21.3	21.4	9.66	0.221532
41BP471	4	16	5.99	9.7	9.7	9.7	2.9	0.334483
41BP471	4	17	7.13	10.7	11	10.85	4.04	0.268564
41BP471	4	18	8.11	13.8	14.2	14	5.02	0.278884
41BP471	4	19	8.19	13	13.2	13.1	5.1	0.256863
41BP471	4	20	15.48	25.4	25.4	25.4	12.39	0.205004
41BP471	4	21	14.72	20.2	20.4	20.3	11.63	0.174549
41BP471	4	22	16.52	22.9	23	22.95	13.43	0.170886
41BP471	4	23	10.18	14.1	14	14.05	7.09	0.198166
41BP471	4	24	10.09	14	14.7	14.35	7	0.205
41BP471	4	25	8.65	10.9	10.8	10.85	5.56	0.195144
41BP471	4	26	13.98	17.8	17.7	17.75	10.89	0.162994
41BP471	4	27	16.53	18.8	18.9	18.85	13.44	0.140253
41BP471	4	28	15.92	17.4	17.3	17.35	12.83	0.13523
41BP471	4	29	7.02	9	9	9	3.93	0.229008
41BP471	5	1	17.12	17	16.7	16.85	14.02	0.120185
41BP471	5	2	16.87	16.7	17.2	16.95	13.77	0.123094
41BP471	5	3	16.57	16.1	16.7	16.4	13.47	0.121752
41BP471	5	4	17.06	18	18.1	18.05	13.96	0.129298

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP471	5	5	16.75	18.3	18.3	18.3	13.65	0.134066
41BP471	5	6	15.67	16.6	16.6	16.6	12.57	0.13206
41BP471	5	7	17.43	18	17.9	17.95	14.33	0.125262
41BP471	5	8	17.08	18.4	18.6	18.5	13.98	0.132332
41BP471	5	9	17.86	19.1	19.3	19.2	14.76	0.130081
41BP471	5	10	17.31	16.9	17.2	17.05	14.21	0.119986
41BP471	5	11	17.67	19.7	20	19.85	14.57	0.136239
41BP471	5	12	17.41	17.6	18.1	17.85	14.31	0.124738
41BP471	5	13	15.3	15.9	16.2	16.05	12.2	0.131557
41BP471	5	14	17.05	17.9	17.5	17.7	13.95	0.126882
41BP471	5	15	16.24	15.1	15.9	15.5	13.14	0.11796
41BP471	5	16	13.36	12.1	12.4	12.25	10.26	0.119396
41BP471	5	17	14.07	13.5	13	13.25	10.97	0.120784
41BP471	5	18	16.85	16.8	16.9	16.85	13.75	0.122545
41BP471	5	19	12.24	11.6	11.8	11.7	9.14	0.128009
41BP471	5	20	15.76	14.8	15.1	14.95	12.66	0.118088
41BP471	5	21	14.57	12.5	12.6	12.55	11.47	0.109416
41BP471	5	22	11.28	8.7	8.8	8.75	8.18	0.106968
41BP471	5	23	16.4	15.2	15.5	15.35	13.3	0.115414
41BP471	5	24	17.1	16.9	17.1	17	14	0.121429
41BP471	5	25	16.32	16.9	16.7	16.8	13.22	0.12708
near 41BP471	MSS Pit	1	14.65	23.3	23.4	23.35	11.57	0.201815
near 41BP471	MSS Pit	2	14.29	23.9	23.9	23.9	11.21	0.213202
near 41BP471	MSS Pit	3	14.38	24.2	23.9	24.05	11.3	0.212832
near 41BP471	MSS Pit	4	14.66	21	21	21	11.58	0.181347
near 41BP471	MSS Pit	5	15.11	18.6	18.7	18.65	12.03	0.155029
near 41BP471	MSS Pit	6	14.79	21.2	21	21.1	11.71	0.180188
near 41BP471	MSS Pit	7	13.57	18.1	18.2	18.15	10.49	0.173022
near 41BP471	MSS Pit	8	14.44	19.5	19.5	19.5	11.36	0.171655
near 41BP471	MSS Pit	9	15.43	20.3	20.3	20.3	12.35	0.164372
near 41BP471	MSS Pit	10	14.57	20.8	21.2	21	11.49	0.182768
near 41BP471	MSS Pit	11	15.1	18.4	18.5	18.45	12.02	0.153494
near 41BP471	MSS Pit	12	14.51	17.6	17.7	17.65	11.43	0.154418

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
near 41BP471	MSS Pit	13	14.71	20.4	20.4	20.4	11.63	0.175408
near 41BP471	MSS Pit	14	15.81	19.1	18.9	19	12.73	0.149254
near 41BP471	MSS Pit	15	14.46	17.9	18.1	18	11.38	0.158172
near 41BP471	MSS Pit	16	14.76	18.6	18.4	18.5	11.68	0.15839
near 41BP471	MSS Pit	17	14.97	17.8	17.9	17.85	11.89	0.150126
near 41BP471	MSS Pit	18	14.53	17.3	17.4	17.35	11.45	0.151528
near 41BP471	MSS Pit	19	15.2	17.3	17.5	17.4	12.12	0.143564
near 41BP471	MSS Pit	20	15.31	17	17.2	17.1	12.23	0.13982
near 41BP471	MSS Pit	21	15.66	18.3	18.4	18.35	12.58	0.145866
near 41BP471	MSS Pit	22	15.71	16.6	16.6	16.6	12.63	0.131433
near 41BP471	MSS Pit	23	15.11	16.8	16.9	16.85	12.03	0.140067
near 41BP471	MSS Pit	24	15.09	16.6	16.6	16.6	12.01	0.138218
near 41BP471	MSS Pit	25	15.27	15.5	15.3	15.4	12.19	0.126333
near 41BP471	MSS Pit	26	14.93	15.1	15.2	15.15	11.85	0.127848
near 41BP471	MSS Pit	27	15.27	15.2	15.3	15.25	12.19	0.125103
near 41BP471	MSS Pit	28	14.32	19.6	19.8	19.7	11.24	0.175267
near 41BP471	MSS Pit	29	13.97	15.1	15.2	15.15	10.89	0.139118
near 41BP471	MSS Pit	30	14.27	15.9	16.2	16.05	11.19	0.143432
41BP477	1	1	14.78	20.9	22.8	21.85	11.68	0.187072
41BP477	1	2	12.01	27.8	27.7	27.75	8.91	0.311448
41BP477	1	3	13.29	20.5	20.6	20.55	10.19	0.201668
41BP477	1	4	6.9	14.8	14.3	14.55	3.8	0.382895
41BP477	1	5	9.1	13.9	15.1	14.5	6	0.241667
41BP477	1	6	8.92	14.5	14.7	14.6	5.82	0.250859
41BP477	1	7	14.18	22.6	22.7	22.65	11.08	0.204422
41BP477	1	8	11.16	17.9	18	17.95	8.06	0.222705
41BP477	1	9	12.9	20.2	20.5	20.35	9.8	0.207653
41BP477	1	10	12.61	21.8	21.9	21.85	9.51	0.229758

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP477	1	11	13.17	22.8	22.8	22.8	10.07	0.226415
41BP477	1	12	12.48	20.4	20.6	20.5	9.38	0.21855
41BP477	1	13	13.3	19.9	20.1	20	10.2	0.196078
41BP477	1	14	13.84	21	20.9	20.95	10.74	0.195065
41BP477	1	15	14.42	19.8	20.1	19.95	11.32	0.176237
41BP477	1	16	13.19	15.9	16	15.95	10.09	0.158077
41BP477	1	17	13.21	17.3	17.5	17.4	10.11	0.172107
41BP477	1	18	13.62	17.3	17.5	17.4	10.52	0.165399
41BP477	1	19	13.37	17	16.6	16.8	10.27	0.163583
41BP477	1	20	13.58	17.4	17.2	17.3	10.48	0.165076
41BP477	1	21	13.15	15.8	15.7	15.75	10.05	0.156716
41BP477	1	22	13.97	16.8	16.9	16.85	10.87	0.155014
41BP477	1	23	13.91	17.1	16.7	16.9	10.81	0.156337
41BP477	1	24	13.45	16.5	16.9	16.7	10.35	0.161353
41BP477	1	25	13.42	16.7	17	16.85	10.32	0.163275
41BP477	1	26	13.94	16.5	17	16.75	10.84	0.15452
41BP477	1	27	13.7	16.5	16.8	16.65	10.6	0.157075
41BP477	1	28	13.58	16.5	16.5	16.5	10.48	0.157443
41BP477	1	29	14.21	16.9	16.8	16.85	11.11	0.151665
41BP477	2	1	10.02	7.1	6.7	6.9	6.93	0.099567
41BP477	2	2	13.85	10.9	11.3	11.1	10.76	0.10316
41BP477	2	3	16.77	13.4	13.5	13.45	13.68	0.098319
41BP477	2	4	16.28	13.9	13.7	13.8	13.19	0.104625
41BP477	2	5	16.35	16.6	16.2	16.4	13.26	0.12368
41BP477	2	6	15.12	14.2	14.3	14.25	12.03	0.118454
41BP477	2	7	16.43	16.4	16.7	16.55	13.34	0.124063
41BP477	2	8	16.73	16.9	17.2	17.05	13.64	0.125
41BP477	2	9	16.69	17.2	17.7	17.45	13.6	0.128309
41BP477	2	10	14.43	13.8	13.8	13.8	11.34	0.121693
41BP477	2	11	16.67	20.4	20.7	20.55	13.58	0.151325
41BP477	2	12	16.77	16.7	16.9	16.8	13.68	0.122807
41BP477	2	13	16.71	16.9	16.8	16.85	13.62	0.123715
41BP477	2	14	16.39	16.8	16.6	16.7	13.3	0.125564
41BP477	2	15	16.94	16.6	17.1	16.85	13.85	0.121661
41BP477	2	16	16.31	16.2	16.1	16.15	13.22	0.122163
41BP477	2	17	16.78	16.1	16.2	16.15	13.69	0.117969
41BP477	3	1	15.88	14	14.2	14.1	12.78	0.110329
41BP477	3	2	16.98	17.5	17.3	17.4	13.88	0.12536
41BP477	3	3	17.48	19.7	19.7	19.7	14.38	0.136996
41BP477	3	4	17.01	20.2	20.8	20.5	13.91	0.147376
41BP477	3	5	16.09	18.4	19	18.7	12.99	0.143957
41BP477	3	6				0	-3.1	0

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP477	3	7	15.53	15.9	15.7	15.8	12.43	0.127112
41BP477	3	8	17.05	27.4	27.6	27.5	13.95	0.197133
41BP477	3	9	17.07	21.4	21.6	21.5	13.97	0.153901
41BP477	3	10	16.06	22.5	22.8	22.65	12.96	0.174769
41BP477	3	11	17.14	22.6	22.2	22.4	14.04	0.159544
41BP477	3	12	16.6	22.2	22.2	22.2	13.5	0.164444
41BP477	3	13	16.49	21	23.1	22.05	13.39	0.164675
41BP477	3	14	16.42	21.7	21.7	21.7	13.32	0.162913
41BP477	3	15	17.07	22.7	22.6	22.65	13.97	0.162133
41BP477	3	16	16.35	21.9	22.2	22.05	13.25	0.166415
41BP477	3	17	14.1	17.6	17.4	17.5	11	0.159091
41BP477	3	18	13.63	55.4	55.5	55.45	10.53	0.526591
41BP477	3	19	15.01	20.4	20.3	20.35	11.91	0.170865
41BP477	3	20	14.99	19	19.1	19.05	11.89	0.160219
41BP477	3	21	13.77	16.7	16.8	16.75	10.67	0.156982
41BP477	3	22	14.78	16.3	16.3	16.3	11.68	0.139555
41BP477	3	23	14.44	18.5	18.2	18.35	11.34	0.161817
41BP477	3	24	14.43	16.2	16.6	16.4	11.33	0.144748
41BP477	3	25	13.82	15.9	15.7	15.8	10.72	0.147388
41BP477	3	26	14.84	17.3	17.9	17.6	11.74	0.149915
41BP477	3	27	14.67	16.5	16.9	16.7	11.57	0.144339
41BP477	3	28	10.08	11.9	11.8	11.85	6.98	0.169771
41BP477	4	1	14.57	9.1	9.8	9.45	11.47	0.082389
41BP477	4	2	15.65	10.2	10.7	10.45	12.55	0.083267
41BP477	4	3	11.6	7.9	8.3	8.1	8.5	0.095294
41BP477	4	4	14.34	10.7	10.8	10.75	11.24	0.095641
41BP477	4	5	14.69	10.7	10.9	10.8	11.59	0.093184
41BP477	4	6	14.87	11.6	12.1	11.85	11.77	0.10068
41BP477	4	7	14.66	11.4	11.9	11.65	11.56	0.100779
41BP477	4	8	15.05	12.9	13	12.95	11.95	0.108368
41BP477	4	9	8.61	7.2	8	7.6	5.51	0.137931
41BP477	4	10	13.57	12.5	12.9	12.7	10.47	0.121299
41BP477	4	11	12.44	12.3	12.8	12.55	9.34	0.134368
41BP477	4	12	10.96	10.9	11	10.95	7.86	0.139313
41BP477	4	13	14.34	14.3	14.7	14.5	11.24	0.129004
41BP477	4	14	14.89	15.2	15.7	15.45	11.79	0.131043
41BP477	4	15	14.63	16.8	16.6	16.7	11.53	0.14484
41BP477	4	16	14.09	13.8	14	13.9	10.99	0.126479
41BP477	4	17	13.72	13.2	13.4	13.3	10.62	0.125235
41BP477	4	18	15.62	14.2	14.8	14.5	12.52	0.115815
41BP477	4	19	14.48	16.3	16.3	16.3	11.38	0.143234
41BP477	4	20	13.15	13.4	13.6	13.5	10.05	0.134328

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP477	4	21	14.27	13.7	13.6	13.65	11.17	0.122202
41BP477	4	22	13.74	13.3	13.3	13.3	10.64	0.125
41BP477	4	23	14.47	14.1	14.4	14.25	11.37	0.12533
41BP477	4	24	15.14	15.3	15.4	15.35	12.04	0.127492
41BP477	4	25A	10.47	10.8	11	10.9	7.37	0.147897
41BP477	4	25B	12.74	12.8	13.2	13	9.64	0.134855
41BP666	1	1	7.76	7	6.2	6.6	4.66	0.141631
41BP666	1	2	8.45	7.3	6.9	7.1	5.35	0.13271
41BP666	1	3	11.32	7.3	7.3	7.3	8.22	0.088808
41BP666	1	4	11.85	8.4	8.2	8.3	8.75	0.094857
41BP666	1	5	11.43	8.3	7.8	8.05	8.33	0.096639
41BP666	1	6	11.84	8.4	8.4	8.4	8.74	0.09611
41BP666	1	7	10.74	8.1	7.9	8	7.64	0.104712
41BP666	1	8	12	8.8	8.8	8.8	8.9	0.098876
41BP666	1	9	12.45	9.8	9.5	9.65	9.35	0.103209
41BP666	1	10	10.77	10.7	11	10.85	7.67	0.14146
41BP666	1	11	9.82	9.2	9.2	9.2	6.72	0.136905
41BP666	1	12	15.12	16.6	16.9	16.75	12.02	0.139351
41BP666	1	13	15.04	17	17	17	11.94	0.142379
41BP666	1	14	15.72	17.8	17.8	17.8	12.62	0.141046
41BP666	1	15	11.76	14.2	14.2	14.2	8.66	0.163972
41BP666	1	16	15.76	17.4	17.4	17.4	12.66	0.137441
41BP666	1	17	12.93	16.2	16.3	16.25	9.83	0.16531
41BP666	1	18	16.03	22.6	21.8	22.2	12.93	0.171694
41BP666	1	19	15.82	18.9	19	18.95	12.72	0.148978
41BP666	1	20	14.79	18.5	18.1	18.3	11.69	0.156544
41BP666	1	21	14.31	17.9	17.8	17.85	11.21	0.159233
41BP666	1	22	14.9	18.2	18.1	18.15	11.8	0.153814
41BP666	1	23	15.47	18.7	18.9	18.8	12.37	0.151981
41BP666	1	24	15.82	19.1	18.8	18.95	12.72	0.148978
41BP666	1	25	16.08	18.2	17.9	18.05	12.98	0.13906
41BP666	1	26	15.96	21.1	21.1	21.1	12.86	0.164075
41BP666	2	1	13.15	10.8	10.9	10.85	10.05	0.10796
41BP666	2	2	14.81	14.5	14.3	14.4	11.71	0.122972
41BP666	2	3	13.86	17.1	16.9	17	10.76	0.157993
41BP666	2	4	15.67	23.9	23.7	23.8	12.57	0.18934
41BP666	2	5	15.53	20	20	20	12.43	0.160901
41BP666	2	6	15.39	21.1	21.3	21.2	12.29	0.172498
41BP666	2	7	15.99	21.6	21.4	21.5	12.89	0.166796
41BP666	2	8	16.54	21.4	21.3	21.35	13.44	0.158854
41BP666	2	9	15.54	23.1	23	23.05	12.44	0.185289
41BP666	2	10	16	24.3	24.6	24.45	12.9	0.189535

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP666	2	11	15.51	20.9	23.8	22.35	12.41	0.180097
41BP666	2	12	16.41	25.5	25.1	25.3	13.31	0.190083
41BP666	2	13	16.42	24.8	24.2	24.5	13.32	0.183934
41BP666	2	14	15.73	22.4	22.9	22.65	12.63	0.179335
41BP666	2	15	15.94	22.1	21.8	21.95	12.84	0.17095
41BP666	2	16	15.62	21.5	20.9	21.2	12.52	0.169329
41BP666	2	17	16.81	22.4	22.4	22.4	13.71	0.163384
41BP666	2	18	16.23	24.2	24.3	24.25	13.13	0.184692
41BP666	2	19	17.09	19.5	20.2	19.85	13.99	0.141887
41BP666	2	20	17.09	19.1	19.1	19.1	13.99	0.136526
41BP666	2	21	18.29	20	20.7	20.35	15.19	0.13397
41BP666	2	22	18.06	19.8	20	19.9	14.96	0.133021
41BP666	2	23	17.98	18	18.1	18.05	14.88	0.121304
41BP666	2	24	17.44	18.6	18.6	18.6	14.34	0.129707
41BP666	2	25	17.2	20.3	20.4	20.35	14.1	0.144326
41BP666	2	26	17.15	16.4	16.6	16.5	14.05	0.117438
41BP666	2	27	18.23	18.2	18	18.1	15.13	0.11963
41BP666	2	28	16.81	17.3	17.7	17.5	13.71	0.127644
41BP666	2	29	15.32	13.6	13.7	13.65	12.22	0.111702
41BP666	3	1	16.21	10.6	10.5	10.55	13.12	0.080412
41BP666	3	2	11.41	8	7.9	7.95	8.32	0.095553
41BP666	3	3	9.49	6.3	6.4	6.35	6.4	0.099219
41BP666	3	4	9.73	6.4	6.5	6.45	6.64	0.097139
41BP666	3	5	12.66	8.1	8.1	8.1	9.57	0.084639
41BP666	3	6	13.81	9.1	9.2	9.15	10.72	0.085354
41BP666	3	7	16.98	14.8	14.8	14.8	13.89	0.106551
41BP666	3	8	16.09	11.2	11.1	11.15	13	0.085769
41BP666	3	9	16.09	12	12.2	12.1	13	0.093077
41BP666	3	10	14.86	11.3	11.3	11.3	11.77	0.096007
41BP666	3	11	17.01	13.7	13.8	13.75	13.92	0.098779
41BP666	3	12	16.71	14.3	14.4	14.35	13.62	0.10536
41BP666	3	13	16.96	13.7	13.7	13.7	13.87	0.098774
41BP666	3	14	11	8.6	8.6	8.6	7.91	0.108723
41BP666	3	15	15.13	11.6	11.7	11.65	12.04	0.096761
41BP666	3	16	16.09	10.7	10.6	10.65	13	0.081923
41BP666	3	17	16.13	12	11.9	11.95	13.04	0.091641
41BP666	3	18	16.36	13.3	13.6	13.45	13.27	0.101356
41BP666	4	1	12.7	11.6	11.6	11.6	9.6	0.120833
41BP666	4	2	12.65	14.3	14.3	14.3	9.55	0.149738
41BP666	4	3	13.25	13.9	13.9	13.9	10.15	0.136946
41BP666	4	4	13.49	13.4	13.6	13.5	10.39	0.129933
41BP666	4	5	13.56	13.4	13.4	13.4	10.46	0.128107

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
41BP666	4	6	13.9	15.5	15.3	15.4	10.8	0.142593
41BP666	4	7	13.76	15.1	15	15.05	10.66	0.141182
41BP666	4	8	13.75	14.7	14.8	14.75	10.65	0.138498
41BP666	4	9	13.86	15.9	16	15.95	10.76	0.148234
41BP666	4	10	13.8	16	16.2	16.1	10.7	0.150467
41BP666	4	11	13.79	15.8	15.8	15.8	10.69	0.147802
41BP666	4	12	14.37	19	19	19	11.27	0.168589
41BP666	4	12	14.35	19.1	19.2	19.15	11.25	0.170222
41BP666	4	13	14.43	15.9	16	15.95	11.33	0.140777
41BP666	4	14	14.47	16	16.1	16.05	11.37	0.141161
41BP666	4	15	14.69	16.2	16.3	16.25	11.59	0.140207
41BP666	4	16	13.97	15	15.2	15.1	10.87	0.138914
41BP666	4	17	14.31	15.3	15.3	15.3	11.21	0.136485
41BP666	4	18	13.83	15.3	15.1	15.2	10.73	0.141659
41BP666	4	19	14.04	15.4	15.7	15.55	10.94	0.142139
41BP666	4	20	13.87	15.1	15.3	15.2	10.77	0.141133
41BP666	5	1	14.8	10.9	10.8	10.85	11.7	0.092735
41BP666	5	2	13.62	9.7	9.7	9.7	10.52	0.092205
41BP666	5	3	14.22	14.5	14.4	14.45	11.12	0.129946
41BP666	5	4	14.11	16.1	16.5	16.3	11.01	0.148047
41BP666	5	5	15.18	17.6	18.1	17.85	12.08	0.147765
41BP666	5	6	14.49	19	18.9	18.95	11.39	0.166374
41BP666	5	7	14.4	17.7	17.9	17.8	11.3	0.157522
41BP666	5	8	15.38	20	20.1	20.05	12.28	0.163274
41BP666	5	9	14.52	19.6	20.1	19.85	11.42	0.173818
41BP666	5	10	14.42	21.1	21.1	21.1	11.32	0.186396
41BP666	5	11	14.76	21.6	21.8	21.7	11.66	0.186106
41BP666	5	12	14.54	21	21.3	21.15	11.44	0.184878
41BP666	5	13	14.49	20.1	20	20.05	11.39	0.176032
41BP666	5	14	14.38	19.8	19.8	19.8	11.28	0.175532
41BP666	5	15	14.32	18	18.1	18.05	11.22	0.160873
41BP666	5	16	14.71	19	19.5	19.25	11.61	0.165805
41BP666	5	17	14.41	16.4	17.1	16.75	11.31	0.148099
41BP666	5	18	14.42	16.6	17	16.8	11.32	0.14841
41BP666	5	19	15.09	16	16.3	16.15	11.99	0.134696
41BP666	5	20	14.99	17.9	18.6	18.25	11.89	0.15349
41BP666	5	21	14.97	14.6	15.1	14.85	11.87	0.125105
41BP666	5	22	15.41	16.1	16.1	16.1	12.31	0.130788
41BP666	5	23	13.82	12	12.1	12.05	10.72	0.112407
W of 41BP666	MSS Pit	1	8.42	15.4	15.5	15.45	5.32	0.290414
W of 41BP666	MSS Pit	2	13.74	19.4	19.2	19.3	10.64	0.181391

Site	Unit	Sample	Weight (g)	VSS 1	VSS 2	Average VSS	Corrected Weight	MSS Value
W of 41BP666	MSS Pit	3	14.28	22.8	22.7	22.75	11.18	0.203488
W of 41BP666	MSS Pit	4	14.63	22.2	22.2	22.2	11.53	0.192541
W of 41BP666	MSS Pit	5	14.73	21.2	21.5	21.35	11.63	0.183577
W of 41BP666	MSS Pit	6	11.31	16.9	16.8	16.85	8.21	0.205238
W of 41BP666	MSS Pit	7	14.71	21.5	21.6	21.55	11.61	0.185616
W of 41BP666	MSS Pit	8	14.8	21.2	21.2	21.2	11.7	0.181197
W of 41BP666	MSS Pit	9	13.89	19.9	19.9	19.9	10.79	0.18443
W of 41BP666	MSS Pit	10	13.46	19.7	19.8	19.75	10.36	0.190637
W of 41BP666	MSS Pit	11	14.18	20.8	20.9	20.85	11.08	0.188177
W of 41BP666	MSS Pit	12	14.56	34.4	34.7	34.55	11.46	0.301483
W of 41BP666	MSS Pit	13	14.82	19.4	19.7	19.55	11.72	0.166809
W of 41BP666	MSS Pit	14	13.97	18.4	18.3	18.35	10.87	0.168813
W of 41BP666	MSS Pit	15	14.76	18.7	19	18.85	11.66	0.161664
W of 41BP666	MSS Pit	16	14.14	19	19	19	11.04	0.172101
W of 41BP666	MSS Pit	17	14.61	18.8	18.7	18.75	11.51	0.162902
W of 41BP666	MSS Pit	18	14.13	15.7	15.7	15.7	11.03	0.142339
W of 41BP666	MSS Pit	19	14.05	15.4	15.6	15.5	10.95	0.141553

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Appendix C: Debitage Analysis Used in Chapter 9

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
471	2018	0	6.91	2	0	1	8	yellow-orange/ yellow-orange	Edwards
471	2016	0	7.73	2	0	1	6	yellow/orange	Edwards
471	1019	25	8.16	1	0	1	9	purple-red/purple-red	Local
471	2105	0	8.2	2	1	1	5	purple-red/purple-red	Local
471	2013	0	8.47	2	0	1	3	yellow/orange	Edwards
471	1018	0	8.6	1	0	1	8	dark red/purple-red	Local
471	2019	0	8.73	2	0	1	9	purple-red/purple-red	Local
471	2013	0	8.87	2	0	1	3	yellow-orange/ orange	Edwards
471	2013	0	8.9	2	0	1	3	yellow-orange/ yellow-orange	Edwards
471	1019	0	9.35	1	0	1	9	brown/brown	Local
471	1015	0	9.47	1	0	1	5	purple-red/purple-red	Local
471	2015	0	9.7	2	0	1	5	orange/yellow-orange	Edwards
471	2118	0	9.94	2	1	1	8	yellow/yellow	Local
471	2112	0	9.95	2	0	1	2	orange/orange	Edwards
471	2012	0	10.17	2	0	1	2	yellow/yellow	Local
471	2019	0	10.31	2	0	1	9	yellow-orange/ yellow-orange	Edwards
471	1016	0	10.41	1	0	1	6	yellow/purple-red	Local
471	2018	0	10.44	2	0	1	8	red/red	Non-Local
471	2112	0	10.51	2	1	1	2	orange/orange	Edwards
471	2018	0	10.65	2	0	1	8	yellow-orange/ orange	Edwards
471	2115	0	10.65	2	1	1	5	brown/yellow-orange	Edwards
471	2115	0	10.95	2	1	1	5	purple-red/purple-red	Local
471	2018	0	11.24	2	0	1	8	yellow/purple-red	Local
471	1015	25	11.41	1	0	1	5	yellow-orange/ yellow-orange	Edwards
471	2013	0	11.52	2	0	1	3	yellow/orange	Edwards
471	2110	0	11.66	2	1	1	0	purple-red/purple-red	Local
471	1028	0	11.69	1	0	2	8	purple-red/purple-red	Local
471	2012	0	11.83	2	0	1	2	yellow/orange-brown	Edwards
471	2018	75	11.96	2	0	1	8	yellow-orange/ yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
471	2015	0	12.1	2	0	1	5	yellow/yellow-orange	Edwards
471	2015	25	12.33	2	0	1	5	yellow-orange/ yellow-orange	Edwards
471	2015	0	12.33	2	0	1	5	yellow/yellow	Local
471	2017	0	12.39	2	0	1	7	brown/purple-red	Local
471	1018	75	12.44	1	0	1	8	yellow-orange/ purple-red	Edwards
471	2115	0	12.52	2	1	1	5	no reaction/purple-red	Local
471	2015	0	12.53	2	0	1	5	yellow/yellow-orange	Edwards
471	1019	100	12.55	1	0	1	9	purple-red/purple-red	Local
471	2015	25	12.59	2	0	1	5	yellow-orange/ orange	Edwards
471	2018	0	12.83	2	0	1	8	yellow-orange/ orange	Edwards
471	2018	0	12.9	2	0	1	8	yellow/yellow-orange	Edwards
471	2115	0	12.9	2	1	1	5	yellow-orange/ orange	Edwards
471	1026	0	13.08	1	0	2	6	purple-red/purple-red	Local
471	2116	0	13.49	2	1	1	6	purple-red/purple-red	Local
471	2012	0	13.57	2	0	1	2	yellow-orange/ yellow-orange	Edwards
471	2015	25	13.63	2	0	1	5	yellow-orange/ yellow-orange	Edwards
471	1018	0	13.84	1	0	1	8	yellow/yellow-orange	Edwards
471	1015	0	14	1	0	1	5	yellow-orange/ yellow-orange	Edwards
471	2013	0	14.18	2	0	1	3	yellow-orange/ orange	Edwards
471	2012	0	14.28	2	0	1	2	yellow/yellow-orange	Edwards
471	2019	0	14.29	2	0	1	9	dark red/purple-red	Local
471	2015	0	14.32	2	0	1	5	yellow/yellow-orange	Edwards
471	2012	0	14.37	2	0	1	2	yellow-orange/ orange	Edwards
471	2018	0	14.5	2	0	1	8	yellow-orange/ orange	Edwards
471	2018	0	14.56	2	0	1	8	yellow-orange/ orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
471	2018	25	14.75	2	0	1	8	yellow/yellow	Local
471	2013	25	14.78	2	0	1	3	yellow/purple-red	Local
471	2018	0	14.85	2	0	1	8	yellow-green-brown/ red	Non-Local
471	2015	25	14.86	2	0	1	5	yellow/orange	Edwards
471	1018	0	14.98	1	0	1	8	yellow-orange/ yellow-orange	Edwards
471	1215	0	15.31	1	1	1	5	purple-red/purple-red	Local
471	2115	0	15.46	2	1	1	5	purple-red/purple-red	Local
471	1012	25	15.55	1	0	1	2	dark red/dark red	Local
471	2115	0	15.6	2	1	1	5	purple-red/purple-red	Local
471	2019	25	15.62	2	0	1	9	yellow-orange/dark red	Edwards
471	2112	0	15.79	2	1	1	2	yellow-orange/ orange	Edwards
471	2012	0	16.07	2	0	1	2	yellow-orange/ yellow-orange	Edwards
471	2115	0	16.08	2	1	1	5	yellow/orange	Edwards
471	1118	0	16.24	1	1	1	8	purple/purple-red	Non-Local
471	1125	0	16.4	1	1	2	5	yellow/yellow-orange	Edwards
471	2015	0	16.44	2	0	1	5	yellow-orange/ yellow-orange	Edwards
471	2013	0	17.03	2	0	1	3	yellow/yellow-orange	Edwards
471	2012	0	17.21	2	0	1	2	yellow-orange/ yellow-orange	Edwards
471	2117	100	17.39	2	1	1	7	purple-red/purple-red	Local
471	2013	0	17.53	2	0	1	3	yellow/yellow-orange	Edwards
471	2012	0	17.75	2	0	1	2	yellow/yellow	Local
471	2116	0	17.89	2	1	1	6	yellow-orange/ yellow-orange	Edwards
471	2113	0	17.9	2	1	1	3	yellow-orange/ orange	Edwards
471	1126	0	18.13	1	1	2	6	purple-red/purple-red	Local
471	1110	0	18.27	1	1	1	0	purple-red/purple-red	Local
471	2115	0	18.39	2	1	1	5	yellow-green-brown/ yellow-orange	Non-Local
471	1012	0	18.41	1	0	1	2	yellow-orange/ yellow-orange	Edwards
471	2015	0	18.59	2	0	1	5	yellow/orange-red(pink-gray)	Non-Local

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
471	2015	0	18.62	2	0	1	5	orange/orange	Edwards
471	2013	0	18.7	2	0	1	3	green/yellow-orange	Non-Local
471	2112	0	18.71	2	1	1	2	green/yellow	Non-Local
471	1015	0	18.84	1	0	1	5	yellow/yellow-orange	Edwards
471	2012	0	19.06	2	0	1	2	yellow-orange/orange	Edwards
471	2019	25	19.17	2	0	1	9	purple-red/dark red	Local
471	2013	0	19.85	2	0	1	3	yellow/yellow-orange	Edwards
471	2125	0	19.94	2	1	2	5	orange/orange	Edwards
471	1110	0	19.98	1	1	1	0	yellow/yellow-orange	Edwards
471	1018	75	20.03	1	0	1	8	purple-red/purple-red	Local
471	2018	0	20.23	2	0	1	8	yellow/yellow	Local
471	2012	0	20.27	2	0	1	2	yellow-orange/orange	Edwards
471	2117	75	20.86	2	1	1	7	dark red/purple-red	Local
471	2018	0	21.2	2	0	1	8	yellow-orange/orange	Edwards
471	2117	25	21.38	2	1	1	7	purple-red/purple-red	Local
471	2115	25	21.68	2	1	1	5	yellow/yellow-orange	Edwards
471	2113	0	21.85	2	1	1	3	yellow/yellow-orange	Edwards
471	2013	0	21.92	2	0	1	3	yellow/yellow-orange	Edwards
471	2110	0	21.98	2	1	1	0	green/purple-red	Non-Local
471	1015	25	22.39	1	0	1	5	yellow/yellow	Local
471	1028	25	23.2	1	0	2	8	dark red/red	Non-Local
471	2015	25	24.1	2	0	1	5	yellow-orange/yellow-orange	Edwards
471	2117	25	25.22	2	1	1	7	yellow-orange/orange	Edwards
471	2013	25	25.8	2	0	1	3	yellow/yellow-orange	Edwards
471	2015	0	26.22	2	0	1	2	orange/orange	Edwards
471	2118	0	26.53	2	1	1	8	yellow/yellow-orange	Edwards
471	2015	0	26.89	2	0	1	5	yellow/yellow	Local
471	2018	75	27.29	2	0	1	8	yellow/yellow	Local
471	2015	25	27.53	2	0	1	5	yellow-orange/orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
471	2013	0	27.55	2	0	1	3	yellow/orange	Edwards
471	2112	25	29.85	2	1	1	2	yellow/yellow-orange	Edwards
471	1015	25	30.07	1	0	1	5	yellow/yellow	Local
471	2019	25	30.36	2	0	1	9	yellow-orange/ yellow-orange	Edwards
471	2012	25	30.62	2	0	1	2	yellow/yellow-orange	Edwards
471	2115	75	30.72	2	1	1	5	yellow/yellow-orange	Edwards
471	1126	75	31.52	1	1	2	6	purple-red/purple-red	Local
471	2015	75	31.71	2	0	1	5	yellow/yellow	Local
471	1012	25	33.84	1	0	1	2	yellow-orange/ yellow-orange	Edwards
471	1125	75	34.23	1	1	2	5	yellow-orange/ orange	Edwards
471	1015	0	35.91	1	0	1	5	yellow/yellow	Local
471	2115	75	36.29	2	1	1	5	yellow/yellow	Local
471	1125	75	37.31	1	1	2	5	dark red/dark red	Local
471	1016	25	39.57	1	0	1	6	yellow-orange/ yellow-orange	Edwards
471	1117	0	39.74	1	1	1	7	yellow/yellow	Local
471	1014	25	40.22	1	0	1	4	yellow/yellow	Local
471	1115	25	40.77	1	1	1	5	yellow/yellow-orange	Edwards
471	1028	25	44.47	1	0	2	8	purple-red/purple-red	Local
471	2012	75	44.74	2	0	1	2	yellow-orange/ yellow-orange	Edwards
471	2018	25	51.98	2	0	1	8	orange/orange-yellow	Edwards
471	1015	25	54.68	1	0	1	5	yellow/yellow-orange	Edwards
471	1125	0	74.47	1	1	2	5	dark red/dark red	Local
477	2013	0	7.54	2	0	1	3	yellow/yellow	Local
477	2115	0	8.46	2	1	1	5	purple-red/purple-red	Local
477	1018	0	8.81	1	0	1	8	yellow/yellow-orange	Edwards
477	1018	0	8.84	1	0	1	8	yellow/yellow-orange	Edwards
477	1013	0	8.91	1	0	1	3	yellow/purple-red	Local
477	2023	0	9.01	2	0	2	3	purple-red/purple-red	Local
477	2116	0	9.51	2	1	1	6	yellow/yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
477	1115	0	9.56	1	1	1	5	yellow/purple-red	Edwards
477	1113	0	9.75	1	1	1	3	yellow/yellow	Local
477	2018	25	9.83	2	0	1	8	yellow/yellow-orange	Edwards
477	2013	0	9.99	2	0	1	3	yellow/yellow-orange	Edwards
477	1119	25	10.19	1	1	1	9	purple-red/purple-red	Local
477	1110	75	10.5	1	1	1	0	purple-red/purple-red	Local
477	1126	100	10.55	1	1	2	6	purple-red/purple-red	Local
477	1029	100	10.57	1	0	2	9	purple-red/purple-red	Local
477	1015	0	10.62	1	0	1	5	yellow/yellow-orange	Edwards
477	1115	0	10.62	1	1	1	5	yellow-orange/yellow-orange	Edwards
477	2012	0	10.63	2	0	1	2	yellow-orange/yellow-orange	Edwards
477	2015	0	10.67	2	0	1	5	yellow/yellow-orange	Edwards
477	1018	0	10.79	1	0	1	8	yellow/yellow-orange	Edwards
477	1018	0	10.79	1	0	1	8	yellow/yellow	Local
477	1019	0	10.85	1	0	1	9	purple-red/purple-red	Local
477	1115	0	10.92	1	1	1	5	purple-red/purple-red	Local
477	1018	0	10.92	1	0	1	8	purple-red/purple-red	Local
477	2110	0	11.06	2	1	1	0	yellow-green-brown/purple-red	Non-Local
477	1115	0	11.07	1	1	1	5	purple-red/purple-red	Local
477	2018	0	11.09	2	0	1	8	yellow/yellow	Local
477	1018	0	11.13	1	0	1	8	purple/purple	Non-Local
477	1018	0	11.15	1	0	1	8	yellow/yellow-orange	Edwards
477	2117	0	11.36	2	1	1	7	purple-red/purple-red	Local
477	2018	0	11.42	2	0	1	8	yellow/yellow-orange	Edwards
477	2013	0	11.43	2	0	1	3	yellow/yellow	Local
477	2018	75	11.49	2	0	1	8	yellow-orange/orange	Edwards
477	2113	0	11.5	2	1	1	3	yellow/yellow-orange	Edwards
477	2115	0	11.58	2	1	1	5	yellow-orange/yellow-orange	Edwards
477	1116	0	11.63	1	1	1	6	yellow/yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
477	1116	0	11.64	1	1	1	6	purple-red/purple-red	Local
477	2119	25	11.67	2	1	1	9	purple-red/purple-red	Local
477	1115	0	11.84	1	1	1	5	purple-red/purple-red	Local
477	1115	0	11.85	1	1	1	5	yellow/purple-red	Edwards
477	1118	0	11.91	1	1	1	8	yellow/yellow-orange	Edwards
477	2013	0	11.93	2	0	1	3	purple-red/purple-red	Local
477	1118	0	12.06	1	1	1	8	yellow-orange/orange	Edwards
477	2117	75	12.09	2	1	1	7	purple-red/purple-red	Local
477	2118	0	12.13	2	1	1	8	purple-red/purple-red	Local
477	1013	0	12.42	1	0	1	3	yellow/yellow-orange	Edwards
477	1016	0	12.45	1	0	1	6	purple-red/brown	Local
477	2112	0	12.47	2	1	1	2	yellow-orange/orange	Edwards
477	2012	0	12.55	2	0	1	2	yellow-orange/orange	Edwards
477	1115	25	12.56	1	1	1	5	yellow/yellow	Local
477	2120	25	12.74	2	1	2	0	purple-red/purple-red	Local
477	1112	0	12.79	1	1	1	2	yellow-orange/yellow-orange	Edwards
477	1127	100	12.86	1	1	2	7	purple-red/purple-red	Local
477	2115	0	12.88	2	1	1	5	purple-red/purple-red	Local
477	2115	0	12.93	2	1	1	5	purple-red/purple-red	Local
477	2013	100	12.97	2	0	1	3	purple-red/purple-red	Local
477	2115	0	13.09	2	1	1	5	brown/yellow-orange	Edwards
477	1018	0	13.19	1	0	1	8	yellow/yellow-orange	Edwards
477	2115	0	13.21	2	1	1	5	purple-red/purple-red	Local
477	1115	0	13.35	1	1	1	5	purple-red/purple-red	Local
477	2015	0	13.37	2	0	1	5	purple-red/purple-red	Local
477	2115	0	13.5	2	1	1	5	yellow-orange/orange	Edwards
477	2115	0	13.61	2	1	1	5	yellow/yellow-orange	Edwards
477	2117	25	13.97	2	1	1	7	yellow/yellow-orange	Edwards
477	1018	0	14.27	1	0	1	8	yellow-orange/yellow-orange	Edwards
477	2115	25	14.39	2	1	1	5	purple-red/purple-red	Local

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
477	2116	25	14.5	2	1	1	6	yellow-orange/ orange	Edwards
477	2113	0	14.61	2	1	1	3	yellow/yellow-orange	Edwards
477	2019	0	14.73	2	0	1	9	purple-red/purple-red	Local
477	2113	0	14.85	2	1	1	3	yellow/yellow-orange	Edwards
477	1115	0	15.06	1	1	1	5	dark red/dark red	Local
477	1115	0	15.29	1	1	1	5	purple-red/purple-red	Local
477	2110	25	15.35	2	1	1	0	yellow/purple-red	Local
477	1018	0	15.69	1	0	1	8	yellow/yellow-orange	Edwards
477	2110	0	15.75	2	1	1	0	yellow-orange/ yellow-orange	Edwards
477	2013	0	15.83	2	0	1	3	yellow/yellow-orange	Edwards
477	2112	0	15.84	2	1	1	2	yellow/yellow-orange	Edwards
477	2015	0	15.92	2	0	1	5	yellow-orange/ orange	Edwards
477	2116	0	16.12	2	1	1	6	yellow/yellow-orange	Edwards
477	1115	0	16.17	1	1	1	5	yellow/yellow	Local
477	1126	25	16.28	1	1	2	6	purple-red/purple-red	Local
477	1125	0	16.38	1	1	2	5	purple-red/purple-red	Local
477	2118	0	16.5	2	1	1	8	yellow/orange	Edwards
477	2119	0	16.53	2	1	1	9	purple-red/purple-red	Local
477	2018	0	16.71	2	0	1	8	yellow/yellow	Local
477	2013	0	16.81	2	0	1	3	yellow/yellow	Local
477	1015	0	16.9	1	0	1	5	yellow-orange/ yellow-orange	Edwards
477	2112	0	16.95	2	1	1	2	yellow-orange/ orange	Edwards
477	1127	25	16.99	1	1	2	7	purple-red/purple-red	Local
477	1015	0	17	1	0	1	5	purple-red/purple-red	Local
477	2112	25	17.05	2	1	1	2	yellow/yellow	Local
477	1118	0	17.22	1	1	1	8	yellow/dark red	Edwards
477	2114	100	17.36	2	1	1	4	purple-red/purple-red	Local
477	2013	0	17.55	2	0	1	3	yellow/yellow	Local
477	2110	0	17.62	2	1	1	0	purple-red/purple-red	Local
477	1019	100	17.62	1	0	1	9	purple-red/purple-red	Local
477	1115	0	18.13	1	1	1	5	purple-red/purple-red	Local

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
477	2115	0	18.18	2	1	1	5	yellow/yellow-orange	Edwards
477	2112	25	18.51	2	1	1	2	yellow/orange	Edwards
477	2013	25	18.83	2	0	1	3	yellow/yellow	Local
477	2014	0	18.96	2	0	1	4	purple-red/purple-red	Local
477	1113	0	19.09	1	1	1	3	yellow/yellow	Local
477	2015	75	19.13	2	0	1	5	yellow/yellow	Local
477	1015	0	19.36	1	0	1	5	yellow/yellow	Local
477	1025	25	19.63	1	0	2	5	yellow-orange/orange	Edwards
477	2117	0	20.02	2	1	1	7	purple-red/purple-red	Local
477	2115	0	20.29	2	1	1	5	yellow-orange/yellow-orange	Edwards
477	2116	0	20.66	2	1	1	6	yellow/yellow	Local
477	1125	0	20.82	1	1	2	5	purple-red/purple-red	Local
477	1029	0	21.74	1	0	2	9	purple-red/purple-red	Local
477	2012	75	21.82	2	0	1	2	purple-red/purple-red	Local
477	2113	25	22.11	2	1	1	3	yellow/yellow	Local
477	1014	75	22.63	1	0	1	4	purple-red/purple-red	Local
477	1019	0	23.38	1	0	1	9	yellow-orange/orange	Edwards
477	2018	0	23.73	2	0	1	8	yellow/yellow-orange	Edwards
477	2015	0	23.87	2	0	1	5	yellow/yellow-orange	Edwards
477	2112	0	24.3	2	1	1	2	yellow-orange/orange	Edwards
477	1015	0	24.61	1	0	1	5	yellow-orange/orange	Edwards
477	2013	0	24.98	2	0	1	3	yellow/yellow-orange	Edwards
477	1116	0	25.03	1	1	1	6	purple-red/dark red	Local
477	2117	0	25.15	2	1	1	7	purple-red/dark red	Local
477	2117	25	25.73	2	1	1	7	dark red/purple-red	Local
477	1025	0	25.94	1	0	2	5	purple-red/purple-red	Local
477	2110	25	27.68	2	1	1	0	yellow-orange/yellow-orange	Edwards
477	2112	0	28.29	2	1	1	2	yellow/yellow	Local
477	2015	25	28.58	2	0	1	5	yellow/yellow-orange	Edwards
477	2113	25	28.92	2	1	1	3	yellow/yellow	Local
477	2012	0	29.34	2	0	1	2	yellow/yellow	Local

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
477	2013	25	30.26	2	0	1	3	orange/orange	Edwards
477	2112	25	31.57	2	1	1	2	yellow-orange/ yellow-orange	Edwards
477	1125	0	34.39	1	1	2	5	yellow/yellow-orange	Edwards
477	1126	25	34.51	1	1	2	6	purple-red/purple-red	Local
477	1015	75	37.22	1	0	1	5	yellow-orange/ yellow	Edwards
477	1120	75	38.28	1	1	2	0	purple-red/purple-red	Local
477	1125	25	41.24	1	1	2	5	purple-red/purple-red	Local
477	2012	0	46.86	2	0	1	2	green/yellow	Non-Local
477	1127	25	51.64	1	1	2	7	purple-red/purple-red	Local
477	1025	100	58.5	1	0	2	5	purple-red/purple-red	Local
477	1125	25	59.77	1	1	2	5	purple-red/purple-red	Local
666	2116	0	5.38	2	1	1	6	yellow-orange/ yellow-orange	Edwards
666	2015	0	6.08	2	0	1	5	yellow-orange/ orange	Edwards
666	1019	0	7.13	1	0	1	9	yellow/yellow-orange	Edwards
666	2015	0	7.27	2	0	1	5	yellow-green-brown/ purple-red	Non-Local
666	1115	0	8.3	1	1	1	5	purple-red/purple-red	Local
666	2112	25	8.33	2	1	1	2	yellow-green-brown/ purple-red	Non-Local
666	2018	0	8.4	2	0	1	8	yellow-green-brown/ yellow-orange	Non-Local
666	2117	0	8.52	2	1	1	7	yellow/yellow	Local
666	2013	0	9.16	2	0	1	3	yellow-green-brown/ yellow-orange	Non-Local
666	2018	0	9.22	2	0	1	8	yellow/yellow	Local
666	2015	0	9.22	2	0	1	5	yellow/yellow-orange	Edwards
666	2118	0	9.42	2	1	1	8	yellow-orange/ orange	Edwards
666	2115	0	9.55	2	1	1	5	yellow-green-brown/ yellow-orange	Non-Local
666	2013	0	9.57	2	0	1	3	brown/purple-red	Local
666	2013	0	9.59	2	0	1	3	yellow-orange/ yellow-orange	Edwards
666	2018	0	9.74	2	0	1	8	yellow/orange	Edwards
666	1018	0	9.81	1	0	1	8	yellow-orange/dark red	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	2013	0	9.96	2	0	1	3	yellow/yellow-orange	Edwards
666	2012	25	10.03	2	0	1	2	yellow-orange/ yellow-orange	Edwards
666	2018	0	10.11	2	0	1	8	yellow-orange/ orange	Edwards
666	2013	0	10.15	2	0	1	3	yellow/yellow-orange	Edwards
666	1125	0	10.17	1	1	2	5	purple-red/purple-red	Local
666	2013	0	10.17	2	0	1	3	yellow-orange/ orange	Edwards
666	2116	0	10.24	2	1	1	6	yellow/yellow-orange	Edwards
666	1121	0	10.29	1	1	2	1	no reaction/dark red	Local
666	2013	0	10.32	2	0	1	3	yellow/yellow-orange	Edwards
666	2014	0	10.39	2	0	1	4	yellow/yellow-orange	Edwards
666	1018	0	10.39	1	0	1	8	yellow/yellow	Local
666	1018	0	10.45	1	0	1	8	yellow/yellow	Local
666	1113	0	10.49	1	1	1	3	yellow/yellow-orange	Edwards
666	2018	0	10.63	2	0	1	8	dark red/yellow-orange	Edwards
666	2117	25	10.64	2	1	1	7	purple-red/purple-red	Local
666	2013	0	10.64	2	0	1	3	yellow-orange/ yellow-orange	Edwards
666	2012	0	10.71	2	0	1	2	yellow/yellow	Local
666	2018	0	10.72	2	0	1	8	white/yellow	Edwards
666	2117	0	10.74	2	1	1	7	brown/purple-red	Local
666	2012	25	10.76	2	0	1	2	purple-red/purple-red	Local
666	2012	25	10.8	2	0	1	2	dark red/yellow-orange	Edwards
666	2116	0	10.83	2	1	1	6	yellow/yellow-orange	Edwards
666	2118	0	10.84	2	1	1	8	white/yellow-orange	Edwards
666	2013	0	11.12	2	0	1	3	yellow/yellow-orange	Edwards
666	2113	0	11.15	2	1	1	3	yellow/yellow-orange	Edwards
666	1117	0	11.39	1	1	1	7	brown/brown	Local
666	1013	0	11.46	1	0	1	3	yellow-orange/ orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	1015	0	11.58	1	0	1	5	yellow-orange/ yellow-orange	Edwards
666	2013	0	11.7	2	0	1	3	yellow-green-brown/ brown	Non-Local
666	2018	75	11.87	2	0	1	8	purple-red/purple-red	Local
666	1126	0	11.94	1	1	2	6	white/white	Non-Local
666	2015	0	12.02	2	0	1	5	brown/purple-red	Local
666	1015	0	12.04	1	0	1	5	yellow/yellow-orange	Edwards
666	1115	0	12.07	1	1	1	5	gray/yellow	Non-Local
666	2015	25	12.08	2	0	1	5	yellow/yellow	Local
666	2016	0	12.18	2	0	1	6	orange/orange	Edwards
666	2013	0	12.2	2	0	1	3	yellow/yellow	Local
666	2113	0	12.26	2	1	1	3	yellow/yellow-orange	Edwards
666	2018	0	12.31	2	0	1	8	yellow/yellow-orange	Edwards
666	1028	0	12.35	1	0	2	8	purple-red/purple-red	Local
666	1115	0	12.5	1	1	1	5	yellow/yellow	Local
666	2117	0	12.51	2	1	1	7	yellow-orange/ yellow-orange	Edwards
666	2117	0	12.69	2	1	1	7	dark red/dark red	Local
666	2115	0	12.71	2	1	1	5	purple-red/purple-red	Local
666	2013	0	12.82	2	0	1	3	yellow-orange/ yellow-orange	Edwards
666	2115	0	12.86	2	1	1	5	yellow/yellow-orange	Edwards
666	2018	0	12.88	2	0	1	8	white/yellow-orange	Edwards
666	1117	25	12.92	1	1	1	7	dark red/purple-red	Local
666	1013	25	13.11	1	0	1	3	yellow/yellow	Local
666	1019	75	13.19	1	0	1	9	purple-red/purple-red	Local
666	2013	25	13.32	2	0	1	3	yellow/yellow	Local
666	2117	25	13.36	2	1	1	7	orange/yellow-orange	Edwards
666	1116	25	13.6	1	1	1	6	yellow/yellow-orange	Edwards
666	2111	0	13.67	2	1	1	1	no reaction/dark red	Local
666	1018	0	13.68	1	0	1	8	yellow/yellow	Local
666	2110	0	13.73	2	1	1	0	green/purple-red	Non-Local
666	1028	0	13.74	1	0	2	8	yellow-orange/ yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	1012	0	13.76	1	0	1	2	yellow-orange/ yellow-orange	Edwards
666	2012	75	13.93	2	0	1	2	yellow-orange/ yellow-orange	Edwards
666	2115	0	13.94	2	1	1	5	yellow/yellow	Local
666	2013	0	14.19	2	0	1	3	yellow/yellow-orange	Edwards
666	1025	25	14.52	1	0	2	5	yellow-orange/ orange	Edwards
666	2113	0	14.58	2	1	1	3	yellow-orange/ orange	Edwards
666	2117	0	14.75	2	1	1	7	yellow-green-brown/ yellow-orange	Non-Local
666	1013	0	14.8	1	0	1	3	yellow-orange/ yellow-orange	Edwards
666	1015	0	14.9	1	0	1	5	yellow-orange/ yellow-orange	Edwards
666	1018	0	15.17	1	0	1	8	yellow-orange/ orange	Edwards
666	2018	0	15.18	2	0	1	8	yellow/yellow-orange	Edwards
666	1118	25	15.23	1	1	1	8	dark red/red	Non-Local
666	2117	0	15.34	2	1	1	7	purple-red/purple-red	Local
666	1015	0	15.39	1	0	1	5	yellow-orange/ yellow-orange	Edwards
666	1113	0	15.41	1	1	1	3	yellow-orange/ yellow-orange	Edwards
666	2015	0	15.55	2	0	1	5	yellow-orange/ yellow-brown	Edwards
666	2115	0	15.65	2	1	1	5	yellow-orange/ orange	Edwards
666	2011	75	15.89	2	0	1	1	brown/brown	Local
666	2115	0	16.02	2	1	1	5	purple-red/purple-red	Local
666	2015	0	16.14	2	0	1	5	yellow/yellow-orange	Edwards
666	2019	75	16.47	2	0	1	9	yellow/yellow	Local
666	1018	0	16.48	1	0	1	8	yellow-orange/ yellow-orange	Edwards
666	1018	0	16.59	1	0	1	8	yellow/yellow	Local
666	2113	0	16.76	2	1	1	3	yellow-orange/ yellow-orange	Edwards
666	1125	0	16.88	1	1	2	5	purple-red/purple-red	Local

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	2110	0	16.9	2	1	1	0	yellow-orange/ orange	Edwards
666	2013	0	17.17	2	0	1	3	yellow-orange/ orange	Edwards
666	2115	75	17.18	2	1	1	5	yellow/yellow-orange	Edwards
666	2117	0	17.77	2	1	1	7	dark red/orange	Edwards
666	1025	0	17.82	1	0	2	5	yellow-orange/ yellow-orange	Edwards
666	2115	0	17.83	2	1	1	5	yellow-green-brown/ purple-red	Non-Local
666	2015	0	17.88	2	0	1	5	yellow-green-brown/ yellow-orange	Non-Local
666	2116	75	18.03	2	1	1	6	yellow-orange/ orange	Edwards
666	1108	75	18.18	1	1	1	8	yellow/yellow-orange	Edwards
666	1029	0	18.33	1	0	2	9	yellow-green-brown/ yellow-orange	Non-Local
666	2013	0	18.56	2	0	1	3	yellow-green-brown/ orange	Non-Local
666	1018	0	18.82	1	0	1	8	yellow/yellow-orange	Edwards
666	1125	0	18.92	1	1	2	5	purple-red/purple-red	Local
666	2102	0	19.06	2	1	1	2	yellow/yellow-orange	Edwards
666	1115	25	19.18	1	1	1	5	yellow-orange/ orange	Edwards
666	2119	0	19.39	2	1	1	9	yellow-green-brown/ yellow-orange	Non-Local
666	1019	25	19.88	1	0	1	9	yellow-green-brown/ purple-red	Non-Local
666	1015	0	20.02	1	0	1	5	yellow-green-brown/ yellow	Non-Local
666	1015	0	20.07	1	0	1	5	yellow/yellow-orange	Edwards
666	2016	0	20.13	2	0	1	6	yellow/yellow	Local
666	2115	0	20.22	2	1	1	5	green/orange	Non-Local
666	2112	0	20.59	2	1	1	2	yellow/yellow-orange	Edwards
666	2013	0	20.61	2	0	1	3	yellow-orange/ orange	Edwards
666	2115	0	21.07	2	1	1	5	yellow/yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	2013	0	21.11	2	0	1	3	yellow/yellow-orange	Edwards
666	2116	0	21.67	2	1	1	6	dark red/yellow-orange	Edwards
666	2116	0	22.01	2	1	1	6	purple-red/dark red	Local
666	2015	0	22.64	2	0	1	5	yellow-green-brown/ yellow-orange	Non-Local
666	2117	0	22.83	2	1	1	7	yellow-orange/ orange	Edwards
666	1015	0	23.4	1	0	1	5	yellow-orange/ yellow-orange	Edwards
666	2113	0	24.17	2	1	1	3	yellow-orange/ orange	Edwards
666	2015	0	24.65	2	0	1	5	yellow/yellow-orange	Edwards
666	2114	75	25.04	2	1	1	4	yellow-green-brown/ light brown	Non-Local
666	2118	25	25.19	2	1	1	8	no reaction/yellow-orange	Edwards
666	2012	100	25.33	2	0	1	2	yellow/yellow-orange	Edwards
666	2015	0	25.84	2	0	1	5	white/yellow	Edwards
666	2115	0	25.94	2	1	1	5	yellow/yellow-orange	Edwards
666	2118	25	26.21	2	1	1	8	white/yellow	Non-Local
666	2115	0	26.38	2	1	1	5	green/yellow-orange	Non-Local
666	2113	0	26.79	2	1	1	3	yellow-orange/ yellow	Edwards
666	2015	0	27.02	2	0	1	5	yellow-green-brown/ yellow-orange	Non-Local
666	1018	0	27.19	1	0	1	8	yellow/yellow	Local
666	2112	25	27.34	2	1	1	2	yellow-orange/ yellow-orange	Edwards
666	2118	25	27.75	2	1	1	8	yellow/yellow-orange	Edwards
666	2012	0	28.75	2	0	1	2	gray-green/purple-red	Non-Local
666	2019	25	29.47	2	0	1	9	yellow/yellow-orange	Edwards
666	2115	25	30.51	2	1	1	5	yellow/yellow	Local
666	2115	25	31.4	2	1	1	5	yellow/yellow	Local
666	1013	25	32.04	1	0	1	3	yellow-orange/ yellow-orange	Edwards

Site	Material Code	Dorsal Cortex-0, 1-50 (25), 51-99 (75), 100	Max. length (mm)	Material Characteristics	Heat	Grain	Color	Colors (Short/long)	Local, Edwards, Non-local
666	1125	75	32.73	1	1	2	5	gray/gray	Non-Local
666	2015	0	32.99	2	0	1	5	yellow-orange/ yellow-orange	Edwards
666	1015	0	35.82	1	0	1	5	yellow/yellow	Local
666	2015	25	36.34	2	0	1	5	yellow-orange/ yellow-orange	Edwards
666	1125	0	37.36	1	1	2	5	yellow-orange/ orange	Edwards
666	2115	25	37.77	2	1	1	5	yellow-green-brown/ light brown	Non-Local
666	1125	0	43.69	1	1	2	5	purple-red/purple-red	Local
666	2115	0	46.05	2	1	1	5	yellow-green-brown/ yellow-orange	Non-Local
666	2118	25	48.04	2	1	1	8	yellow-orange/ orange	Edwards