RAIN DON'T STOP THE REGGAE JAM:
LOCATING EARLY ARCHAIC MATERIALS THROUGH PALEOSOL IDENTIFICATION AND PREDICTIVE MODELING, BELIZE RIVER VALLEY, CAYO DISTRICT, BELIZE

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ABSTRACT

RAIN DON'T STOP THE REGGAE JAM: LOCATING ARCHAIC MATERIALS THROUGH PALEOSOL IDENTIFICATION AND PREDICTIVE MODELING, BELIZE RIVER VALLEY, CAYO DISTRICT, BELIZE

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The Archaic Period in western Belize is represented entirely by lithic materials, the majority of which have been located in secondary or tertiary context and lack absolute dates. Using a geomorphological approach to landform development, I attempt to identify soils of concurrent age, known as "relict soils" or paleosols. The preservation potential for Archaic deposits is more likely in intact paleosols as opposed to soils that have been disturbed since site deposition by activities such as Maya agriculture and land modification. Therefore, I hypothesize that survey focused within paleosols will yield superior results to random survey. My study area is within and surrounding the floodplains of the upper Belize River Valley and lower Macal and Mopan rivers of Cayo, Belize. The upper Belize River Valley provides a landscape with varied elevation, soil types, vegetation cover, and geomorphological activity, providing a wide range of ecological zones in which to test my hypothesis.

El Período Arcaico en el oeste de Belice está representado completamente por materiales líticos, la mayoría de los cuales se han localizado en contexto secundario o terciario. Nos faltan datos de fechas absolutas. Utilizando un enfoque geomorfológico de teorías del desarrollo de las tierras, intento identificar suelos de edad concurrente, conocidos como “suelos relictos” o paleosoles. El potencial de preservación de los depósitos arcaicos es más probable en los paleosoles intactos que los suelos que han sido perturbados desde la deposición del sitio arqueológico por actividades como la agricultura Maya y la modificación de los terrenos. Por lo tanto, hipotetizó que mi encuesta enfocada en los paleosoles, producirá resultados superiores a una encuesta aleatoria. Mi área de estudio está dentro y alrededor de las llanuras de inundación del río Belice y los ríos Macal y Mopan de Cayo, Belice. El valle superior del río Belice es un paisaje con elevación variadas, muchos tipos de suelos, de coberturas vegetales, y actividades geomorfológicas. Esta área me de muchas zonas ecológicas para probar mi hipotesis.

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Last I thank my travel partner and love, who has made my time in graduate school as well as my adventures in Mexico and Belize that much richer, miss Emily Anne Brooke. Thanks for being so supportive throughout this process, and making it a blast along the way.

This work is dedicated to my stepfather, Lance Boissevain, who passed shortly before fieldwork began and was with me in spirit throughout this entire process. You are deeply missed, and always remembered in our family and beyond.

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Chapter 1: Introduction and Background

My thesis focuses on the enigmatic, largely unknown Early Archaic peoples who were the foundational cultures of western Belize (Figure 1.1) prior to approximately 3000 B.C. My project area includes the watersheds of the Macal, Mopan, and upper Belize Rivers in western Belize (Figure 1.2). I utilize multiple forms of survey and predictive modeling in an attempt to locate intact buried Archaic deposits in a region with high soil deposition rates following the Archaic Period.

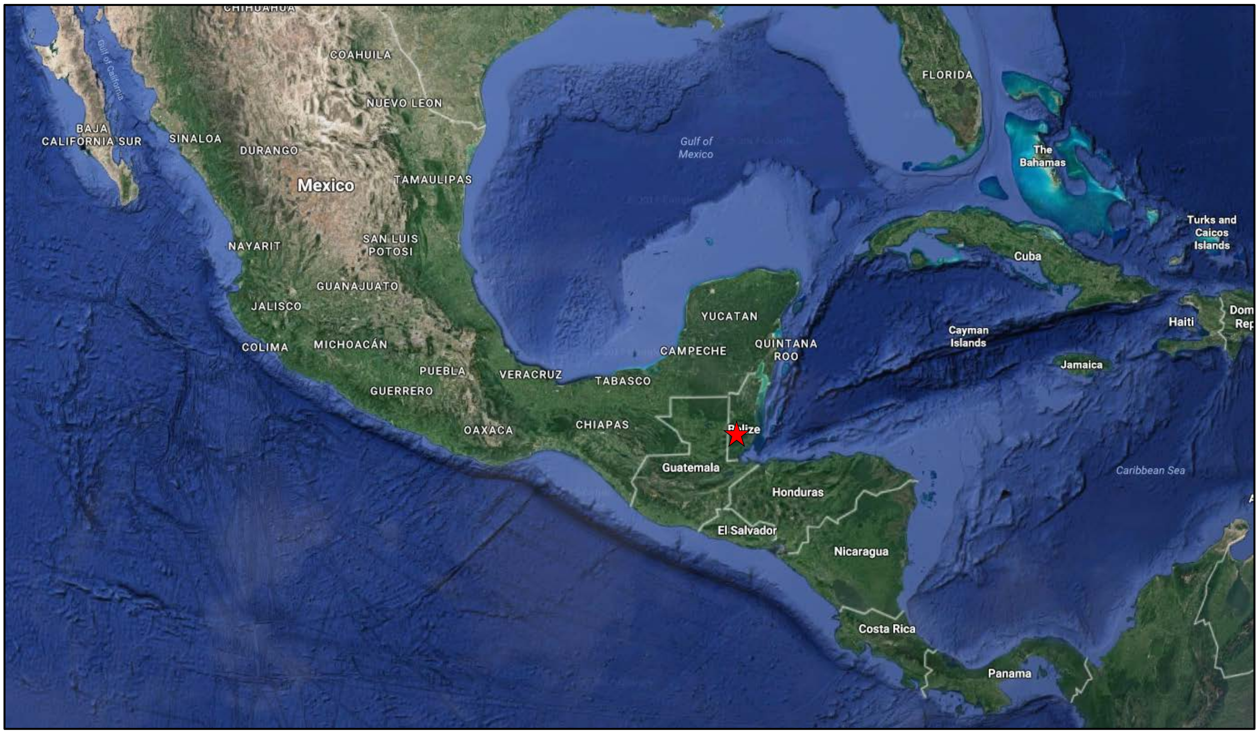


Figure1.1. An overview of Mesoamerica showing the location of Belize (Image courtesy of Google Earth, May 2017).

Intact soils dating to the Archaic Period are scarce in Belize. This factor, coupled with research being historically focused on ancient Maya remains as opposed to prior cultures with more scant material remains, have resulted in the Archaic Period being poorly represented in the archaeological record. The majority of Archaic Period cultural materials in the lowland Maya region consist of surface finds of lithic materials, many of which are due to disturbance by agriculture and development. The lithics are dated to the Archaic Period based on cross-referencing with similar materials located elsewhere. With the exception of Keith Prufer's recent find in southern Belize (Prufer et al. In Press), no Archaic Period materials have been found in direct correlation with datable material, leaving archaeologists to speculate about the absolute age of the artifacts. As opposed to lithic surface finds without context, buried sites have a greater potential to yield datable materials such as food remains, charcoal, and other perishable materials not preserved on the surface. Flood deposits, especially rapid depositional events, have the potential to encapsulate surface remains and halt pedogenesis, preserving materials that otherwise degrade rapidly in the humid environment of Belize.

Figure 1.2. An overview of the Belize River Valley showing the confluence of the Macal and Mopan Rivers and the head of the Belize River (Image courtesy of Google Earth, May 2017).

I utilize a predictive modeling strategy to locate relict soils, or paleosols, containing Archaic Period deposits using Lidar, aerial maps, geomorphology, hydrologic data, vegetation regimes, and soils maps. I first begin by locating paleosol deposits in the riverine floodplains of the Macal, Mopan, and upper Belize Rivers in western Belize.

I then utilize vegetation that favors paleosols to locate soils outside the river channels likely to contain Archaic deposits. In the Cayo District, paleosols tend to contain high sand content. Pine trees also tend to grow in sandy soils, so pines serve as an index species for locating paleosols, which thereby serves as a means of locating Archaic deposits.

This research is unique in the lowland Maya region for several reasons. A formalized study of the Archaic Period in the upper Belize River Valley has yet to be conducted. All evidence of Archaic peoples in the region have come from inadvertent discoveries, mostly by untrained individuals that did not record exact provenience information or context surrounding their finds. This study is the first to use systematic criteria in the search for Archaic sites in the upper Belize River Valley, and to document finds using formal archaeological methods. Therefore, this study adds to the data presently available by documenting new sites in their original context, which also provides predictive elements in the form of ideal soils and environmental conditions in which to locate future Archaic Period materials.

Environmental Background

Climate, Past and Present. During the Pleistocene, eustatic sea level change repeatedly flooded the coastline, with a maximum mean sea level approximately 180 feet higher than today (Fox 1962). Glacial and interglacial cycles created an undulating sea level that exposed karst limestone during colder periods by trapping water in ice, and flooded limestones during interglacial periods. During the end of the last ice age, low sea level left exposed cave systems that were utilized by Paleo-Indian and Early Archaic peoples. Sea level rise following the end of the Pleistocene has since flooded these caves both along the shore and further inland due to rising water tables.

The climate in western Belize today is characterized as tropical to subtropical. Rainfall is heaviest in the summer months, while April has the lowest annual rainfall. High humidity and warm temperatures dominate, creating a lush environment with rapid vegetation growth.

Vegetation. Vegetation has changed considerably since deforestation and large scale agriculture have impacted the landscape over the last two hundred years. Lowland subtropical broadleaf forest covers the lower elevation, carbonate-rich regions of Belize, though this vegetation has been severely impacted by agricultural clearing. In areas with older alluvial deposits with a sandy substrate, lowland pine forest dominates (Figure 1.3). In higher elevations in the Maya Mountains, submontane pine forests and submontane broadleaf forests dominate. The coast of Belize is covered by mangrove and littoral forests.

Figure 1.3. An overview of much of the present day lowland pine forest area, cleared for agriculture and grazing. The city of San Ignacio is in the background, and the site of Cahal Pech is located on the largest hilltop. Southwest aspect.

Regional Geology

The earliest geologic explorations in Belize took place in the late 1800's and early 1900's (Bateson and Hall 1977; Grant 1929; Ower 1928; Sapper 1889) for the purpose of resource extraction by the British government. Early geologic studies focused mainly on exploitable resources such as metals, found primarily in the Maya Mountain region of central Belize. These studies found few concentrations of metals and minerals sufficient for profitable extractive operations. Since those initial exploratory studies, geologic research in Belize has been minimal as compared with regions containing higher concentrations of extractive materials. The majority of studies have focused on academic geologic topics such as the faulting of the northern and southern Maya Mountain region (Bateson and Hall 1977). More recently, researchers have focused on topics such as soil erosion and nutrient capacity in soils utilized by the Maya (Beach et al. 2006; Dunning and Beach 1994).

The geology of Belize is mainly that of a shallow carbonate bedrock with occasional upwellings of older igneous rock and younger alluvial deposits in river valleys. The bedrock of Belize is comprised primarily of shallow water carbonates deposited during the Cretaceous Period, between approximately 145 and 66 million years ago (Mya). Older Paleozoic outcrops of sedimentary and igneous rock comprise the Maya Mountains in central Belize.

During the Paleozoic Era, approximately 541 to 252 Mya, orogenic activity created the Maya mountains, located in present-day southern Cayo District, Belize. The Maya mountains are a batholith of igneous materials including granites and diorites as well as late Paleozoic sediments (Bateson and Hall 1977). Minimal faulting exists within the Maya Mountains, though the mountains are bounded by a northern and southern fault (Bateson and Hall 1977).

During the Cretaceous, mean sea level was far higher than today. Shallow marine waters covered most of present-day Belize, the Yucatan Peninsula, and parts of Guatemala. These conditions provided an environment favorable to shallow water fauna that develop calcium and silica-rich exoskeletons that accumulate on the sea floor, gradually developing into thick carbonate deposits. Calcium-rich reefs developed and accumulated throughout the Cretaceous, creating the limestones and dolostones present across the region today (González et al., 2008).

During the Cretaceous, the Maya Mountains were the only land mass in Central America protruding above sea level. This led to a widespread layer of carbonate material deposited surrounding the mountains, as is seen today in the karstic limestones of the Vaca Plateau to the west and the Macal River Valley north of the mountains. After sea level decline following the Cretaceous, fluvial action carried materials from the Maya Mountains and spread alluvial deposits across the landscape. This resulted in widespread alluvial strata overlaying the Cretaceous carbonate deposits in regions adjacent to the Maya Mountains.

Today, the Cayo District bears little resemblance to its Cretaceous past. The region contains a variety of deposits ranging from igneous to sedimentary, though the most common deposit consists of alluvial sediments in the lowland regions. The Maya Mountains still exist as the tallest feature in Cayo, and igneous alluvial clasts are still carried to lower elevations through its drainages, as seen in the bedload of the Macal and several smaller tributaries. The Belize River is the largest river in Cayo, flowing from southwest to northeast and emptying into the Caribbean Sea over 100 miles away. It is fed by two moderately sized drainages, the Macal and Mopan Rivers. The Macal flows northward out of the Maya Mountains. It cuts steeply through the igneous mountains and the lower limestones of the foothills before reaching its confluence with the Mopan River. The Mopan begins in the mountains of Guatemala and flows north along the Belize-Guatemala border before meeting the Macal to form the headwaters of the Belize River. Along the river corridors, thick, fine-grained alluvial deposits of silts and clays cover the valley floor with several meters of sediment. The clays are calcium-rich due to the surrounding and underlying limestone bedrock. As the rivers meander across the valley floor, they cut steep terraces that in some places reveal the underlying limestone bedrock, dotted with karstic depressions and cave systems.

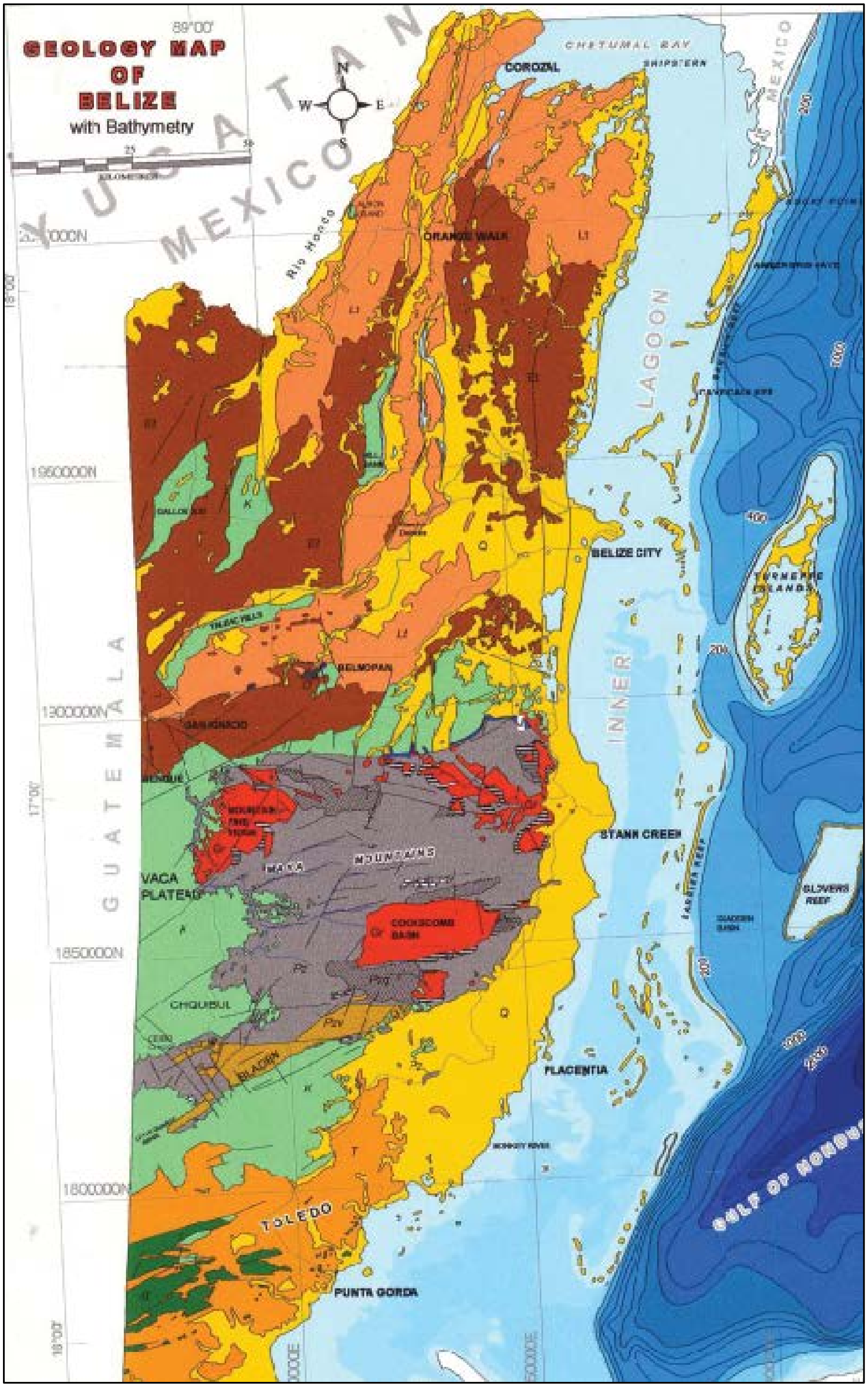


Figure 1.4. Geologic map of Belize showing generalized bedrock structures, stratigraphic correlation, and tectonic features. Courtesy of Jean H. Comec (2004).

Chapter Two: Cultural Background and Literature Review

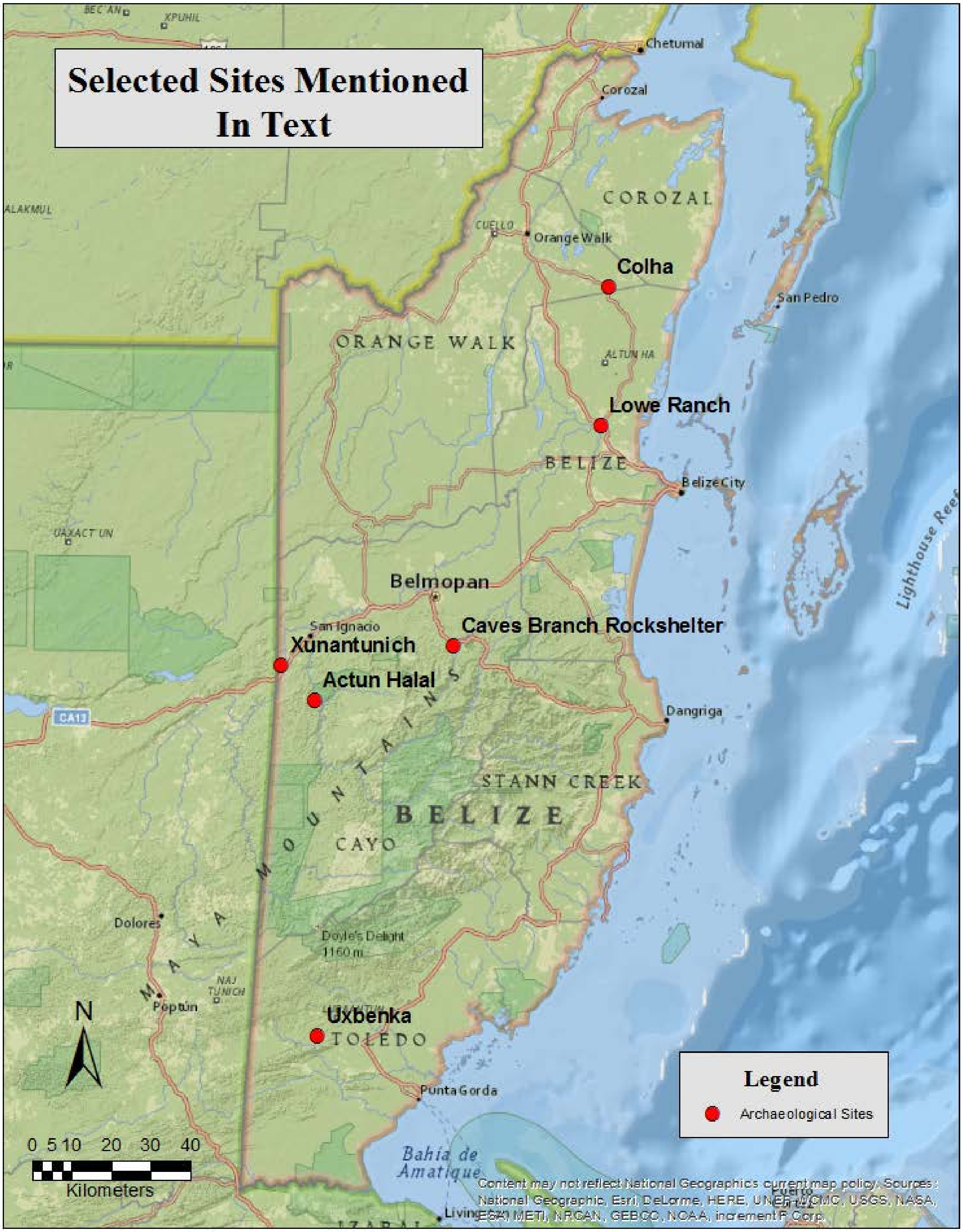


Figure 2.1. Map showing the location of selected sites referenced in the text.

Archaic Period in the Maya Lowland. The Archaic Period in western Belize begins at circa 9000-8000 B.C. during the beginning of the Holocene, and extends as late as 1200 B.C. with the emergence of late Early Formative Period Maya culture (Awe 1992). The Archaic is divided into Early (circa 9000-8000 B.C. to 3400 B.C.) and Late (3400 B.C. to 1200 B.C.). The Late Archaic Period is then divided into Early Preceramic (2500-1900 B.C.) and Late Preceramic (1900-1200 B.C.), when landscape modification and crop cultivation emerge throughout parts of the Yucatan (Lohse et al. 2006; Lohse 2010; Stemp et al. 2016). When the earliest village sites were established, much evidence of preceramic occupation in the same areas would likely have been obliterated by house floors, various platforms, and additional village clearing (Lohse 2010:315). A substantial amount of dates have been recovered representing Late Archaic human occupation in the Yucatan (Iceland 1997), but the Early Archaic is still sparsely represented.

Evidence of an Early Archaic presence in western Belize consists primarily of surface finds of individual projectile points typologically assumed to be Archaic in age (Lohse et al. 2006; Kelly 1993; Stemp et al. 2016). Known as Sawmill and Lowe projectile points, these large points resemble Archaic Period lithics in areas surrounding the lowland Maya region.

Archaic Period points were first subdivided into two types, Lowe and Sawmill, based on basal form by MacNeish and Nelken-Terner (1983). Lowe points are corner notched with a level to concave base, deeply notched barbs and a beveled left lateral margin (Kelly 1993) (Figure 2.2, left). Sawmill points are morphologically similar to Lowe points, with pronounced barbs, an expanding stem, and a concave base. Sawmill points often exhibit alternate beveling along the left margin. Basal thinning flakes tend to be more pronounced on Sawmill points, and their overall stature is narrower and more delicate than a Lowe point (Figure 2.2, right) (Kelly 1993).

Figure 2.1. A cast of the Lowe Point recovered at Lowe Ranch in northern Belize (left). Note the alternate beveling along the left margin, pronounced basal thinning scars along a concave base, and the large, pronounced barbs. Cast by Peter A. Bostrom, Lithic Casting Lab. A Sawmill Point recovered from Actun Tzimin Cave (right). Note the narrower and slightly expanding base as well as the narrower body.

Evidence of early human occupation in the lowland Maya region is concentrated most heavily in close proximity to the coastline. The majority of Archaic projectile points in Belize have been found closer to the mouth of the Belize River in closer proximity to the shoreline than the Belize River Valley (González et al. 2008; Kelly 1993; Lohse et al. 2006), though more recent finds have been concentrated within the Belize River Valley (Stemp and Awe 2013). Several submerged cave sites contain evidence of Archaic occupation in the broader Maya region. To date, the only Archaic Period human skeletal remains in the Maya region have been found within cave systems, particularly in the Mexican state of Quintana Roo (González et al. 2008; Lohse et al. 2006) and in a rockshelter in southern Belize (Awe pers. comm. 2016).

The first traces of agricultural land modification occur during the Late Archaic (Brooks et al. 1973; Lohse 2010; Pohl et al. 1996). Along with Lowe and Sawmill projectile points, unifacially flaked constricted adzes become a part of the lithic assemblage at this time (Figure

2.3). Based on usewear analysis, it is suggested that constricted adzes were hafted and used as a digging implement. Constricted adzes are associated with early agricultural practice, and their presence coincides with some of the earliest evidence of land modification in the Lowland Maya region (Beach et al. 2006; Lohse 2010; Pohl et al. 1996).

Figure 2.3. A constricted adze recovered from the Sibun Valley, western Belize.

Site Formation Processes and Human Impacts. Human impacts strongly influence the presence and visibility of Archaic Period sites throughout the lowland Maya region. Since Maya settlement, land modification including agricultural practice and construction of habitation sites has disturbed soils that would have likely contained Archaic materials (Beach et al. 2006; Coe 2015; Lohse 2010; Schiffer 1975). Soil degradation due to agricultural practice began in the Preclassic and earlier throughout much of the Maya lowlands (Beach et al. 2006). Additionally, fluvial processes within river floodplains can both deposit sediment covering Archaic Period living surfaces as well as erode them (Brown 1997). To locate sites dating to the Archaic, we need to first consider the natural and cultural transformations (N-transforms and C-transforms, respectively) that have taken place on the landscape since initial site abandonment (Binford 1981; Waters and Kuehn 1996; Schiffer 1975).

Previous Work Focused on Belize Archaic. Only a few projects have focused specific attention on the Belize Archaic Period, though none with the amount of time and detail spent on Maya archaeology. The following describes some of the more noteworthy projects focused on the Archaic Period in Belize as well as some significant inadvertent discoveries.

The Colha Preceramic Project (CPP), directed by Thomas Hester and Harry Shafer, was a large project begun in 1979 focused on Maya lithic workshops in the chert bearing zone of northern Belize. (Hester, Schafer, and Ligabue 1980; Iceland 1997, 2005) It began as an investigation of Maya lithic workshops located at the site of Colha, north of Belize City. At the site of Colha, lithic mass production occurred between Early Preclassic and Early Postclassic times (Hester et al. 1981). Another goal of the CPP was to explore lithic workshops throughout the region. What they found was that the chert bearing zone had been utilized by both Maya and pre-Maya peoples. Though the site of Colha contained lithics dating to the Maya Period, other sites throughout the chert bearing zone were older in origin.

In 1980, they were approached by a rancher named David Lowe. Lowe had discovered several lithic deposits on his nearby ranch, including a large, projectile point unfamiliar to the researchers (Figure 2.1, left) (Hester et al. 1980). Initially, Hester and colleagues attempted to compare the projectile points located on the Lowe Ranch with other Mesoamerican and Central American points. They noted morphological similarities between projectile points found in central Texas and South America, but found little correlation with Central American lithic materials. Hester asked Richard MacNeish, who was running the Belize Archaic Archaeological

Reconnaissance (BAAR) at the time, to examine the sites in more detail (Hester, Schafer, and Kelly 1980; MacNeish and Nelken-Terner 1982).

The Belize Archaic Archaeological Reconnaissance (BAAR), directed by Richard MacNeish, operated for four field seasons (MacNeish 1981; MacNeish et al. 1980; MacNeish and Nelken-Terner 1983; Zeitlin 1984). With its initial survey begun in 1980, the BAAR focused attention mainly in river corridors and mangrove swamps along the northern Belizean coast, as well as some coastal areas near Stann Creek to the south. Their work eventually moved away from the river courses as they had minimal success in locating sites directly along waterways. MacNeish discovered that near waterways, sites were buried under younger soils. They had better success when excavating in drier areas with higher elevation.

BAAR's excavations at Lowe Ranch helped create the chronological sequence that initially was to become one of the major contributions of its four field seasons. Though the BAAR work was preliminary in regard to preceramic lowland history, they were able to locate at least 160 sites, many preceramic, and compile a relative lithic sequence (Hester et al. 1982; MacNeish and Nelken-Terner 1983; Zeitlin 1984). Recently, however, MacNeish and Nelken-Terner's lithic sequence, and many of their interpretations on Archaic period culture history have been revised or rejected (see Lohse et al. 2006 and Stemp et al. 2016).

Figure 2.4. Lowe and Sawmill points recovered in the vicinity of the upper Belize River Valley. A Lowe point recovered along the Macal River near the wooden bridge in San Ignacio (A); Lowe point recovered along the Macal River near Black Rock (B); Lowe point recovered in Roaring Creek Valley (C); Lowe point recovered at the base of Burial 66 at Caves Branch Rockshelter (D); Sawmill point recovered along the east bank of the Macal River in Santa Elena (E); Sawmill point recovered along the west bank of the Mopan River in Caller Creek (F); Sawmill point recovered at KS003 south of Spanish Lookout (G); Sawmill point recovered near Iguana Creek (H); Sawmill point recovered somewhere in the vicinity of Iguana Creek and KS003 (I).

Archaic Presence in the Belize River Valley and Vicinity. Beginning in 2000, Dr. Jaime Awe of the Belize Valley Archaeological Reconnaissance (BVAR) began asking community members throughout the upper Belize River Valley about Archaic Period discoveries they may have made. He presented images of preceramic lithic materials during presentations for farmers, tour guides, and other community members with the hope that they might have seen or collected artifacts themselves. Since 2000, at least 15 Archaic Period projectile points and one constricted adze have been reported by the community (Figure 2.4 A-C, E, F, H, and I) (Stemp and Awe 2013; Stemp et al. 2016). The lithics recovered by community members have varying degrees of provenience information, but do show that Archaic Period lithics have a higher presence in the upper Belize River Valley than previously thought.

In the Mopan River Valley, located immediately south of the Belize River and forming one fork of the headwaters of the Belize River, Kathryn Brown of the Mopan Valley Preclassic Project (MVPP) has located a paleosol stratum below a hardened marl in Group E at the site of Xunantunich on the western slope of the Mopan (Brown 2011, 2012; Brown et al. 2011). The paleosol contains preceramic deposits of heavily patinated lithic materials and extends below the northern section of Structure E-1 as well as outward beyond the site center. Unique to Brown's find is the stratigraphic continuity between the paleosol and Early to Middle Preclassic strata. Most Maya sites in the Belize River Valley do not contain preceramic deposits, and certainly do not have stratigraphic continuity between preceramic and Early Formative periods.

In the Macal River Valley, which comprises the other fork of the upper Belize River, Terminal Pleistocene faunal remains have been recovered in association with non-diagnostic lithic materials at the cave site of Actun Halal. The faunal remains and lithics were located in the lowest excavation levels and included horse, peccary, and bear fragments (Lhose et al. 2006).

At Caves Branch Rockshelter (CBR) in the Caves Branch River Valley of central Belize, a BVAR investigation in 2005 located one Lowe projectile point (Figure 2.4 D) (Wrobel and Tyler 2006; Wrobel et al. 2007). In contrast to the early date associated with the Lowe point, the majority of artifacts recovered at CBR dated between the Late Preclassic and Late to Terminal Classic periods (Stemp et al. 2013). Previous looting and reexcavation of buried deposits during the site's long occupational period produced heavily mixed deposits, making stratigraphic interpretation speculative at best (Stemp et al. 2013). The Lowe point was found in association with a burial (Burial 66, see Wrobel 2008) with no other evidence of Archaic period occupation, leaving one to speculate that it was secondarily deposited during Maya occupation at CBR.

More recently, Dr. Keith Prufer of the University of New Mexico along with the Uxbenká Archaeological Project (UAP) has located a rockshelter in the Rio Blanco Valley of the Toledo District in southern Belize containing stratified deposits dating as far back as the Late Pleistocene (Prufer et al. In Press). Tzib Te Yux rockshelter contains in situ deposits spanning at least 5,000 years. Excavations from 2012 through 2015 revealed thick deposits of freshwater snail (jute) and radiocarbon samples at the base of the jute midden returned dates as far back as 10,571 - 10,526 BC. A total of 17 AMS radiocarbon samples were taken from the jute midden and below, and show that the rockshelter was used as an animal processing site for at least 4,500 to 5,000 years. In addition to thick jute deposits, the rockshelter contains concentrations of undiagnostic, expedient lithic materials also seen throughout southern Belize in preceramic contexts (Prufer et al. In Press).

Despite the fact that archaeological investigation has been ongoing in Belize for over a century, the Archaic Period is disproportionately represented in comparison to Maya Period sites. The majority of Archaic Period materials have been located in secondary or tertiary context, and most often by individuals not trained in archaeological methods. Investigations by the UAP in southern Belize represent some of the only in situ Archaic and Paleoindian materials discovered to date, illustrating the importance of an effort concentrated on locating and further documenting preceramic deposits. Within the Belize River Valley an in situ Archaic deposit has yet to be discovered, making an investigation focused on the preceramic time period within the valley all the more necessary.

Chapter Three: Archaeological Theory

Several theoretical perspectives have helped inform my research. I have chosen ecological theoretical perspectives because they complement each other and are often overlapping in their approach to understanding the past. I prefer interdisciplinary approaches to research, because a holistic approach is necessary for a thorough understanding of culture, history, and the surrounding environment.

The theories of ecological anthropology and human ecology aid in predicting patterns based on resource proximity and site patterning. Middle range theory aids in making predictions about Archaic Period hunter gatherers in Belize by comparing their mobility patterns to hunter gatherers with similar subsistence patterns elsewhere. Landscape archaeology informs my research by applying a focus on the larger landscape for regional mobility patterns and migrations throughout a changing resource base. Furthermore, the concept of site formation processes has led to my selection of survey areas based on site preservation potential and geomorphologic site impacts since site abandonment.

Ecological Anthropology; Human Ecology. The Ecological anthropology approach to culture focuses on a human population’s relationship with the environment and the human adaptations made because of outside environmental influence. Ecological anthropology asserts that humans adapt to their surroundings and are influenced by natural, outside forces imposed on them. This theory is most often applied to aspects of survival and resource procurement, but may be applied to more minute aspects of culture as well. Human reliance on resource bases is central to an ecological approach. Access to resources influences population density, subsistence patterns, and migratory patterns.

Human ecology is a broader theoretical perspective that employs many aspects of ecological anthropology, but includes a more interdisciplinary approach (Park 1936; Wirth 1945). Aspects of biology, psychology, sociology, as well as anthropology inform human ecology (Bruhn 1972). In addition to observing human physiological changes and adaptations to the natural ecosystem, human ecology also looks at human interaction with the built-environment as a part of our overall ecology, essentially incorporating human influence on the environment into the overall ecological perspective.

An ecological approach is useful for locating patterns of human occupation. In the context of my thesis work, human ecology aids in the location of sites based on proximity and access to resources. Water, navigational paths based on slope and direction, raw material availability, and food sources play a role in site selection. Nomadic hunter gatherers tend to inhabit areas with access to water, food and tool resources, and convenient travel corridors. Utilizing resource proximity as partial criteria in my choice of survey areas yielded more positive results than searching randomly across the landscape.

Middle Range Theory. Middle range theory employs the observation of cultural systems within a well-known culture and correlates those traits to lesser known cultures in an attempt to draw inferences (Binford 1967). Specific indicators of cultural phenomena are identified in one group and used cross-culturally to draw patterns between groups. Corollaries are often drawn from modern material culture and used to infer details about past cultures, not unlike a behavioral archaeological approach as proposed by Schiffer, Reid, and others (Lamotta et al.

2001; Reid et al. 1975). Middle range theory relies on the concept of *systems*, which are organizations of cultural phenomena aimed at deriving patterns across cultures. Systems are interrelated and nested, so that a change in any one system will cause change throughout other systems. In observing cultural dynamics and their material indicators in hunter gatherers in one area, I was able employ middle range theory to make inferences about the hunter gatherers of the Belize River Valley.

Middle Range Theory relies strongly on scientific methods, including statistical analysis and objective reasoning. The theoretical framework of middle range theory has its roots in functionalism and systems theory. Hypotheses derived from middle range theoretical methods are testable using statistical backing to show their significance.

Landscape Archaeology. Landscape archaeology is an approach to archaeological resources that does not confine archaeological sites to restricted concentrations of cultural materials, but rather includes the surrounding landscape as an important component of the archaeological record. A landscape approach to archaeological interpretation considers monumental features, resource procurement areas, viewsheds, travel corridors, and sacred spaces as equally important to the understanding of past cultures as the material remains they left behind (Chapman 2006; Thomas 2001).

In my study, I employ a landscape approach to Archaic Period settlement patterns and resource procurement areas. Mobility is an extremely important aspect to hunter gatherer cultures, and therefore the broader landscape plays an important role in the overall subsistence patterns that make up their lives. Further, different cultures perceive the landscape in differing ways based on their beliefs and subsistence patterns (Thomas 2001). In light of the sparse

Archaic record within the Belize River Valley, it is important to consider the breadth of resources utilized by Archaic Peoples across the landscape. Hunting and gathering areas, lithic procurement areas, and habitation areas are likely spread across a wide geographic area and need to be approached on a landscape scale.

Site Formation Processes. Michael Schiffer (1975, 1983, 1995), Louis Binford (1980, 1981), and others (Ravesloot and Waters 2002; Waters 1992; Waters and Kuehn 1996) have stressed the importance of site formation processes on archaeological site preservation and interpretation. Sites are not in a stasis when being deposited or after abandonment. Impacts change sites by moving artifacts, decomposing perishable materials, and depositing materials after site abandonment. When an archaeological site is discovered, it is not as much a snapshot in time, as Binford's (1981) widely adopted "Pompeii Premise" would suggest, but the remnants of a changing material culture that has been slowly erasing itself since abandonment.

Schiffer (1975, 1983, 1995) describes site formation processes in two categories: natural and cultural site formation processes (N and C-transforms respectively). C-transforms are impacts to an archaeological site created by humans. Human impacts may come from individuals of the culture represented in the archaeological deposit or subsequent human impacts. Implied in a discussion of C-transforms is that in some way the material record is reused for other purposes, is decomposing, and is being replaced as a culture resides in a particular site (Ascher 1961; Binford 1981), and that later cultures may have alternative uses for a place or object that removes it from the archaeological record. Examples of C-transforms may include the excavation and reburial of Maya remains and reoccupation of Pueblo sites after abandonment.

N-transforms are the natural processes that impact site integrity. Disturbances such as those caused by flooding, bioturbation, and erosion are common at archaeological sites. Differentiating N from C-transforms is important for site interpretation. Proper identification of N-transforms requires some geomorphological background. The sequence of natural events versus the deposition of cultural material remains can reveal a site's age, as well as identify a lack of cultural material due to erosional events as opposed to a lack of population during a specific time period.

To consider the impact of N-transforms on site presence and integrity, I employ a geoarchaeological perspective (Beach et al. 2006; Hassan 1979; Ravesloot and Waters 2002; Waters and Kuehn 1996). Using Lidar and geomorphic maps, which show depositional events of the geologically recent past in finer detail than early geologic maps (Ower 1928; Sapper 1896), the ages of sites based on the corresponding depositional events of the soils they inhabit become evident (Ravesloot and Waters 2002; Ray 2009). When paired with C-transforms, particularly agricultural practices from perhaps 1000 B.C. through present day, geomorphic evidence shows a clearer picture of the impacts affecting Archaic Period soils and therefore Archaic cultural materials.

Predictions based on theoretical perspectives. Using middle range theory to predict site density within the Belize River Valley requires consideration of many variables. Limited environmental and cultural knowledge of the Archaic Period in the broader lowland Maya region leaves open the possibility of misinterpretation, but a few predictions may be presented. Ethnographic studies of present-day hunter gatherer populations are often used to create predictive models of the foraging practices, population sizes, and mobility patterns of past populations. In determining hunter gatherer population and territory size, environmental variables play an important role (Bettinger et al. 2015; Binford 1980, 1990; Kelly 1983). Mobility strategies are dependent on resource availability, embedded in which are the foraging strategies that sustain a hunter-gatherer community (Kelly 1983). The environment in western Belize during the Archaic would have been deemed a “benevolent” environment, based on effective temperature (ET), amount of primary production, and primary biomass on the landscape (Binford 1980; Kelly 1983). Hunter gatherers in such an environment, where warm temperatures create year round food resources and the primary production to primary biomass ratio (Binford 1980; Kelly 1983) is somewhat favorable, would require less time monitoring specific food resource availability (Kelly 1983), and therefore *may* structure their mobility patterns around other resources, such as toolstones, desirable upland locations, and specific desirable foods.

Modern ethnographic data of tropical forest hunter gatherer populations shows that residential mobility increases with increased primary biomass, because they are able to travel between resource acquisition areas while still gathering food along the way (Kelly 1983). Their mobility is often “residential,” where they move their primary residence often to capitalize on the resources of a specific area as opposed to a “logistical” mobility pattern where a home base is maintained and groups go on forays to gather and return with resources. Based on Kelly’s (1983) analysis, I would predict that the Archaic Peoples of western Belize would move residences on a regular basis, and that long term camps would be less common than in a colder, low biomass environment. This may mean that sites would remain ephemeral, and may not consist of the material remains seen at long term camps or residences.

The impacts of formation processes since site abandonment suggests that the number of sites abandoned by Archaic Period peoples on the landscape would be far more than what are presently visible. Depositional and erosional forces (N-transforms) work continuously to eradicate archaeological sites and alter landscapes, particularly in high energy fluvial environments like the Belize River Valley floodplains. Further, Maya land modification (C-transforms), have destroyed or buried many sites in high density population centers and agricultural areas. Therefore, the number of intact Archaic sites should be far less than what existed during the Archaic Period. Though not a quantifiable or verifiable theory due to the fact that this concept highlights the presence of negative information, it is important to consider when beginning a survey on a highly modified landscape.

Chapter Four: Methods

My work in the Belize River Valley progressed through multiple phases of research, survey, and testing. I began by researching previous Archaic discoveries throughout Belize and the surrounding region. I found that aside from limited recent discoveries, most Archaic artifacts consisted of lithics discovered inadvertently in tertiary deposits. Areas where diagnostically Archaic projectile points have been discovered tend to be along river corridors, in disturbed areas, and in upland areas where sediment accumulation had been minimal since the Archaic Period.

In researching preceramic sites throughout the region, I found that very few projects have been conducted specifically focused on sites predating the Maya. One notable exception was the Belize Archaic Archaeological Reconnaissance (BAAR) by Richard MacNeish, which operated for four field seasons (MacNeish and Nelken-Terner 1983; Zeitlin 1984), locating at least 160 preceramic and/or multicomponent sites. Their focus was along the northern coast, with most of their survey work taking place near mangrove swamps and river corridors. In the Belize River Valley, Archaic Period discoveries are still limited mainly to surface finds aside from a potential late preceramic component identified in the lowest levels at Cahal Pech (Awe and Healey 1994).

Because the Belize River Valley has seen so little research on Archaic Period occupations, I decided to conduct a broad survey focused on first locating relict soils likely to contain their deposits. I focused first on river valleys, but also included upland areas in my survey work.

Mapping. A major component of my research prior to survey consisted of first mapping aspects related to my project in GIS. I included background information such as soil maps, modern hydrologic data, known archaeological sites, roads, modern and former river courses, slope, vegetation cover, and environmental zones. I used these base map elements to create an interactive file that could be altered in the field as needed. Additionally, I overlaid soils data with Lidar and aerial photographs to identify locations along the Belize, Macal, and Mopan Rivers likely to contain cutbanks with exposed relict soils. Prior to beginning fieldwork, I printed several paper maps covering the Belize River Valley and sections of the Macal and Mopan Rivers for use during fieldwork in the event that internet, computer access or large format printers were not available.

Once in the field, I recorded approximate GPS positions for many previously located Archaic Period lithics in the area surrounding the Belize River Valley. In instances where artifacts did not have exact provenience information (such as private collections), I attempted to approximate their provenience based on the descriptions available. While conducting river survey, I used a Garmin GPS to track survey sections and record cutbank locations.

Equipment. I used traditional survey and excavation equipment for all my fieldwork, in addition to numerous computer programs. Field equipment included an extendable basket augur with multiple auger heads to facilitate soil sampling in a variety of soil types. I used a ¼ inch mesh shaker screen to sift all sediment from my auger cores, shovel tests, and excavation units. All photographs were shot with a Nikon Coolpix S2900 digital camera. GPS points were recorded with a Garmin RINO 530HCx. Software employed included the ESRI ArcGIS suite, Adobe Suite, Microsoft Office, and Google Earth Pro. I downloaded and processed all recorded data daily, and uploaded information to a cloud server as a backup.

Survey. I first visited surface paleosol exposures to ground truth their extent and record soil information including color, consistency, and content for comparison with possible paleosols located during survey. Once I mapped several exposed surface paleosols, I began survey of the lower Mopan, Macal, and upper Belize Rivers. I floated the river systems and identified cut banks observed in Lidar and aerial photographs, as well as additional cut banks not identifiable in the map images. I surveyed several slopes adjacent to the rivers in an attempt to identify buried paleosols below colluvial deposits.

Shovel Probing and Coring. Once I had completed survey of the river corridors, I began a subsurface testing regiment. I returned to several cutbanks identified during river survey and excavated shovel probes and cores to search for buried deposits. Shovel probes consisted of cylindrical holes approximately 50 cm in diameter. All sediment was screened through ¼ inch mesh. Stratigraphic and soil consistency information was recorded, GPS points were recorded with a Garmin GPS, and photographs were taken with a digital camera. When possible, a three-inch diameter basket auger was used to core as deep into the base of the shovel probe as possible, with a maximum depth of 13 feet. All core sediments were screened and recorded identically to shovel probe sediments.

Chapter Five: Survey Results

Stream Corridor Survey

Stream corridor survey for my thesis included sections of the Macal, Mopan, and Belize Rivers (Figure 5.1). I conducted survey along river corridors by floating the rivers and documenting cutbanks containing deep, exposed soil deposits and examining them for cultural materials. Documentation included GPS points, photographs, and written descriptions. I surveyed approximately 45.22 km of river corridor, and located 11 cutbanks with exposed sediment (Figure 5.1). Of the cutbanks located, only one contained cultural deposits (site KS001), and only one confirmed paleosol exposure was located, also in the same cutbank. KS001 turned out to be a previously documented Maya site, which was not known at the time of survey. An additional likely unrecorded Maya site was located along the west bank of the Mopan River (KS002). Both sites were assigned temporary site numbers and briefly recorded as the aim of survey was not Maya sites but older paleosol identification. Descriptions of KS001 and KS002 are detailed below.

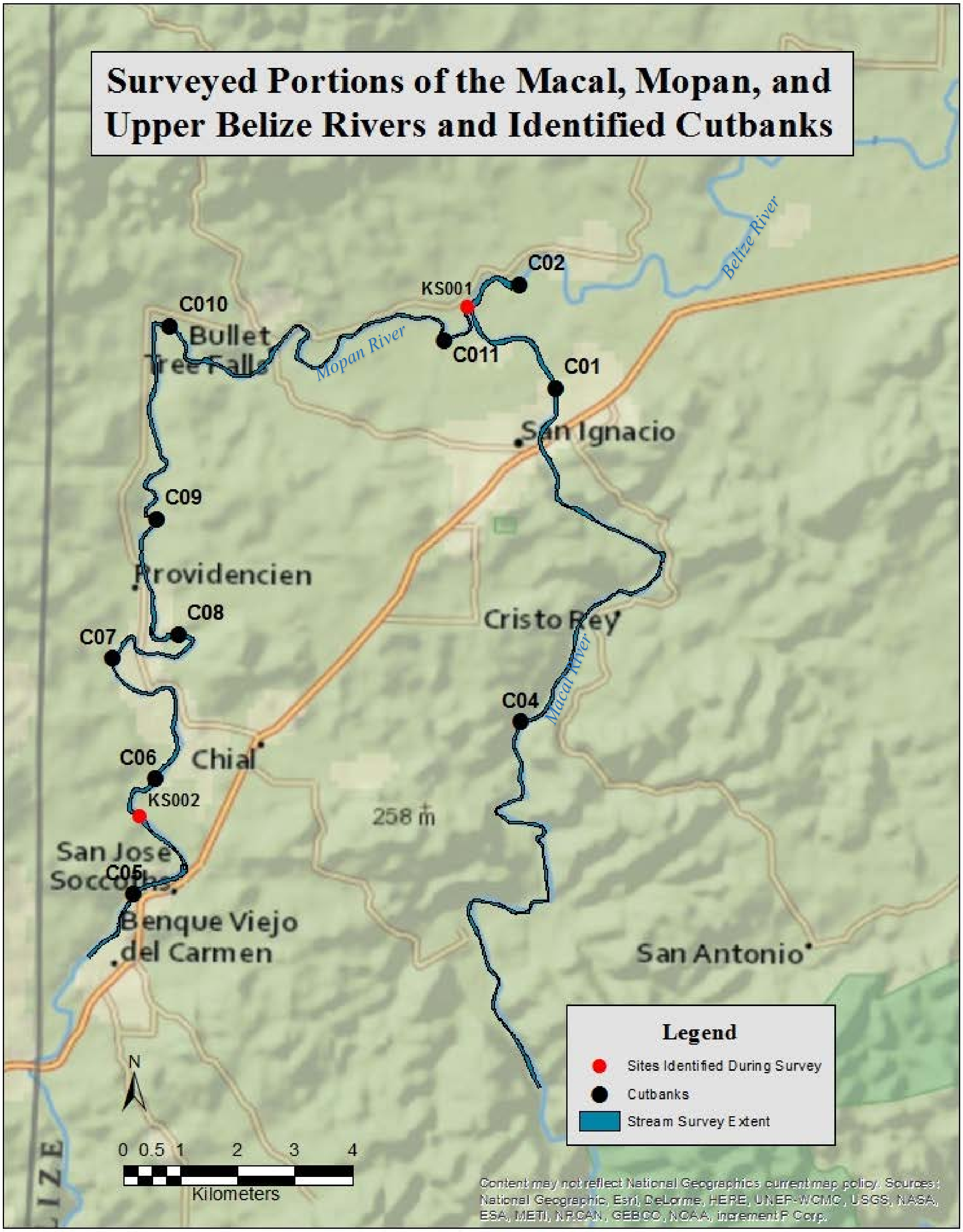


Figure 5.1. Map showing the surveyed portions of the Macal, Mopan, and upper Belize Rivers along with exposed cutbank locations and sites located during survey. Note that cutbank three (C03) is not labeled because it was later discarded due to lack of relevant soils.

KS001. Site KS001 is located at the confluence of the Macal and Mopan rivers, the head of the Belize River (Figure 5.1). The cultural deposits are located in the upper two meters of sediment and consist of Maya artifacts including chert debitage and ceramics (Figure 5.2). A paleosol exposure in the lowest portion of KS001 was the previous discovery site of the femur of an extinct sloth bone recovered after a hurricane eroded a portion of the cutbank (Awe pers. comm. 2016), though no cultural or natural materials were recovered during this survey.

Figure 5.2. Overview of the cutbank containing KS001 in the upper stratum of the cutbank. The lowest stratum with large peds in the center of the image is the paleosol reported to have contained the sloth bone noted above.

KS002. Site KS002 is a mound containing Maya ceramics, chert debitage, and many structural blocks (Figure 5.4). It is located along the western channel edge of the Mopan River. The mound is approximately 35 meters wide along the river bank by ten meters tall. It is covered with dense vegetation, and substantial bioturbation was noted along the bank and slope. Many large cut blocks are visible in the lower portion of the mound, due in part to channel erosion (Figure 5.5). On the southeast (upstream) portion of the mound, a natural limestone bedrock exposure is incorporated into the structure itself. No excavation was conducted at the site, but artifacts noted eroding from the slope consisted of one chert flake and one ceramic sherd (Figure 5.3).

Figure 5.3. A piece of chert debitage (left) and a ceramic sherd (right) observed eroding out of the slope of the mound at KS002.

Figure 5.4. Overview of the mound at KS002.

Figure 5.5. Close-up of the eroding structural blocks at the base of KS002. Note what may be the lowest building blocks on a cleared surface near the water level.

Subsurface Shovel Testing

Shovel testing along the Macal River. Shovel probing along the Macal River was conducted to explore the extinct terraces on the east side of the river. Aside from testing for buried paleosols, I was curious about the level of hillslope erosion versus alluvial deposition on the various terraces. I suspected that thick alluvial and colluvial deposits covered the river bank, but was unsure about the upper terraces.

Shovel testing took place over two days on the 8th and 13th of July 2016 (Table 5.1). Shovel Probe 1 (SP01) was excavated on the first terrace above the east bank of the Macal at the boat launch in Cristo Rey. Sediment consisted of deep sandy deposits with no cultural materials present to a depth of 387 cm below ground surface (cmbgs). Shovel Probes 2, 3, and 4 were excavated at Table Rock Lodge, approximately 2.5 km upstream of Cristo Rey on the east bank of the Macal. SP02 was excavated approximately 50 m away from the present river bank, along one of the many terraces on the slope above the Macal. It consisted of a shallow clay loam above a rotten limestone bedrock. SP03 was excavated on the first terrace above the present stream bed, approximately 25 m above the present river level. Sediment in SP03 consisted of deep sandy deposits with clay in the uppermost stratum. SP04 was excavated approximately 100 m southeast and upslope of SP02 along the upper shoulder of the slope comprising the eastern edge of the Macal’s oldest terrace. Sediment in SP04 consisted of a shallow sandy clay loam over a rotting limestone bedrock, similar to SP02.

Table 5.1. Shovel Probe Results along the Macal River.

Depth (cm)	Sediment Description	Cultural Materials
Shovel Probe 1 (Cristo Rey boat launch) 281255mE, 1895414mN		
0 – 36	10YR 3/3 dark brown fine sandy loam	No Cultural Material
36 - 76	10YR 4/3 brown fine to medium sand	No Cultural Material
76 – 90	10YR 4/3 brown fine to medium sand, very compact	No Cultural Material
Core: 90 – 145	10YR 4/3 brown fine to medium sand, gradually less compact with depth	No Cultural Material
145 – 195	10YR 4/3 brown medium sand, loose	No Cultural Material
195 - 387	10YR 4/3 brown fine sand, slightly compact and finer with depth	No Cultural Material
Comments: SP excavated to 90 cmbgs, 3” dia. core excavated to 387 cmbgs.		
Shovel Probe 2 (Table Rock Lodge) 280038mE, 1893343mN		
0 – 29	10YR 3/3 dark brown clay loam, compact with minimal angular limestone cobbles and one small natural chert fragment	No Cultural Material
29 - 50	7.5YR 4/4 brown clay loam with rotting limestone bedrock	No Cultural Material
Shovel Probe 3 (Table Rock Lodge) 279900mE, 1893260mN		
0 – 21	10YR 4/3 brown fine sand/clay loam	No Cultural Material
21 – 97	10YR 4/3 brown fine sand	No Cultural Material
Core: 97 – 235	10YR 4/3 brown fine sand	No Cultural Material
235 – 304	10YR 4/3 brown fine sand, more compact with depth	No Cultural Material
Comments: SP excavated to 97 cmbgs, 3” dia. core excavated to 304 cmbgs.		
Shovel Probe 4 (Table Rock Lodge) 280128mE, 1893286mN		
0 – 35	10YR 3/1 very dark gray medium sand/clay loam with high angular limestone cobble content	No Cultural Material
Comments: Root impasse at 35 cmbgs.		

Shovel probes along the eastern terraces of the Macal River show that the upper terraces have been stripped of alluvial sediment in the time it has taken the river to downcut and migrate west near Table Rock Lodge. The shallow bedrock on upper terraces suggests that relict soils have likely been washed away over time. Shovel probes on the lower terraces containing deep alluvial sands suggest deep flood deposits in more recent times. The lack of relict soils in the shovel probes neither confirms nor denies a relict soil presence below the limit of excavation, but shows that alluvial deposits have been extensive and would be extremely difficult to test further without heavy machinery and substantial disturbance to the river terraces.

Upland Survey

Because paleosol exposures within the Belize River floodplain proved to be either nonexistent in some places or deeply buried in others, I chose to survey several upland areas reported to have paleosol and preceramic deposits. On 15 July 2016, Victor Gonzalez and I drove to an area near the village of Billy White. We were looking for the pine forest region, which grows in sandy soils unlike the lower, clay-rich soils in the floodplains. An Archaic projectile point had been recovered somewhere in the area but exact provenience information was never recorded. We stopped at several quarry sites and conducted a casual sweep of the area, looking mainly for debitage or other lithics indicative of a preceramic site. After a day of searching, we found two quarries that contained cultural materials (Figure 5.6). Quarry 1 contained several possible cultural materials, while Quarry 2 contained far more cultural materials and a diagnostic projectile point. We recorded and collected the artifacts located at Quarry 1, described in detail below, and decided to concentrate future efforts on Quarry 2, later renamed KS003.

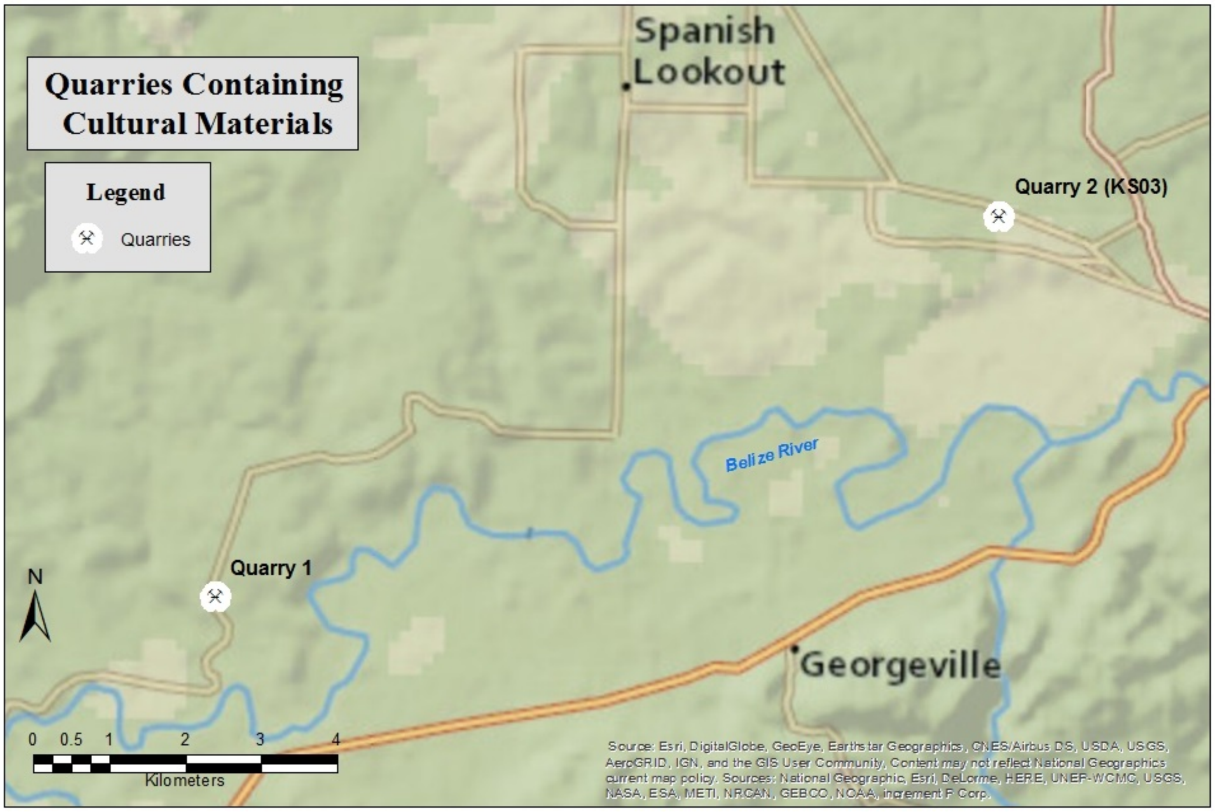


Figure 5.6. Map showing the locations of Quarry 1 and Quarry 2 (later renamed KS03).

Quarry 1. Quarry 1 is located on a relatively flat section of land covered with low brush, pine trees, and bunchgrasses. Sediment consists of between six and 20 cm of sand over water worn cobbles of chert, quartzite, andesite, and diorite. The area has been heavily disturbed by machinery. Most cleared areas had up to a meter of sediment removed (Figure 5.7). Cultural materials located at Quarry 1 consisted of a chert primary flake, a chert secondary flake, and two chert cores (Table 5.2). The two pieces of chert debitage were not definitively cultural in origin because of the large degree of mechanical disturbance in the area, but both cores exhibited distinctive flaking patterns. In particular, FS04 exhibited a radial pattern that could only have come from intentional flaking (Figure 5.8).

Table 5.2. Field Specimens Collected at Quarry 1.

FS #	Easting	Northing	Depth	Description	Material
FS01	281755	1902677	Surface (Disturbed area)	Primary flake	Chert
FS02	281758	1902699	Surface (Disturbed area)	Secondary flake	Chert
FS03	281750	1902701	Surface (Disturbed area)	Core	Chert
FS04	281703	1902608	Surface (Disturbed area)	Core	Chert

Figure 5.7. A disturbed area at Quarry 1, showing the sediment profile with large amounts of rounded cobbles.

Figure 5.8. FS04, a radially flaked core located at Quarry 1.

KS003: A Preceramic Lithic Procurement Area

KS003 was located while surveying upland areas previously identified as pine forest. Pine forest regions in Cayo tend to grow in sandier substrate than the tropical broadleaf forests lower in the floodplain, so using pine as a survey criteria allowed us to narrow in on soils with less alluvial overburden. Therefore, soils that support pine forest are likely much older than those with a silt and clay rich substrate.

Surface recovery. Initial discovery of KS003 occurred on 15 July 2016. The site area consisted of a largely disturbed gravel quarry. Sediment on site consisted of a reddish sandy loam surface strata with many subrounded gravels over a layer of subrounded cobbles. Disturbances consisted of heavy machinery scrapes to a depth of approximately 50 cm below ground surface (Figure 5.9). Vegetation was nonexistent in the disturbed areas, and consisted of pines, young tropical oaks, palms, and bunchgrasses surrounding the disturbance. Our initial artifact discoveries were located within the disturbed region of the quarry.

Figure 5.9. An overview of the section of KS003 where FS01 was discovered. FS01 was located immediately in front of the bulldozer push pile in the center of the frame.

We first located a chert Sawmill projectile point (FS01, Figure 5.10) on the surface of a disturbed area immediately to the east of an existing two-track. We next located several pieces of chert debitage and a chert biface (FS02). In total, 15 pieces of chert debitage were located during the initial discovery, all within disturbed machinery scrapes. All the artifacts were located within a 30m N/S x 25m E/W area. Much of the debitage was located within machinery push piles at the edges of the disturbance, and a small amount was located within the two-track to the south of FS01 and FS02. Once we documented the surface artifacts, we left to obtain landowner permission before continuing work.

Figure 5.10. FS01, a chert Sawmill projectile point located during the initial survey of KS003.

Surface mapping. Detailed surface mapping took place on 19 July 2016. Our crew consisted of Steven Fox, Caroline Watson, and myself. Surface mapping was conducted with tape and compass as well as a Garmin GPS. A site datum was set at a fence post located at UTM Zone 16Q, 292013m East/1907534m North. During surface mapping, we located ten additional field specimens (Figure 5.11) (FS03 – FS12) (See Table 5.3). Field specimens located during mapping consisted of four bifaces, two cores, two utilized flakes, one overshot flake from a biface, and one chopper. Debitage located during surface mapping consisted of a total of 41 flakes: three chert primary flakes, 20 chert secondary flakes, 17 chert tertiary flakes, and one quartzite secondary flake. All field specimens were collected, and debitage was left on site.

Figure 5.11. KS003, FS11. A chert chopper located during surface collection.

Table 5.3. Field Specimens Collected During Surface Mapping.

FS #	Easting	Northing	Depth	Description	Material
FS01	292027	1907530	Surface (Disturbed area)	Sawmill projectile point	Chert
FS02	292024	1907525	Surface (Disturbed area)	Biface	Chert
FS03	292023	1907552	Surface (Disturbed area)	Biface Fragment	Chert
FS04	292037	1907548	Surface (Disturbed area)	Core	Chert
FS05	292034	1907529	Surface (Disturbed area)	Biface	Chert
FS06	292025	1907526	Surface (Disturbed area)	Biface	Chert
FS07	292019	1907523	Surface (Disturbed area)	Utilized flake, possible scraper	Chert
FS08	292015	1907535	Surface (Disturbed area)	Early stage biface	Chert
FS09	292019	1907538	Surface (Disturbed area)	Core	Chert
FS10	292013	1907537	Surface (Disturbed area)	Overshot flake from biface	Chert
FS11	292014	1907537	Surface (Disturbed area)	Chopper	Chert
FS12	292024	1907525	Surface (Disturbed area)	Utilized flake	Chert

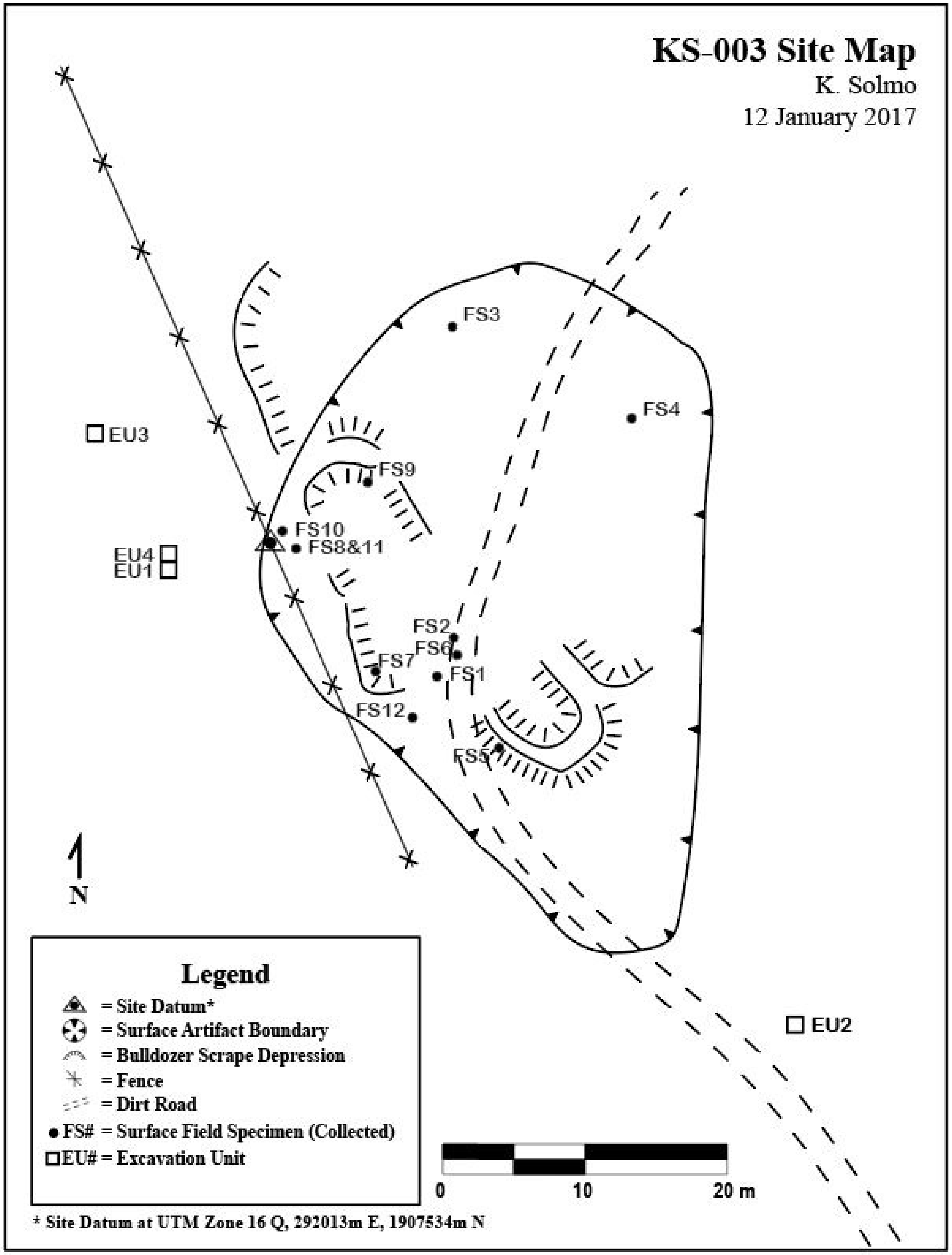


Figure 5.12. KS003 site map showing surface collection, surface artifact extent, and excavation units.

Table 5.4. KS003 Subdatum Locations and Heights (In cm Above Ground Surface).

Datum	UTM Zone	Easting	Northing	Height (cm AGS)
Primary Datum	16 Q	292013	1907534	N/A
Subdatum A	16 Q	292005	1907534	10
Subdatum B	16 Q	292052	1907505	10
Subdatum C	16 Q	291995	1907537	10

Test Excavations

Test excavation at the KS003 site took place over six days, on the 21st, 23rd, 24th, 26th, 27th, and 28th of July 2016. Excavators consisted of Steven Fox, Shawn Dennehy, Kelly Segura, and myself. We excavated a total of four 1x1m excavation units (EU01 – 04) (See Figure 5.12, Site Map). All excavation units (EUs) were located outside the area disturbed by heavy machinery. Sediment was screened through ¼ inch mesh. All artifacts were collected. Levels were excavated based on stratigraphic horizons, with some arbitrary level breaks in excessively deep strata. For each level, soil descriptions, artifact counts, and field specimen descriptions were recorded as excavation occurred. The following are detailed descriptions of each EU by level.

Excavation Unit 1. Excavation on EU01 began on 21 July 2016. The location of EU01 was chosen because lithic materials were located within disturbed sediment approximately ten meters east-northeast, the area contained undisturbed soil, and had minimal amounts of surrounding dense vegetation. The surface consisted of a level area with bunch grasses and shrubs. All measurements were taken from Subdatum A (See Table 5.4 for subdatum heights and locations).

EU01, Level 1. Level 1 was excavated from the ground surface to approximately 25 cm below datum (cmbd). Sediment consisted of a very dark grayish brown (10YR 3/2) loose, fine sandy loam with minimal subangular gravels and moderate charcoal content (Strat I). Level 1 was terminated because excavation encountered a mottled interface with a lower stratum (Strat II). Cultural materials consisted of 14 pieces of lithic debitage (Table 5.5). The majority of debitage was located in the SW quadrant near the interface with Strat II.

Table 5.5. Excavation Unit 1 Level 1 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	1	3	9	1		14
Quartzite	0	0	0	0	0	0
Total	1	3	9	1	0	14

EU01, Level 2. Level 2 was excavated from the interface with Strat II (25 cmbd) to 35 cmbd. Sediment consisted of a yellowish brown (10YR 5/4) fine sand with approximately 20% subrounded cobbles and gravels and charcoal staining (Strat II). Level 2 was terminated arbitrarily within Strat II. Cultural materials consisted of 119 pieces of chert debitage, two pieces of quartzite debitage, one chert biface (EU01FS01), and three chert cores (Figure 5.13) (EU01FS02, 03, and 04). See Table 5.6 for detailed debitage descriptions.

Table 5.6. Excavation Unit 1 Level 2 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	3	15	90	8	3	119
Quartzite	0	0	1	0	1	2
Total	3	15	91	8	4	121

Figure 5.13. EU01, Level 2, FS2, a chert bifacially flaked chopper.

EU01, Level 3. Level 3 was excavated from the base of Level 2 (35 cmbd) to 45 cmbd, still within Strat II. Sediment is consistent with Level 2. Cultural materials consisted of 84 pieces of chert debitage, two pieces of quartzite debitage, one chert chopper (EU01FS05), one chert overshot flake (EU01FS06), one chert core (EU01FS07), and one chert medial biface fragment (EU01FS08). See Table 5.7 for detailed debitage descriptions.

Table 5.7. Excavation Unit 1 Level 3 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	4	19	53	4	4	84
Quartzite	0	1	0	1	0	2
Total	4	20	53	5	4	86

EU01, Level 4. Level 4 was excavated from the base of Level 3 (45 cmbd) to 55 cmbd. Sediment was consistent with Level 3 for the majority of the level, though at the base of the NE quadrant a clay loam was encountered (Strat III). Cultural materials were far fewer than the previous level, and consisted of 31 pieces of chert debitage. See Table 5.8 for detailed debitage descriptions.

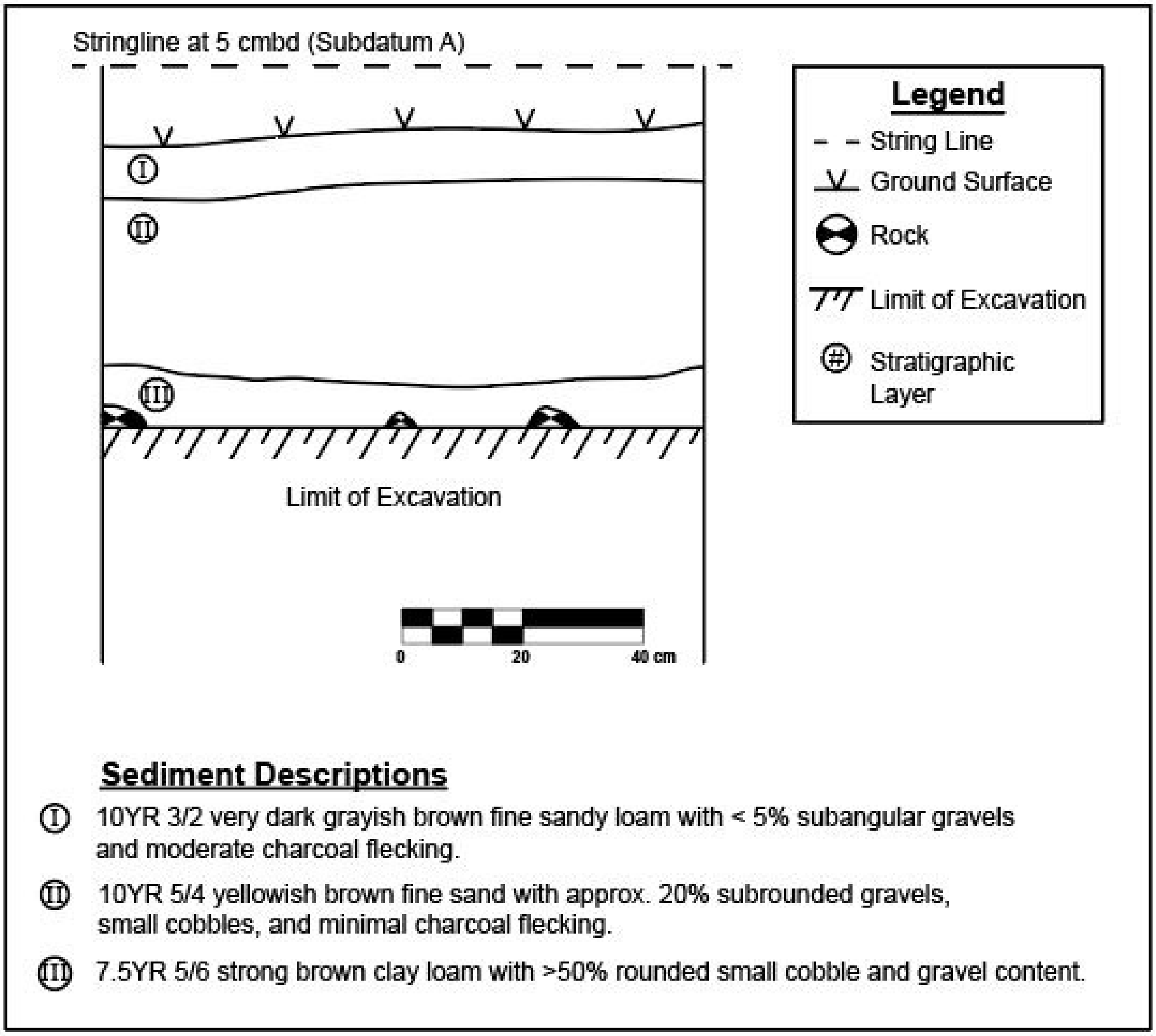
Table 5.8. Excavation Unit 1 Level 4 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	1	8	22	0	0	31
Quartzite	0	0	0	0	0	0
Total	1	8	22	0	0	31

EU01, Level 5. Level 5 was excavated from the base of Level 04 (55 cmbd) to 65 cmbd (Figure 5.14). Sediment began at the Strat II/III interface and progressed into Strat III, a strong brown (7.5YR 5/6) clay loam with approximately 50% rounded gravel and small cobbles. Cultural materials consisted of 12 pieces of chert debitage, all located in the Strat II/III interface. No cultural material was located within Strat III. See Table 5.9 for detailed debitage descriptions. EU01 was terminated at the base of Level 5 (Figure 5.15).

Table 5.9. Excavation Unit 1 Level 5 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	1	1	10	0	0	12
Quartzite	0	0	0	0	0	0
Total	1	1	10	0	0	12



Sediment Descriptions

(I) 10YR 3/2 very dark grayish brown fine sandy loam with < 5% subangular gravels and moderate charcoal flecking.

(II) 10YR 5/4 yellowish brown fine sand with approx. 20% subrounded gravels, small cobbles, and minimal charcoal flecking.

(III) 7.5YR 5/6 strong brown clay loam with >50% rounded small cobble and gravel content.

Figure 5.14. Excavation Unit 1 north wall profile.

Figure 5.15. EU01, base of Level 5. North aspect.

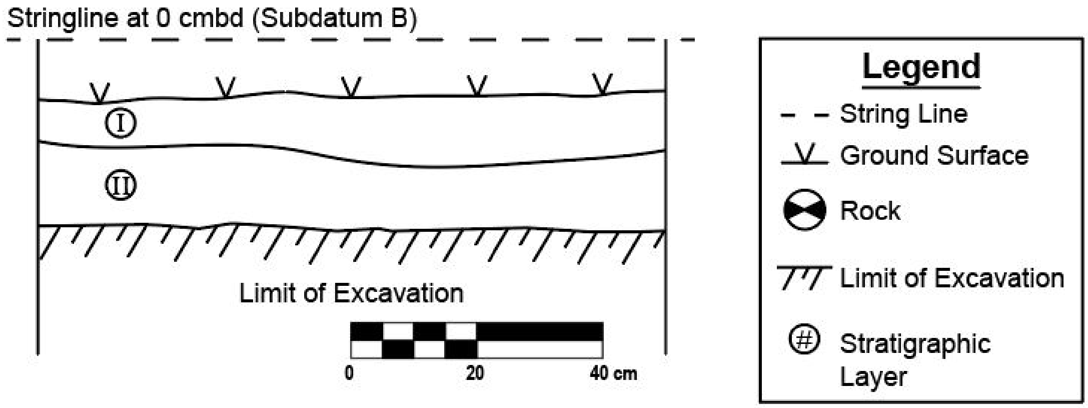
Excavation Unit 2. Excavation on EU02 began on 26 July 2016. The location of EU02 was chosen to explore potentially undisturbed sediment to the south-southeast of the KS003 surface finds and to explore the extent of the site. It is located approximately ten meters southeast of the southernmost identified surface artifact. The surface consisted of a level area with bunch grasses. The young vegetation suggests that the ground surface may have been minimally disturbed in the past. All measurements were taken from Subdatum B (See Table 5.4 for subdatum heights and locations).

EU02, Level 1. Level 1 was excavated from ground surface (7 cmbd) to 16 cmbd. Sediment consisted of a very dark grayish brown (10YR 3/2) fine sandy loam with minimal subrounded gravels (Strat I). Level 1 was terminated because excavation encountered an interface with a lower stratum (Strat II). Cultural materials consisted of five pieces of chert debitage (Table 5.10).

Table 5.10. Excavation Unit 2 Level 1 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	0	0	5	0	0	5
Quartzite	0	0	0	0	0	0
Total	0	0	5	0	0	5

EU02, Level 2. Level 2 was excavated from the Strat I/II interface (16 cmbd) to a depth of 30 cmbd (Figure 5.16). Sediment consisted of a yellowish brown (10YR 5/6) fine sandy clay loam transitioning into a clay loam with depth (Strat II). Level 2 was terminated due to the absence of cultural materials (Figure 5.17). No cultural materials were located in this level.



Sediment Descriptions

Ⓘ 10YR 3/2 very dark grayish brown fine sandy loam with < 5% subrounded gravels.

Ⓘⅰ 10YR 5/6 yellowish brown fine sandy clay loam transitioning to clay loam. Higher clay content in the north half of the unit.

Figure 5.16. Excavation Unit 2 west wall profile.

Figure 5.17. Excavation Unit 2, base of Level 2. North aspect.

Excavation Unit 3. Excavation on EU03 began on 27 July 2016. The location of EU03 was chosen to explore the site extent to the west of EU01. It is located approximately nine meters west-northwest of EU01. The surface consisted of a level area with bunch grasses and small shrubs with surrounding oak trees. All measurements were taken from Subdatum C (See Table 5.4 for subdatum heights and locations).

EU03, Level 1. Level 1 was excavated from ground surface (15 cmbd) to 21 cmbd. Sediment consisted of a dark grayish brown (10YR 4/2) loose loamy fine sand with subrounded gravels and charcoal flecking (Strat I). Level 1 was terminated because excavation encountered an interface with a lower stratum (Strat II). Cultural materials consisted of ten pieces of chert debitage (Table 5.11).

Table 5.11. Excavation Unit 3 Level 1 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	3	2	5	0	0	10
Quartzite	0	0	0	0	0	0
Total	3	2	5	0	0	10

EU03, Level 2. Level 2 was excavated from the interface with Strat II (21 cmbd) to 48 cmbd. Sediment consisted of a strong brown (7.5YR 5/6) clay loam with at least 50% subrounded cobbles and gravels, similar to Strat III in EU01. Level 2 was terminated because excavation encountered an interface with a lower stratum (Strat III). Cultural materials consisted of 11 pieces of chert debitage and one possible chert core (EU03FS01) (Table 5.12).

Table 5.12. Excavation Unit 3 Level 2 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	2	3	4	1	1	11
Quartzite	0	0	0	0	0	0
Total	2	3	4	1	1	11

EU03, Level 3. Level 3 was excavated from the interface with Strat III (48 cmbd) to 54 cmbd. Sediment consisted of a yellowish red (5YR 4/6) medium to coarse sandy clay loam with at least 50% subrounded cobbles and gravels and some bioturbation. Level 3 was terminated because of a lack of cultural material.

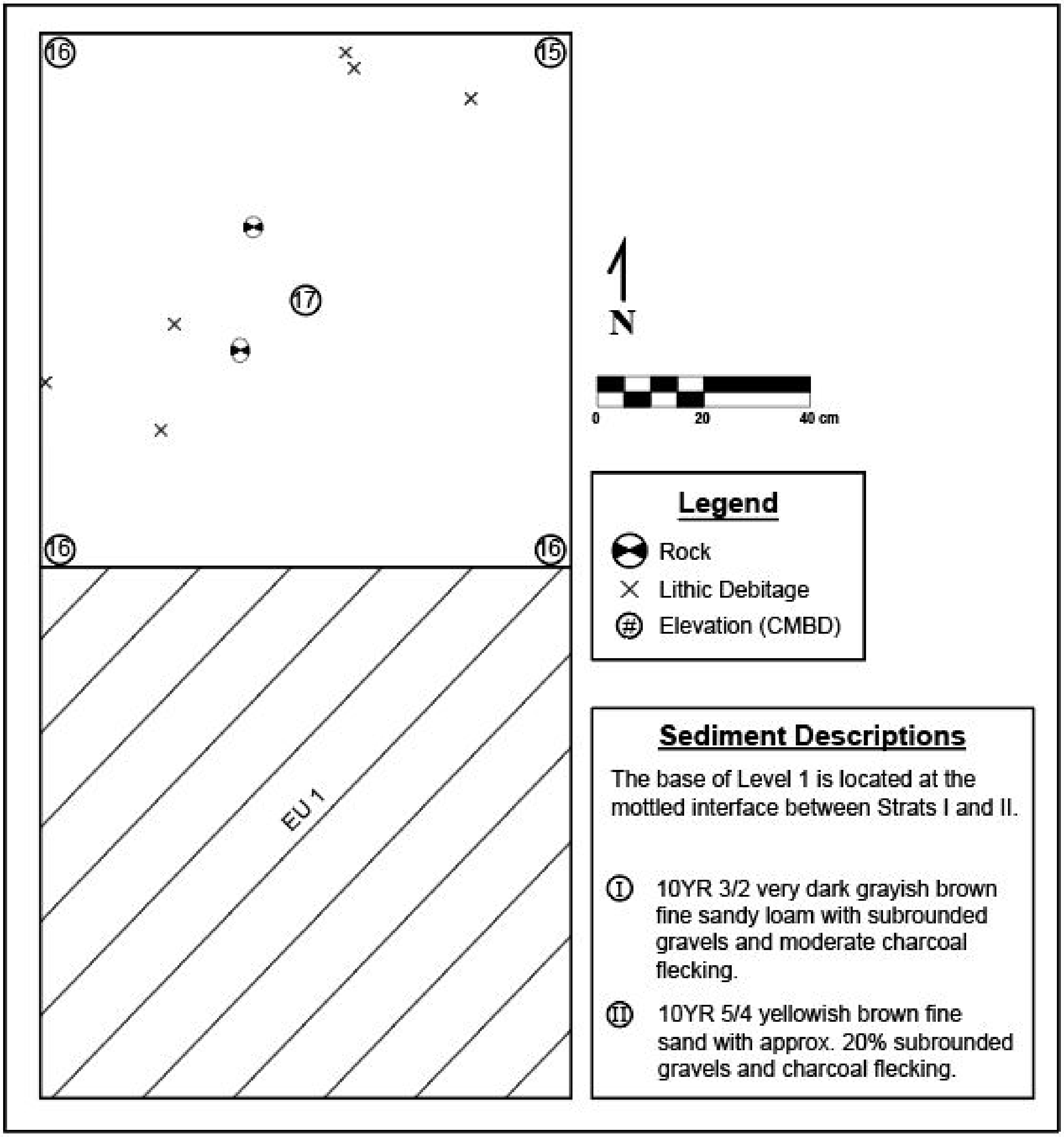
Excavation Unit 4. Excavation on EU04 began on 27 July 2016. The location of EU04 was chosen to further explore the deposits surrounding EU01. It is located adjacent to the north wall of EU01 (Figure 5.18). The surface consisted of a level area with bunch grasses and small shrubs. All measurements were taken from Subdatum A (See Table 5.4 for subdatum heights and locations).

Figure 5.18. BVAR field school student Shawn Dennehey taking measurements in the upper level of EU04.

EU04, *Level 1*. Level 1 was excavated from ground surface (15 cmbd) to 27 cmbd. Sediment consisted of a very dark grayish brown (10YR 3/2) fine sandy loam with charcoal flecking and subrounded gravels (Strat I). Level 1 was terminated because excavation encountered a mottled interface with a lower stratum (Strat II). Cultural materials consisted of nine pieces of chert debitage and one piece of quartz debitage (Table 5.14). Several pieces of chert debitage were visible in the floorplan at the base of Level 1 (Figure 5.19).

Table 5.14. Excavation Unit 4 Level 1 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	0	3	5	1	0	9
Quartzite	0	0	0	0	0	0
Quartz	0	0	1	0	0	1
Total	0	3	6	1	0	10



The base of Level 1 is located at the mottled interface between Strats I and II.

Ⓘ 10YR 3/2 very dark grayish brown fine sandy loam with subrounded gravels and moderate charcoal flecking.

Ⓘⓘ 10YR 5/4 yellowish brown fine sand with approx. 20% subrounded gravels and charcoal flecking.

Figure 5.19. Excavation Unit 4 Level 1 floorplan.

EU04, *Level 2*. Level 2 was excavated from the Strat I/II interface (27 cmbd) to 34 cmbd. Sediment consisted of a yellowish brown (10YR 5/4) fine to medium sandy loam with heavy charcoal flecking, approximately 20% subrounded gravels, and some oxidized soil (Strat II). Level 02 was terminated within Strat II to coincide with the levels in adjacent EU01. Cultural materials consisted of 95 pieces of chert debitage, two pieces of quartz debitage, and two chert cores/choppers (EU04FS01 and 02) (Table 5.15). Additionally, two charcoal samples were obtained (EU04AFS01 and 02). AFS01 was located at 28 cmbd, 20 cm E, 22 cm N. AFS 02 was located at 33 cmbd, 24 cm E, 29 cm N (Figure 5.20). Oxidized soil, charcoal, and several chert potlids all evidence burning. Additionally, a chert chopper (EU04FS03) is visible in the Level 2 floorplan (Figure 5.21).

Table 5.15. Excavation Unit 4 Level 2 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	2	17	72	3	1	95
Quartzite	0	0	0	0	0	0
Quartz	0	0	2	0	0	2
Total	2	17	74	3	1	97

Figure 5.20. EU04, base of Level 2. Note the debitage in the floorplan and FS3, a chert chopper, partially exposed in the southeast quadrant. North aspect.

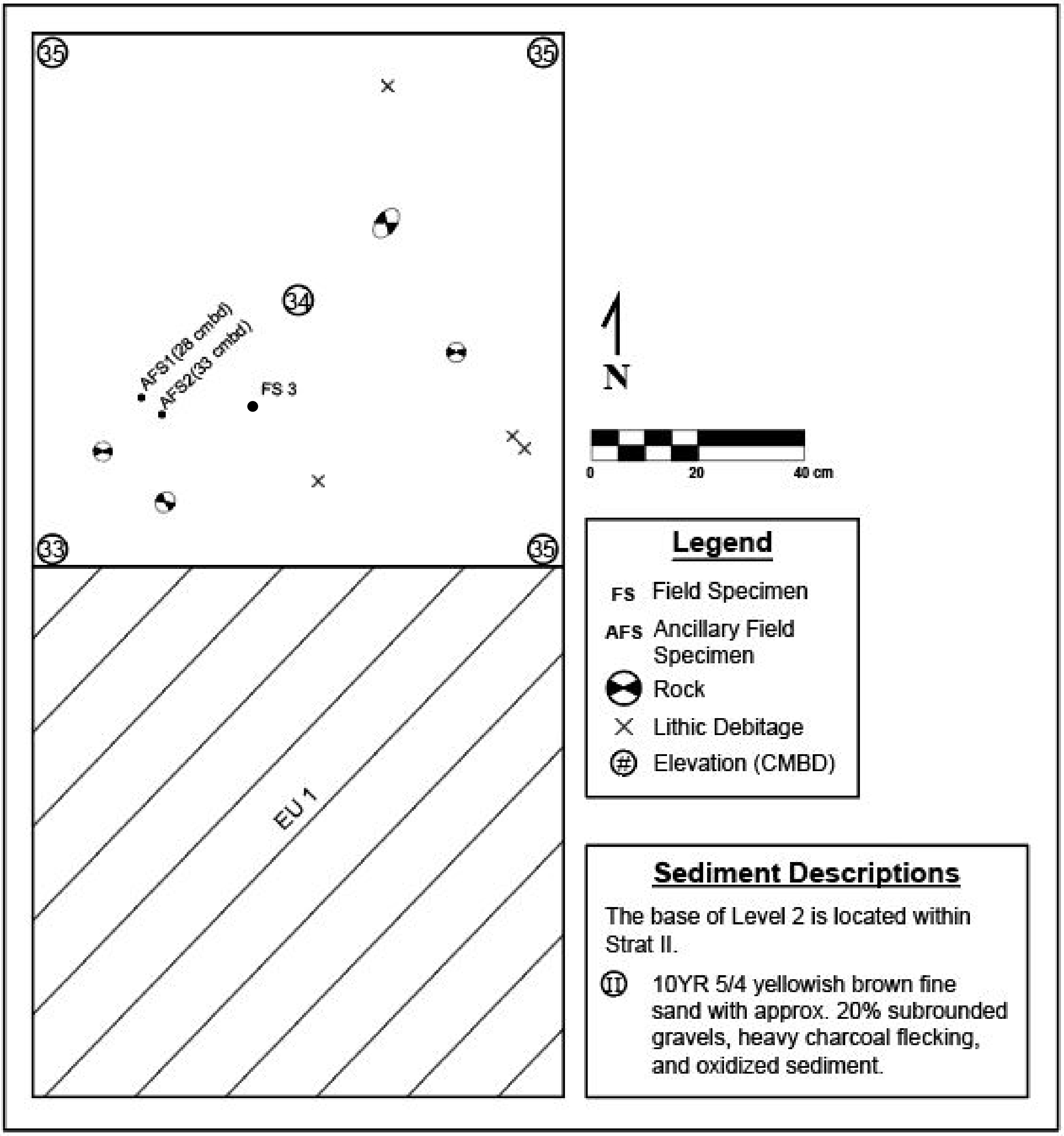


Figure 5.21. Excavation Unit 4 Level 2 floorplan. Note the location of two charcoal samples, AFS 1 and 2.

EU04, Level 3. Level 3 was excavated from 34 cmbd into Strat III to a depth of 45 cmbd. Sediment began as Strat II in Level 2, and at approximately 37 cmbd the interface with Strat III was encountered. Strat III was similar to Strat II but with lower charcoal flecking and more densely compacted. It consisted of a yellowish brown (10YR 5/4) moderately compact medium sandy loam with approximately 20% subrounded gravels and minimal charcoal flecking. Level 03 was terminated within Strat III to coincide with the levels in adjacent EU01. Cultural materials were concentrated in the upper five cm of Level 3. Materials consisted of 198 pieces of chert debitage, two pieces of quartz debitage, one chert chopper (EU04FS03, Figure 5.22), and one early stage chert biface (EU04FS04) (Table 5.16).

Table 5.16. Excavation Unit 4 Level 3 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	7	38	144	9	0	198
Quartzite	0	0	0	0	0	0
Quartz	0	0	2	1	0	3
Total	7	38	146	10	0	201

Figure 5.22. FS3, a chert core tool with battering on one distal end (left in the photo) from EU04 Level 3.

EU04, Level 4. Level 4 was excavated from 45 cmbd through the remainder of Strat III and into Strat IV, to a depth of 54 cmbd. Strat IV appeared at the base of Level 4 in the eastern half of the unit. It consisted of a strong brown (7.5YR 5/6) coarse sandy clay loam with approximately 10% subrounded gravels. Level 4 was terminated because of the interface with

Strat IV. Cultural materials were all obtained within Strat III, and consisted of 23 pieces of chert debitage (Table 5.17).

Table 5.17. Excavation Unit 4 Level 4 Flake Tally.

Material	Primary	Secondary	Tertiary	Shatter	Potlid	Total
Chert	1	3	18	1	0	23
Quartzite	0	0	0	0	0	0
Quartz	0	0	0	0	0	0
Total	1	3	18	1	0	23

Figure 5.23. EU04, base of Level 4. The base of EU01 Level 5 is in the foreground. North aspect.

EU04 was unintentionally terminated at the base of Level 4 (Figure 5.23) when Hurricane Earl flooded the site and caused widespread flooding throughout the region, prematurely ending the field season and investigations at KS003. Had weather not halted excavation, EU04 would have been excavated level with EU01 provided artifact counts continued to dwindle and sediment transitioned into the gravelly substrate noted as the subsoil in previous units.

Chapter Six: Conclusions

Research Complications

The difficulties of survey made testing the entirety of the floodplains within the upper Belize River Valley impossible. I conducted a sample based on criteria I set forth, so the success of my survey was bounded by my own assumptions. Paleosols within the river channels and floodplains were deeper than I had anticipated, so locating riverine Archaic Period sites with the methods available to me was far more unlikely than I had planned. Because visible paleosols within the Belize River Valley floodplains are so few and so deeply buried, Archaic Period deposits would be identifiable only in active cutbanks. Such a small survey is unlikely to yield considerable positive results even if populations were large during the Archaic. Failing to locate Archaic Period materials in river cutbanks did not indicate the absence of riverine human activity during the Archaic, but instead illustrates the difficulty of finding evidence in a rapidly depositional and geomorphically active environment. After many miles of river channel survey and very little success, I adapted my survey to include upland areas where paleosol exposures were closer to the ground surface.

Upland areas presented their own challenges. The pine forests that grow in sandy relict soils also tend to be in areas owned by Mennonite farmers. Private property access became a constant challenge, as did relations with farmers that do not necessarily want their fields turned into an archaeological site. The initial survey work was subtle enough to go unbothered, but once I located KS003, obtaining permission to dig was a small challenge. The site is located on property owned by Stones and Excel, two gravel quarrying operations owned by American investors. I obtained permission to work at the site from the company owner, but answered questions from curious employees almost daily. Also, the quarrying operations themselves have done irreparable damage to KS003, as well as countless undiscovered sites in the upland pine forest area.

Finally, weather was a constant adversary. Rainfall swelled the rivers during river survey making navigation a challenge. During excavation, rain flooded the units on several occasions. Ultimately, Hurricane Earl hit the shores of eastern Belize and moved into Cayo, flooding the site and ending my fieldwork for the season. This occurred just prior to completing excavation on Unit 4, which would have tied the two most productive units together and provided a complete wall profile depicting the strata containing the site's toolstone source and its overlying cultural component.

Predictive Modeling

The predictive modeling I employed for locating paleosols and Archaic deposits had varying results based on inputs. Lidar proved to be less useful because soil types and the subtle landforms where paleosol exposures are abundant are not easily visible on a Lidar map. Mapping Hydrologic data combined with Lidar was effective in locating some cutbank soil exposures, though identifying exposures deep enough to contain paleosols was difficult and ground truthing was far more effective than predictive work.

The most useful inputs for predictive modeling of Archaic deposits and their surrounding soils proved to be the use of soils maps paired with vegetation zones. Soils layers, and to a lesser degree elevation layers, isolated areas that were more likely composed of paleosols containing cultural materials deposited during the Archaic. Most helpful, however, was above ground survey. Vegetation proved to be the most useful tool for locating paleosols, because lowland pine forest prefers to grow in the sandy soils that make up the paleosols of Cayo District. Presently, lowland pine forest is being eradicated to make way for agricultural development and industrial land uses, making the identification of lowland pine forest more difficult. It is no coincidence that gravel mining takes place in the same areas as lowland pine forest, because the same soils that promote pine growth also contain the cobbles sought after for gravel production. Therefore, to more accurately represent areas of former lowland pine forest, regions cleared for agriculture and gravel mining operations must be included in survey.

Theoretical predictions. As suspected, much of the Macal, Mopan, and upper Belize River floodplains contained thick deposits of alluvium covering paleosol strata. Other sections were heavily eroded, removing paleosols in addition to burying the deposits. Sites are indeed sparse, and the one location containing diagnostic Archaic Period materials is in a toolstone source and contained only materials related to stone tool production (KS003), rather than evidence of habitation. Whether this is a result of low population density or a high degree of site transforms is uncertain, but the result is that presently Archaic Period site presence on the landscape is minimal.

Stream Corridor Survey

My hypothesis that stream cutbanks would provide a profile view of soils containing paleosols was somewhat correct because at least one cutbank did contain a paleosol component, site KS001. It was not, however, very successful because floodplains on the Macal, Mopan, and upper Belize Rivers tend to have very deep alluvial sediment deposits dating to Maya Period or later. Therefore, cutbanks in within the survey area aside from KS001, tended to expose profiles that did not include relict soils. In an environment with less alluvial deposition, this method has proven to be effective but in the Belize River Valley cutbanks with sufficient depth are rare.

Future Research. Data collected through stream survey, though it did not provide positive results for my thesis, is still useful for additional research. Cutbanks and exposed soil profiles are useful for documenting sediment profiles of later stream meandering events, stream downcutting during and after Maya occupation of the valley, and other geomorphological and geoarchaeological studies. Further, we noted many occurrences of limestone bedrock outcrops that limited downward stream cutting and create rapids and knickpoints in a stream course. The timing of bedrock exposure due to downcutting, paired with stream morphology and Maya site locations will inform the reconstruction of trade routes along stream corridors. Sites like KS002 may have been trade-related centers, and further investigation may show that stream downcutting occurred after the decline of sites utilizing the river as a trade route.

KS003 Site Interpretations

Site KS003 contained a dense artifact concentration in only three one by one meter units. The cultural material bearing stratum, consisting entirely of lithics, was discrete and consistent in all units and in the disturbed surface collection. The sediment is a sandy deposit above a sand/clay loam containing rounded cobbles ideal for lithic tool manufacture. The sandy stratum overlaid on top of alluvially deposited cobbles and clays suggests the people utilizing the site were digging up cobbles and working the material on site, rather than carrying it away.

A peculiar aspect of KS003 involves the type of debitage present. The artifact assemblage consists of a large amount of lithic debitage including primary, secondary, and tertiary flakes

(Tables 5.5 - 5.17) as well as several early stage bifaces, choppers, and cores (Table 6.1). Unique in the lithic assemblage is an unusually high percentage of tertiary flakes for a lithic procurement site, suggesting that final tool retouch was occurring at the material source. There are numerous possible explanations for the disproportionate percentage of finishing flakes. Perhaps KS003 was not just a lithic procurement area, but also a habitation site. The battered choppers found onsite lend evidence for activity beyond simple material gathering. A nomadic hunter gatherer culture may have had use for this area in addition to its toolstones- this may have been an encampment for avoiding high water during river flood stages, an area away from insect-infested wetlands closer to the river, or simply an area where people stayed for periods while gathering materials. Given the large time gap between site deposition and present day, the Belize River was likely at a much different location and elevation, placing the site in closer proximity to the river and not as far above the floodplain.

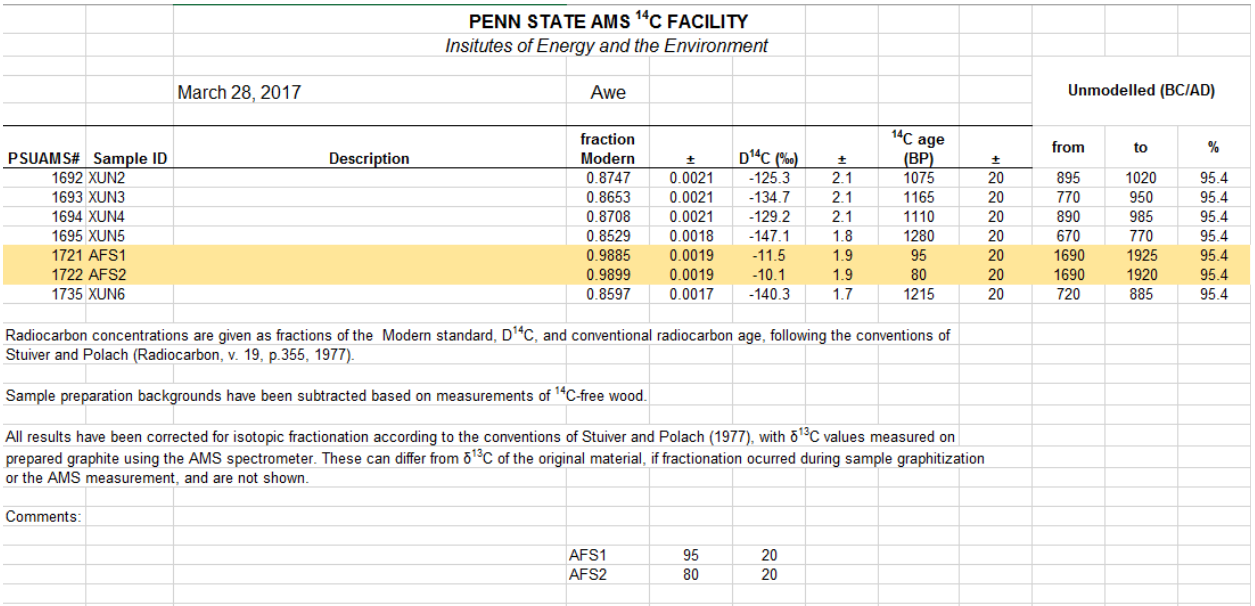
Table 6.1. Field Specimens Recovered by Excavation Unit at KS003.

	Level	Description
EU01		
FS01	2	Chert biface
FS02	2	Chert core, battering on distal end
FS03	2	Chert core
FS04	2	Chert core
FS05	3	Chert chopper
FS06	3	Chert overshot flake
FS07	3	Chert core fragment
FS08	3	Chert medial biface fragment
EU3		
FS1	2	Chert core
EU4		
FS1	2	Chert core
FS2	2	Chert core
FS3	3	Chert core
FS4	3	Chert biface, early stage

The intact nature of the sediment overlaying the cultural stratum at KS003 suggests that minimal disturbance had impacted the site until modern quarrying activity obliterated the northeastern section. During the Maya occupation of the region, soils at KS003 would have been less ideal for maize farming than in lower elevations closer to the river. Traditional Maya farming methods consisted of hand digging fields, and rocky soils would have been less desirable than the thicker silt and clay deposits in the river floodplain (Fedick 1995). It was not until the recent introduction of mechanical farming implements brought by Mennonite farmers that the soils around Spanish Lookout became desirable sites for large scale agricultural production. Even still, the soils surrounding KS003 are less desirable than those further north, and as of yet, the area has seen disturbance limited mainly to gravel extraction and production.

Radiometric Dates. Collecting carbon samples at KS003 was a challenging process for several reasons. Sediment consisted primarily of a sandy matrix with very high drainage rates, repeatedly flooding and rotting organic materials at a faster rate than would be seen in a clay rich soil. Additionally, bioturbation was widespread throughout the area in the form of both root penetration and animal burrowing. Finally, the sediment showed signs of repeated burning, evidenced by charcoal flecking throughout most levels of excavation. It is likely that the lowland pine forests that surround KS003 burn on a regular basis, adding carbon to the sediment repeatedly since the original site occupation.

Two charcoal samples (AFS 1 and 2) were removed from Excavation Unit 4, Level 3 (See Figure 5.19) in a dense concentration of lithic material including debitage and a chopper (EU04FS03). Both samples were sent to the Human Paleoecology and Isotope Geochemistry Lab in the Department of Anthropology at Penn State University for AMS dating. The samples were processed following conventions set by Stuiver and Polach (1977). Unfortunately, both samples returned dates far more recent than their surrounding artifacts. AFS 1 (PSUAMS#1721) returned a conventional radiocarbon age (CRA) of AD1690 to 1925 with a 95.4% degree of accuracy. AFS 2 (PSUAMS#1722) returned a CRA of AD1690 to 1920, also with a 95.4% degree of accuracy. The soil profiles in EU04 were intact and undisturbed, which suggests that at some point in recent history the lowland pine forest surrounding KS003 burned and may have charred root structures extending into the sediment. The modern fraction, D^{14}C, and ^{14}C BP ages are presented below (Figure 6.1).



PENN STATE AMS ^{14}C FACILITY

Insitutes of Energy and the Environment

March 28, 2017 Awe

									Unmodelled (BC/AD)		
PSUAMS#	**Sample ID**	**Description**	**fraction Modern**	**±**	**D^{14}C (‰)**	**±**	**^{14}C age (BP)**	**±**	**from**	**to**	**%**
1692	XUN2		0.8747	0.0021	-125.3	2.1	1075	20	895	1020	95.4
1693	XUN3		0.8653	0.0021	-134.7	2.1	1165	20	770	950	95.4
1694	XUN4		0.8708	0.0021	-129.2	2.1	1110	20	890	985	95.4
1695	XUN5		0.8529	0.0018	-147.1	1.8	1280	20	670	770	95.4
1721	AFS1		0.9885	0.0019	-11.5	1.9	95	20	1690	1925	95.4
1722	AFS2		0.9899	0.0019	-10.1	1.9	80	20	1690	1920	95.4
1735	XUN6		0.8597	0.0017	-140.3	1.7	1215	20	720	885	95.4

Radiocarbon concentrations are given as fractions of the Modern standard, D^{14}C, and conventional radiocarbon age, following the conventions of Stuiver and Polach (Radiocarbon, v. 19, p.355, 1977).

Sample preparation backgrounds have been subtracted based on measurements of ^{14}C-free wood.

All results have been corrected for isotopic fractionation according to the conventions of Stuiver and Polach (1977), with δ^{13}C values measured on prepared graphite using the AMS spectrometer. These can differ from δ^{13}C of the original material, if fractionation ocurred during sample graphitization or the AMS measurement, and are not shown.

Comments:

AFS1	95	20
AFS2	80	20

Figure 6.1. A copy of the radiometric results for AFS 1 and 2 from the Penn State AMS ^{14}C facility.

A lack of radiometric dates is not uncommon at preceramic sites in Belize, and though it does not confirm an absolute age for KS003, the associated Sawmill projectile point places it firmly within the Archaic Period. Widespread burning and land clearing is common throughout Belize, and contaminated or recent radiocarbon dates are also common as a result. A similar result occurred during the 2015 BVAR field season in the Barton Creek Valley, where agricultural burning contaminated several radiocarbon dates (Kollias 2016).

Additional Discoveries and Future Research

In addition to FS1 at KS003, two other Sawmill projectile points have been recovered in the surrounding lowland pine region north of the Belize River. Neither point has exact provenience information, and both were discovered inadvertently by locals. One Sawmill point was discovered near Iguana Creek (Figure 6.2, center). Unlike the Sawmill point at KS003 (Figure 6.2, left), the Iguana Creek point exhibits alternate beveling on its left edge, but is otherwise morphologically very similar to the KS003 point. Also located in this region was a Sawmill point with less pronounced beveling on its left margin (Figure 6.2, right). This point was shown to BVAR archaeologist Hannah Zannatto late in the 2016 field season. This point is made of quartzite as opposed to chert, which is very rare in Archaic Period stone tools.

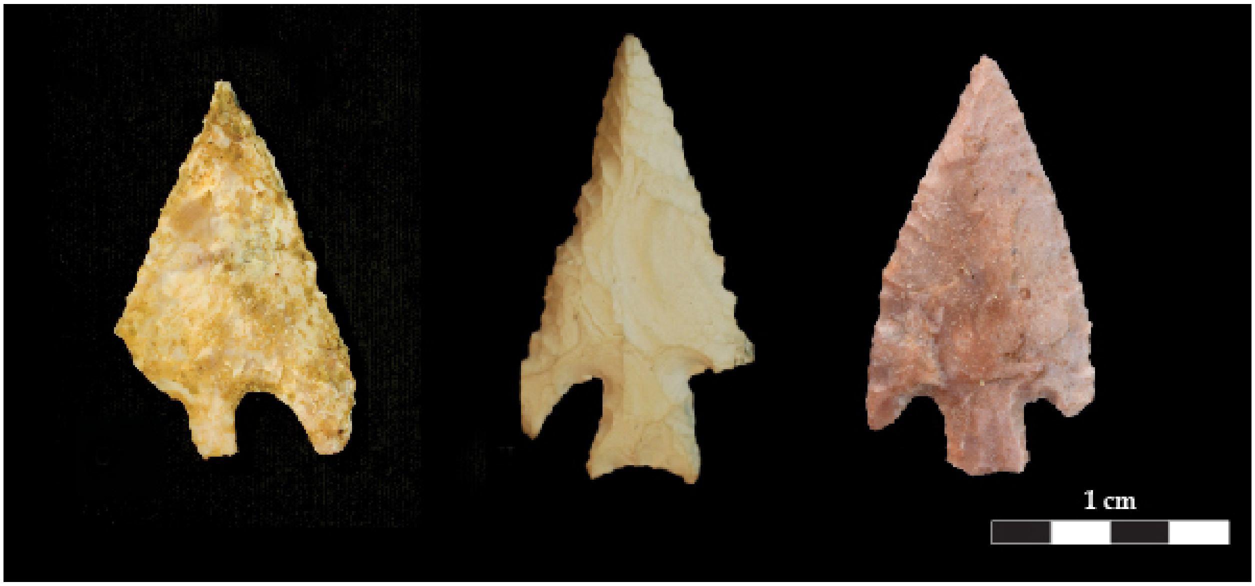


Figure 6.2. Three Sawmill projectile points discovered in the vicinity of Iguana Creek and KS003. FS01 at KS003 (left), The Iguana Creek Point (center), and a collected point (right).

The presence of additional Sawmill projectile points, along with the high density of lithic materials present at KS003, show that Archaic Period presence in the lowland pine region of the upper Belize River Valley is not an isolated occurrence. Future survey and excavation will likely reveal additional intact buried deposits of Archaic materials. Because of the threatened nature of this area by industrial extractive industries and farming, it is paramount that efforts be conducted soon to avoid an irreplaceable loss of data.

The efforts presented here, in addition to the efforts of many before me to define and bolster our understanding of the Archaic Period in Belize, are only preliminary. The potential to refine and rewrite the history of Archaic Period human presence in the upper Belize River Valley exists in the soils of the lowland pine forest. Further investigation will likely show a larger Archaic presence in the region, as has already been seen in both northern and southern Belize.

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