# SURVEY AND SETTLEMENT AT THE ANCIENT MAYA SITE OF KA'KABISH, NORTHERN BELIZE

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**ABSTRACT**

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Archaeologists at the ancient Maya site of Ka'Kabish, in northern Belize, have begun to recreate the developmental history of this medium sized center. Over the course of the 2010 and 2011 field seasons, investigations of settlement surrounding the site revealed several areas of domestic occupation.Archaeologists conducted field survey and test-pit excavationsto investigate the distribution and density of these structures, as well as the occupation history, of the settlement zone. These investigations revealed that areasof the site wereoccupied as early as theLate Preclassic (300BC-AD100) until the Late Postclassic (AD1250-1521), approaching the Colonialperiod of early Maya history.Archaeologists compared distributional characteristics, along with structural densities, to other ancient Maya sites in Northern Belize. These results demonstrate changes in the Ka'Kabish community over time and space, providing yet another example of the variability in the rise and fall of ancient Maya polities.

Key Words: Archaeology, Ancient Maya, Ka'Kabish, Archaeological Survey, Settlement

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# CHAPTER 1: INTRODUCTION

The ancient Maya are a widely studied civilization that thrived for over 1000 years in the tropical environment of Central America. Numerous introductory texts cover various topics related to their ancient society (see Demarest 2004; McKillop 2006; Sharer and Traxler 2006). Archaeologists sometimes organize these documents thematically, while others form a narrative that traces the development of their culture through time. Thematic texts tend to divide the past into clear topics of study, such as the advent of agriculture, the switch to sedentary societies, the domestication of certain types of plants and animals, early writing and calendrics, etc. Chronological reconstructions use time periods to track certain developmental trends, or dynamics, in the archaeological record. These temporal markers are now widely established within the discipline. Table 1 displays the standard time periods used to describe the ancient Maya.

| Cultural Period | Dates |
|---|---|
| Colonial Period | AD 1542 - 1821 |
| Postclassic | AD 900 - 1542 |
| Terminal Classic | AD 800 - 1000 |
| Classic Period | AD 300 - 900 |
| Late Preclassic | 400 BC – 300 AD |
| Middle Preclassic | 1000 BC – 400 BC |
| Early Preclassic | 2000 BC – 1000 BC |
| Archaic Period | 7000 BC – 2000 BC |
| Paleo-Indian Period | 12,000 BC – 7000 BC |

**Table 1: Chronological Division of Ancient Maya History (Demarest 2004)**

Rather than focus on thematic reconstructions, which would exceed the scope of this project, I will provide a brief overview of these main chronological periods and some of the major trends that accompany these spans of time.

**Chronology**

*Paleo-Indian Period (12,000 BC to 7000 BC)*

The date for the start of the Paleo-Indian period has been a subject of debate, as archaeologists, geologists, and geneticists, often dispute when the first occupation of the New World occurred (see Jablonski 2002; Meltzer 2009). Various models of migration show different routes from the Old World. For example, one of the most common theories posits that early humans crossed the exposed Bering Sea land bridge from Siberia into modern day Alaska at least 12,000 years ago, following an ice-free corridor through North America (Goebel et al. 2008). Another common hypothesis, which is referred to as the Pacific Coast Migration Model, states that early humans used the broad, exposed coastline to travel from northeast Asia into the Americas, while relying on marine resources for subsistence (Fladmark 1979). Other theories suggest that very early populations may have migrated across the Atlantic (Stanford and Bradley 2012), or even island hopped across the Pacific, using productive kelp forest habitats to facilitate movement (Erlandson et al. 2007). These theories sometimes argue that the New World was first inhabited as early as 20,000 BC (Adovsaio and Page 2003). For the purposes of this study, I will use dates advocated by Mesoamericanists, and more specifically, Mayanists, who generally place the beginning of the Paleo-Indian period at about 12,000 BC (Demarest 2004; Sharer and Traxler 2006).

During this period, early colonists of the Yucatan Peninsula were comprised of small nomadic bands that subsisted on strategies of hunting and gathering of wild plants and animals. In comparison to the subsequent Archaic period, in which archaeologists have documented sites used as chipping stations, base camps, and limited resource camps (see Brown 1980), Paleo-Indian populations exercised a greater degree of mobility. These small, scattered groups likely relied on several now-extinct species of fauna, along with smaller animals and plants. Archaeological data related to this period is particularly scarce, as little evidence of their populations exists, other than individual finds of diagnostic artifacts, mostly lithics, collected from surface contexts (Lohse et al. 2006:210). For example, in Belize, archaeologists have identified lithic materials – fluted points – that are diagnostic of Paleo-Indian occupation (MacNeish and Nelken-Terner 1983; Pearson and Bostrom 1998).

*Archaic Period (7000 BC to 2000 BC)*

The Archaic period witnessed significant climatic changes, which altered the ecological conditions of the region. By the onset of this era, the Pleistocenemegafauna were mostly extinct in the Americas; however, the rapidity of their demise has often been questioned (Hailea et al. 2009). One notable genus, *Equus*, from which the domestic horse derives, did not return to the continent until the arrival of the Spanish in the 16th century. The cause of these Ice Age extinctions is a matter of debate, with some scholars supporting an overkill, or blitzkrieg, hypothesis, which asserts that humans hunted these animals into extinction within 1000 years of their arrival in the New World (Burney and Flannery 2005). Regardless of the cause, climatic changes, which brought warmer and wetter conditions, along with the disappearance of the megafauna, affected the subsistence patterns of Archaichuman populations in Mesoamerica.

Some of the strongest evidence of these changes in Central America comes from several parts of Panama (Neff et al. 2006:289). For example, scholars used paleoenvironmental evidence from several caves in central Pacific Panama to argue that human populations were using proto-domesticates as early as 6000 BC (Cooke 2005; Ranere and Cooke 1996). At another site in Panama, Cueva de los Ladrones, archaeologists argued that evidence of pollen and phytoliths suggested the presence of domestic maize by 4000 BC (Piperno et al. 1985). Along with evidence from Panama, pollen north of this area, along the Gulf Coast of Tabasco, Mexico, shows that maize may have been cultivated as early as 5000 BC (Pope et al. 2001). These changes in adaptive patterns, along with evidence of sedentary, or semi-sedentary, sites (Brown 1980), suggests that the reliance on wild animals and plants was replaced gradually with an increased dependence on agriculture. In Northern Belize, archaeologists have documented four sites – Laguna de On, Caye Coco, Fred Smith and San Estevan – that have evidence of preceramic lithic technology (Rosenswig 2004). An analysis of pollen data, and use-wear from macroflakes, suggests thatthese groups cleared areas of the forest for plant cultivation as early as 2500 BC (Rosenswig 2004:269).

*Preclassic Period (2000 BC to AD 300)*

This period is commonly divided into the Early Preclassic (2000 BC - 1000 BC), the Middle Preclassic (1000 BC - 400 BC), and the Late Preclassic (400 BC - AD 300). Mayanists also referred to it as the Formative period (Willey 1956; Demarest 2004). During the Early Preclassic, earlier developments, such as initial sedentism and an increased reliance on plant domesticates, led to larger populations and a greater degree of social stratification. Early chiefdoms, or societies characterized by the centralization of political and economic authority, appeared throughout Mesoamerica. For example, evidence from the site of Chalcatzingo, in Central Mexico, shows a socially complex society involved in the construction of dams and irrigation canals, along with involvement in long-distance exchange systems, as evinced by the exportation of white kaolin clay (Flannery and Marcus 2000). By the latter half of the Early Preclassic, Mesoamerican societies had developed various forms of information systems, such as monumental art, iconography, calendric and writing systems.

During the Middle Preclassic, some archaeologists argue that these complex societies in Mesoamerica evolved into the first archaic states – a form of societal organization defined by classes, or strata, centralized governance, along with increased power in "waging war, exacting tribute, controlling information, drafting soldiers, and regulating manpower and labor" (Marcus and Feinman 1998:13). For example, at the site of Cuello, a Preclassic ancient Maya settlement, archaeologists uncovered various burials with children accompanied by an abundance of grave goods –indicating status based on rank, rather than individual achievement (Hammond et al. 1991). This period also witnessed the fluorescence of Olmec civilization along the Gulf Coast of Mexico, in Veracruz and Tabasco. Evidence from the site of La Venta shows a socially stratified community, comprised of a civic-ceremonial complex, with permanent domestic settlement involved in the intensification of riverine resources (Rust and Sharer 1988). In Northern Belize, evidence from the site of Colha suggests that ancient Maya lithic specialists produced tools, such as macroblades and celts, for wide distribution (Shafer and Hester 1983, 1991:91).

The Late Preclassic witnessed the rise of one of the first truly urbanized Mesoamerican cities – Teotihuacan. At its height, during the Classic period, archaeologists estimate that the site covered roughly 19 square kilometers, with populations exceeding 85,000 (Haviland 1970:186). In the Maya lowlands, several sites experienced continued population growth, with increased social and economic interaction. For example, at the site of El Mirador, Guatemala – an ancient Maya site that reached its cultural and demographic climax during the Late Preclassic – archaeologists argued that increased interaction with a distant highland site, Kaminaljuyu, enhanced the flow of obsidian to the lowlands (Fowler et al. 1989). Other Maya sites, such as Cerros, in Northern Belize, reached their apogee during this period, with ceremonial precincts composed of monumental architectural constructions

(Garber 1989). Other evidence of interaction in the Maya subarea comes from the widespread use and manufacture of Chicanel pottery (Ball 1977; Hammond 1977).

*Classic Period (AD 300 to 900)*

Similar to the Preclassic period, archaeologists have sub-divided the Classic Period into the Early Classic (AD 300 - 600) and the Late Classic (AD 600 - 900), with a short period of cultural recession, called the hiatus, dividing the two epochs (Willey 1974). However, as Demarest (2004:16) noted, this hiatus period likely witnessed a period of decline in certain regions of the Southern Lowlands, while other regions continued to flourish. Some archaeologists characterize the Classic period in the Maya Lowlands by the advent of unique cultural traits – such as the appearance of carved stelae,above-ground corbeled vaulted architecture, earliest writing and calendrics, and polychrome ceramics (Sabloff 1985; Willey 1987). Other archaeologists emphasize the appearance of "divine kingship," which saw the rulers of ancient Maya polities become instilled with particular religious qualities (Schele and Freidel 1990). Although many of these qualities emerged in earlier periods, the widespread adoption of these traits at multiple ancient Maya centers supports these established temporal divisions. Some of the largest and most densely occupied centers, such as Tikal, Caracol, Calakmul, and Copan, reached their climax during this period.

*Terminal Classic Period (AD 800 to 1000)*

The Terminal Classic period, sometimes referred to as the time of "collapse," witnessed several significant cultural and demographic changes, or transformations. Archaeologists acknowledge that variability exists in the timing and regional occurrence of these changes, as some sites, such as Lamanai, continued to prosper throughout this period (Haug et al. 2003; Pendergast 1981, 1985; Webster 2002). Archaeologists also debate the causes of these changes, with some scholars emphasizing the role of drought during the Terminal Classic (Gill 2000). Other archaeologists, such as Demarest (2004:244), stress the inherent weaknesses of political systems based on divine rulership, as the structure encouraged rivalries, weakening dynastic authority. Most recent accounts list a litany of internal and external factors contributing to the changes in the Terminal Classic, from catastrophic events such as hurricanes and volcanic eruptions, to problems in Maya society, such as the inability of the kingships to address issues of overpopulation (Demarest et al. 2004; Sharer and Traxler 2006). Regardless of the underlying causes of the decline of Classic-period states, by the end of the Terminal Classic, new centers of political control, such as Chichen Itza and Mayapan, rose to power in Northern Yucatan.

*Postclassic Period (AD 900 to 1542)*

Archaeologists formerly interpreted the Postclassic as a period of cultural decline, as many of the hallmarks of Classic civilization disappeared from the archaeological record. Most notably, systems of shared power (multepal) replaced the institution of divine kingship in the Yucatan (Schele and Freidel 1990:346-349). Archaeologists attribute this change of governance to the Itza Maya, who shared rulership among individuals from different social groups (Schele and Freidel 1990). This departure from Classic institutions of power inspired a change in Maya political organization, from smaller dynastic states to larger polities, with more complex state levels of organization, as evinced by historic and symbolic imagery at Chichen Itza (Andrews et al. 2003:153).

Along with these changes, material evidence from the Postclassic shows increased interaction with Central Mexico, with Chichen Itza regarded as one of the earliest cosmopolitan cultures to embrace wider Mesoamerican traditions (Sharer and

Traxler2006:590). During the Postclassic, major cultural developments shifted from the central and southern lowlands to the northern lowlands and highlands. Economic exchange moved from the interior to sites located in coastal regions, such as Tulum, Mexico. One of the largest and most influential sites of this period, Mayapan, existed nearly until the 16th century arrival of the Spanish. Larger populations concentrated along coastal regions at this time engaged in seaborne commerce, trading commodities, rather than prestige goods, which was more common in the Classic period (McKillop and Healy 1989; Sharer and Traxler 2006:627). Rather than a period of decline, archaeologists increasingly view the Postclassic as a period of drastic change, in which new economic and political orders replaced previously failed systems of governance.

**The Site of Ka'Kabish**

*Geographic Location and Description*

The ancient Maya site of Ka'Kabish is located on a limestone ridge in North-Central Belize (Figure 1).

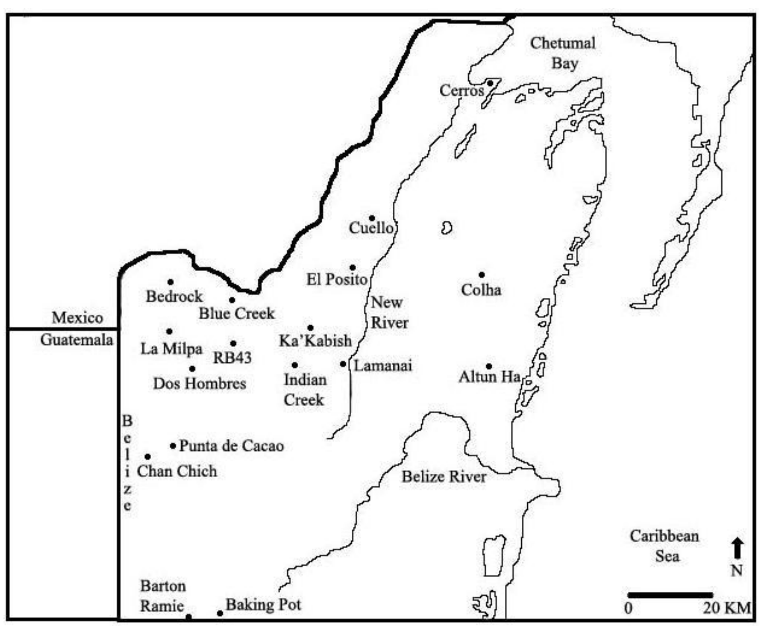


**Figure 1: Location of Ka'Kabish and other nearby Sites**

The site is 10 km from one of the largest centers in the region, Lamanai, which has undergone multiple seasons of study (Graham 2004; Pengergast 1981, 1985, 1986). Several other sites have also been located in the region, such as Blue Creek, Indian Creek, El Posito, along with another larger site, La Milpa (which is 30 km west of Ka'Kabish). Ka'Kabish can be seen from the vantage point of the High Temple at Lamanai. It is located at approximately 17.48.58 north latitude by 88.43.47 west longitude (Haines 2007). Several modern villages exist in the area such as Indian Church, San Carlos, and San Filipe. A modern road cuts through the site core to connect two of these villages; Indian Church and San Filipe.

*Composition of the Site*

The construction of the modern road effectively divided the site core into two constituent parts – the North and South Complex. This activity also affected the composition of the site, destroying at least one structure, while construction workers used parts of two other structures as building material forthe road (Guderjan 1996). Similar to the damaging effect of these activities, looters also dug trenches into most of the buildings in the site core (see Tremain 2011). In areas outside of the site core several modern activities, such as farming, quarrying, and road constructions, affected the archaeological preservation of the ancient Maya occupation. In some cases, modern farmers bulldozed ancient Maya structures to increase field size and agricultural yields, making it increasingly difficult to identify ancient areas of occupation.

The monumental center, which covers somewhere between 0.2-0.3 square kilometers, contains 27 individual structures (Figure 2 and Figure 3). The southern complex is comprised of several high temples, range structures, and a ball court. The northern complex also contains several high temples and range structures. Most notably, the southeastern portion of the northern complex has been reported to house two adjoining temples; however, limited excavations have failed, so far, to reveal substantial architectural evidence to support this claim. Future excavations may cast light on the form of these structures.

## Archaeological History of Ka'Kabish

*Earlier investigations*

David Pendergast was one of the first archaeologists to visit the ancient Maya site of Ka'Kabish. In the early 1980s, he collected surface ceramics from several low lying mounds located in cleared agricultural fields adjacent to the site core (Haines 2007:4). These materials suggested that the ancient Maya occupied these mounds during Early Postclassic period. Later, archaeologists from the Maya Research Program mapped the site core (Guderjan 1996). Ceramic and architectural evidence suggested a long history of occupation, beginning as early as the Late Preclassic period, and continuing until the end of the Late Classic period. Archaeologists also discovered five looted tombs – one with a plaster dome roof. Evidence suggested the ancient Maya constructed these tombs during the Late Classic period (Guderjan 1996). One of the tombs was originally painted red, with glyphs adorning the walls; however, exposure affected the preservation of these iconographic materials. Archaeological analysis of the glyphs, conducted by Christophe Helmke (2010), determined that they identified the name of the tomb's occupant (Haines 2010). Based on similarities in architectural arrangements, along with elite markers of social status, such as a ball court and elaborate burials, Haines suggested that Ka'Kabish was a Maya secondary center within the larger Lamanai polity (Haines 2007).

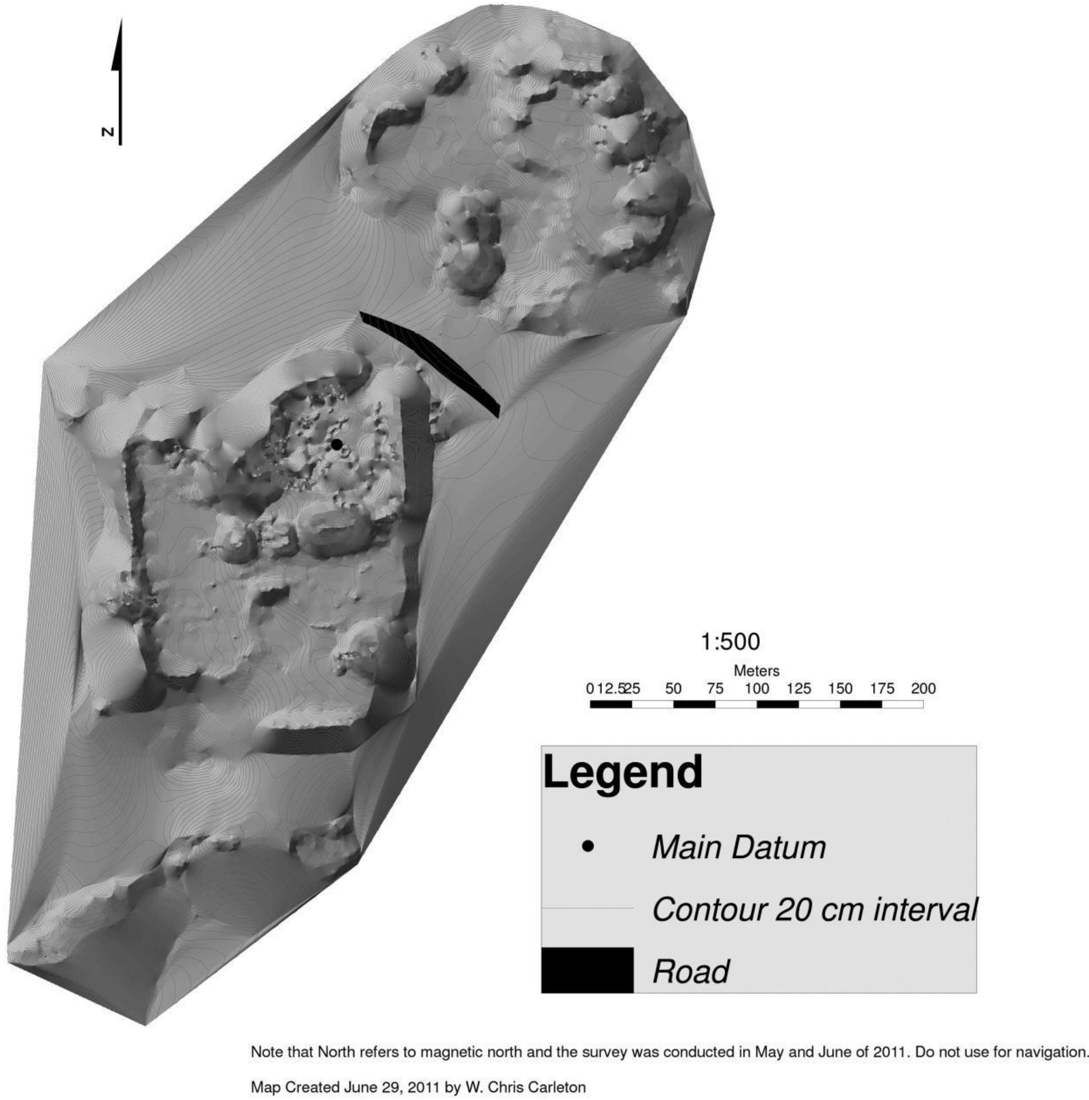


**Figure 2: Map of the Site Core of Ka'Kabish (generated by C. Carleton)**

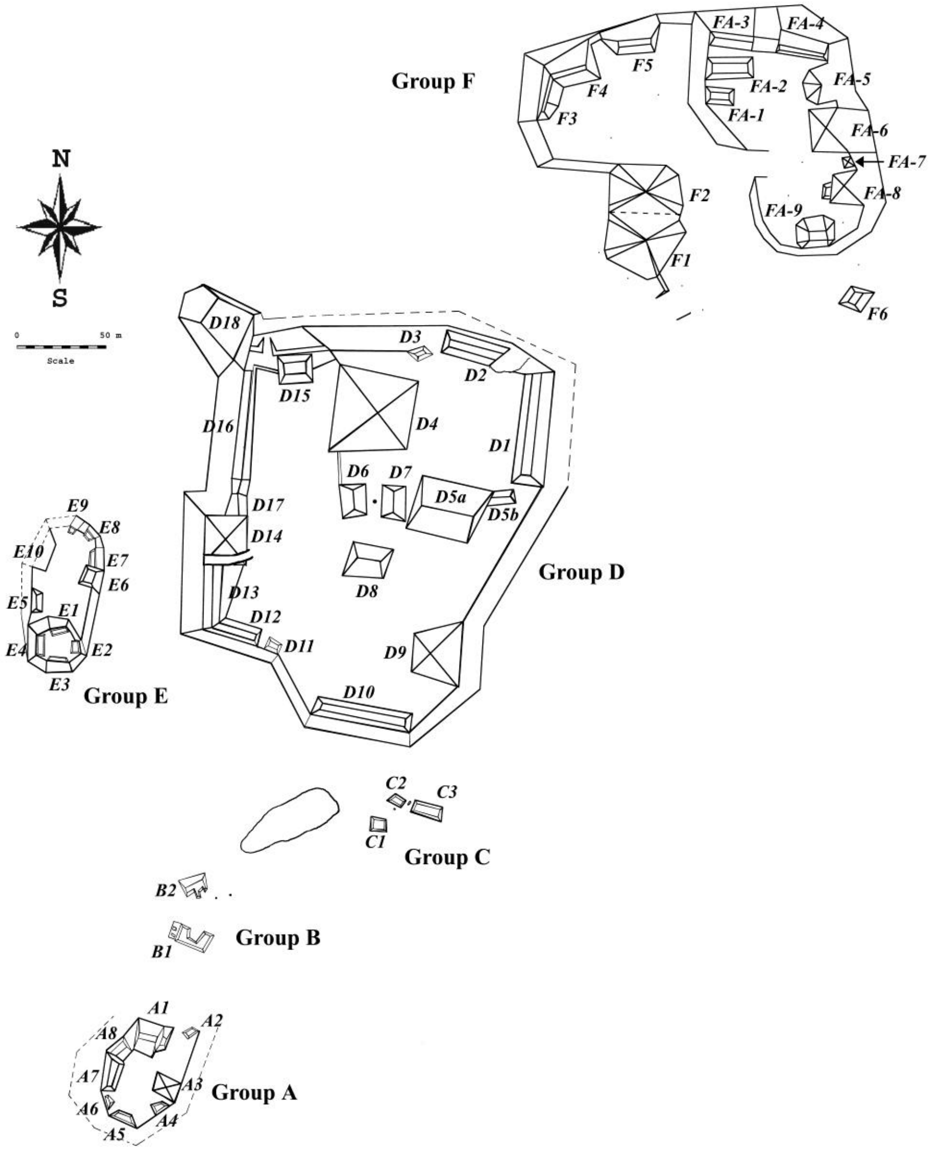


**Figure 3: Map of the Site Core of Ka'Kabish, Identifying the Northern Complex (Group F) and the Southern Complex (Group D) (generated by H. Haines)**

In 2005, under the auspices of Dr. Helen R. Haines, archaeologists returned to the site to assess its potential for future study. Over the course of three weeks, Haines and two workers from the village of Indian Church located and surveyed the site core (Haines 2005). Along with relocating areas originally mapped by the Maya Research Program, Haines (2007) also identified several outlying courtyard groups and low-lying residential mounds. While this initial assessment identified additional looting in the site core, it also suggested that Ka'Kabish "retained sufficient integrity to contribute valuable information regarding the organization of pre-Hispanic Maya polities in North-Central Belize" (Haines 2007:5). Meanwhile, Haines also argued that recent exposure of the surrounding settlement zone allowed future researchers to investigate the site on a "multi-scalar level," allowing for an investigation of various tiers of society (Haines 2007:5).

*The Settlement Zone of Ka'Kabish*

In January of 2007, under the supervision of Dr. Helen Haines, Clifford B. Patterson surveyed two areas in the periphery of Ka'Kabish (Patterson 2007). One of these areas, referred to as Chomokeil, was located roughly mid-way between the site of Lamanai and Ka'Kabish, along the road between the modern villages of San Filipe and Indian Church. Another survey area was located immediately adjacent to the site core, in a series of agricultural fields south and east of Ka'Kabish.

At Chomokeil, Patterson (2007:52) identified eight mounds, one multi-mounded group, and 16 artifacts scatters. The multi-mound group was comprised of four individual mounds arranged orthogonally in a plazuela group, with mound heights ranging between 1 to 2 meters. Patterson argued that the artifact scatters represented post-depositional activities, rather than the remains of ancient households without stone platforms. He posited that these scatters resulted from recent agricultural activities that had damaged or destroyed previously mounded structures, as slight elevations, along with higher concentrations of limestone materials, accompanied these scatters (Patterson 2007:50).

In the survey area immediately adjacent to the site core, Patterson identified four mounds, three multi-mounded groups, and seven artifact scatters, yielding 1322 sherds and 55 lithic artifacts (Figure 4).

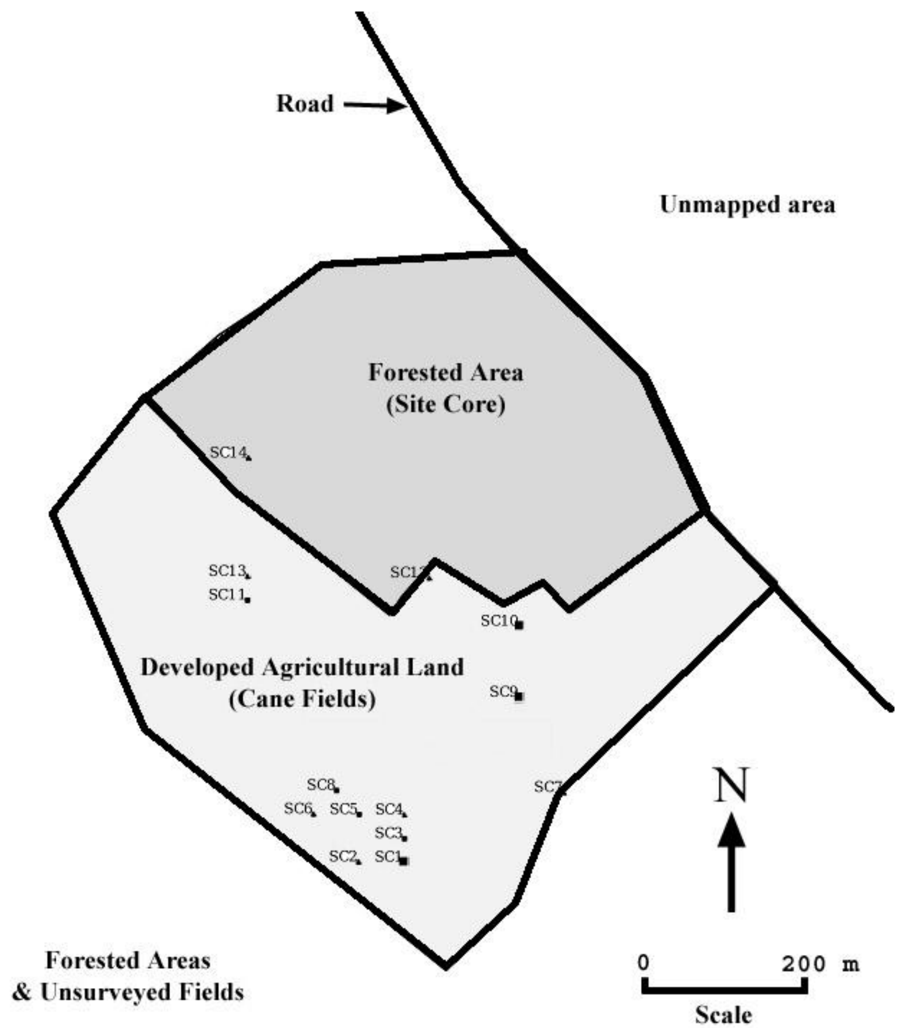


**Figure 4: Map of the Settlement Surveyed in 2007 (generated by C. Patterson)**

Patterson argued that evidence from the supporting countryside demonstrated that Ka'Kabish was far "larger than once thought" (Patterson 2007:52). He urged subsequent archaeologists to continue using cleared agricultural spaces to gather data on the growth and development of Ka'Kabish and its neighboring site, Lamanai.

*Ka'Kabish Archaeological Research Project*

As mentioned, the Ka'Kabish Archaeological Research Project began in 2005, with the initial goal of assessing the site's potential for future study. In 2007 and 2009, archaeologists returned to Ka'Kabish to map the site core and to conduct survey and reconnaissance in several cleared areas surrounding the site. These investigations cast light on the size and organization of the site core and provided a preliminary assessment of the density of settlement in the periphery. In 2010, with financial support from the Social Sciences and Humanities Research Council (SSHRC) of Canada, the project expanded to include excavations of several structures in the site core – most notably Plaza D, Structure D-4 and Structure D-9. These investigations determined the construction chronology of the southern complex, which revealed first evidence of Middle Preclassic occupation, with the site abandoned sometime during the Terminal Classic period.

Along with plaza excavations, one of the project goals was to map the construction sequences of one of the structures in the southern complex (Tremain 2011). Archaeologists cleared several looters trenches in Structure D-4. These investigations revealed that the structure had undergone threesignificant construction periods; however, limited ceramic materials made these periods difficult to date with precision. While Tremain mapped these trenches, another graduate student, Danielle Budhoo, excavated the painted tomb found in Structure FA-6, of the northern complex. Archaeologists were initially optimistic that previous looting activities had missed important parts of the burial chamber. However, subsequent study showed that the tomb was thoroughly looted, leaving little archaeological evidence of supporting grave goods. Ceramic analysis suggested that the ancient Maya constructed the tomb sometime during the Early Classic period.

Finally, one of the goals of the SSHRC-sponsored Ka'Kabish Archaeological Research Project was to map several areas of settlement surrounding the site core. These investigations were intended to build upon Patterson's (2007) initial study. I spent roughly 12 weeks during the summer of 2010 and 2011 surveying and surface collecting artifacts from several areas of occupation southeast and southwest of the site. In the text that follows, I summarize the results of these investigations.

## Goals and Research Questions

Similar to Ashmore's (2007) analysis of settlement at Quirigua, most Maya settlement pattern studies seek to examine evidence of settlement distributions, "the way in which man disposed himself over the landscape on which he lived" (Willey 1953:1). Along with distributions, archaeologists use settlement studies to define the occupational history of a site, as well as to investigate the function of structures in ancient societies. The settlement pattern study I conducted at Ka'Kabish focused on determining the domestic occupation history of the populations surrounding the site core. In my study, I address the following questions:

- What was the density and distribution of occupation?
- What was the duration of settlement?
- Did areas of settlement remain occupied following the collapse of the monumental core zone and, if so, for how long?
- What was the degree of variability in the size and organization of structures in the periphery?
- Is there material evidence of domestic activities?

On a more general level, I also investigated if there are signs of any material similarities between Ka'Kabish and its larger, neighboring site, Lamanai.

**Overview of Chapters**

Chapter 2 traces the historical development of settlement studies in the Maya subarea of Mesoamerica. The first section, "Early Investigations of Ancient Maya Domestic Structures," discusses several initial studies by archaeologists in the late 19$^{th}$ and early 20$^{th}$ centuries. These early observations, such as Gordon's (1896) identification of small mounds at Copan, or Hewett's (1911) investigation of residential structures at Quirigua, changed the way archaeologists traditionally viewed the ancient Maya.

The next section, "Settlement Patterns Studies in the 1950s and the 1960s", largely focuses on the contributions of Gordon R. Willey (1953, 1956, 1981), who pioneered many of the methodologies employed in modern settlement studies. His work in the Viru Valley, Peru, was well received and this encouraged similar archaeological investigations in many parts of the world. Various studies were conducted throughout the Maya subarea, at sites such as Tikal (Haviland 1965, 1966), Dzibilchaltun (Andrews IV 1965a,b), Barton Ramie (Willey et al. 1965), among others. These investigations shed light on questions related to site location, population size, sociopolitical organization, and processes of urbanization.

The third section of the chapter, "Settlement Systems and the Detectability of Surface Remains," describes the concept of settlement systems – defined as the relationship, or interaction, between various settlement sites within the same cultural group. With an increased understanding of the settlement patterns of a range of sites, archaeologists were able to see larger trends, or laws, that applied to these locations. For example, archaeologists noted that ancient Maya major centers along the Belize River are all roughly 9.9 km apart

(Driver and Garber 2004:289). Along with an exploration of this concept, this section also covers issues related to detectability, as some architectural forms are often difficult to identify in the Maya subarea, such as minimally mounded structures and non-architectural artifact scatters.

The final section of Chapter 2, “GPS, Remote Sensing, and GIS: The Modern Era,” discusses several recently developed technologies that are aiding archaeologists in the discovery, and recording, of ancient Maya sites. Global Positioning Satellites have allowed archaeologists to record, quickly and accurately, the location of various forms of settlement. Remote sensing has provided a means for archaeologists to discover sites that are hidden, and often inaccessible. Finally, Geographic Information Systems (GIS) has provided a platform for archaeologists to record and analyze geographic information. These tools have improved archaeologists’ ability to interpret and disseminate archaeological data.

Chapter 3 focuses on the distribution and density of ancient Maya occupation and the ways in which archaeologists have interpreted these patterns of settlement. The first section, “Models of Ancient Maya Settlement,” focuses on several theoretical constructs that archaeologists use to describe, and sometimes predict, the social organization of the ancient Maya. Specifically, I discuss the concentric zonation model, to which Diego De Landa, a Spanish friar, first alluded in the 16th century. This model, which was favoured by archaeologists in the mid-to-late 20th century, suggested that more influential, or prominent, members of society were situated in the center of sites, surrounded by poorer populations which lived in the periphery. In this section, I discuss several recent models of settlement based on Fractal relationships and Central Place theories.

In the second section of Chapter 3, “Ancient Maya Urbanism,” I discuss population estimates from several notable sites. These population reconstructions reinvigorated the debate over the presence, or absence, of urbanism in the Maya subarea. Archaeologists identified urban populations in Central Mexico at the site of Teotihuacan (Sanders and Price 1968); however, seemingly lower populations, with less densely occupied centers, encouraged archaeologists to describe sites of the Maya lowlands as essentially non-urban (Haviland 1970:186). Following a summary of this debate, I will discuss a newer theoretical direction – one based on low-density urbanism.

In Chapter 4, I provide an overview of the methodologies used to analyze and record evidence of occupation in the Ka’Kabish settlement zone. In the first section, “Archaeological Relevance,” I discuss the ways in which archaeologists use settlement pattern studies to understand ancient societies. Settlement pattern studies are widely used in archaeology today, and are often recognized as one of the core concepts in archaeological investigations. The second section, “Culture-History and Time-Space Systematics,” focuses on one of the major methodological goals of this study – to see how the settlement at Ka’Kabish changed over time and space. By refining an understanding of where and when cultural activities took place, archaeologists can recognize developmental trends, or dynamics, in the archaeological record. The third section of this chapter is divided into three sub-headings: survey and collection strategies, analysis processes and test-pit excavations, and recording and mapping. This section of Chapter 4 covers the methodologies used in the settlement survey at Ka’Kabish. In this section, I discuss strategies based on field walking and surface collections, as well as the ways in which archaeologists recorded and disseminated settlement data at Ka’Kabish.

In the final section of this chapter, I discuss several methodological limitations, such as the experience of the archaeologist, surface detectability, and the preservation and analysis of ceramic materials. While conducting the settlement study at Ka'Kabish, it was readily apparent that the degree of experience commanded by the archaeologists greatly affected their ability to find and locate archaeological materials in the settlement zone. Along with this limitation, I also discuss how the detectability of surface remains varies depending of the compositional characteristics of the landscape. Finally, I discuss the methodological limitations of reconstructing the chronology of the settlement zone based on ceramics that are surface collected.

Chapter 5 focuses on the data collected by surveyors in the Ka'Kabish settlement zone. Various maps display the density and distribution of ancient Maya settlement surrounding the site core. Topographic reconstructions accompany these maps of distributional characteristics. I applied Ashmore and colleagues (1994) typology for the organization of structures to the data recorded at Ka'Kabish. These investigations determined the variability of different forms of settlement surrounding the site.

Following this section, I present the material evidence collected from the settlement zone. This section is divided into several sub-headings: ceramics, lithics, and burials. In the ceramic section, I discuss the most common diagnostic types identified. In the lithic section, I present the most common forms of chipped and ground stone tools encountered in the Ka'Kabish settlement zone. Lastly, I discuss a burial found in an area southeast of the site. In the final section, I compare the chronology of individual areas of occupation to their spatial location surrounding the site.

In Chapter 6, I present some of the major findings of the settlement study at Ka'Kabish. In the first section, I describe the distribution of settlement and discuss similarities between Ka'Kabish and other sites in the region, such as Blue Creek. In the next section, I compare the density of settlement at Ka'Kabish with several other sites in the greater Maya subarea. Next, I discuss the archaeological appearance of minimally mounded structures, and non-architectural artifact scatters; forms of settlement that are archaeologically difficult to detect. Finally, I compare the burial at Ka'Kabish with evidence of burials at Lamanai.

In Chapter 7, I review the key research questions identified in Chapter 1, and provide a response to each. I also explore the implications for future study, and provide some concluding remarks to the thesis.

**Summary**

Continued investigations of various sites in the Maya subarea have revealed the chronological history of their populations. From early appearances in the Paleo-Indian period, to the Classic florescence of ancient Maya society, archaeologists have continued to refine their understandings of this ancient civilization. Detailed mapping of the site of Ka'Kabish adds to this understanding by providing a compositional reconstruction of the site. Investigations of social dynamics and the developmental trajectory of individual sites, such as Ka'Kabish, allows archaeologists to see variability in the rise and fall of particular segments of ancient Maya society. With a greater understanding of the cause of these population fluctuations, archaeologists can investigate the social mechanisms that affected the growth and subsequent demise of these once prosperous polities. Archaeological investigations of the site of Ka'Kabish can add to this growing body of literature, providing yet another example of a site that declined during the Terminal Classic Period.

# CHAPTER 2:
# HISTORY OF SETTLEMENT STUDIES IN THE MAYA SUBAREA

Archaeologists use settlement pattern studies in various parts of the world to reveal the social, political, economic, and ideological constructions of past societies. Through survey, surface collection, and excavation on regional scales, archaeologists are able to recreate the composition of entire cities. Archaeologists slowly and meticulously expanded these methods over several centuries, refining their interpretations, while developing new ways to understand the past. By tracing the historical development of settlement pattern studies in the Americas, focusing on investigations in the Maya subarea, I will describe the modest beginning of these methodologies and common problems that have affected their application.

In the first section, "Pioneering Developments: the Late 19$^{th}$ Century and the Early 20$^{th}$ Century," I discuss the connection between new methodological and theoretical developments in the discipline and the first uses of settlement pattern analysis. The switch from a theoretical focus on culture-history to functionalist, or processual, archaeology had an immense influence on the goals of settlement study research, affecting the fundamental questions that scholars attempted to answer.

In the second section, I focus on contributions made by Gordon R. Willey (1953, 1956; Willey et al. 1965) and other archaeologists throughout the 1950s and 1960s. These decades are described concurrently to highlight several trends – that is, beginning in the 1950s, settlement archaeology was popularly applied in various parts of the world, while in the late 1960s, several archaeologists, most significantly Bruce G. Trigger (1967), began to outline the limitations of the approach. Through an analysis of these periods, I demonstrate how new methodological developments addressed these limiting factors, inspiring archaeologists to push the boundaries of settlement archaeology.

In the third section, I assess the impact of these methodological breakthroughs, while discussing the analyticaldifference between site related settlement patterns and settlement systems. Studies of settlement patterns focused on the density and distribution of sites on a regional landscape, while investigations of settlement systems aimed to understand general rules, or trends, that appeared in sets of settlement pattern data. Studies of settlement systems required extensive surveys of vast areas of space and relied heavily on the contributions of many settlement archaeologists.

Finally, in the fourth section, I tie the past to the present to demonstrate how far archaeologists have come in understanding the intricate life patterns of previous societies. In particular, I discuss the use of new information technologies, such as Geographic Information Systems (GIS), remote sensing, and Global Positioning Systems (GPS), to demonstrate improvements in the accuracy and resolution of archaeologists' depictions of the past.

*Early Investigations of Ancient Maya Domestic Structures*

An American archaeologist, Edward H. Thompson (1886, 1892), inspired one of the earliest innovations in the settlement pattern approach in the Maya area. In the late 19th century, archaeologists questioned the conclusions put forth by their forerunners, debating references to Maya "cities" and the nature of settlement in the New World. Lewis H. Morgan (1880, 1881), an American anthropologist and social theorist, challenged the notion of Maya cities, arguing that settlement in the New World was not supported by densely occupied urban settings.

Thompson (1886, 1892) countered this conclusion by conducting work at Labna and other site centers in the Yucatan. He analyzed several small groups of mounds surrounding these centers, noting both their abundance and their similarity to modern Maya constructions. When excavated, these mounds revealed large assemblages of domestic artifacts, which further supported Thompson's hypothesis that large supporting populations surrounded ancient Maya centers. Thompson's (1911:501) investigation of smaller, domestic remains led him to refute the "generally accepted belief among archaeologists that the entire plan of the ancient stone structures of Yucatan was developed elsewhere." Thompson (1911:501) demonstrated that Maya sites were sometimes densely occupied, reflecting a "typical process of development" from pole-and-thatch structures to monumental limestone constructions.

Similar to Thompson's work, several other archaeologists in the Maya subarea began to note the occurrence of small, residential mounds. George B. Gordon (1896), one of the earliest scholars to teach undergraduate and graduate courses in Anthropology, noted small mounds near the site of Copan. Edgar L. Hewett (1912), known for his role in the creation of the Antiquities Act in the United States of America, recorded residential structures surrounding the site of Quirigua. Hewett (1911:127) described multiple ruins that were scattered over three kilometres along a terrace northwest of the site core. In the Peten, Alfred M. Tozzer (1913), of Harvard University, noticed numerous mounded structures on either side of the trails between several ancient Maya sites (Willey 1981:6).

These scholars noted and recorded their observations; however, they were more archaeologically interested in the monumental architecture that composed the core of their respective sites. Samuel K. Lothrop (1924), in his work, *Tulum: An Archaeological Study of the East Coast of the* Yucatan, shifted this focus by counting and noting the distribution of smaller mounds surrounding the site. Lothrop conducted an extensive, above-ground, or surface, survey of Tulum and other surrounding sites, distinguishing five temporal periods of occupation. These were chronologically determined by analyzing changes in architectural elements, allowing Lothrop to position the site historically. Although these arbitrary periods have largely fallen out of use, Lothrop's attention to structural densities and distributions by period foreshadowed the methodological breakthroughs of subsequent generations. Beginning in the 1930s, ancient Maya settlement studies became more commonly pursued, leading to several methodological developments.

Julian H. Steward, an anthropologist who studied at the University of California-Berkeley with Alfred Kidder and Robert Lowie, was one of the earliest to adopt an ecological perspective on ancient settlements. In his monograph, *Basin-Plateau Aboriginal Sociopolitical Groups*, Steward (1938) demonstrated connections between periods of social fragmentation and changing systems of sustenance production among the aboriginal group of the Western Shoshoni. He collected evidence by systematically surveying the region, valley-by-valley. Robert F. Murphy (1981:122) commented that Steward "was not an ecologist so much as a social anthropologist whose feet were planted firmly in the hard realities of economic necessity." Steward used both ecology and settlement patterns to understand changes in cultures over time.

These methodological developments inspired Steward and Setzler (1938) to argue that archaeologists and ethnologists needed to study changes in subsistence economies, population sizes, and settlement patterns. Decades later, Jeffery R. Parsons (1972:128) commented that Steward's work stimulated "a series of productive and enduring innovations in archaeological research." The archaeological "thought" of this period influenced the historic development of Maya settlement studies. While Steward was developing his ecological, settlement approach, several other studies in the Maya subarea continued to pursue new methodological developments.

The "Carnegie Period" (1920-1940) of Maya archaeology was comprised of several influential studies. Robert E. Smith (1936a, 1936b) developed the first chronological sequence of ceramic styles at the site of Uaxactun, Guatemala. This analytical tool was indispensable to the settlement pattern approach, adding a chronological element to the investigation of spatial distributions. Willey (1981:7) later noted that the Mamom, Chicanel, Tzakol, and Tepeu sequence "became the standard relative dating yardstick." Likewise, the development of regional survey techniques (Morley 1937-1938), along with detailed mapping projects (Andrews 1943; Ruppert and Denison 1943), allowed archaeologists to represent visually the occupation densities of vast areas of space.

` These settlement strategies were built upon by a number of studies led by Alfred V. Kidder. Kidder (1937:164) believed that, "only with thorough knowledge of the living people and of modern conditions can one utilize understandingly the documentary records of the post-Conquest period, and from them work still further backward into prehistoric times." Kidder's ethnographic research focused on agricultural techniques and the development of subsistence strategies. These analytical tools – chronological typology, regional surveys, cartography, and ethnographic analogies – allowed archaeologists to pursue some of the earliest systematic settlement surveys in the Americas.

The Maya archaeologist J. Eric S. Thompson carried out the first of these studies. Thompson (1931) investigated two small ceremonial centers (Cahal Pichik and Hatzcap Ceel) and two residential areas (Tzimin Kax and Cahal Cunil) in the Mountain Cow region of the southern Cayo District of Belize. Lothrop (1933:185) later commented that Thompson's study represented a new phase of archaeological investigation – one dominated by new techniques and field methods. Thompson (1931:233) examined the spatial distribution of several residential areas, using the term *plazuela* to describe raised courts accompanied by groups of house mounds. These findings inspired Thompson (1931:336) to comment, "small residential mounds offer much greater possibilities of a reconstruction of Maya history than do the ceremonial centers."

Oliver G. Ricketson conducted one of the most in-depth studies of this period at the site of Uaxactun. Ricketson (Ricketson and Ricketson 1937) surveyed the material remains surrounding the site center, using a cruciform transect, with each arm reaching 1600 meters in length and 365 meters in width. Along these survey lines, 78 structures were located, yielding a density of 40 structures per square kilometre. Ricketson interpreted these mounds as domestic residences, due to their sheer quantity and their lack of large-scale architecture. This assumption, known as the "principle of abundance," was earlier used by Thompson (1931) to describe the numerous mounds he found in the Cayo District of Belize. Due to their small size and their large quantity, archaeologists argued that these mounds represented ordinary domestic living spaces.

The work of Robert Wauchope (1934), who excavated five ancient structures and compared them to modern Maya domestic houses, complemented Ricketson's interpretation. Wauchope's (1938) study, *Modern Maya Houses*, allowed archaeologists to compare ancient and modern populations, revealing similarities in house plans, construction techniques, materials, and other related behaviours. Although his work aided the interpretations of archaeologists, Ochoa-Winemiller (2004) has recently questioned its application in ancient Maya reconstructions. Using interviews, questionnaires, archaeological surveys, and geographic information systems, Ochoa-Winemiller (2004) demonstrated that the design and use of domestic spaces varied significantly between modern Maya communities. Although

Wauchope's study may not have completely covered the variability in ancient Maya domestic occupation, archaeologists in this period were increasingly interested in the presence and nature of these structures, using settlement survey techniques to understand ancient Maya society.

Later, in the lower Mississippi Valley, Phillips, Ford, and Griffin (1951) located and mapped archaeological evidence of settlement. They created a temporal framework based on site patterns, using ceramics to determine chronological sequences. However, as Baerreis (1953) noted, the survey was primarily concerned with ceramic materials and the elaboration of seriation techniques for surface collections, rather than the analysis of changing settlement patterns and ecological determinants of occupation. While their study investigated spatial distributions, a large, and particularly relevant, section of their work was devoted to typological sequences of ceramics. The application of these sequences to the distribution of archaeological remains increased the importance of settlement data. Archaeologists recreated the dynamics, or developmental trends, of particular regions by coupling settlement pattern data with ceramic typologies. This approach aided the development of time-space systematics, changing the way archaeologists viewed ancient societies.

*Settlement Patterns Studies in the 1950s and the 1960s*

Prior to the 1950s and 1960s, the archaeological climate underwent various changes in its theoretical focus. Beginning in the 1930s, William D. Strong (1936) questioned the value of the culture-historic approach to archaeology, which was particularly popular in the field. Strong advocated for an approach that merged chronological sequences with ethnography and sociology. Likewise, as previously mentioned, Steward and Setzler (1938) criticized the culture-historic focus on chronology, urging a higher-level of generalizations in archaeological investigations. John W. Bennett (1943) also stressed the importance of developing concepts and generalizations about data, arguing that the fact-gathering stage of culture-history would give way to a period of theorization, as it had in other sciences such a chemistry and physics. Waltor Taylor (1948), in *A Study of Archaeology*, similarly challenged the culture-history approach, proposing a "conjunctive approach" to archaeology. Taylor (1948:96) referred to excavated materials as "objectifications of culture," arguing that culture is "a mental phenomenon, consisting of the content of minds, not of material culture of observable behaviour." Thus, archaeologists were encouraged to understand the people behind the artifacts, rather than the artifacts themselves. These scholars stressed the importance of moving away from static descriptions of history.

Calls for changes in the discipline were largely unheeded by the larger archaeological community until the end of the 1950s. This new theoretical focus, which attempted to move beyond culture-history, focused on "early-functional-processual archaeology" (Trigger 2006). Although these theoretical changes did not directly affect the larger methodological innovations in the study of settlement patterns, they affected the questions and answers proposed by archaeologists conducting settlement archaeology. Scholars further emphasized the role of people, societies, and behaviour within these societies, while focusing on general functions and processes of culture.

Steward was a leading advocate of this approach, arguing that the analysis of settlement patterns would provide the means to investigate prehistoric strategies of adaptation, revealing subsistence patterns and social organizations. Gordon R. Willey, in 1946, with the encouragement of Steward, initiated an investigation on the form, setting, and spatial relationships of archaeological sites in the Viru Valley of Peru. Although Willey (1974:154) was initially disheartened by his approach, commenting that his colleagues were discovering tangible ceramic sequences, while he was chasing some "kind of wraith" called settlement patterns, Steward (1954:51) later commented that Willey's (1953) work provided an "encouraging illustration of how basic features of social development can be recognized in the prehistoric remains of people who left no written records." Prior to Willey's study, with a few exceptions, surveying techniques had largely been used to locate sites for future excavation (Sumner 1990:87-88). Willey used aerial photographs and ground surveys to locate and map several hundred sites, taking into consideration the visible remains of buildings and their potential function in prehistoric societies.

Similar to the study by Phillips, and colleagues, Willey used surface collections of ceramics to provide chronological sequences. However, unlike Steward, who focused on the relationship between groups of people and their natural environment – as demonstrated in the settlement pattern – Willey extended his scope to include how patterns could be used to demonstrate human behaviour. As Trigger (2006:377) noted, Willey recognized the "full potential of settlement-pattern data for the systematic study of the economic, social, and political organization of ancient societies." Willey's work left an unmistakable impression on the archaeological methodologies of the discipline, encouraging the use of settlement patterns studies in the reconstructions of past societies. Surveying techniques were no longer restricted to locating sites in the field, but extended to explain the social, political, and economic structures of the past.

A couple of years after the publication of Willey's Viru Valley study, archaeologists conducted numerous settlement pattern investigations in various areas of the world. In particular, in 1955, a major effort was put forth to integrate "the concept of settlement pattern within a general developmental classification of culture" (Parsons 1972:129). Under the chairmanship of Richard Beardsley (Beardsley et al. 1956), an anthropologist from the University of Michigan, a series of seminars were held by the Society for American

Archaeology to understand the settlement and subsistence patterns of Aboriginal Americans. These seminars highlighted seven cultural stages, characterized by patterns of settlement and the subsistence strategies used by particular groups of people. As Parsons (1972:129) noted, this was one of the first times that archaeological settlement patterns were used to predict, "what the archaeological manifestations of each community pattern would be." Settlement pattern studies developed evolutionary sequences, which viewed population expansion due to increased productivity in subsistence strategies as a catalyst of cultural progression.

These series of seminars demonstrated the popularity of settlement pattern analysis at the time and the potential it held for social reconstructions. Two years later, Willey (1956b) edited an influential work, *Prehistoric Settlement Patterns in the New World*. This collection of papers further demonstrated the importance of settlement studies. In the introduction of the work, Willey (1956b:1) wrote, "settlements are a more direct reflection of social and economic activities than are most other aspects of material culture available to the archaeologist." By the mid-1950s, settlement pattern approaches were becoming the standard analytical practice in determining both the size and influence of archaeological sites.

Following his study in the Viru Valley, Peru, and with the advice of Alfred M. Tozzer, Willey brought his settlement pattern approach to the Maya lowlands. In 1954, at the site of Barton Ramie, in the Belize Valley, Willey surveyed an area of domestic occupation. Similar to his previous study, Willey applied his data to questions concerning site location, population size, sociopolitical organization, and the process of urbanization. His work, *Prehistoric Maya Settlements in the Belize Valley* (Willey et al. 1965), was widely regarded, described as a "first class" contribution to Maya archaeology (Thompson 1966:110). William Coe (1966:309) called it a "superlative study, not only clearly written, but meticulously documented by both word and illustration, admirably arranged, and enviably printed."

Following his study at Barton Ramie, Willey continued to document several other Maya sites, such as Altar de Sacrificios, Seibal, and settlement in the Copan Valley, revealing significant information about the "structure of ancient Maya societies and their change through time and space" (Fash 1994:183). William R. Bullard (1960), one of Willey's many graduate students at Harvard, conducted a settlement study in the northeast Peten, creating a hierarchy of domestic structures, using titles such as "major ceremonial center" and "household cluster." William T. Sanders (1962, 1963) used similar strategies in the Chontalpa region of the Tabasco lowlands. Meanwhile, William A. Haviland (1965, 1966) mapped and excavated domestic structures near the ceremonial center of Tikal. These studies focused on prehistoric social organization and ancient population densities. E. W. Andrews IV (1965a, 1965b) also conducted a settlement study at the site of Dzibilchaltun. The settlement density of this Yucatec site inspired Andrews IV to argue that Dzibilchaltun was comprised of urban-sized populations. These studies provided large collections of settlement data, leading to reinvigorated debates over the composition of Maya communities. However, as these Mayanists continued to discuss the social organization of these societies, archaeologists raised other concerns in the theoretical trajectory of the discipline.

As early as the 1950s, several scholars questioned the conclusions forwarded by settlement archaeologists. In a review of Willey's (1956b) *Prehistoric Settlement Patterns in the New World*, Wilson D. Wallis (1957) was surprised by Willey's interpretations. Wallis (1957:213) commented:

> How can anyone know that a certain prehistoric group consisted of 'small, semi-isolated, individualistic, and relatively unstable bands composed of kinsmen and congenial outsiders, under temporary chieftainship?' How can he know that 'the greatest elaboration of many aspects of culture, including religious ideology

> were reached?' Does looking through the crystal ball at the past allow more accuracy than looking through it at the future?

Prior to Willey's publication, Charles F. Hawkes (1954) warned archaeologists of the difficulty of defining the social, political, and religious institutions of the past. Various scholars were particularly guarded against generalized explanations, questioning the "challenging variety of interpretations" offered by settlement archaeologists (McClellan 1957:415) McClellan argued that such studies were open to the subjective creations of the author, highlighting the individual interests and biases of the archaeologist. Parsons (1972:132) later noted that in the mid-1960s particularly, archaeologists were becoming increasingly aware of the methodological and analytical limitations of the settlement pattern approach. Bruce G. Trigger (1967) summarized these limitations in his seminal article, "Settlement Archaeology: Its Goals and Promise."

Although Trigger (1967:158) initially demonstrated the potential of settlement studies, in the conclusion of his work he stated, "more than anything else, [Iroquoian warfare] shows what settlement archaeology cannot do." Trigger outlined three levels of analysis used by settlement archaeologists: 1) the organization of nuclear families and larger residential units, 2) the investigation of class divisions and occupation specializations, and 3) an analysis of social relations. He was most concerned with the inability of the approach to establish correlations between types of buildings and various sorts of social structures (Trigger 1967:152). Trigger concluded that different forms of buildings could demonstrate different social structures, while similar types of buildings could serve different functions. He commented, "in one community an especially large house may be the private residence of an important chief, in another merely a building used for public gatherings" (Trigger 1967:153). Trigger (1967:152) also questioned evidence of economic structures, arguing that some forms of exchange were difficult to detect archaeologically. For example, in some cultures in the tropics, economic exchange happened in the "open air," leaving little material evidence of the transaction. These questions, rather than discourage the use of settlement pattern analysis, promoted an interest in the re-evaluation of common methodologies. Leading up to the 1970s, Parsons (1972:132) commented that several important breakthroughs encouraged further methodological sophistication.

*Post-1960s: Settlement Systems and the Detectability of Surface Remains*

One of the major developments of the late 20th century, which had promising roots in previous periods, was inspired by the continued refinement of the "settlement system" concept. Although earlier archaeologists, such as Thompson (1939), mentioned this idea, it was not a theoretical focus of scholars until the end of the 1960s. Howard D. Winters (1969), writing about prehistoric settlement in the Wabash Valley, U.S.A, was one of the earliest archaeologists to refer to settlement systems. He defined settlement systems as the "functional relationship among a contemporaneous group of sites within a single culture" (Winters 1969:110). These single cultures were defined by the distribution of distinctive stylistic traits, as represented by material evidence of occupation. Winters attempted to understand differences in the function of sites by investigating variations in the artifact assemblages of specific cultural groups.

Kent V. Flannery (1976) also distinguished between archaeological approaches that focused on settlement patterns and settlement systems. Flannery (1976:162) described settlement "patterns" as the distribution of sites on a regional landscape. Archaeologists investigating settlement "systems" focused on the set of "rules" that reflected probabilistic trends in the data. For example, patterns of settlement showed where and when ancient structures were located and occupied. Settlement systems provided larger, generalized, interpretations of settlement data. Flannery (1976:163) presented several statements that demonstrated the analysis of settlement systems:

> The sentences ‘no village ever seems to have been founded within a mile of another’ and ‘daughter communities were usually founded some four miles upstream from the parent community’ are probabilistic statements that indirectly reflect some of the rules of the settlement system.

Archaeologists uncovered these rules by looking for regionally distributed patterns in specific cultural areas. Settlement systems investigations combined evidence of settlement patterns from multiple sites, looking for laws that applied to multiple patterns.

As Parsons (1972:132) noted, these investigations required large collections of a variety of data, including faunal and flora remains, subsistence strategies, distributions of artifacts and architectural features. Approaches to settlement system analysis incorporated a range of materials, requiring exhaustive surveys of occupation areas. These investigations allowed archaeologists to move beyond descriptive reconstructions of populations and analyses of functional aspects of individual structures. Settlement systems studies investigated the rules of settlement, which aided archaeologists in understanding the interactions of various levels of ancient societies.

In various areas of the world, extensive survey of numerous archaeological sites encouraged archaeologists to conduct studies of settlement systems. For example, Rani T. Alexander (2006) investigated trends in settlement systems to determine the agricultural response of the Maya to European colonization from AD 1800-2000. Alexander (2006:450) relied on four factors to understand the level of mobility exercised by agriculturalists: “population density; the physical attributes of the environment; technological and managerial use strategies; and political and economic policies that encouraged overexploitation or sustainability.” By investigating general trends in the data, Alexander concluded that small-scale internal migrations were visible in the archaeological record.

These micro-migrations demonstrated that the Maya were not "tradition-bound" in their agricultural practices but, instead, reacted to changes in the global economy. Alexander's study offered a noticeable break from analytical strategies that focused on "where and when," demonstrating that settlement data supported a theoretical investigation of "why" changes in settlement occurred.

Similar to Trigger's critique of the limitations of settlement pattern studies, other scholars attempted to isolate and identify potential problems in the recovery and analysis of settlement data. For example, archaeologists have attempted to understand the impact of natural processes such as alleviation and erosion, as well as cultural practices, like deforestation, reforestation, plowing, and terracing, on the material record. Although the impact of natural and cultural processes are relative to particular areas under investigation, archaeological materials are often obscured, hidden, exposed, shifted, or completely destroyed. Several archaeologists have attempted to understand how these processes have affected archaeological data.

Suzanne K. Fish (1999), in her concluding remarks of the edited collection*Settlement Pattern Studies in the Americas: Fifty Years Since Viru*, stressed the importance of geomorphologists, who helped archaeologists understand the material evidence on ground surfaces in regional surveys. She commented:

> Even in regions of maximum visibility, obliteration of pattern segments is inevitable, as in submerged coastlines, alleviated floodplains, and sectors transformed by heavy land use. When these effects are not recognized and acknowledged, inferences based on settlement patterns may be inaccurate or misleading (Fish 1999:205).

To address these issues accurately, archaeologists have attempted to understand the site formation processes that inspire inaccurate interpretations.

In Kevin J. Johnston's (2004) article, "The 'Invisible' Maya: Minimally Mounded Structures at Itzan, Peten, Guatemala" he discussed "invisible settlement," which consisted of settlement remains that left little trace of surface evidence, making detection impossible through contemporary survey methods. Johnston (2004:167) noticed several of these remains at Itzan, approximately 13 km northeast of Altar de Sacrificios. He argued that minimally mounded structures, with heights less than 0.3 meters, formed a large portion of ancient Maya invisible settlement. These findings have implications for population estimates derived by archaeologists, as some of these invisible structures are likely domestic in function. Similarly, two years earlier, Johnston (2002) outlined several possible environmental processes that affected the detection of settlement data, such as bioturbation and protrusion. Bioturbation is characterized by the displacement, or mixing, of sediment, while protrusion describes the relationship between the height of ancient structures and the biomantle. Johnston concluded that bioturbation and protrusion played a significant role in the destruction of archaeological sites, possibly obscuring significant evidence of settlement in certain areas.

*The Modern Era: GPS, Remote Sensing, and GIS*

Along with the theoretical and methodological advances in the field of settlement archaeology, technological innovations have improved archaeologists' interpretations of the past. Global Positioning Systems (GPS), which rely on space-based networks of satellites, have aided archaeologists in settlement surveys. Unlike Total Data Stations, which archaeologists use commonly in many parts of the world, GPS does not rely on permanent landscape features or clear lines of sight. For example, Femke Martens (2005) used GPS to establish an excavation grid on a Roman site, laying out units by triangulating on GPS-located points. Likewise, Rudi Goossens et al. (2006) tested three different GPS systems to map and locate sites in the Altai Mountains of Western Siberia. They found that some satellite information technologies provided an accuracy of within 1-2 meters. GPS has improved the efficiency of large, regional surveys, allowing archaeologists to disseminate information with the help of mobile computers and database software.

In the Maya subarea, GPS technologies and remote sensing, which allows archaeologists to investigate areas that are often inaccessible, have improved the coverage of traditional landscape surveys. Remote sensing relies on aerial sensor technologies, such as Landsat Thematic Mapper satellites or airborne color infrared photography, to describe geographical characteristics. For example, William Saturno et al. (2006) located and mapped archaeological features such as sites, roadways, canals, and water reservoirs, by using various information technologies. Their study demonstrated that *bajos*, or seasonally flooded swamps, were utilized by the ancient Maya for settlement and farming. By coupling GPS with remote sensing technologies, archaeologists quickly and accurately locate areas of interest. As Saturno et al. (2006:159) noted, these technologies have safeguarded archaeological materials from destructive forces, such as deforestation, human migration, and looting.

The successful application of Geographic Information Systems (GIS) to archaeological data has been demonstrated in several influential publications (Conolly and Lake 2006; Meher and Wescott 2006; Wheatly and Gillings 2002). GIS incorporates statistics, cartography and database technologies to store, analyze, and manage geographical data. The San Bartolo GIS project used ArcGIS, a system used to compile geographic and mapping information, to analyze various different datasets. They assembled satellite, airborne, and topographic data and represented it using Raster and Vector graphic images (Saturno et al. 2006). This approach allowed Saturno et al. (2006:141) to examine transformations that occurred during the transitional phases of the Preclassic (2000 BC – 300 AD). At Homul, in Guatemala, archaeologists (Estrada-Belli and Koch 2006) used GIS to identify the relationship between settlement and landscape features. Similar to Saturno et al.'s (2006) study, Estrada-Belli and Kock (2006) used a variety of remote sensing techniques, coupled with GIS databases, to investigate inaccessible, uncharted, areas. Multiple archaeological projects have demonstrated the analytical advantage of GIS, encouraging its use in the investigation and dissemination of settlement information.

Beyond the site level of analysis, archaeologists have used GIS to incorporate data from multiple areas of occupation to investigate compositional features of ancient Maya societies. For example, the *Electronic Atlas of Ancient Maya Sites*, established by Walter Witschey and Clifford Brown (2010), integrates data from several sites to understand the political organization of the ancient Maya. They (Witchey and Brown 2006) used various models of settlement, such as the Central Place Model, based on Marcus's (1973, 1976) four-tiered hierarchy of settlement, to predict site locations. GIS allowed these archaeologists to amass numerous datasets for an investigation of social complexity, providing an informational conduit for the testing of multiple settlement models.

**Summary**

The continued refinement of various methodological and theoretical innovations influenced the historical development of settlement studies in the Americas. Steward actively rallied against the culture-historic approach, while promoting the use of large regional surveys and settlement analysis. He played a major role in establishing the "ground rules" for settlement studies and was later known for encouraging Willey to adopt a settlement approach.

By the 1950s, Willey had completed his settlement study of the Viru Valley in Peru. Following his work in South America, Willey embarked on several settlement studies in the Maya subarea. Although Linton Satterthwaite initially criticized Willey (2004:22) for avoiding the site of Cahal Pech, remarking that he seemed to be "afraid of the bush," Willey eventually completed an immensely influential study of settlement around Barton Ramie. This period marked a florescence in the definition and development of settlement studies, inspiring settlement projects in various areas of the world.

Following this period, archaeologists experienced a short era of scepticism, in which scholars like Trigger, outlined the limitations of the approach. These limiting factors did not dissuade archaeologists from adopting settlement strategies, but made them more aware of their methodological restrictions. In addition, as the theoretical direction of archaeology swayed in favour of processualism, settlement pattern studies gave way to the development of the settlement system concept. Similar to other processual archaeologists, who were seeking general laws to explain human behaviour, archaeologists employing settlement system analysis looked for rules that described regional patterns of settlement.

Finally, through technological advances in the fields of cartography and satellite information systems, archaeologists are now surveying vast areas of often-inaccessible space. GIS, remote sensing, and GPS have improved the coverage and the accuracy of traditional field methods. Through increasing methodological sophistication and technological intensification, settlement studies of the future will build upon these historical developments of the past, allowing for increased accuracy in the recreation of past societies.

# CHAPTER 3:
# SOCIAL ORGANIZATION AND ANCIENT URBANISM

Inspired by Willey's (1953) influential settlement study in the Viru Valley, Peru, archaeologists in the mid-to-late twentieth century conducted systematic settlement surveys at several ancient Maya sites. These investigations changed the way archaeologists interpreted the spatial distribution and organization of ancient Maya communities. The "vacant ceremonial center" (see Ricketson and Ricketson 1937; Thompson 1927) model was replaced by more intricate understandings of the composition of ancient Maya societies. Rather than "vacant," archaeologists found that major Late Classic cities, such as Tikal, were densely occupied, approaching population levels indicative of urbanization (Haviland 1965, 1969, 1970).

Along with this realization, archaeologists attempted to understand the social organization of the ancient Maya. Early excavations and settlement surveys encouraged archaeologists to view centers as comprised of elite-only members of society, with lower-ranking individuals residing in more remote, peripheral areas surrounding the site. Diego De Landa (Tozzer 1941) first alluded to this form of social organization in the sixteenth century. Ernest Burgess (1967), an urban sociologist, later used this notion, defined as the concentric zonation model, to describe twentieth century cities. Archaeologists in the mid-twentieth century applied this model to several sites to understand the political organization of ancient Maya societies (see Folan et al. 1979; Kurjack 1974).

In the late twentieth century, several archaeologists, who viewed concentric zonation as idealized and simplistic, questioned its use in understanding the social organization of the ancient Maya. Following a published debate between several Mayanists (see Arnold and Ford 1980; Folan et al. 1982; Haviland 1982), archaeologists looked for other models to capture the developmental variability witnessed in the settlement and social composition of various sites. I discuss these models, as well as references to urbanism and population densities, to demonstrate some of the ways that archaeologists have moved away from early interpretations that stressed the geographic segregation of elite and commoner populations. Instead, more recently, archaeologists have embraced models that attempt to explain the varied nature of ancient Maya settlement.

In the first section, "Models of Ancient Maya Settlement," I discuss concentric zonation, the Arnold and Ford debate (Arnold and Ford 1980; Folan et al. 1982; Haviland 1982), and various other models of settlement. By the 1970s, many archaeologists (Folan et al. 1979; Kurjack 1974) noted that larger structures were concentrated in the center of sites, with smaller, mounded structures, mostly in the periphery. The concentric zonation model, however, was questioned by Arnold and Ford (1980, 1982) who found some elite structures dispersed in the periphery of Tikal, Guatemala. Arnold and Ford's findings led to a reinvigorated discussion of the organization of ancient Maya sites. The debate between Arnold and Ford (1980, 1982), Folan et al. (1982), and Haviland (1982) highlighted a common theme: that is, variability between sites and over time existed in the archaeological record, with multiple forms of occupation at various distances from the site core. Later models, such as Fractals (Brown and Witschey 2003) and Central Place theories (Flannery 1972; Inomata and Aoyama 1996; Marcus 1973, 1976), attempted to explain this variation by borrowing findings from modern geography and mathematics. These theories encouraged archaeologists to view the social organization of the ancient Maya in terms of economic exchange.

In the second section, "Ancient Maya Urbanism," I will discuss the population size and density of several ancient Maya sites, the debate over the presence/absence of urbanism, regal-ritual cities, and the investigation of low-density urbanism. Based on settlement studies, Maya archaeologists recreated the size and extent of various sites, providing new insights into the social complexity of the ancient Maya. Earlier archaeologists (Sanders and Price 1968) had argued that the tropical lowlands were unsuited to sustain urban populations due to the heavy dependence on slash-and-burn agriculture. Subsequent studies showed that the ancient Maya subsisted on various agrotechnologies (Harrison and Turner 1978; Healy et al. 1983; Turner 1974; Turner and Harrison 2000). Later, archaeologists characterized ancient Maya cities as regal-ritual (Sanders and Webster 1988); that is, politically decentralized centers based on kinship. Following this work, Demarest (1992) proposed a model of galactic polities for Classic Maya states. These models - regal-ritual and galactic polities - portrayed ancient Maya settlement as based on ideology and ritualistic functions. I conclude this section with a discussion of low-density urbanism and describe how it relates to the composition of ancient Maya societies.

**Models of Ancient Maya Settlement**

*The Concentric Zonational Model*

In the mid-nineteenth century, several explorers referred to Maya centers as cities (Charnay 1887; Maudsley 1889-1902; Stephens 1841, 1843). In the 1560s, Diego de Landa (Tozzer 1941) described sixteenth-century Maya towns as comprised of priests and temples, surrounded by the wealthy, with lower class individuals residing in the periphery. Maler (1911:11) described the site of Tikal in a similar way: "in ancient times the monumental sections of the city were surrounded by thousands of houses and huts." By the 1930s, archaeologists questioned these assumptions, which characterized ancient Maya centers as cities, arguing in favour a "vacant ceremonial center" model. Ricketson and Ricketson (1937) argued that Maya centers served populations from the surrounding rural countryside, who gathered to participate in center markets and religious festivals. Otherwise, Ricketson and Ricketson (1937:15) described the centers as largely unoccupied, architectural constructions that offered “no housing accommodations for the common people.” While widely accepted for decades, this model was disproven in the 1960s by archaeologists at Tikal (Haviland 1969, 1970), who demonstrated populations that were higher and denser than previously expected.

The concentric zonation model describes a city as consisted of various rings of occupation that radiate outwards from central areas of settlement. Archaeologists used the model to demonstrate that wealthy, or elite, populations generally resided nearest to the civic-ceremonial centers of ancient Maya sites. Typically, lower ranking, or commoner, populations resided in more distant, outlying areas. Distance from the center reflected the wealth and social influence of different groups of people. Several scholars at various ancient Maya sites noted this pattern (Folan et al. 1979; Kurjack 1974; Morley and Brainerd 1956). For example, Sylvanus Morley and George Brainerd (1956:158) asserted, “common people lived on the outskirts of the towns and villages, and the distance of a man’s house from the central plaza depended upon his position on the social scale.”

For a significant period in the mid-twentieth century, archaeologists accepted this assertion, arguing that concentrically organized sites, with wealthy individuals residing nearest to the center and lower, commoner, populations living in surrounding areas, appeared in the Maya subarea (see Morley 1946; Thompson 1954). Later, Bullard (1960:369) argued that large house ruins in northeastern Peten appeared far from the major centers, suggesting that Maya leaders lived “scattered among the rest of the population.” Jeanne Arnold and Anabel Ford (1980), who analyzed settlement patterns at the site of Tikal, Guatemala, also questioned the concentric model. Arnold and Ford (1980:722) argued that smaller groups of elite residences were interspersed among lower status residences. These conclusions were reinforced by findings forwarded by Richard Leventhal (1981), who described settlement at Copan as comprised of households of wealthy individuals, surrounded by lesser status servants and poorer relations. Archaeologists interpreted these groupings of residential units as small, coordinated, divisions that were scattered throughout the community. This form of social organization was significantly different then the concentric views voiced by earlier archaeologists, inspiring scholars to question their conclusions (Folan et al. 1982; Haviland 1981, 1982).

*The Arnold and Ford Debate*

Arnold and Ford based their investigation of ancient Maya social organization on an examination of the labour investment costs needed for the construction of residential units. Their work incorporated earlier investigations by Carr and Hazard (1961), who mapped some of the settlement surrounding Tikal. Their study explicitly excluded the ceremonial center, which Haviland (1982:427) argued undermined their conclusions, as they were unable to identify "where the rich and influential were and were not living." Similarly, Haviland (1982) questioned the cartographic evidence, which portrayed higher status residential structures as roughly the same size (see Arnold and Ford 1980:717). Haviland (1982:429) argued that archaeologists needed other markers of social status, such as artifact assemblages and burials, to test the concentric zonation model conclusively.

Folan and collegues (1982) also criticized the methodology used in Arnold and Ford's (1980) study. They argued that archaeologists needed large-scale excavations to identify vaulted structures (Folan et al. 1982). Folan and collegues (1982) commented that Arnold and Ford's failure to distinguish between vaulted and non-vaulted structures favoured a model that decreased the actual variation between elite and non-elite structures.

Instead of finding elite structures scattered in the periphery of the site, Folan and collegues (1982:434) argued that archaeologists would have found “a well-planned generally concentric zonation of different architectural styles, formed of neighbourhood clusters.” Folan and colleagues (1982:435) also suggested that environmental conditions, such as hills and dense forests, affected Arnold and Ford’s ability at Tikal to locate smaller stone-platform structures.

Arnold and Ford (1982) addressed the concerns of Folan and colleagues (1982) and Haviland (1982) in a follow-up article. Folan and colleagues (1982) and Haviland (1982) argued that Arnold and Ford relied too heavily on labour costs to determine social differentiation. Arnold and Ford (1982:437) maintained their position, arguing that the total cumulative labor invested in the construction of residential structures indicated the relative status of the occupants. They insisted that their results provided a “good relative means of evaluating residential unit status” (Arnold and Ford 1982:440). Along with these conclusions, Arnold and Ford also argued that the removal of some elite populations – those inhabiting the center of the site – would not affect their interpretations, as not all of the elites resided in the site center.

*Understanding the Organization of the Ancient Maya*

Later in the twentieth century, several other archaeologists (Ashmore 1988; Chase 1992; Smyth et al. 1995) questioned the archaeological applicability of the concentric zonation model. Smyth and colleagues (1995) argued that the variability witnessed in the social organization at Sayil, Mexico, suggested that traditional concentric zonation models were unsuited to explain the composition of ancient Maya societies. They urged archaeologists to view areas of monumental architecture as places of “political, ceremonial, and economic activity,” which served “limited residential roles for societal elites” (Smyth et al. 1995:342). Smyth and colleagues argued that urban garden agriculture affected the social organization of Sayil, rather than the segregation of elite and commoner populations. Chase (1986) also noted that Diego de Landa based his descriptions of Maya towns on cultures in southern Central America, as Landa often adopted data from other contact period writers. Chase (1992:31) argued that the archaeological data from Classic and Postclassic periods refuted the notion that ancient Maya societies were concentrically organized.

The debate between Arnold and Ford (1980, 1982), Haviland (1982), and Folan and colleagues (1982) raised the possibility that the ancient Maya organized their sites in different ways, during different periods. Arnold and Ford (1982) hypothesized that the environment, populations, and other socio-political factors, affected the organization of ancient Maya societies. For example, Chase (1992) argued that the site of Caracol experienced changes in social organization over time. During the Early Classic, Chase (1992:43) posited that the segregation of elite and commoner populations was commonplace, as elite burials were restricted to the site center. With the expansion of the middle class in the Late Classic period, Maya elites "decreased in their overall distance" from the rest of the community (Chase 1992:46). During the Late Classic, Chase (1992) found elite burials scattered in peripheral areas surrounding the site, but rarely accompanied by inordinately decorated, or polychrome, wares.

Along with an understanding of the chronological depth of the organization of ancient Maya settlement, archaeologists also noted outlying groups of elite structures at several sites (Chase and Chase 2004; Folan et al. 2009). For example, Folan and colleagues (2009:67) argued that settlement patterns at Coba, Mexico, were generally concentric, with the exception of a causeway terminus group, which was "strategically placed at its periphery."

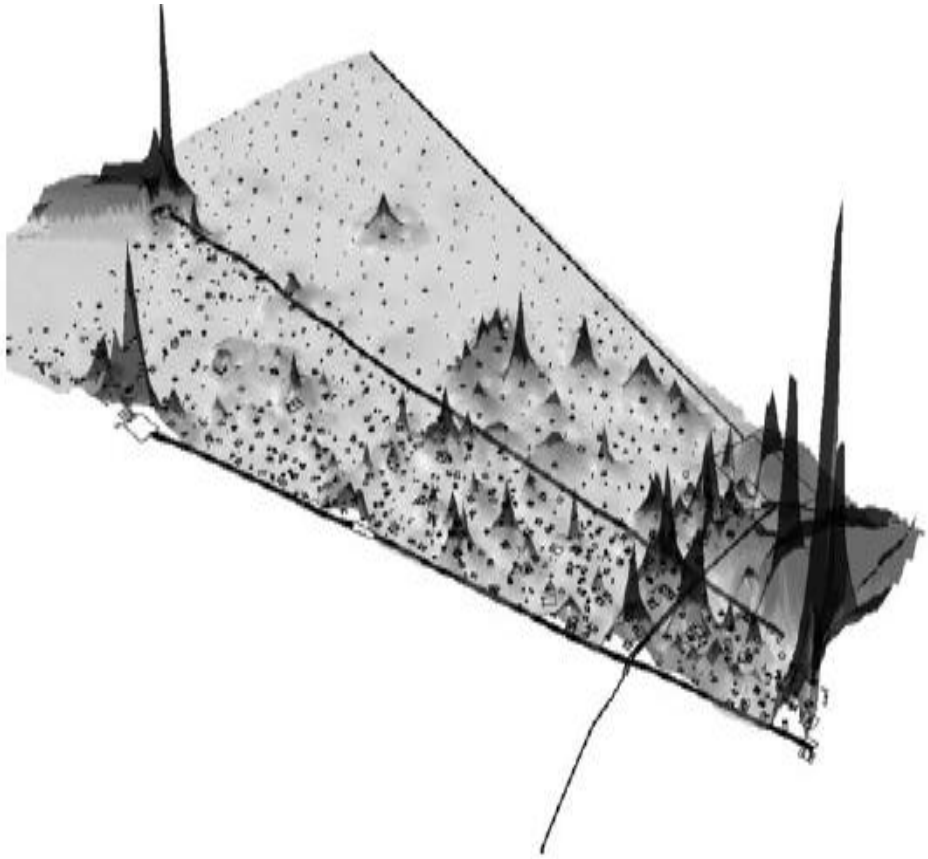

**Figure 5: Map of Coba, Mexico, Showing Elite Causeway Terminus Group (Folan et al. 2009:64)**

Folan and colleagues (2009:68) posited that this group reflected the social influence of the elite, who built their "households in strategic positions in relationship to the middle class and commoner household compounds." Likewise, Chase and Chase (2004:142) found that dietary information of ancient Maya populations at Caracol supported a model that placed elites in residential plazas adjacent to causeway termini. Archaeologists found diets higher in maize and protein among these groups, as well as the elite populations living closer to the site.

*Social Complexity and Other Models of Settlement*

Similar to the conclusions of Chase (1992), who argued that the social composition of sites changed over time, other archaeologists also noted the variability witnessed in the developmental sequences of ancient Maya societies (Iannone and Connell 2003: Marcus 1998; Yeager 2003). Lecount and Yaeger (2010:25) encouraged scholars to view the organization of the ancient Maya "as fluid instead of fixed and static." Archaeologists often investigated the form of political organization exercised by the ancient Maya, arguing for various models of centralized, or decentralized states (Fox et al. 1996; Folan et al. 1995; Iannone 2002). These scholars characterized centralized states by increased social and political differentiation, with a hierarchical organization of various constituents; while decentralized models viewed sites as composed of diffused power relations (see Iannone 2002). As Lecount and Yaeger (2010:23) noted, these views depended on the size of the site, as archaeologists tended to view larger sites as centralized, while smaller sites were characterized as decentralized. Lecount and Yaeger (2010:23) applauded this debate, as it encouraged an investigation of "diverse forms of Maya states," which were "structured by different organizational principles."

Along with an acknowledgement of the diversity witnessed in various forms of settlement, archaeologists also used other models to describe the organization of the ancient Maya. For example, Brown and Witschey (2003) argued that models adopted from modern geography were particularly suited for an understanding of the ancient Maya (Figure 6). They viewed ancient Maya settlement as fractal – that is, buildings formed "a pattern of repeated, complex, nested clusters of clusters" (Brown and Witchey 2003:1619). Fractals are often described as fragmented shapes that can be split into smaller parts, that are identical to the original shape (see Mandelbrot 1982).

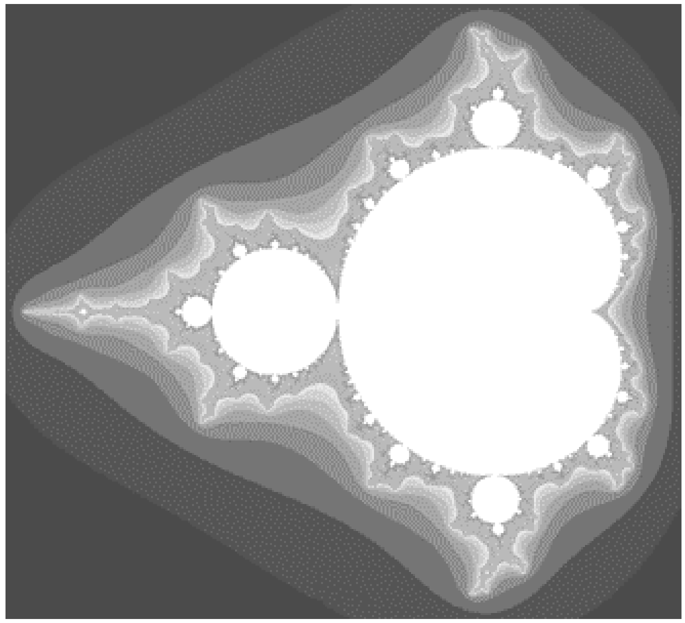

**Figure 6: Artistic Representation of a Fractal Relationship Known as the Mandelbrot Set (Encyclopaedia Britannica 2006)**

Brown and colleagues (2005:39) encouraged archaeologists to use fractal analysis to understand the "dynamics of prehistoric social systems." Brown and Witschey (2003) argued that data from several sites such as Mayapan and Dzibilchaltun revealed that ancient Maya settlement was fractal. They hypothesized that a "family-lineage-clan-state hierarchy," which was characterized by "groups of groups", affected the organization of the ancient Maya (Brown and Witschey 2003:1627).

Brown and Witschey (2003:1625) also noted that fractal settlement patterns were consistent with Central Place models. In the La Entrada region of Honduras, Inomata and Aoyama (1996:307) argued that the presence of a "central-place system" demonstrated the influence of economic exchange on the development of Classic Maya polities. Central Place theory held that settlements were organized to economically serve the needs of surrounding areas (see Christaller 1966; Losch 1954). Generally, these settlements were hexagonally distributed, with hierarchies of interrelated sites (Figure 7). As Inomata and Aoyama

(1996:292) noted, these patterns were ideal for “minimizing the cost of travel and transport and for maximizing economic profits.”

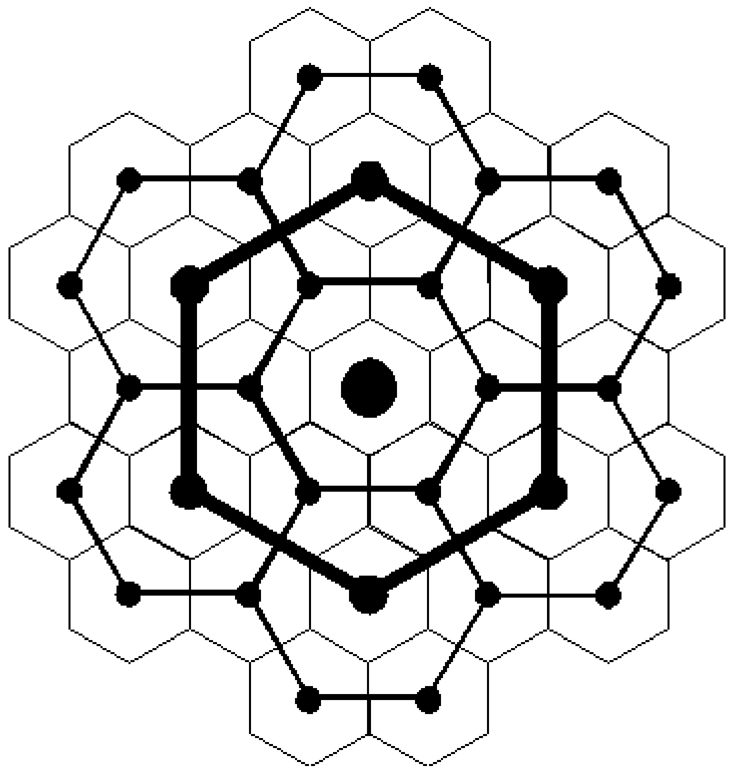

**Figure 7: Ideal Central-Place Hierarchy Demonstrating Distributions of Settlement (Hayes-Bohanan 1998)**

Prior to Inomata and Aoyama’s (1996) study, archaeologists applied central place models at various sites, with differing levels of success (Flannery 1972; Hammond 1974; Marcus 1973, 1976). Joyce Marcus (1973:915) argued that a “lattice-like network” existed, with a “quadripartite organization” of capitals, secondary and tertiary centers, villages and hamlets (Figure 4). At the site of Caracol, the nature of causeway systems inspired Chase and Chase (2001:278) to comment that the organization of roadways supported central-place models. Archaeologists interpreted these roadways as conduits of economic exchange between various residential groups (Chase and Chase 2001). Marcus (1993) found similar patterns at the site of Calakmul, Mexico. Although these studies faced criticism (Crumley 1979; Mathews 1991; Smith 1974), Brown and Witschey (2003:1625) asserted that Central Place theory merited further research.

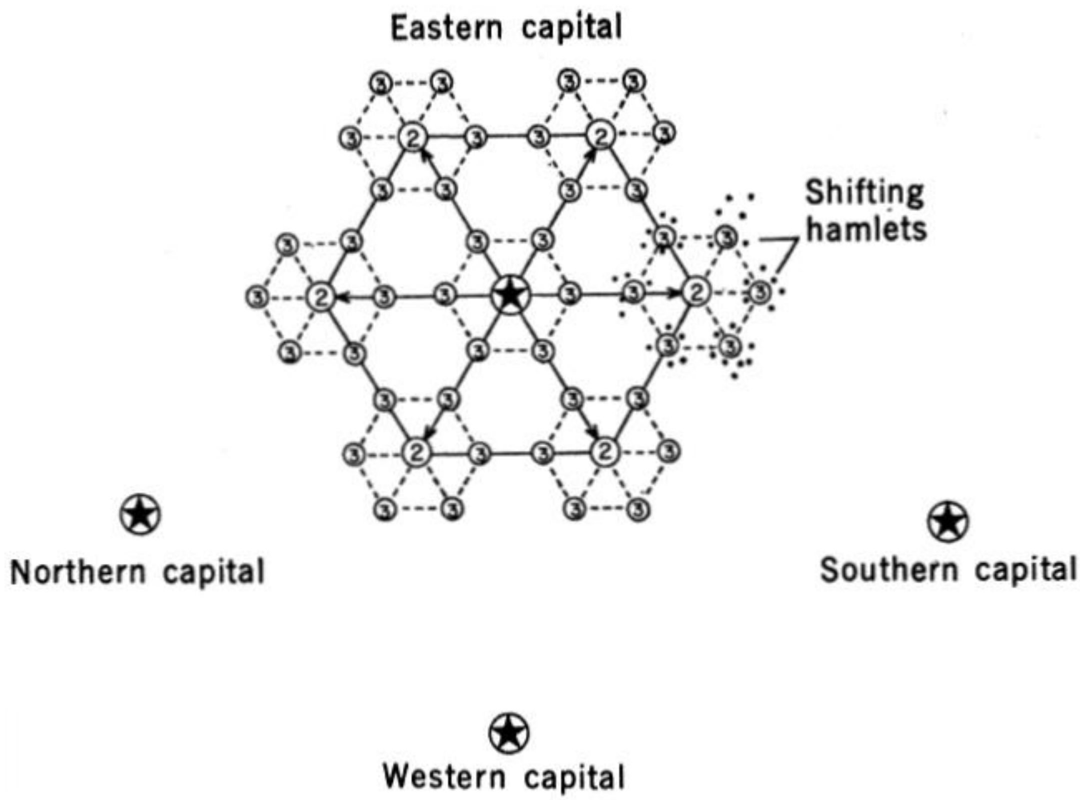


**Figure 8: Model of Ancient Maya Territorial Organization (Marcus 1973:915)**

**Ancient Maya Urbanism**

Scholars usually defineurbanism by highlighting a variety of criteria, or traits, that are present in a given society (see Marcus and Sabloff 2008). For example, archaeologists have listed various characteristics that determine the extent of urbanism in ancient cities, such as settlement densities, heterogeneity of population, a central precinct, or a specific form of spatial organization (see Hansen 2008:68-70; Renfrew 2008:46-47). Although it is difficult to assess the validity of this approach (see Butzer 2008:77-78), while discussing urbanism I generally refer to three attributes: density of settlement, size of population, and socio-political organization.

*Population and Density of Settlement*

One of the major findings of early ancient Maya archaeologists was the sheer size and extent of ancient Maya communities. Although “vacant ceremonial center” models dominated the beginning of the twentieth century, the discovery of high densities of residential populations irrevocably altered this assumption (see Puleston 1973, 1974; Rice and Culbert 1990a). Studies that counted the number of structures that were found at ancient Maya centers provided population estimates for sites such Caracol (Chase and Chase 2007), Coba (Folan et al. 2009), Pacbitun (Healy et al. 2007), among others. For example, Chase and Chase (2007:60) estimated that at its climax Caracol contained as many as 115,000 people (Figure 9). During the Late Classic, Folan et al. (2009:60) posited that Coba had a population of between 20,000-60,000 people, while at Pacbitun at this time Healy et al. (2007) estimated the site had a population of between 5000-6000 people.

Along with population estimates, archaeologists were also interested in the density of structures surrounding ancient Maya sites. In the 1930s, at the site of Uaxactun, Ricketson and Ricketson (1937) on average found 82 structures per square kilometre. In peripheral areas surrounding the site of Tikal, Puleston (1974) found 39 structures per square kilometre. In the Xunantunich hinterlands, in the Rancho San Lorenzo survey area, Yaeger (2010) found 128 mounds per square kilometre. These large densities, coupled with high population estimates, changed archaeologists’ perspective of the nature and composition of ancient Maya societies.

*Central Mexico and Ancient Maya Urbanism*

In the 1960s, archaeologists argued that urban civilizations occurred solely in dry highlands where irrigation agriculture allowed for greater population densities (see Haviland 1970:187). William Sanders and Barbara Price (1968:10) argued that the tropical lowlands, with its dependence on slash-and-burn agriculture, were ill suited to sustain urban populations.

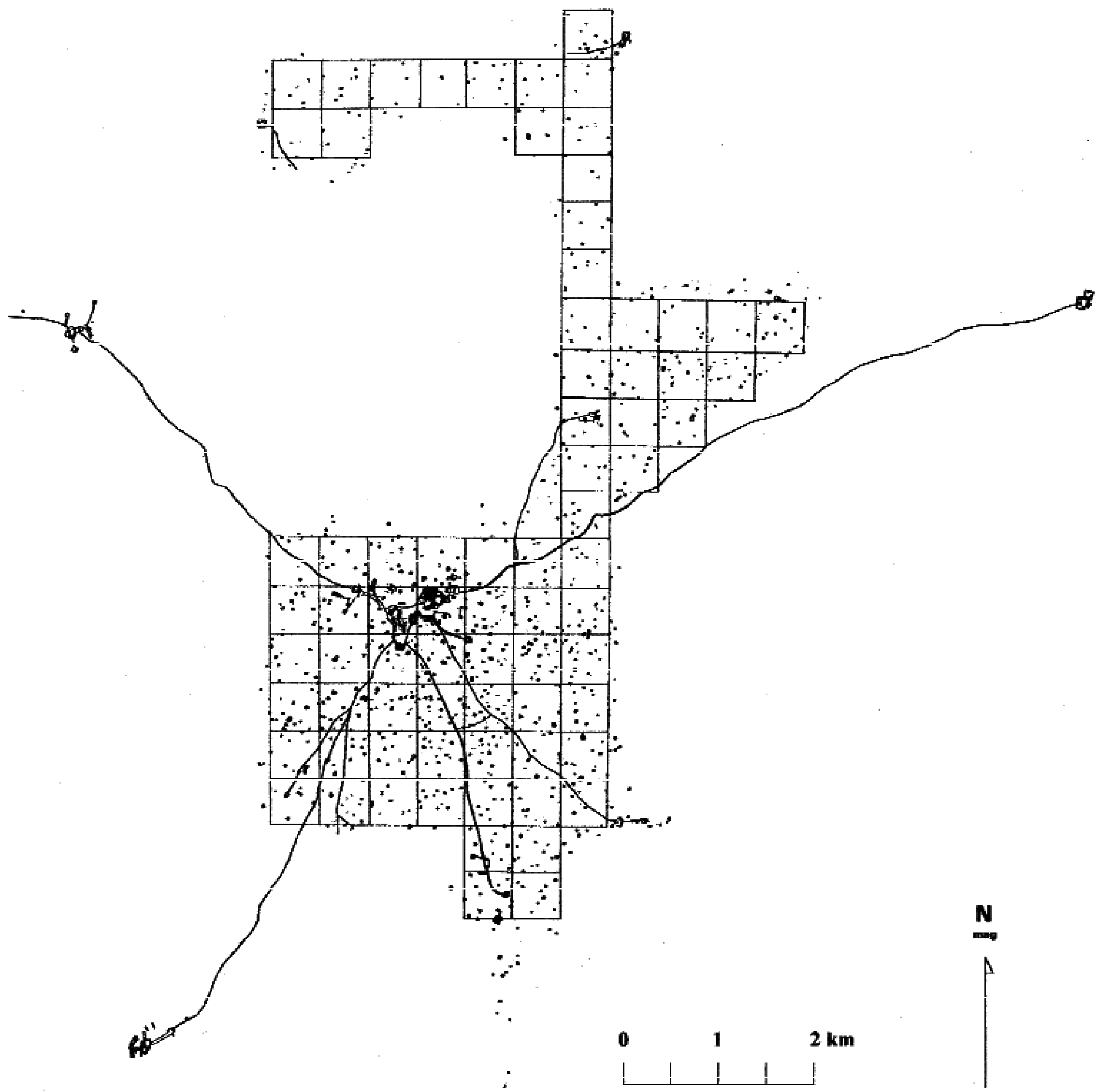


**Figure 9: Map of Settlement at Caracol, Belize (Chase et al. 2009:179)**

One of the most important examples of Central Mexican urbanism was found at the site of Teotihuacan. During the seventh century A.D., Teotihuacan was roughly 19 square kilometres in size, with a population anywhere between 60,000 and 300,000 people (Sanders and Price 1968:151). The site was strategically planned and relied on the use of hydraulic irrigation agriculture. These qualities inspired Sanders and Price (1968) to argue that the appearance of cities and urban centers distinguished the Mexican Highlands from the ancient Lowland Maya.

Several years later, Haviland (1970:193) defined three criteria that characterized an urban city: large populations, nucleation, and socio-economic diversity. Survey and excavations at Tikal, Guatemala, revealed a Late Classic population of 45,000 people (Haviland 1970). Later estimates, which incorporated a larger geographic area, placed this number to at least 60,000 people (Culbert et al. 1990). The lowest estimates, which included uninhabited swampland, provided a density of 600-700 people per square kilometre (Haviland 1970:193) – large enough populations to convince Haviland that Tikal was a city. Haviland (1970:194) argued that earlier populations, particularly during the Preclassic, were agriculturalists who relied on stable crops such as maize, beans, and squash. By about 550 A.D., Haviland (1970) posited that the amount of area occupied by each household structure was too small to provide enough food for families relying on milpa agriculture. Instead, the ancient Maya cultivated other crops (Bronson 1966), such as breadnut (Haviland 1970:194) and manioc (Sheets et al. 2011), which required less work, and provided large nutritional returns (Puleston 1968). Haviland (1970:195) concluded that evidence of social and economic differentiation, archaeologically demonstrated through differing access to material assemblages and variability in the size and extent of domestic structures, showed that Tikal was an urban community by the Late Classic.

*Regal-Ritual Cities and Galactic Polities*

Sanders and Webster (1988) later characterized ancient Maya centers as regal-ritual cities. Sanders and Webster (1988:534) argued that the social structure of Copan was comprised of high-status complexes, which acted as “heads of expanded lineages.” Lower-ranking relatives who performed “administrative, economic, mercantile, and religious services” reinforced these compounds (Sanders and Webster 1988:534). Archaeologists described Copan as a center that possessed a weak, decentralized rule, with poorly developed economic organizations, small populations, and a focus on ritualistic functions (Sanders and Webster 1988:524). This conclusion questioned the urban character of many ancient Maya centers, as Sanders and Webster viewed only the largest and most densely populated cities as urban. As Michael E. Smith (1989:455) noted, this implied that smaller centers served various central place functions and were not considered cities, or urban.

Several scholars (Chase et al. 1990; Aoyama 1999, 2001) who argued that ancient Maya cities served wider administrative and economic functions criticized the regal-ritual model. For example, Chase and colleagues (1990:503) argued that major centers were populous, “with a variety of status groups and not merely a limited group of rulers and associated kin, servants, and specialists.” The ancient Maya invested large amounts of labour in the development of urban areas, requiring the construction of road systems and administrative districts (Chase et al. 1990:502). While ancient Maya cities and regal-ritual cities shared a common concern with ideology, Chase and colleagues (1990:503) insisted that central architecture, along with hierarchically arranged administrative areas, made ancient Maya centers more than households writ large.

In a later study, Aoyama (2001) concluded that Copan had all the hallmarks of central governance, with direct control over both the consumption and production of particular trade goods. Aoyama's (2001:353) study of obsidian demonstrated that only particular households had access to Ixtepeque blade cores, or could manufacture prismatic blades. Lower-status individuals in the peripheral areas of the site were restricted to small quantities of prismatic blades. In another study, Sheets (1983) demonstrated that the Classic Maya elite at Quirigua imported obsidian cores for blade production, while individuals in rural settings obtained obsidian stream cobbles for flaked tools. Aoyama (2001:365) argued that the Yax K'uk' Mo' dynasty institutionalized "the procurement and intra- and inter-regional distribution systems of at least one utilitarian commodity," which was important for both the general welfare of the community, and the consolidation and legitimization of the ruler's political authority.

Similar to the regal-ritual model of settlement, Arthur Demarest (1992) argued that exchange systems were weakly administered by the ancient Maya. Demarest (1992) proposed a galactic polity model of settlement, based on work by Stanley Tambiah (1976), who investigated historical Thailand. This model portrayed ideological factors as paramount in the relationship between elite and non-elites, with the allegiance of commoner populations being particularly unstable. Contrary to this conclusion, Aoyama (1999:205) argued that craft specialists administered the exchange of goods in the urban core of Copan. These populations were concerned with various forms of production, fulfilling "the needs of the inhabitants within the city and those living in the rural areas of the valley" (Aoyama 1999:205).

This debate – similar to previous examples – spiralled towards the centralized vs. decentralized dichotomy, with various archaeologists representing the extremes of their given category. However, rather than disprove the presence of urbanism among the ancient Maya, these studies suggested that a different, dispersed form of urbanism was found in the

Maya subarea – one which was based on “intensive forms of agriculture or gardening in the area immediately adjacent to residences” (Aoyama 1999:205).

*Low Density Urbanism*

In the 1560s, Diego de Landa, a Spanish friar charged with converting the sixteenth century Maya to Christianity, described settlement patterns in Northern Yucatan:

> These peoples had lived for more than twenty years of abundance and good health, and they multiplied so that the whole land appeared to be but one town (Tozzer 1941:40).

Although this observation is temporally and spatially removed from many ancient Maya contexts, archaeologists uncovered similar sprawls of urban occupations at various ancient Maya sites (Chase and Chase 2004; Folan et al. 2009; Russell 2008). Fletcher (2009) described these settlementsas agrarian based, with low-density populations, which were fragile, unsustainable, and susceptible to ecological collapse (Fletcher 2009). Contemporary studies of urbanism identify similar cases of low-density settlement in modern society (Bruegmann 2005; Hayden 2004). Several theorists argue that this form of social organization is physically and environmentally detrimental, reducing social interaction, while contributing to a loss of productive agricultural lands (Brueckner 2000; Ewing et al. 2003; Hasse and Lathrop 2003) These modern examples, similar to ancient Maya settlements, were characterized by sprawling occupations radiating outwards from major centers. Smith (2010) urged archaeologists to document the extent and nature of sprawl surrounding ancient cities to provide context for interpreting variations in sprawl in the modern world.

Urban sprawl, or the expansion of low-density settlement outward from city centers to the countryside, is a common characteristic of contemporary society. Its impact on modern development is often discussed, with theorists mostly highlighting the negative effects of its adoption (Gottdiener and Budd 2005; Norman et al. 2006). This debate has traditionally ignored historic examples of urban sprawls. Instead, it has focused on the unique characteristics of modern development, viewing sprawl as a transitional phase in contemporary societies (Davis 2006). Contrary to this assumption, Fletcher (2009) noted that sprawls of low-density settlement characterized various ancient cities located in Mesoamerica, Sri Lanka, and South-East Asia. Fletcher highlightes these societies, as each example of low-density urbanism experienced a process of collapse around the mid second millennium CE. As Smith (2010) notes, archaeologists can shed light on modern urbanism by studying ancient examples of sprawl and relating these instances to contextual data, such as city size, settlement patterns, and agricultural productivity.

**Summary**

Archaeologists replaced early models that characterized ancient Maya cities as rurally based, with unoccupied monumental centers, with concentric zonation models of settlement. These models cast an urban light on ancient settlement, as archaeologists viewed Maya cities as nucleated, with varying degrees of socio-economic diversity. Later, archaeologists questioned the concentric model, realizing that elite and non-elite populations were more widely interspersed at many ancient Maya sites. These findings inspired archaeologists to investigate the variability in the developmental sequences of ancient Maya communities. Archaeologists found that centers differed in both their size and their social organization, while recognizing and incorporating the existence of causeway terminus groups. Scholars applied other models, such as fractals and central-place, to understand the interaction of various levels of society. These constructions offered archaeologists a conduit for understanding the nature of economic exchange between localized residential groups.

Archaeologists initially questioned the existence of urbanism among the ancient Maya, as they viewed the geographical area as unsuited for larger populations. Settlement surveys eventually identified these larger populations, as archaeologists found dense areas of settlement surrounding many ancient Maya centers. These revelations inspired archaeologists to investigate sites of various sizes, as regal-ritual models portrayed only the largest centers as urban. However, advocates of centralized political organization, who viewed sites as comprised of populations of craft specialists that regulated the production and consumption of commodities, cast an urban light on many ancient Maya sites. These debates also highlighted an attribute of ancient Maya urbanism that has become a topic of recent studies – that is, although populations are sometimes large, densities are low, especially relative to the non-Maya Highland Mexico site of Teotihuacan, Mexico. Although the social composition and organization of the ancient Maya still inspires debate among the archaeology community, low-density urbanism offers a new theoretical direction for studies of the ancient Maya.

# CHAPTER 4:
# ANALYZING AND RECORDING ANCIENT MAYA SETTLEMENT

William Fash (1994:183-184) summarized the methodological goals of settlement pattern studies:

> …the archaeologist documents the size and distribution of human settlements and other landscape modifications as a springboard for inferring land-use, societal complexity and organization, defensive features and measures, and in larger terms the relations of people to their regional physical and cultural environment.

Bruce Trigger (2006:376) best describes the methodological approach employed in this type of study in his summary of Willey's (1953) Peruvian settlement study:

> Aerial photographs and ground surveys were used to locate several hundred prehistoric settlements...pottery was surface collected from each site to determine in which periods it had been inhabited. The traces of buildings that were visible on the surface of sites were also recorded. Then maps were produced showing which sites had been occupied at successive phases in the history of the Viru Valley.

Archaeologists conduct settlement studies in various parts of the world; it is one of the core concepts of archaeological investigations. These studies rely on the survey and reconnaissance of large tracts of land, with excavations serving a supporting role. As Smyth and colleagues (1995:327) noted near the end of the twentieth century, surface archaeology was "fast becoming" an important tool for the reconstruction of "activities that occurred across large horizontal expanses of space." They commented that these studies in the Maya subarea, which rely on the identification of numerous "housemounds" at Maya centers, have "transformed perceptions of Maya urbanism" (Smyth et al. 1995:328) . In short, the methodological approach pioneered by Willey, and applied in this study, redefined depictions of the ancient Maya and their lifeways. Later, Sabloff and Ashmore (2007:23) commented that settlement pattern studies are a widely acknowledged part of “archaeologists’ methodological resources,” aiding in the refinement of both “conceptual and theoretical domains.” They noted that these studies were used to provide “new insights into the development and nature of cultural complexity,” while refining time-space systematics around the world (Sabloff and Ashmore 2007:23).

*Culture History and Time-Space Systematics*

Time-Space systematics is a methodological outgrowth of earlier archaeological interests in culture-history. Culture-history is an archaeological theory that groups past societies into distinct cultural entities based on their material culture. This approach, which traces its roots to the early twentieth century, demonstrates cultural differences across spatial boundaries and through time. As Sabloff and Ashmore (2007:12) noted, archaeologists date artifacts by recognizing the “stratigraphic ordering within excavations and seriation of artifact and architectural styles.” Cultural-historical studies rely on typological sequences of artifacts to distinguish between particular phases of time. Although these phases are overly simplistic reflections of reality, they allow archaeologists to investigate changes in patterns of material culture.

Archaeologists criticized the cultural-historic approach in the mid-to-late twentieth century for its focus on description, rather than explanation (Bennett 1943; Binford 1962; Taylor 1948). However, these studies often form the basis for other explanatory investigations of past societies. For example, Willey and Phillips (1958:4) defined three levels of organization that were applicable to most scientific endeavors: observation, description, and explanation. Each level is dependent on the other, with description based on observation, and explanation based on description. Thus, prior to explaining changes in the archaeological record, it is important to describe where and when previous cultural activities took place.

Time-space systematics, employed in Willey's study of the Viru Valley, and later applied in the Maya subarea, are used to understand the developmental sequences of archaeological sites. By mapping the distribution of occupation, while comparing typological sequences to understand chronology, archaeologists are able to see how settlements change over time. For example, Table 2 shows the ceramic chronology of the ancient Maya site of Tikal, Guatemala. Archaeologists distinguish these periods by investigating variability in material culture.

| Period | Ceramic Complex | Approximate Date |
|---|---|---|
| Postclassic | Caban | A.D. 950–1200(?) |
| Terminal Classic | Eznab | A.D. 850–950 |
| Late Classic | Imix | A.D. 700–850 |
| Late Classic | Ik | A.D. 550–700 |
| Early Classic | Manik | A.D. 250–550 |
| Late Preclassic | Cimi | A.D. 150–250 |
| Late Preclassic | Cauac | 0 B.C.–A.D. 150 |
| Late Preclassic | Chuen | 350–0 B.C. |
| Middle Preclassic | Tzec | 600–350 B.C. |
| Middle Preclassic | Eb | 800–600 B.C. |

**Table 2: Ceramic Chronology of Tikal, Guatemala (Culbert 1993)**

Kosakowsky (2003:61) commented that archaeologists use these categories to develop ceramic sequences, which provide a "time line for dating deposits," as well as for comparisons of chronological histories. Archaeologists use these sequences to investigate variability between sites, or to investigate the multi-component composition of a single site. Archaeologists conducting settlement studies in the Maya subarea often investigate mounded structures surrounding monumental centers, attributing these constructions (mostly assumed to be residential) to particular periods. By mapping where these structures are located, while using ceramic indicators of chronology to hypothesize when the ancient Maya occupied these structures, archaeologists can reconstruct the settlement dynamics of an ancient city.

## Methodological Strategies Employed at Ka'Kabish

### *Survey and Collection Strategies*

During the 2010 field season, a team of three individuals surveyed for six weeks in two specific areas surrounding the ancient Maya center of Ka'Kabish. In the 2011 field season, the team spent another three weeks expanding this part of the survey zone. The first survey location extended in a southwesterly direction from the site core, 0.8 km into the periphery. The transect width varied somewhat depending on the composition of the agricultural fields, but generally averaged 0.2 km. The second survey zone was roughly 1.5 km from the site core, and extended in a southeasterly direction for 1 km. The width of the survey zone was roughly 0.92 km. In total, the team surveyed 1.08 square kilometers over the course of 40 days (Figure 10).

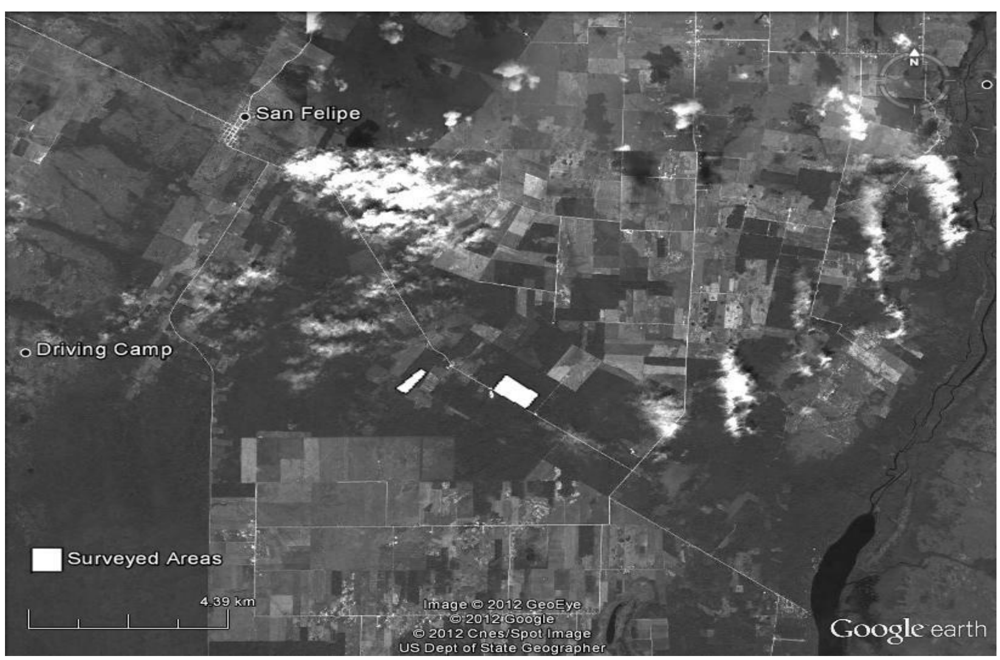


**Figure 10: Location of Survey Zones (generated in Google Earth)**

The team used strategies common in Maya archaeology (see Ashmore 2007:24-36) to document the settlement surrounding Ka'Kabish, using architectural elements (e.g., elevated terrain or mounds with high concentrations of limestone and ceramic materials), as well as the presence of sherd scatters to define sites. Appendix E shows the recording sheets used to document the survey zone. The team employed pedestrian survey strategies, with individuals evenly spaced 5 m apart, walking in parallel directionsacross the entire survey zone. Surveyors used sherd scatters to define sites only in specific situations, as some agricultural areas had a prolonged history of use, decreasing the likelihood that architectural elements survived. Generally, the transect survey was conducted on heavily used agricultural fields that witnessed repeated ploughing and bulldozing (Figure 11).

**Figure 11: Ground Survey of the Settlement Surrounding Ka'Kabish**

The modern farmers in the second area of survey had recently cleared the jungle. Several months prior to the survey, the forest was slash-and-burned, with large stones and debris collected and removed from the fields by workers from local Mennonite communities.

These workers plowed the area prior to the survey. Plows in the settlement zone generally reached a depth of roughly 25 cm. In this newly opened/cleared location, architectural elements were well preserved, with large scatters of artifacts accompanying each mounded structure. The team determined the size and extent of the survey zone by following the natural boundaries of the agricultural areas under investigation, as permission was required from landowners prior to the survey. Surveyors collected ceramic, lithic, and faunal remains from the surface of noticeable material cultural concentrations and mounded structures. The team collected concentrations containing a minimum of five pieces of material for every 30 cm, as lower quantities were less likely to represent permanent occupation. The team visibly marked these concentrations by flagging each individual artifact prior to collection. This allowed surveyors to estimate visually the density of materials. Collection strategies focused on "visibly diagnostic" artifacts that were larger than 5 cm in diameter. "Visibly diagnostic" referred to artifacts that represented the neck, rim, appendage, or base of a vessel, or included bichrome, polychrome, or decorated (e.g., incised, stamped) features.

*Analysis Processes and Test-Pit Excavations*

An analysis of ceramics established the chronology of the settlement zone. Dr. Jim Aimers compared the materials collected at Ka'Kabish to other Maya ceramic typologies for Belize (Gifford 1976; Masson and Mock 2004) to understand dates of occupation in the settlement zone. Aimers conducted this work during the final two weeks of each field season. Analysis focused on dividing the surface ceramics of each individual structure into diagnostic and non-diagnostic types. Aimers compared diagnostic artifacts to other ceramics found in northern Belize, and elsewhere, and recorded the temporal period archaeologists assigned to these materials.

The dates for these ceramics sometimes only represented the last periods of occupation, as deeper, subsurface layers of the stratigraphy often contain the earliest materials. To expand on this “surface” chronology, the team conducted test pit excavations at each mounded structure during the second field season (Figure 12). These excavations reached the depth of a shovel, roughly 35-45 cm. Normally, the team excavated the center of each structure and/or artifact scatter. A total of 95 individual test-pit excavations were conducted. Each test-pit was roughly 40 cm wide, with a length of 40 cm. These test excavations yielded anywhere between 5-40 sherds per mound, accompanied by smaller quantities of lithic and faunal materials. In one case, test-pit excavations revealed the burial of a single individual. The team excavated a 1x1 m unit to retrieve the skeletal and artifactual remains as impending bulldozing activities threatened the preservation of the site.

**Figure 12: Test-Pit Excavation of GF1-M1 in the Settlement Zone**

The depth of the test-pit excavations varied slightly, depending on the recovered materials, as the survey team left architectural elements (cut stones and plaster floors) in-situ. In addition, in some cases, the team may have uncovered more materials – particularly older materials –by increasing the depth of the excavations; however, in the interest of time and for comparability purposes, a prearranged depth (35-45 cm) was agreed upon.

*Recording and Mapping*

Surveyors mapped ceramic scatters and platform constructions by taking GPS coordinates. The World Geodetic System (WGS 84), which is a reference coordinate system based on the Earth's center of mass, was used to map the distribution of archaeological features. The project used a lot system to record the provenience of artifact scatters and mounds. Aster satellite imagery and aerial maps captured the topography of the settlement zone. Several archaeologists conducted aerial reconnaissance of the monumental center, as well as the settlement surrounding Ka'Kabish, during the 2011 field season (Figure 13). Abraham Remble, a Mennonite from the Blue Creek community, piloted a single engine Cessna during the survey. As time permitted, the team used a theodolite, or total-data station, to map occupation areas more accurately. During the 2011 season, surveyors mapped the second survey zone with a total data station to capture precisely the topography, as well as the distribution of settlement. The length, width, and height (if applicable) of ceramic scatters and platform structures were recorded. The team noted these dimensions to investigate the difference between the size of the structures, and their relative distance from the monumental center. Surveyors recorded the primary orientation of these remains, if visible. In reality, however, it was difficult at times to identify the orientation, as architectural elements (retaining walls and stairs) were rarely visible on the surface. The distribution of these scatters and mounds can be seen in Figure 19, in Chapter 5.

**Figure 13: Aerial Photograph of the Settlement Zone**

The team also recorded the approximate distance of archaeological remains from known sources of water in the 2010 field season. Several sources of fresh water are available to modern communities (Figure 14). Sources in the Mennonite community of Shipyard believe that an underground river exists in the area. Manuel Blanco unsuccessfully attempted to tap into this source of water, digging roughly 4 m in depth, during the 2011 field season. Farmers in the settlement zone suggested that these water holes are constant year-around. The team also noted any disturbance factors such as mechanical plowing, or the growth of crops, as well as the percentage of land that was visible (as secondary growth often hid otherwise visible archaeological remains). These disturbance factors varied based on the location, as farmers had recently planted some areas with corn and sugar cane, which again, affected the visibility of surface remains.

**Figure 14: Source of Replenishing Water in the Settlement Zone**

## Methodological Limitations

### *Experience in the Field*

As alluded to earlier, the ability of archaeologists to find and identify archaeological sites, along with archaeological materials, is contingent to some degree on their experience in the field. Archaeologists have conducted multiple studies to predict the accuracy and reliability of field surveys (Ammerman and Feldman 1978; Healy et al. 2007; Shott et al. 2002). A recent study (Banning et al. 2011) has outlined several factors that affect archaeologists' ability to locate cultural materials – the speed of the surveyor, the spacing of the survey, and whether the surveyor walks towards or away from the sun. In particular, Banning and colleagues (2011) were interested in defining the effective sweep width or the ideal width of a survey to uncover the most materials (Figure 15). Although this case study presents an ideal scenario, it is important to note that archaeologists often overlook archaeological materials. Likewise, some materials may be easier, or more difficult, to identify, leading to an overrepresented, or underrepresented sample of a particular materials. The effective sweep width varied depending on materials and the direction of the survey, with surveyors placed anywhere from 1 to 10 m apart (Banning et al. 2011:9). At Ka'Kabish, surveyors walked in 5 m intervals.

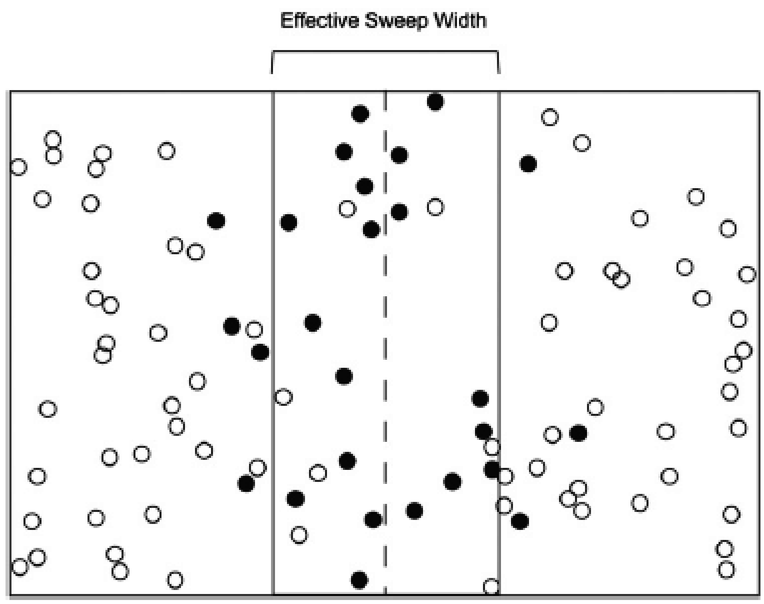


**Figure 15: Effective Sweep Width displaying detected (black dots) artifacts vs. undetected artifacts (white dots) (Banning et al. 2011:2)**

To understand the effectiveness, or detectability, of survey strategies, Banning and colleagues (2011:11) urged archaeologists to report the amount of time spent surveying particular locations. With this in mind, if walking at a standard pace, roughly 5 km an hour, the longest distance travelled in the survey zone (less than 1 km) required one individual roughly 12 minutes to survey. The archaeological team at Ka'Kabish surveyed much slower than the average walking speed, covering 1 km in time units up to 60 minutes in duration.

With three surveyors spaced 5 meters apart, the second survey zone required roughly 6-8 hours to survey; however, the team took significantly longer to record and map each individual structure, affecting the length of the survey.

*Surface Detectability*

Along with the experience of the surveyor, archaeologists noted that some domestic residences, particularly lower-lying, minimally mounded structures, are also difficult to identify. These “invisible” settlements inspired Mayanists to hypothesize that minimally mounded structures represented a sizable and socially important portion of Prehispanic populations (Johnston 2004). Sweely (2005) proposed that archaeologists use electromagnetic induction (EMI) to reveal ground-level floors, use-areas, and footpaths. EMI produces an electromagnatic field that causes an electric current to pass through conductive elements in the subsurface. This allows archaeologists to see subsurface disturbances in the soil composition or evidence of plaster floors. Sweely (2005) demonstrated that this technology could be used to detect invisible remains; however, the cost of the technology has made is less accessible to archaeologists.

One of the major problems with settlement surveys in the Maya subarea is the geographical setting, as dense forest cover makes it difficult to identify archaeological remains, such as low-lying mounds (Healy et al. 2007). However, unlike most major ancient Maya sites, surrounded by jungle, Ka’Kabish is in an area undergoing vigorous agricultural intensification. The geographical setting of Blue Creek is similar to the conditions witnessed at Ka’Kabish (Figure 16). As Guderjan (2007) noted in his investigation of Blue Creek, these activities can damage and destroy archaeological materials. However, they also can make materials more visible on the landscape. Guderjan (2007:49) commented: “while other fieldworkers must cut lines through dense forest, we were able to rapidly map, then (not so rapidly) conduct test excavations across large areas around the site core." These characteristics make it easier to identify archaeological remains in the fields.


**Figure 16: Mounded Structures in the Settlement Zone of Blue Creek, Belize (Barrett 2004:105)**

*The Preservation and Analysis of Ceramic Materials*

Although agricultural activities improve the visibility of mounded structures, these processes also affect the preservation of archaeological materials on the surface. Clearing and continued plowing of the settlement zone degrades the condition of ceramic materials, making typological identification more difficult. For example, exposure to weathering condition wears away the slip, or bichrome or polychrome features, on ceramics. Agricultural activities, such as plowing, further damage and degrade the materials. These site formation characteristics affect the identification of temporally diagnostic materials, decreasing the resolution of time-space reconstructions.

**Future Methodological Considerations**

As Sabloff and Ashmore (2007:25) noted, although archaeologists often rely exclusively on surface collections, most settlement pattern studies are aided by excavations. In a settlement study of the Chiapas region of Mexico, de Montmollin (1989:6) outlined several reasons for subsequent large-scale excavation programs. For the purposes of this study, de Montmollin's suggestions are equally relevant. Full-scale excavations of mounded structures in the settlement zone will help refine the chronological sequence of ceramics at Ka'Kabish, allowing for greater confidence in temporal reconstructions. Likewise, excavations can help reveal the differences, or similarities, in the architectural form of domestic constructions. Finally, excavations of structures dating from different periods may illustrate how the use of domestic space has changed over time, with specific reference to agricultural practices and familial/kinship organizations.

**Summary**

Archaeologists have demonstrated the analytical value of settlement studies in several areas of the world. By understanding "the way in which man disposed himself over the landscape"(Willey 1953:1), archaeologists have begun to reveal the social complexity and organization of some ancient societies. This approach was applied in Northern Belize, at the ancient Maya site of Ka'Kabish, to understand the size, extent, and organization of supporting populations surrounding the monumental center. Although the methodological strategies used in settlement studies have limitations, such as surface detectability and the preservation of surface materials, these studies are vital in understanding the relationship of people to their cultural and physical environment. By adopting a methodological approach grounded in settlement pattern studies, I aim to add to a growing understanding of the developmental variability of ancient Maya centers.

# CHAPTER 5:
# ANCIENT MAYA SETTLEMENT AT KA'KABISH, BELIZE

## System of Codification

The survey team subdivided the fields in the settlement zone into various geographical plots, each of which received a codified designation (Table 3). The survey was conducted on land that was owned by two different agriculturalists – George Wall and Manual Blanco (e.g. G was used describe George Wall's fields, while B was used to distinguish Manual Blanco's fields). Following this abbreviation, the second portion of the code referred to mounded structures grouped closely together, or constructed on residential platforms (e.g. P referred to a platform, while G referred to a group of mounds). The third portion of the code determined if concentrations of artifacts accompanied mounds (M referred to a mounded structure, while SC referred to a scatter of artifacts unaccompanied by a mound). These designations, then, referred to the landscape of the area, the characteristics of the occupation, and the landowner. Below is a list of the abbreviations, along with their meaning, and their significance.

| Designation | Meaning | Significance |
|---|---|---|
| GF | George's Field | Geographical location owned by George Wall |
| BF | Blanco's Field | Geographical location owned by Manual Blanco |
| P | Platform Structure | Mounds found on a raised platform structure |
| G | Mounded Group | Mounds situated in a group of at least 3 |
| M | Mound | Concentration of artifacts found on a mound |
| SC | Scatter | Concentration of artifacts |
| BTL | Blanco's Tree Line | Separated major fields; reduced visibility |
| BSG | Blanco's Sugar Cane Field | Reduced visibility; fewer surface artifacts |
| BC | Blanco's Cabin | Geographical location outside of transect survey |

**Table 3: Definition of Codified Designations for Settlement at Ka'Kabish**

**GPS vs. Total Data Station**

For the most part, the team recorded geographic locations using Global Positioning Satellites. Surveyors used a handheld Magellan Explorist 100 Water Resistant Hiking GPS to record each mound and scatter, along with the extent of the survey zone. In Wall's fields, surveyors used a Total Data Station to map mounded structures and the size of the survey zone. The team modeled this data in Surfer, a full-function 3D visualization, contouring and surface modeling package,to create maps and figures of Wall's and Blanco's fields. Surveyors compared the coordinates taken by the GPS, and those calibrated with the Total Data Station, to test the accuracy of these technologies (Figure 17). This comparison revealed significant discrepancies, with coordinates sometimes off by as much as 20 m. It is likely that these inaccuracies resulted from a combination of both technologies, as GPS handheld systems have 2-5 m accuracy, while the total data station may have accumulated inaccuracies as archaeologists moved the instrument further from the primary datum.

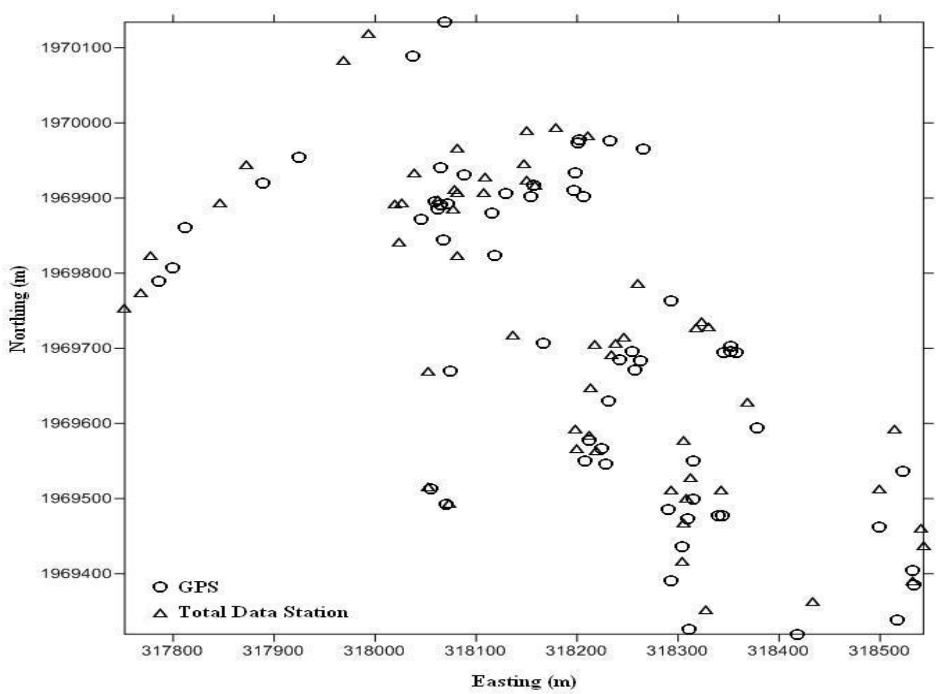


**Figure 17: GPS locations vs. Theodolite locations**

**Density and Distribution of Occupation**

In total, surveyors recorded 95 mounded and non-mounded areas of occupation at Ka'Kabish (Figures 18, 19, and 20). The survey identified 11 scatters of artifacts unaccompanied by mounds and 84 areas mounded due to subsurface stone platforms. Of these mounded structures, the team found 57 mounds on land owned by George Wall. This survey area, which included GF1, GF2, and GF3, was 0.92 square kilometers in size. The second survey area, which was on land owned by Manuel Blanco, was comprised of 11 scatters and 27 mounds. Blanco's fields, which included BF1-BF6, BSG, BTL, and BC, covered 0.16 square kilometers. In order to compare the density of structures in both fields, the team proportionately inflated these numbers to represent one square kilometer, the normal unit of settlement measure. With this in mind, on average, surveyors estimate 62 structures per square kilometer in Wall's fields, and 169 structures per square kilometer in Blanco's fields.


**Figure 18: Map of Surveyed Areas (adapted from Google Maps)**

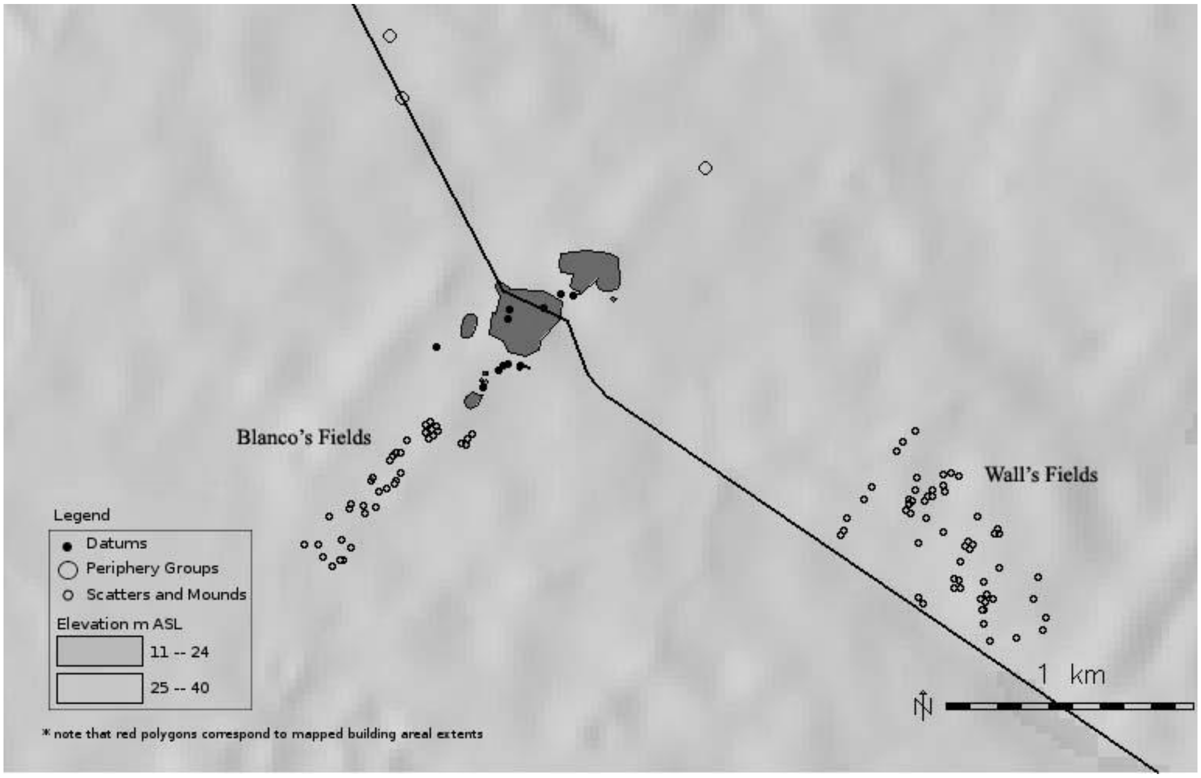


**Figure 19: Map of Settlement and the Site Core (polygons) of Ka'Kabish (Map by W.C. Carleton and A. McLellan)**

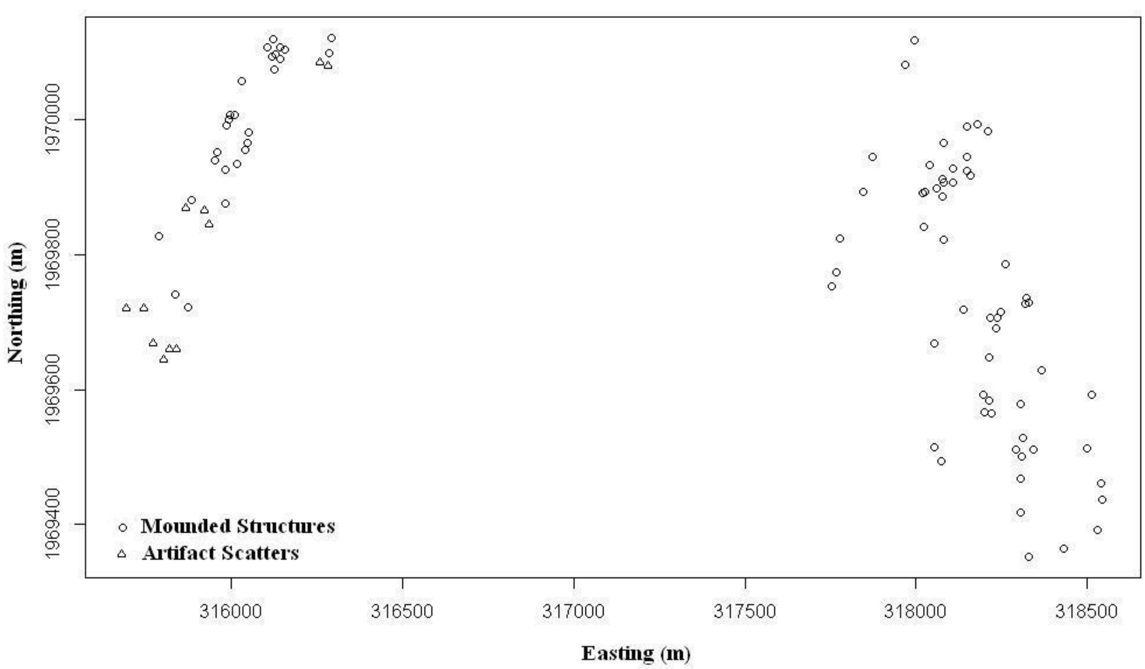


**Figure 20: GPS Distribution of Mounds and Scatters in both Survey Zones**

In Wall's fields, lower lying areas generally averaged between 50-60 m above sea level, while higher areas reached between 70-75 m above sea level (Figures 21-24). Surveyors found these higher elevations in the northeast portion of the survey zone.  Based on initial observations, structures did not correspond with the elevation of the topography, as the team found multiple mounds situated in lower-lying areas.  For example, the largest mounded structure – GF1-M1 – was at the base of these higher elevations.  For comparison purposes, the site core ranges in elevation from 100-120 m above sea level.

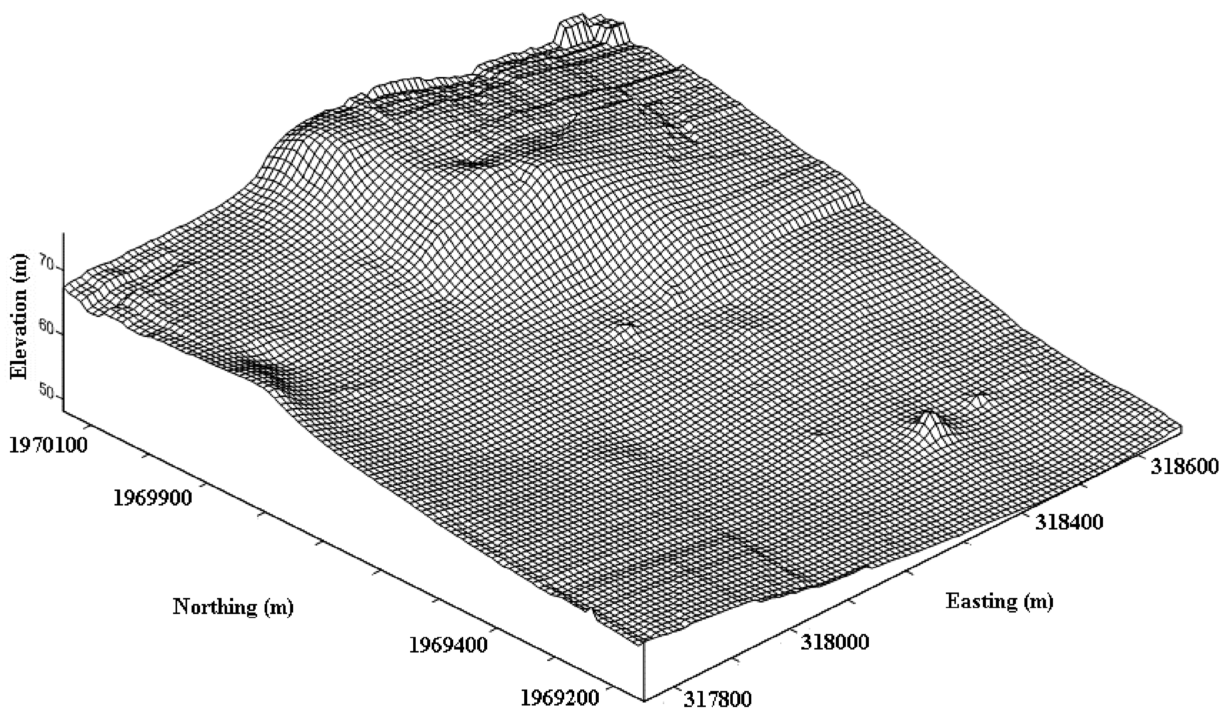


**Figure 21: Wireframe topography of Wall's Fields**

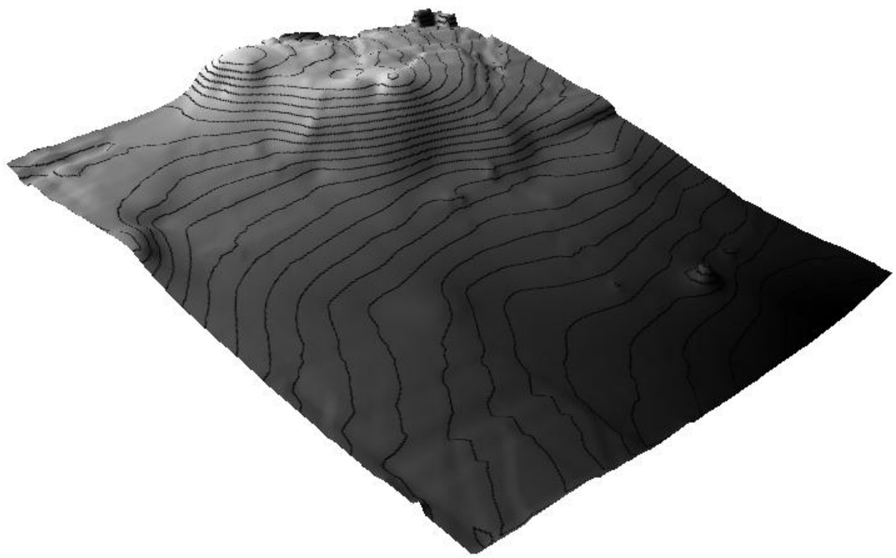

**Figure 22: 3D Surface with Contours of Wall's Fields**

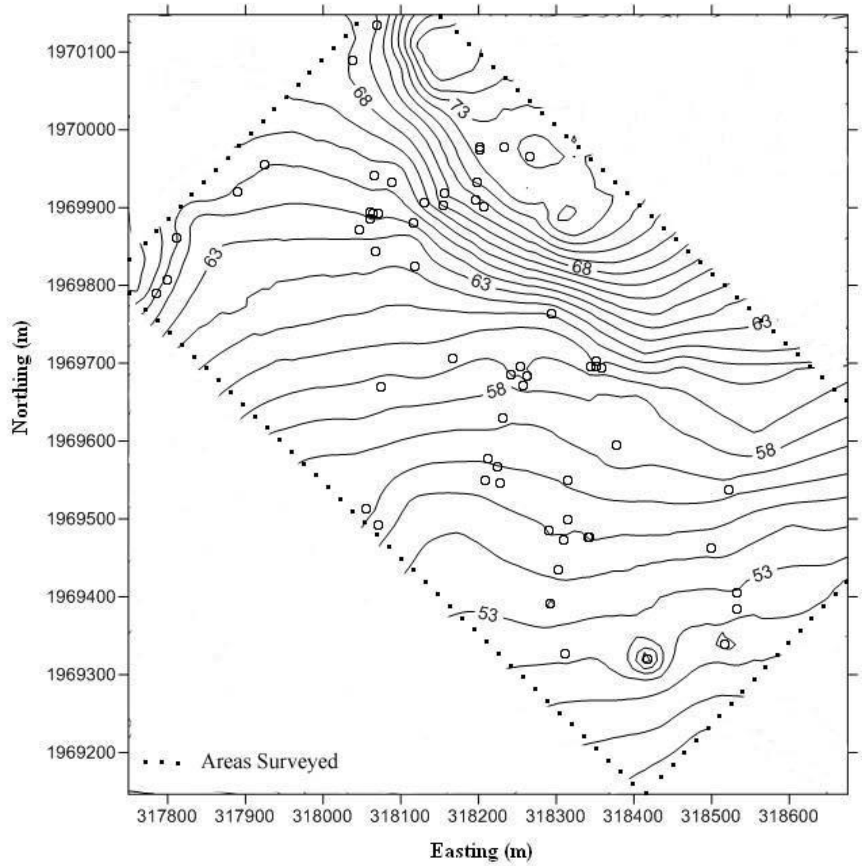


**Figure 23: Topographic Map of Wall's Fields with Mounded Structures**

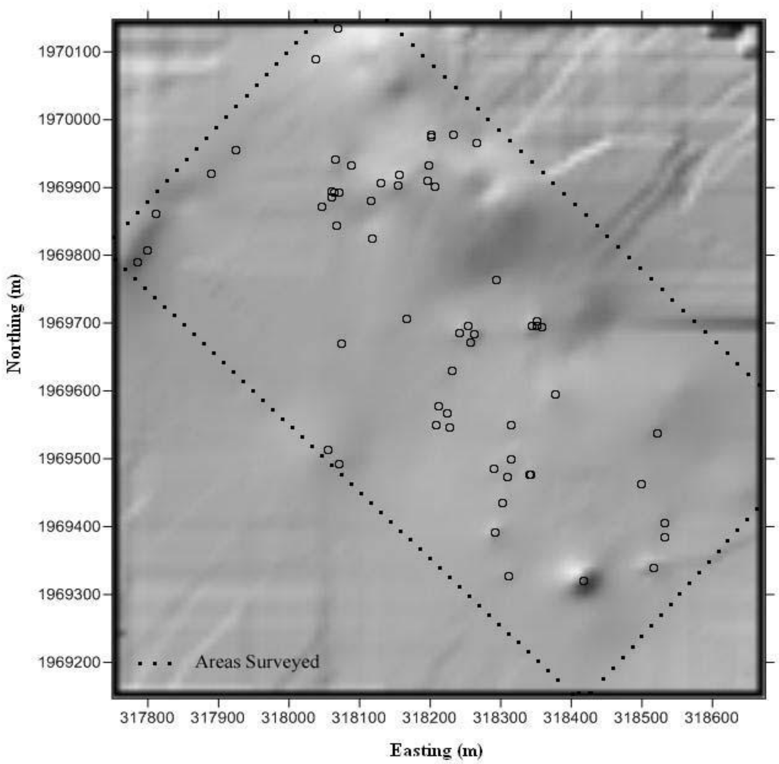


**Figure 24: Shaded Relief Map of Topography of Wall's Fields with Mounded Structures**

In Blanco's fields, lower lying areas generally averaged between 55-60 m above sea level, while higher areas reached between 70-75 m above sea level (Figures 25 and 26). Surveyors found these higher elevations closer to the site core, as the topography generally decreased in height as the distance from the core increased. Based on initial observations, it is important to note that there are fewer mounded structures in lower lying areas further from the site core. Instead, these areas have noticeable concentrations of artifacts unaccompanied by mounded structures. Modern agricultural practices may have caused these site formation processes – as the fields have a prolonged history of use – or because an area surrounding the site core was comprised of structures built on flat terrain - possibly indicating a change in construction patterns surrounding the site. This interpretation is further discussed in Chapter 5.

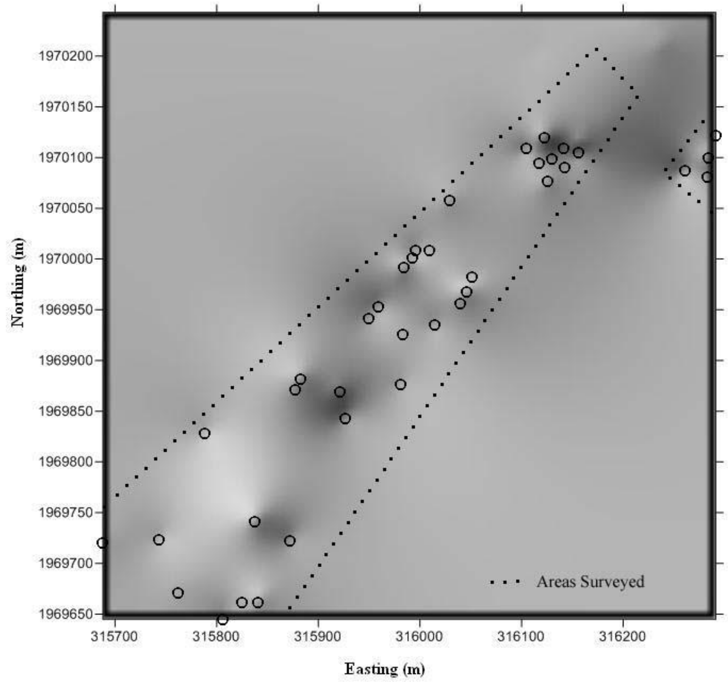


**Figure 25: Shaded Relief Map of Topography of Blanco's Fields with Mounded Structures**

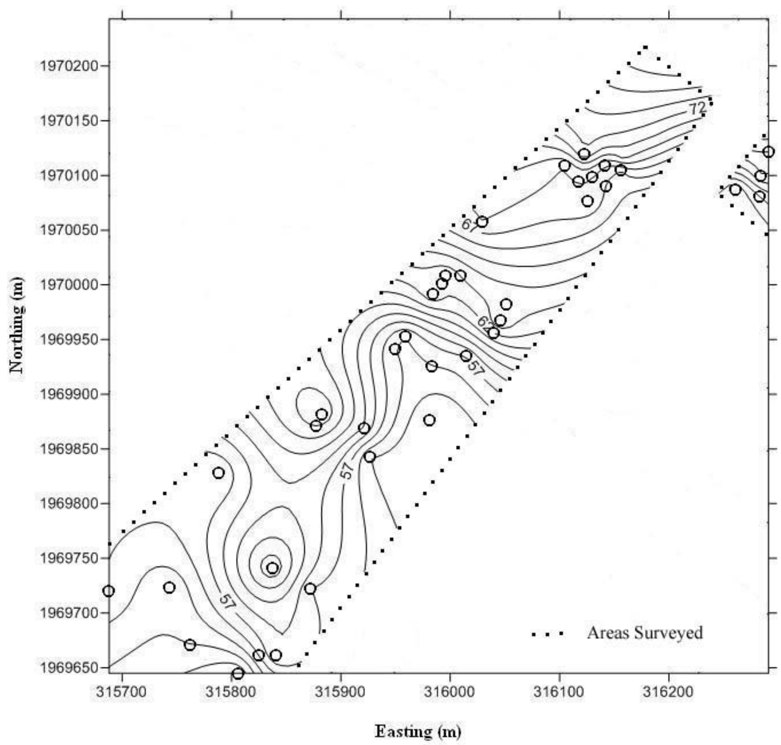


**Figure 26: Topographical Map of Blanco's Fields with Mounded Structures**

Unlike Blanco's fields, which had concentrations of artifacts that were not associated with mounded structures, Wall's fields lacked non-mounded scatters of artifacts. Each artifact scatter in Wall's fields was clearly associated with a platform construction. In some cases, artifacts were scattered over large areas of the landscape. However, this is likely due to site formation processes, such as repeated modern plowing, which alters the context of surface artifacts.

As with the differences in the density and distribution of mounded structures and artifact scatters in the survey zones, the size of these areas of occupation also differed (Appendix A).Generally, surveyors found larger mounded structures in the southeast portion of Wall's fields. In comparison, the structures found in Blanco's fields were smaller in size and height. Interestingly, the team found some of the largest structures in Wall's survey zone at the farthest distance from the site core. Again, these discrepancies may be due to present day agricultural practices, as one example, BF1.5-M1, which was untouched by the owner, was 4 m tall, and was roughly 8 m x 8 m in size. Larger structures were likely once located in Blanco's fields closer to the core; however, clearing and bulldozing activities have altered the archaeological record in these areas.

**Organization of the Structures**

To facilitate intersite comparisons, some archaeologists have adopted a morphological system to categorize different forms of occupation. For example, at the ancient Maya site of Minanha, archaeologists classified settlement based on the maximum height of the structures, the number of the structures, and their arrangement in space (see Longstaffe 2011). Archaeologists originally developed these criteria during the Xunantunich

Settlement Survey project (see Ashmore et al. 1994). Table 4 provides the definition of these various types of Maya settlement.

| Designation | Definition |
|---|---|
| Type 1 | Isolated mound less than 2 m high |
| Type 2 | 2-4 mounds informally arranged, all less than 2 m high |
| Type 3 | 2-4 mounds orthogonally arranged, all less than 2 m high |
| Type 4 | 5 or more mounds informally arranged, all less than 2 m high |
| Type 5 | 5 or more mounds with at least 2 arranged orthogonally, all less than 2 m high |
| Type 6 | 1 or more mounds with at least 1 with a height between 2-5 m |
| Type 7 | 2 or more mounds with at least 1 with a height over 5 m |

**Table 4: Definition of Types of Settlement**

The most common form of settlement at Ka'Kabish was Type 1, as 25 units (54%) of the total sample was comprised of small, isolated, mounds (Table 5 and 6). Type 3 was the second most common form of settlement at Ka'Kabish, with 12units (26%) orthogonally arranged (Figure 27). The third most common form of settlement was Type 2, with fiveunits (10%) informally arranged. Type 6 was represented in two locations of the settlement zone (Figure 28).

| Settlement Zone | Unit Type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | **Total** |
| Wall's Fields | 20 | 3 | 7 | 1 | 0 | 1 | 0 | 32 |
| Blanco's Fields | 5 | 2 | 5 | 0 | 1 | 1 | 0 | 14 |
| **TOTAL** | 25 | 5 | 12 | 1 | 1 | 2 | 0 | 46 |

**Table 5: Types of Settlement**

| Settlement Zone | Unit Type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | **Total** |
| Wall's Fields | 62.5% | 9.4% | 21.9% | 3.1% | 0.0% | 3.1% | 0.0% | 100% |
| Blanco's Fields | 35.7% | 14.3% | 35.7% | 0.0% | 7.15% | 7.15% | 0.0% | 100% |
| **TOTAL** | 54.3% | 10.9% | 26.1% | 2.2% | 2.2% | 4.3% | 0.0% | |

**Table 6: Percentage of Types of Settlement**

**Figure 27: Type 3 Form of Settlement Located in GF3**

**Figure 28: Type 6 Form of Settlement Located in GF1**

For comparison purposes, Tables 7 and 8 present a summary of the types of settlement found at the ancient Maya site of Minanha, located on the north Vaca Plateau of west-central Belize. Similar to Ka'Kabish, the most common forms of settlement are Types 1 and 3. However, unlike Ka'Kabish, in the Site Core of Minanha Type 3 settlements are more common than Type 1 settlements. In addition, while Minanha has evidence of Type 7 settlements in the Epicenter, Ka'Kabish is lacking evidence of these forms of settlement. This discrepancy is likely due to the exclusion of epicentral architecture in the analysis of settlement at Ka'Kabish. With a further understanding of the chronology of certain types of settlement at Ka'Kabish, archaeologists will be able to compare these results, possibly revealing unique developmental trajectories of these particular sites.

| **Settlement Zone** | **Unit Type** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | **Total** |
| Site Core | 10 | 6 | 18 | - | 3 | 2 | 0 | 39 |
| Contreras Valley | 45 | 18 | 29 | - | 4 | 2 | 0 | 98 |
| Epicenter | 2 | 0 | 5 | - | 2 | 3 | 2 | 14 |
| **TOTAL** | 57 | 24 | 52 | - | 9 | 7 | 2 | 151 |

**Table 7: Types of Settlement at Minanha (Longstaffe 2009:50)**

| **Settlement Zone** | **Unit Type** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | **Total** |
| Site Core | 25.6% | 15.4% | 46.2% | - | 7.7% | 5.1% | 0.0% | 100% |
| Contreras Valley | 45.9% | 18.4% | 29.6% | - | 4.1% | 2.0% | 0.0% | 100% |
| Epicenter | 14.3% | 0.0% | 35.7% | - | 14.3% | 21.4% | 14.3% | 100% |
| **TOTAL** | 37.7% | 15.9% | 34.4% | - | 6.0% | 4.6% | 1.3% | |

**Table 8: Percentage of Types of Settlement at Minanha (Longstaffe 2009:50)**

## Material Culture

### Ceramics

*Density of Artifacts*

In total, surveyors collected 3616 ceramic sherds from the Ka'Kabish settlement zone (Figures 29-34). The team collected 3066 sherds from the surface of mounds and scatters. Test-pit excavations uncovered another 550 sherds. In Wall's fields, surveyors recovered 2026 sherds from the surface, while 416 ceramics were test-pit excavated. In Blanco's fields, the team collected 1040 sherds from the surface, while 134 were test-pit excavated. On average, surveyors found 35 sherds on the surface of each mound located in Wall's fields, while in Blanco's fields an average of 21 sherds were found on the surface of each mound. The discrepancy in these averages is likely due to the lower visibility of artifacts in Blanco's fields, as surveyors found some mounds in forested areas and in fields covered with sugar cane, which decreased the likelihood of recovering surface materials.

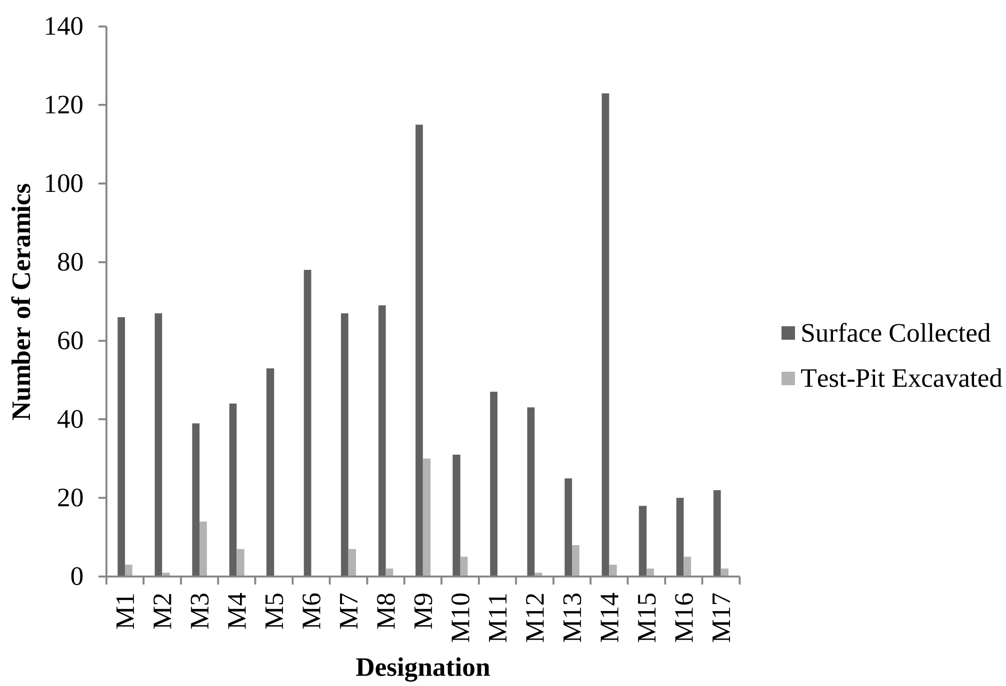


**Figure 29: Densities of Ceramics in GF1**

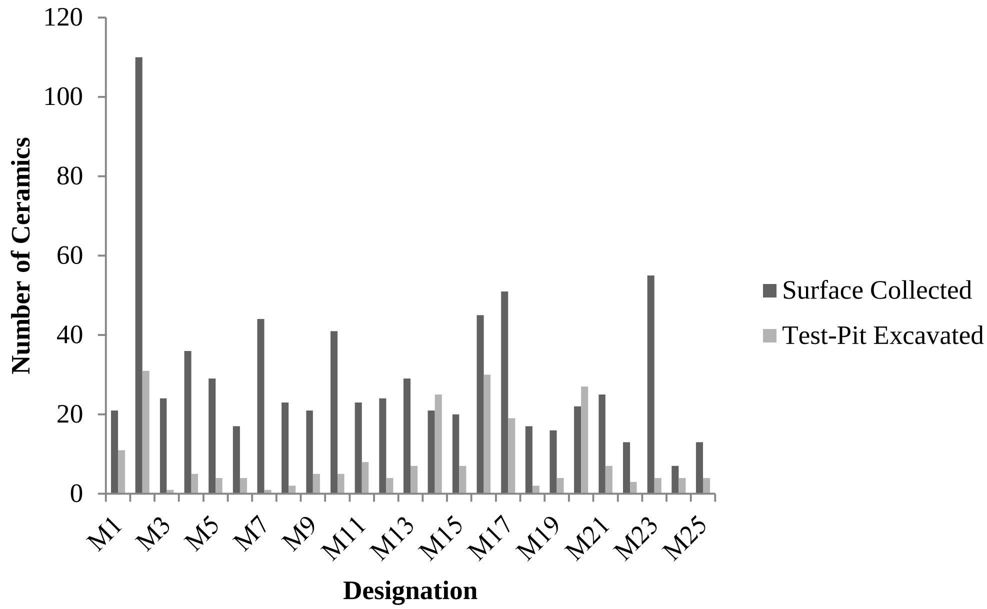


**Figure 30: Densities of Ceramics in GF2**

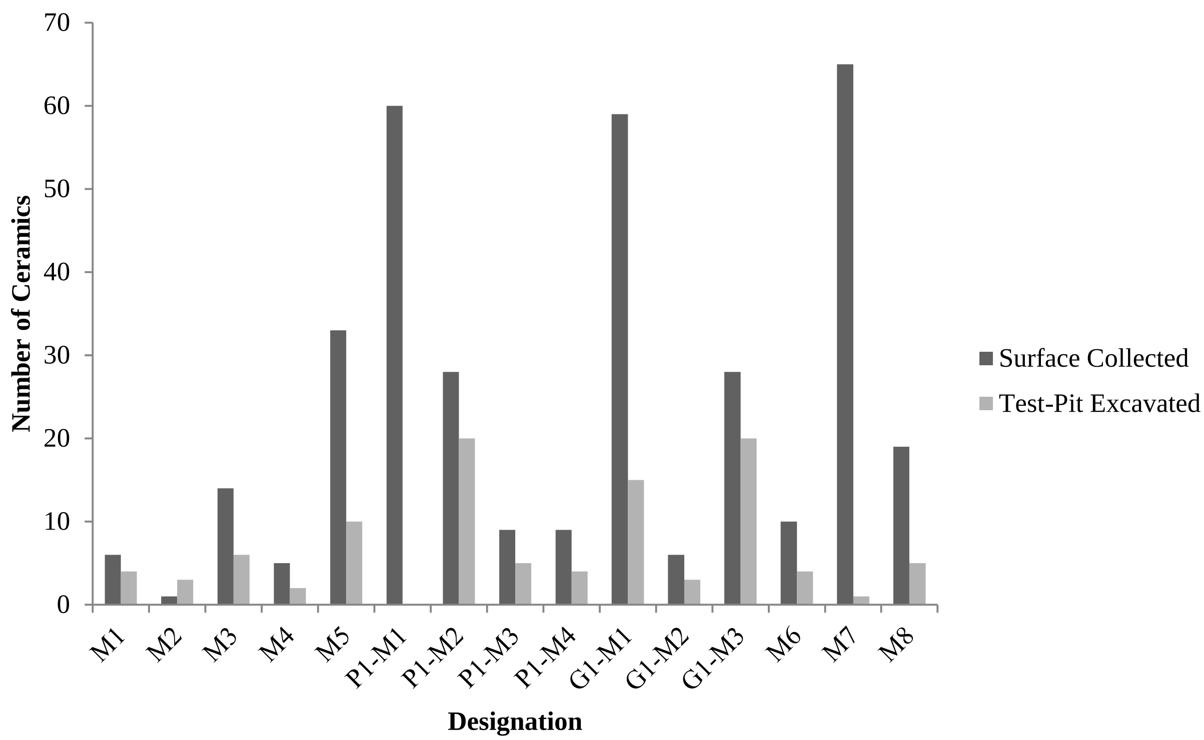


**Figure 31: Densities of Ceramics in GF3**

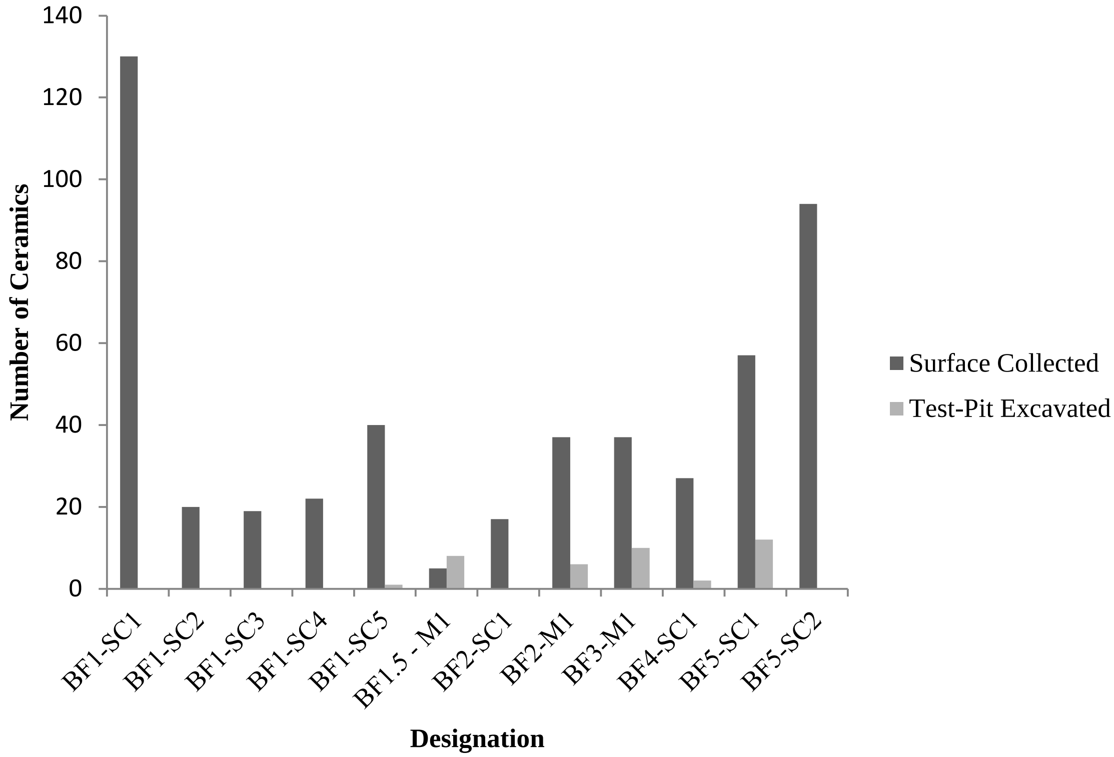


**Figure 32: Densities of Ceramics in BF1 to BF5**

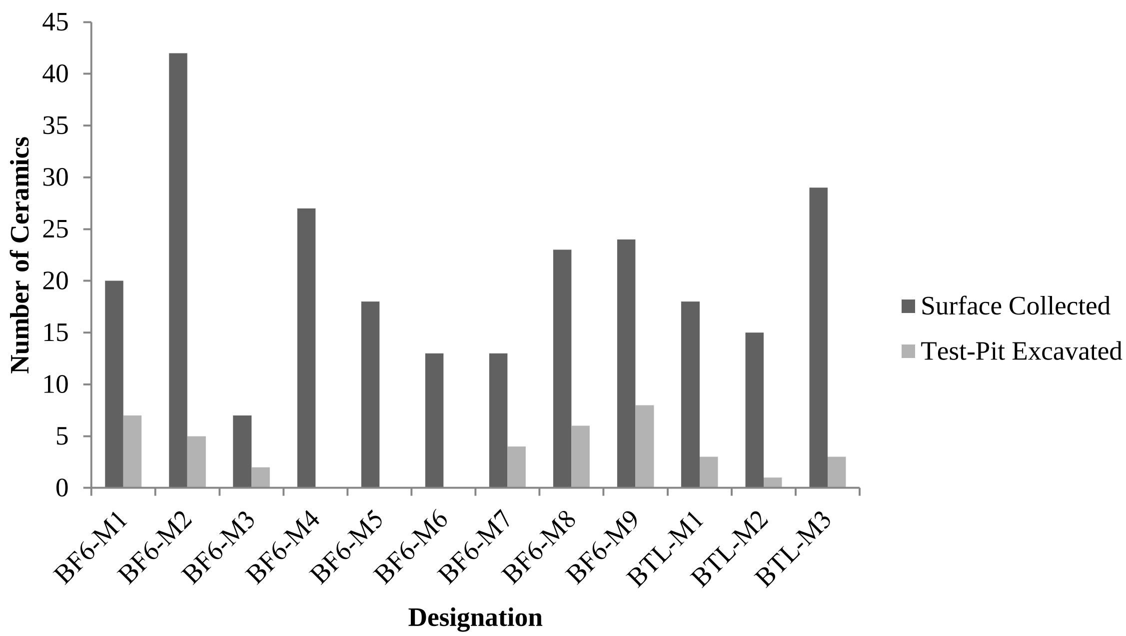


**Figure 33: Densities of Ceramics in BF6 and BTL**

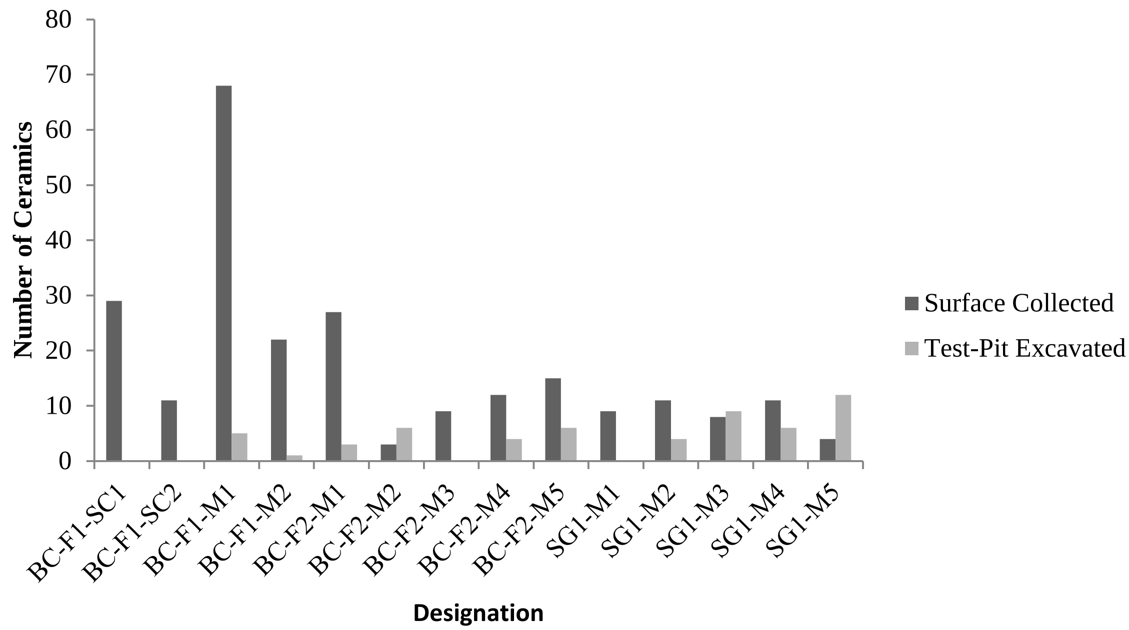


**Figure 34: Densities of Ceramics in BC and BSG**

On average, the team found 44 sherds at each artifact scatter. This number is unrepresentative of the larger sample because of the quantity of sherds found at BF1-SC1. In total, surveyors found 130 sherds at this location. The construction of a road likely created this artifact scatter, as it ran through a mounded structure. The materials were oriented in the same direction of the road; it is also likely that workers bulldozed the structure during construction. This explains the abundance of ceramic materials in comparison to other scatters in the area.

Table 7 presents a comparison of the total ceramics in each survey zone, along with the size of each survey zone.

| Location | Total Ceramics | % of Ceramic Collection | Surface Collected | % of Total | Test Pit | % of Total | Size of Survey Zone | % of Land |
|---|---|---|---|---|---|---|---|---|
| Wall's Fields | 2442 | 68% | 2026 | 83% | 416 | 17% | 0.92 km2 | 86% |
| Blanco's Transect | 1174 | 32% | 1040 | 89% | 134 | 11% | 0.16 km2 | 14% |

**Table 9: Comparison of Ceramic Collections by Fields**

Compared to its geographically small size, 32% of the total ceramic collection was found in Blanco's transect. In comparison to the total number of structures in both survey zones, Blanco's transect, which was closer to the site core, had a higher density of artifacts and mounded structures.

*Test-Pit Excavated Materials*

One of the primary reasons the methodological strategies included test-pit excavations was to increase the size of the ceramic assemblage. Appendix C summarizes the results of these test-pit excavations. Surveyors excavated GF1-M1 twice because of the large size and height of the mound. In both cases, excavations revealed a plaster floor. On average, the team found seven sherds in each excavation of mounded structures in Wall's fields. In Blanco's transect, surveyors found four sherds in each excavation of mounded structures. On average, the team found one sherd in each excavation of artifact scatters. Possibly, this indicates that these scatters represented structures built on flat terrain, as surveyors recovered few artifacts through excavation. Another explanation is that these scatters were associated with other mounds in the area, as agricultural practices affected the primary context of their location. In two cases – BF1-SC2 and BF1-SC3 – surveyors halted excavations due to a high water table. These scatters were located near a water hole dug by the property owner. During times of rain, water saturated this area, making it difficult to excavate. Surveyors did not excavate BF1-SC1 because it was located on a modern road.

*Ceramic Types*

Dr. Jim Aimers (2011) conducted the majority of the analysis of ceramic materials from the settlement zone. In total, Aimers attributed 171 sherds to a particular ceramic type. In comparison to the number of ceramics that were surface collected and excavated, Aimers identified 5% of the total collection. Aimers referenced ceramic types to specific temporal periods in lowland Maya ceramic chronologies; however, archaeologists sometimes question the reliability of matching materials to published reports (Aimers 2011, 2012; Chase and Chase 2012). Over subsequent field seasons at Ka'Kabish, archaeologists will revise these diagnostic types, as new materials are added to the total sample. Thus far, this sample includes roughly 12,000 sherds from the settlement zone and the site core of Ka'Kabish.

Figures 35 and 36 present some of the most common diagnostic types from the settlement zone. The most abundant type was comprised of various jars with arrowhead-shaped rims, with vertical striations. Aimers referred to this type as Freshwater Striated or Blue Creek Striated (J. Aimers, personal communication, 2011; see also Fry 1987, 1989; Gifford 1976; Masson and Rosenswig 2005; Sanders 1960) (Figure 37). This type represented 39% of the ceramics found in the settlement zone. This type dates to the Terminal Classic Period.

Aimers referred to the second most identified type as Red Neck Mother Striated (Chase 1982). Archaeologists initially defined this type at the ancient Maya site of Nohmul, in northern Belize. Red Neck Mother Striated is one of the two specific types of the Chambel Ceramic Group (Chase 1982:75). It also dates to the Terminal Classic.

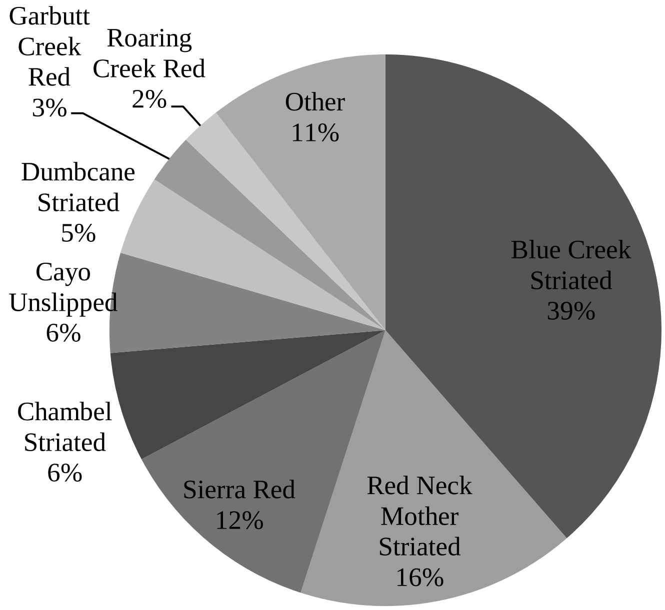


**Figure 35: Percentage of Diagnostic Ceramic Sherds in the Settlement Zone at Ka'Kabish**

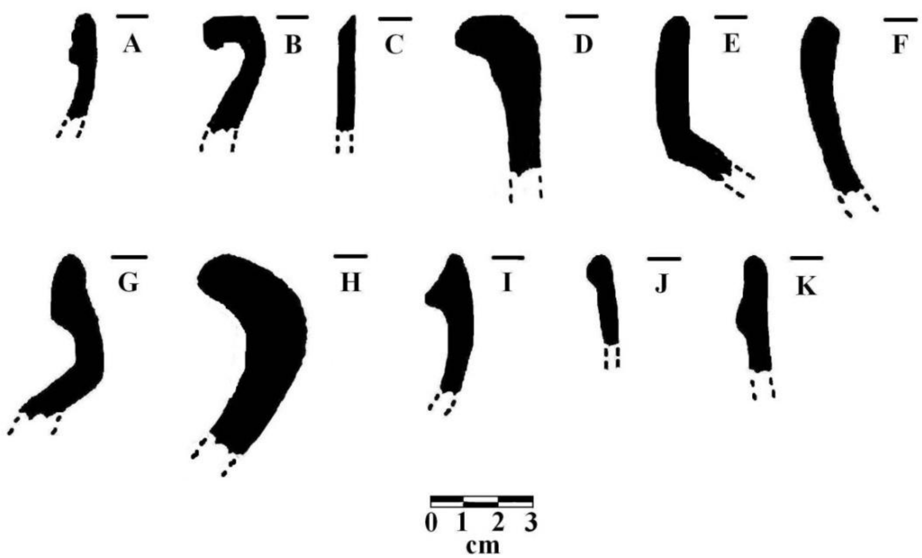


**Figure 36: Ceramic Profiles of Common Diagnostic Types at Ka'Kabish: a) Undesignated Ridged Jar Rim b) Mount Maloney Black c) Rim sherd similar to Yglesias Complex rims at Lamanai d) Chambel Striated e) Tsabak Unslipped System f) Garbutt Group g) Blue Creek Striated h) Red Neck Mother i) Cayo Unslipped System j) Navula Unslipped System k) Dumbcane Striated**


**Figure 37: Blue Creek Striated**

Chase (1982:75) described the type as comprised of large, wide-necked jars, or *ollas*, with outflaring necks. A comparison of the rim profiles of those found at Ka'Kabish and Nohmul is presented in Figure 38.

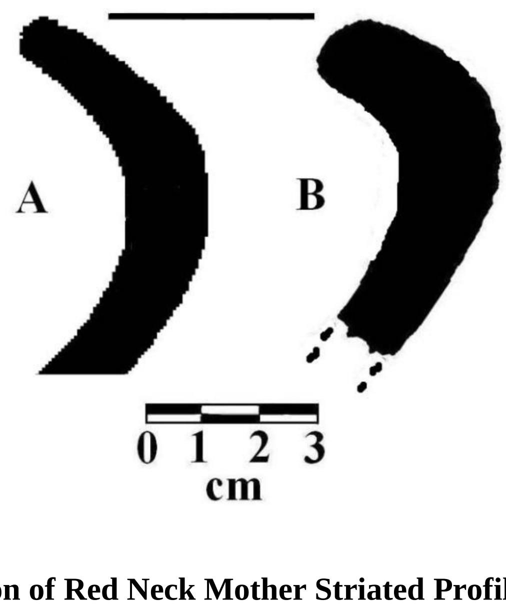


**Figure 38: Comparison of Red Neck Mother Striated Profiles found at A) Nohmul (Chase 1982:67) and B) Ka'Kabish**

Aimers identified another form from the type-variety collection called Chambel Striated at Nohmul (Figure 39). Chambel Striated is the second type that forms the Chambel ceramic group. Archaeologists dated this form to the Terminal Classic. Chase (1982:75) described this type as comprised of large *ollas* with vertical striations, accompanied by unstriated necks. Figure 40 shows a comparison of the rim profiles found at Nohmul and Ka'Kabish.

**Figure 39: Chambel Striated**

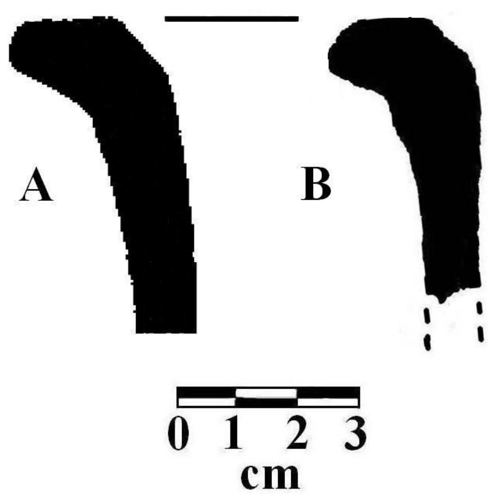


**Figure 40: Comparison of Chambel Striated Profiles found at Nohmul (A: Chase 1982:67) and Ka'Kabish (B)**

Aimers identified another type variously labelled as Tu-Tu Camp Striated, Sisal Unslipped, Caderitas Heavy Plain, or Dumbcane Striated, which archaeologists have dated to the Terminal Classic Period (Aimers 2011) (Figure 41). Aimers (2011) placed these sherds in the Dumbcane Striated System partly because of the uniformity of the type from southern Quintana Roo, in Mexico, to northern Belize. However, future petrographic analysis may lead to a different designation.

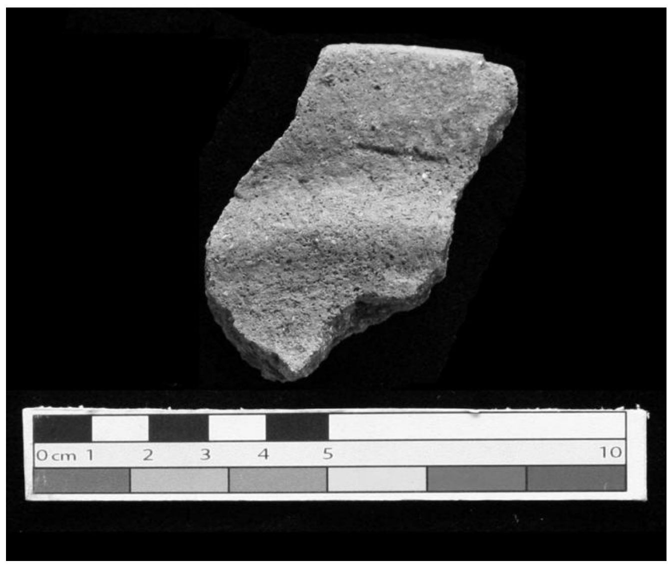


**Figure 41: Dumbcane Striated**

Analysis of types, such as Sierra Red, Dos Arroyos Polychrome, and Fowler Orange-Red, indicated evidence of Late Preclassic and Early Classic settlement at Ka'Kabish (Gifford 1976). Sierra Red sherds, which are dated to the Late Preclassic Period, comprised 12% of the identified ceramic collection in the settlement zone. Surveyors only found a single sherd of Dos Arroyos Polychrome and Fowler Orange-Red types, dated to the Early Classic Period. Other ceramics may have also been temporally diagnostic to these periods; however, their identification was not definitive. For example, Aimers identified types that may have been similar to Aguila Orange, which postdated Aquacate Orange following the Protoclassic (Adams 1971:143) – a period based on changes in ceramic styles between the Late Preclassic and the Early Classic (Brady et al. 1998). Aimers identified another diagnostic characterized by Z-angled bowls, which have been associated with the beginning phases of the Early Classic (Smith 1955). With further research, these typological characteristics may shed more light on ancient Maya settlement during these periods.

Aimers found indicators of Postclassic settlement by comparing ceramic types from the settlement zone to existing typologies at the neighbouring site, Lamanai (Graham 1987). For example, archaeologists found a hollow columnar foot and a vertical neck jar rim from the Red Payil Group (Figure 42).

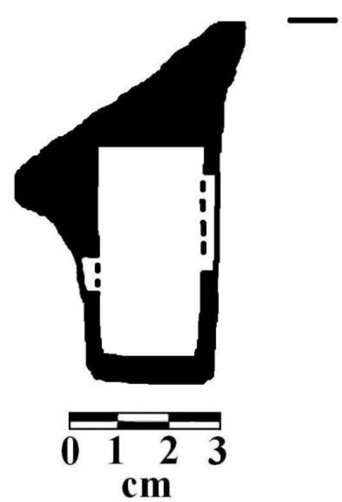


**Figure 42: Postclassic Tubular Foot from a Dish or a Bowl (Aimers, personal communication 2011)**

Archaeologists at Lamanai have documented this type, dating it to the Middle Postclassic Cib period (AD1200/1250 to AD1350) (Graham 1987). Aimers also identified several sherds from the Navula Unslipped System, along with a frying pan censer handle from the same type (Figures 43 and 44). Other phases from the Lamanai typology/chronology included Zakpah group jars or chalices from the Buk phase (AD 962-AD 1200/1250). Finally, Aimers found a jar with an outcurving rim from the Yglesias phase, suggesting Late Postclassic occupation. This period at Lamanai spans from AD 1450-AD 1700.


**Figure 43: Navula Unslipped System**

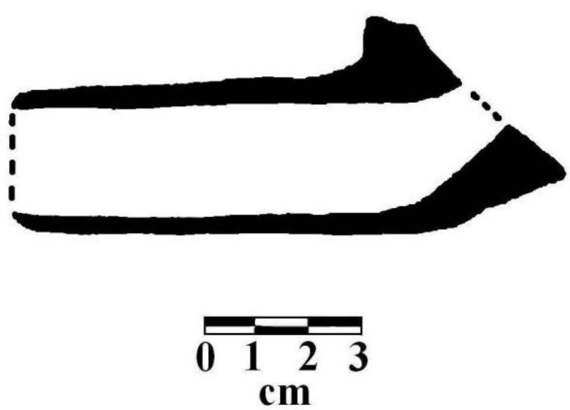


**Figure 44: Frying Pan Censer Handle, Navula Unslipped System**

**Lithics**

*Ground Stone Tools*

Archaeologist's identified 11 ground stone tools in the settlement zone surrounding Ka'Kabish. Most notably, surveyors identified a bark beater in the northwest corner of Wall's fields (Figure 45). Excavators found a similar, larger, object in plaza excavations of the site core. These artifacts indicate that paper, or bark cloth, were possibly produced in the settlement zone, as well as the site core. Archaeologists also recovered several fragmentary manos and metates associated with various mounded structures (Figures 46, 47, and 48). Appendix D provides a full summary of the ground stone tools found in the settlement zone.

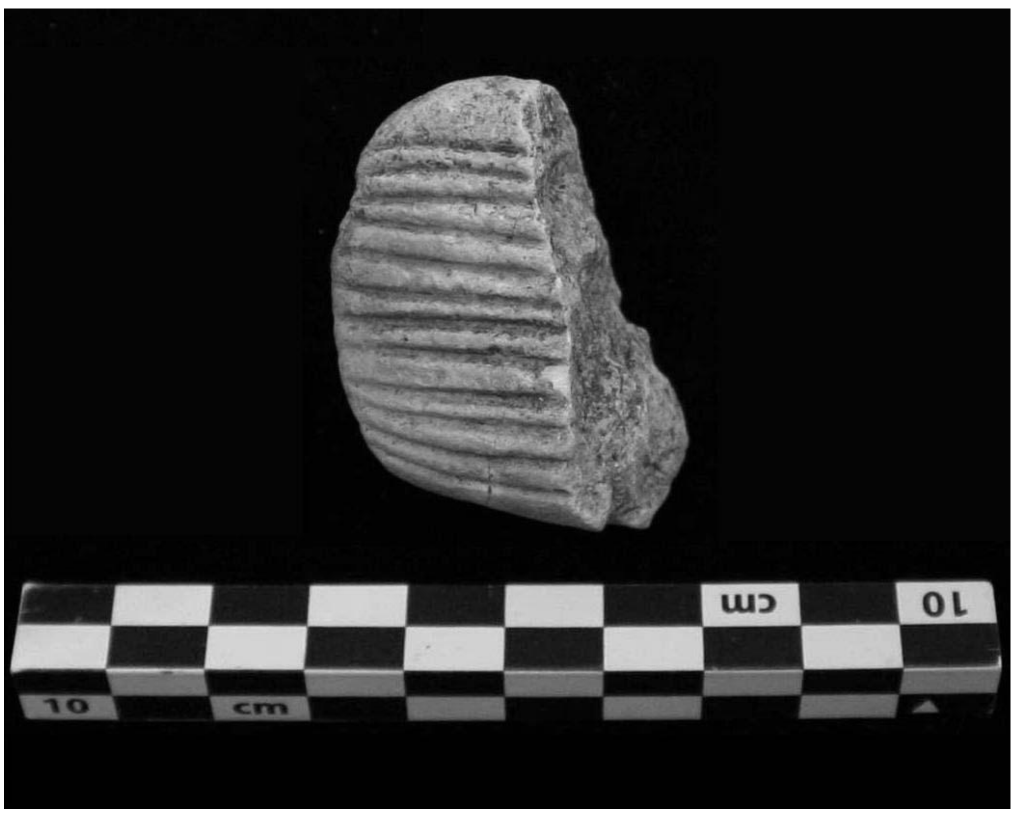


**Figure 45: Rectangular B Variety Bark Beater Fragment Found at GF2-M16 (Willey et al. 1965:471)**

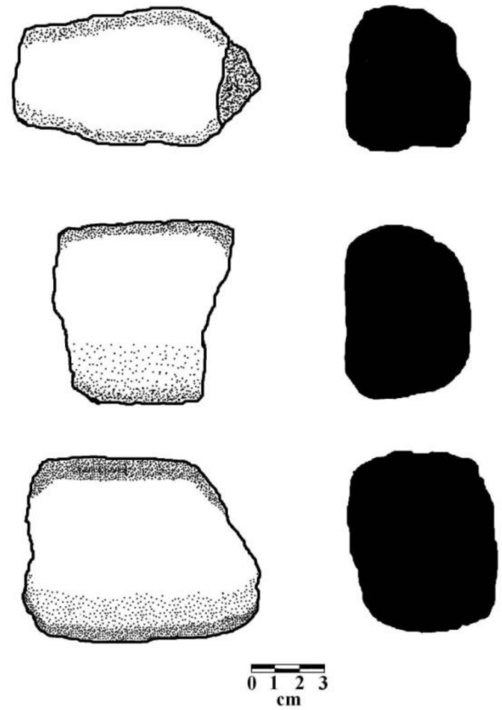


**Figure 46: A) Mano, Rectangular Thin Variety (Willey et al. 1965:458) B) Mano, Rectangular, Thick Variety (Willey et al. 1965: 461) C) Mano, Rectangular, Thick Variety (Willey et al. 1965: 461)**

**Figure 47: Mano, Rectangular, Thick Variety (Willey et al. 1965: 461) found at BF1-SC3**

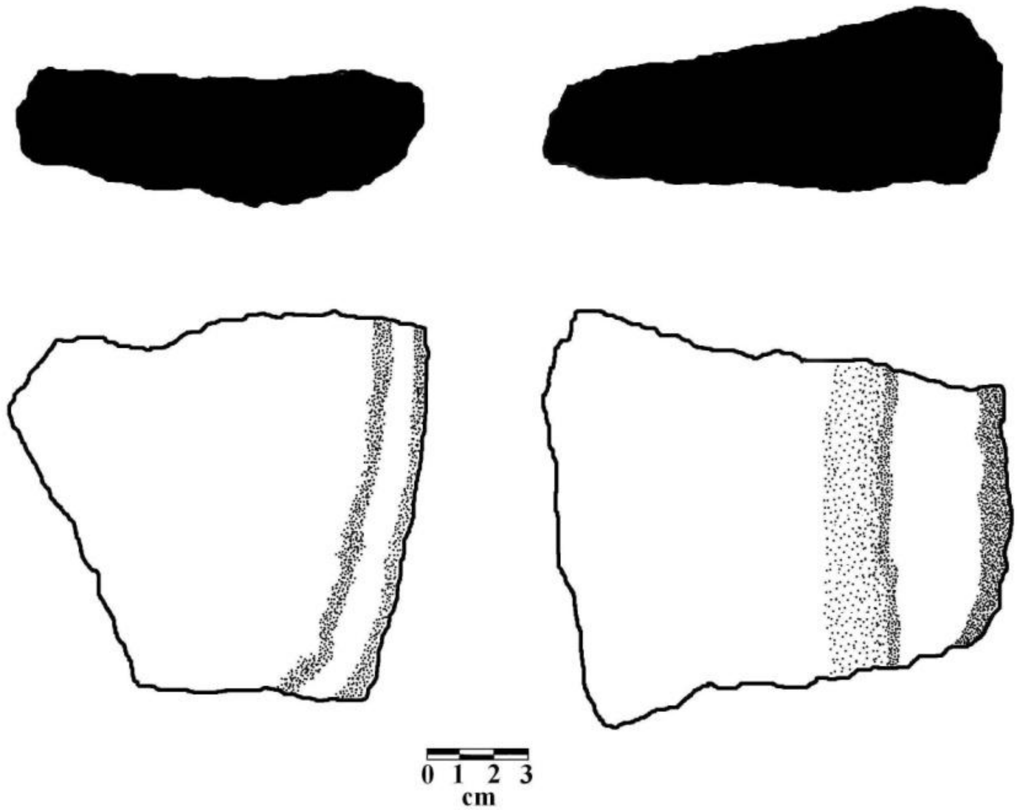


**Figure 48: Metate, Large Variety (Willey et al. 1965:455)**

*Chipped Stone Tools*

Archaeologists found various forms of chipped stone blades and handaxes, along with secondary materials such as flakes and debitage, in the settlement zone. Figure 49 displays several of these artifacts. Surveyors found a complete tapered stemmed long blade at a mounded structure located close to the site core – BF6-M2 (Figure 50). Along with this artifact, archaeologists also uncovered a laurel-leaf point (Figure 51). Appendix D provides a full summary of the chipped stone tools found in the settlement zone.

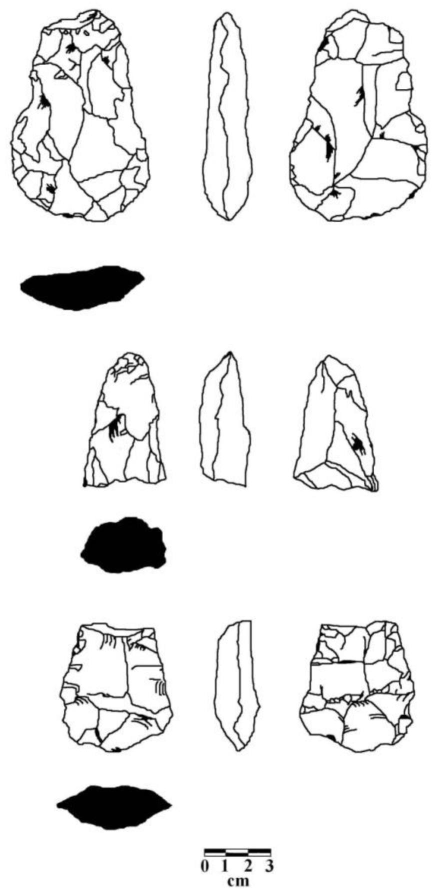


**Figure 49: Standard Bifacial Chopped in the Settlement Zone (Willey et al. 1965:425)**

**Figure 50: Tapered Stem, Long Blade Variety found at BF6-M2 (Willey et al. 1965:421)**

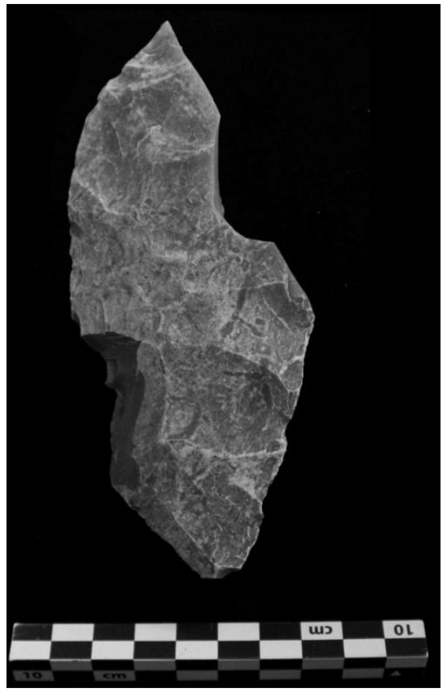

**Figure 51: Laural-Leaf, Unstemmed, Bifacial Blade (Willey et al 1965:421)**

**Burial**

Surveyors uncovered a burial while test excavating a mounded structure 300 m from the site core, designated as GF6-M7. Archaeologists recovered remains 25-45 cm below the surface. Based on the characteristics of the landscape and the disposition of the grave, it seems that bulldozing activities partially displaced the remains, shifting the archaeological context of the burial in a westward direction. Surveyors recovered two ceramic vessels associated with the individual (Figures 52, 53 and 54). One of the vessels (Figure 52) was an outcurving dish with a medial ridge and high ring base, resembling Roaring Creek Red in the Belize Valley and Kik Red for other locations in northern Belize (Aimers 2011). The other vessel (Figures 53 and 54) was an impressed version of Achote Black, which was similar in form to a vessel shown by Dr. Harrison Buck at the 2011 Belize Archaeological Symposium from Tiger Bay Cave (Aimers 2011). Archaeologists dated these vessels and the burial to the Terminal Classic Period.

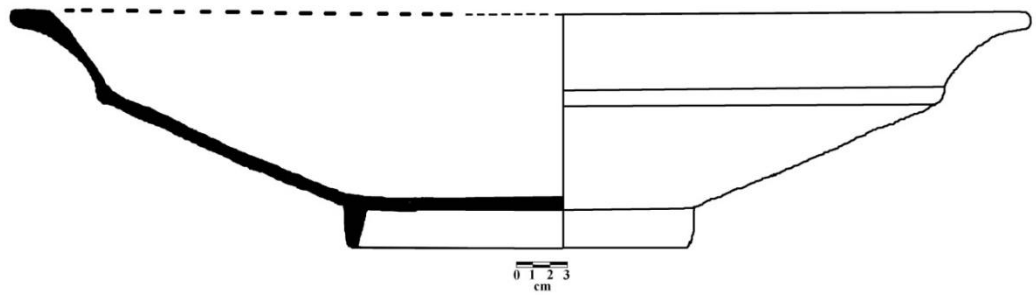


**Figure 52: Outcurving Dish with Ring Base that is Typically Designated as Roaring Creek Red or Kik Red (Illustrated by K. Pierce).**

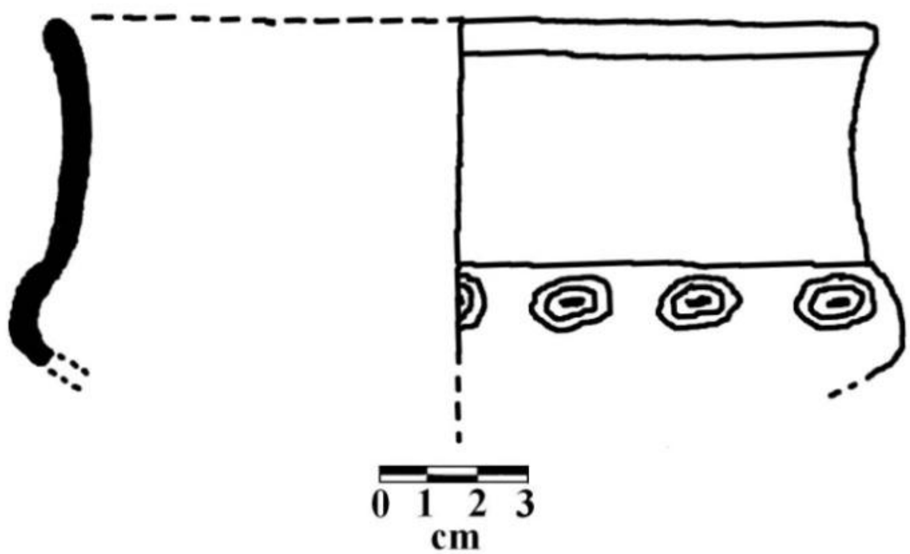


**Figure 53: Achote Black: Stamped-impressed variety (Harrison-Buck, personal communication 2011) (Illustrated by K.Pierce)**


**Figure 54: Vessel Found at the Burial in BF6-M7**

The individual was in a flexed position. The top portion of the cranium was situated 15 cm from the rest of the remains in the same context as Figure 52. It seems that the skull was either placed in, or below, the outcurving vessel (Figure 56). In total, 23 teeth were recovered from this portion of the burial; several of which were carved (Figure 57). The rest of the remains rested above a line of cut stones (Figure 58).

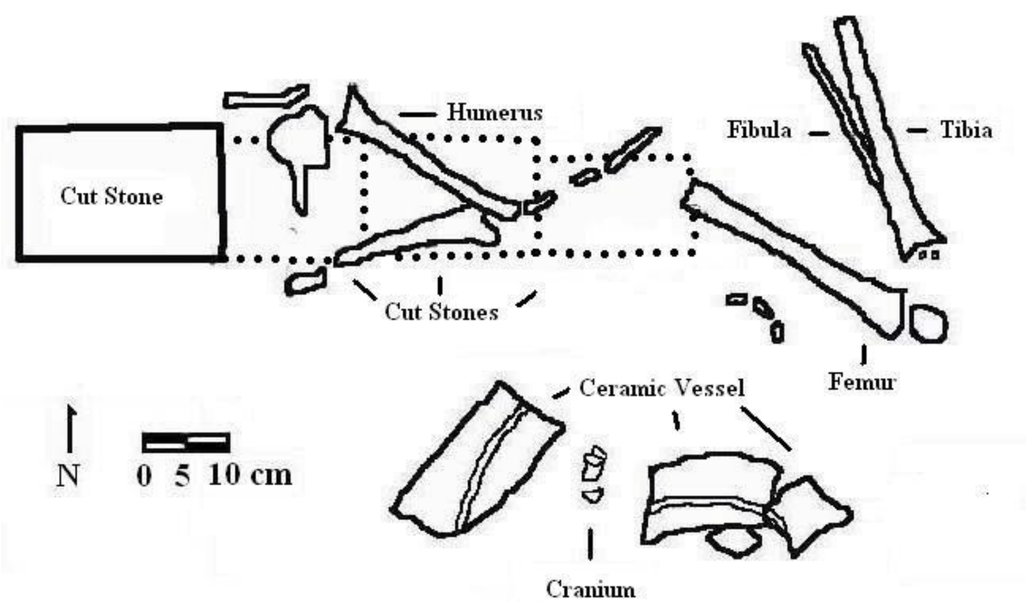


**Figure 55: Burial of a Single Individual at BF6-M7**

**Figure 56: Top of Cranium with Roaring Creek Red/Kik Red Dish**


**Figure 57: Carved Teeth from Burial at BF6-M7**

**Figure 58: Line of Cut Stones Directly Beneath Burial**

**Temporal Reconstruction of Settlement Distributions**

Appendix B presents a summary of the diagnostic types of ceramics, their location and their suggested chronology. Table 8 shows the length of each temporal period, along with the ceramic types that indicated these dates. Particular periods are simultaneously presented for chronological reasons, as some types are known to span more than one period. For example, archaeologists place Late Preclassic types also in the Early Classic period, as the ancient Maya used some forms of Sierra ceramics in later periods of ancient Maya prehistory (Sullivan and Valdez 1996). In addition, archaeologists place some ceramic types in both the Late Classic and Terminal Classic, as some diagnostic types date from AD 700 –

AD 900, crossing over both chronological periods. In this reconstruction, in general, archaeologists did not definitively date the Classic period, as only one ceramic specifically indicated this broad period of occupation. Finally, archaeologists did not divide the Postclassic Period into the phases defined at Lamanai, as the scarcity of materials hindered this form of reconstruction.

| Time | Period | Defining Types |
|---|---|---|
| 400 BC - AD 250 | Late Preclassic | Paso Cabello Waxy/Sierra/Sierra Red<br>Paso Caballo Waxy/Sierra/Puletan Red<br>Unslipped |
| AD 250 - AD 600 | Early Classic | Peten Gloss/Dos Arroyos Polychrome<br>Fowler Orange-Red |
| AD 600 – AD 800 | Late Classic<br>To<br>Terminal Classic | Cayo Unslipped System/Uaxactun<br>Unslipped Ware<br>Dumbcane Striated<br>Blue Creek Striated<br>Chambel Striated<br>Red Neck Mother Striated |
| AD 800 – AD 1000 | | |
| AD 1000 – AD 1521 | Postclassic | Navula Unslipped System<br>Zakpah Group |

**Table 10: Ceramic Chronology of the Settlement Zone at Ka'Kabish**

*Late Preclassic and Early Classic*

In total, archaeologists dated 12 structures to these periods (Figure 59). Various Sierra Red varieties indicate the Late Preclassic, while two ceramic types specifically indicate the Early Classic: Dos Arroyos Polychrome and Fowler Orange-Red. In Blanco's transect, it seems that a small group of four structures existed close to the site core during this time. This group is comprised of mounds – BF6-M1, SG1-M1, SG1-M4, and SG1-M5.

An artifact scatter further from the site core also yielded an Early Classic date – BF1-SC1. Meanwhile, archaeologists found several areas of settlement in Wall's fields that date to the Late Preclassic. However, it seems that these structures were isolated, rather than grouped together.

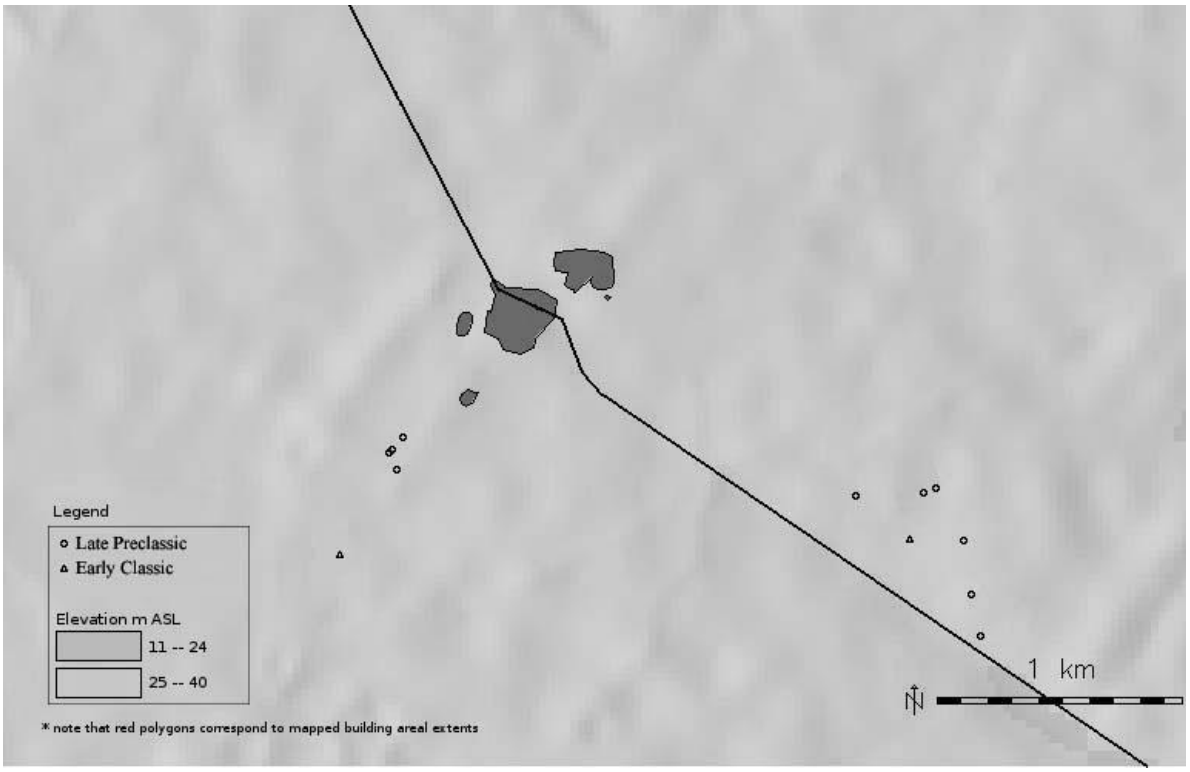


**Figure 59: Late Preclassic and Early Classic Settlement**

*Late Classic and Terminal Classic*

In total, archaeologists dated 51 structures to these periods (Figure 60). Most of the evidence of occupation comes from the Late and Terminal Classic periods. Various forms of ceramics, ranging from Dumbcane Striated and Red Neck Mother Striated to the most abundant type, Blue Creek Striated, indicated this period. Archaeologists identified several areas of occupation, such as BF1-SC1, SG1-M5, GF1-M6, GF2-M4, GF2-M18, GF3-P1-M2, that have evidence for both the Late Preclassic/Early Classic and the Late/Terminal

Classic periods. A Type 6 form of settlement in Blanco's fields (the cluster of eight mounds closest to the site core) yielded numerous Terminal Classic materials. Surveyors also found the burial is this location. Archaeologists identified several Type 3 settlements (2 to 4 orthogonally arranged structures) in Wall's fields dating to the Terminal Classic.

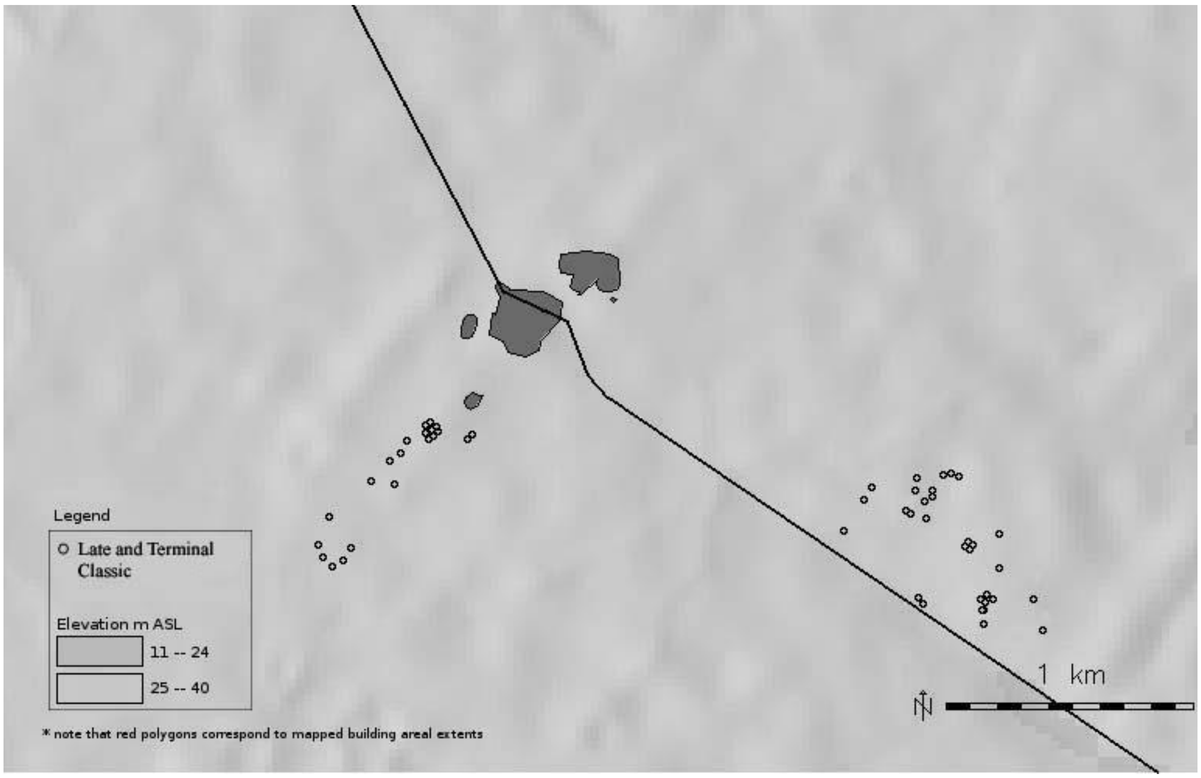


**Figure 60: Late Classic and Terminal Classic Settlement**

*Postclassic*

In total, 6 structures were dated to the Postclassic period (Figure 61). Several sherds from the Navula Unslipped System and the Zakpah group indicate occupation during the Postclassic period. Aimers dated several Postclassic structures also to the Terminal Classic Period (i.e., BF6-M2, GF2-M14, and GF3-G1-M3). In one case, BF5-SC1, materials were collected that dated to the Late Preclassic and the Postclassic, without evidence from the Late/Terminal Classic. Generally, surveyors found Postclassic settlements sporadically situated, with one exception in the southwestern portion of Blanco's fields, characterized by a Type 2 settlement (2 to 4 mounds informally arranged).

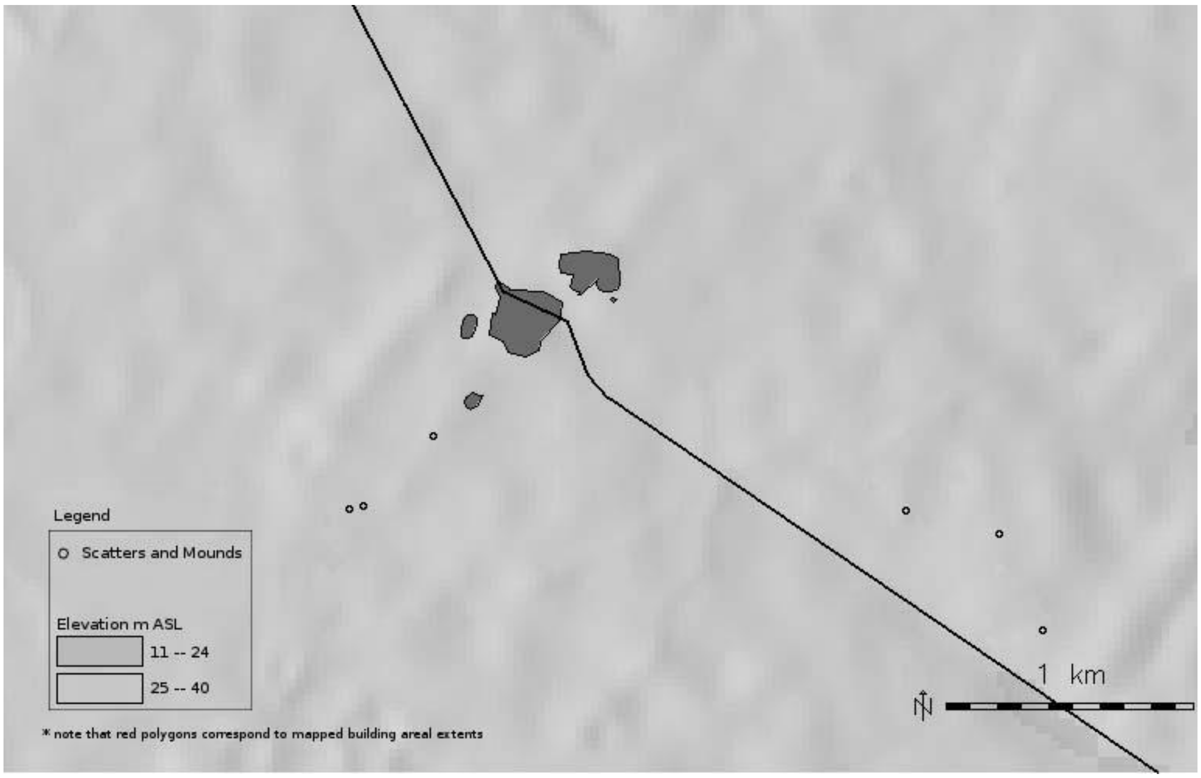


**Figure 61: Postclassic Settlement**

**Summary**

The density and distribution of mounded structures and artifact scatters demonstrates that terrain closer to the site core was more heavily occupied than areas further from the site. Ceramic evidence from the settlement zone indicates that areas were occupied surrounding the site core as early as the Late Preclassic, until the Postclassic period, approaching the historic phase of ancient Maya civilization. Lithic evidence in the settlement zone shows that populations were involved in various domestic activities – indicated by numerous forms of chipped and ground stone tools used in agricultural, or woodworking, or food processing activities - along with the production of paper, or bark cloth. Further analysis of ceramic materials will improve the resolution of time-space reconstructions, allowing future studies to more accurately investigate changes in settlement over time.

# CHAPTER 6:
# RESULTS AND WIDER IMPLICATIONS

Although future study will provide a fuller, and more representative, depiction of the density and distribution of ancient Maya settlement surrounding Ka'Kabish, the project hasrecognizedseveral trends thus far. In various settlement studies of ancient Maya sites, archaeologists have commonly distinguished between the epicenter, core, and peripheral zones of habitation. The size of these zones often depends on the architectural attributes of the site and their relation to other sites in the area. For example, the site of Pacbitun was divided into the epicenter (0.5 sq. km), the core zone (1 sq. km), and the periphery zone (8 sq. km)(Healy et al. 2007). At Ka'Kabish, the settlement zone has not yet been subject to large scale transect surveys, which usually radiate out from the epicenter into the periphery, in a cruciform oriented to cardinal directions. So far, archaeologists have intensively surveyed only portions of the total settlement at Ka'Kabish. These portions will eventually form a fuller transect that will likely extend to, and encompass, 4 km from the site core, allowing for a more detailed depiction of the density and distribution of settlement in the area. However, at this stage of the project, these results, which are tentative and may be subject to revision, demonstrate similarities between Ka'Kabish and other ancient Maya sites that have undergone settlement studies.

*Distribution of Structures*

With this in mind, surveyors made several initial inferences about the distribution of settlement in various areas surrounding the site. Currently, archaeologists have tentatively divided Ka'Kabish into three zones of occupation. The epicenter covers roughly 0.2 square km. Archaeologists mapped this area over several subsequent seasons, revealing an area comprised mostly of monumental architecture. Figure 62 shows the location of the epicenter in relation to the two settlement survey zones.

The core zone, represented by a roughly circular area surrounding the epicenter, covers approximately 2 square kilometers. Archaeologists used data collected from Blanco's fields to define this zone. Surveyors found that mounded structures decreased in occurrence, replaced by multiple non-architectural artifact scatters, 0.8 km southwest of the site. Archaeologists used this change in architectural design to distinguish between the core and peripheral areas of occupation. However, these distinctions are purely arbitrary, used strictly for comparison purposes. Future survey of areas north of the site will provide a fuller depiction of these potentialdivisions.

At this point in the research at Ka'Kabish, it is difficult to determine the full extent of the periphery zone. Surveyors found the furthest mounded structure 2.5 km southeast of the epicenter. This structure marks the end of the survey zone defined by Wall's fields. It is possible that the southern zone of the site extends to a distance as much as 4 km from the epicenter. However, archaeologists have not confirmed this conclusion, as areas between Ka'Kabish and Lamanai have yet to undergo survey and reconnassiance of settlement. Hypothetically, settlement may be continuous between the two sites, or perhaps, clear territorial boundaries may have existed, which archaeologists demonstrate by a sharp drop off in settlement densities. In addition, the nature of settlement north of the site is largely uncertain, as it has undergone only a very limited survey.

Based on overall observations of the periphery, it is unlikely that the ancient Maya continuously inhabited areas 2 km from the epicenter, as surveyors did not identify any mounded structures in the fields immediately west of Wall's survey zone.

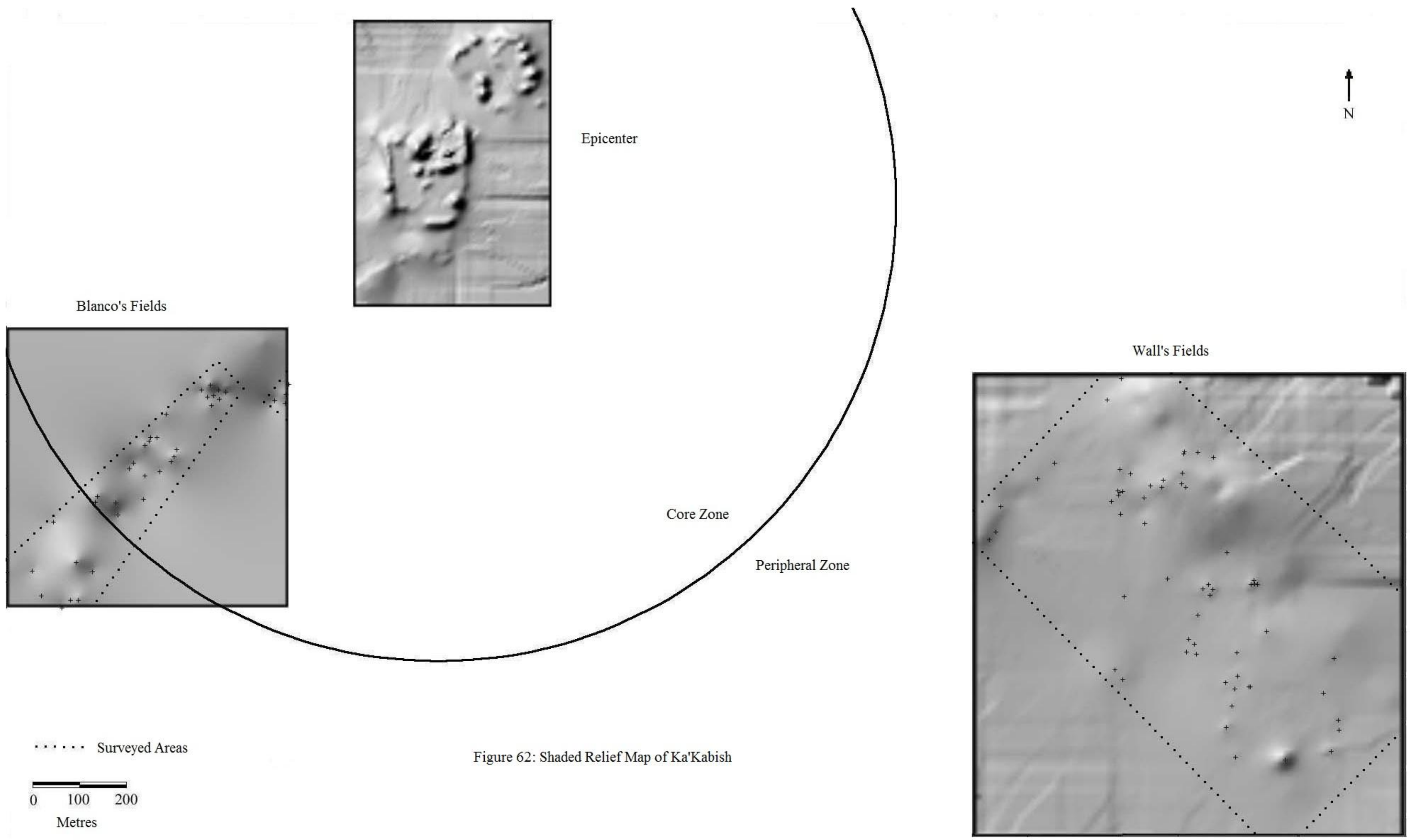


Figure 62: Shaded Relief Map of Ka'Kabish

These compositional characteristics suggest that Ka'Kabish may have had similar settlement patterns as a nearby site, Blue Creek, which was comprised of a dispersed mosaic of residential complexes, public areas, and agricultural lands (Guderjan 2007:18). Blue Creek is located roughly 20 km northwest of Ka'Kabish, and is aptly suited for comparisons due to its size and its geographic location. For example, Blue Creek and Ka'Kabish are each located near two of the largest ancient Maya sites in Northern Belize, La Milpa and Lamanai respectively. In addition, based on initial reconnaissance, it is likely that Ka'Kabish covered a similar area as Blue Creek, with an estimated size of 16 square kilometers. Perhaps, these similarities suggest that portions of land at Ka'Kabish may also have been unoccupied, used for agricultural purposes, or were unsuited for habitation for various other reasons. With further survey, it is possible that peripheral areas of Ka'Kabish will prove to be similar to the distribution of settlement at Blue Creek, with distinct groupings of settlement that are separated by clear expanses of empty space (Figure 63).

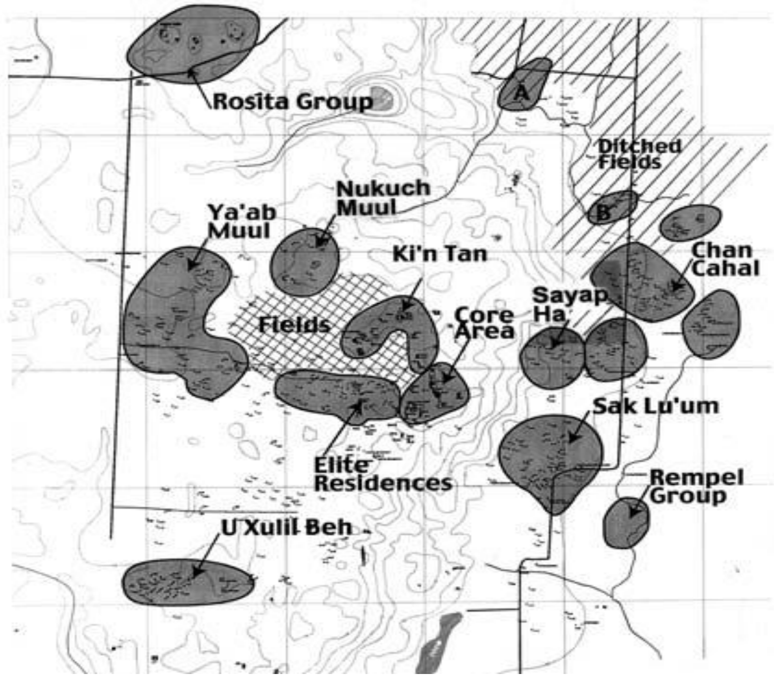


**Figure 63: Distribution of Settlement Units at Blue Creek, in Northern Belize (Guderjan 2007:11)**

The distribution of mounded structures in Wall's fields at Ka'Kabish has several commonalities with a settlement area at Blue Creek, called Nukuck Muul (Guderjan 2007:55). This residential area is 1.6 km northwest of Blue Creek and is comprised of 41 structures variously dated to the Early and Late Classic periods (Lichenstein 2000:34). The settlement located in Wall's fields is 1.5 km southeast of Ka'Kabish and is comprised of 30 structures dated to the Late/Terminal Classic period. Both of these clusters of settlement at Ka'Kabish and Blue Creek are in a similar location in relation to the epicenter, and both show a large degree of structural variability between mounds. For example, residents that held "significantly higher social status" than those in adjacent structures (Guderjan 2007:55) inhabited the plazuela group at Nukuck Muul, as evinced by differing architectural forms and artifact assemblages. In Wall's fields, surveyors categorized some structures as minimally mounded, while others were orthogonally arranged in groups of four, built on visible, raised platforms. At Blue Creek, archaeologists argued that this variability was evidence of an internally hierarchical stratified community, with a range of social strata present (Guderjan 2007:56). Based on the variability in the size and organization of structures in Wall's fields, it is likely that similar distinctions also existed in the community outside of Ka'Kabish's epicenter.

In Blanco's fields, the most notable distributional characteristic is the decline of mounded structures 0.8 km from the epicenter. Beyond this point, archaeologists found artifacts scatters unaccompanied by subsurface platforms. Figure 64 shows an example of a non-architectural artifact scatter. The size of these scatters and the density of artifacts found associated with these scatters varied slightly, with some yielding over 40 ceramic sherds. At this point, it is difficult to determine if these artifact scatters represented areas that were possibly less affluent, as the size of structures, or the labor investment, is often indicative of social status (Arnold and Ford 1980).

**Figure 64: Non-architectural Artifact Scatter found in Blanco's Fields (North facing)**

At some larger Maya sites, such as Caracol, patterns of diet found through an investigation of stable isotopes, showed that individuals with the worst diet in the city lived in the area immediately surrounding the epicenter. Chase and Chase (2007:67) posited that these individuals represented an 'industrialized' labor force that did not produce their own crops, but rather, were involved in the production of goods and the construction of buildings. Although, it is difficult to compare Ka'Kabish, with its modest size, to the massive, sprawling city of Caracol, perhaps, a segment of settlement surrounding Ka'Kabish was also involved in similar activities, evinced by a lack of platform structures. Again, further investigation is required to provide a clearer picture of this non-architectural area.

*Density of Structures*

Concerning settlement densities, ancient Maya sites vary considerably in the number, distribution, and location of their structures. Archaeologists usually calculate these structural densities based on Late/Terminal Classic periods of occupation, as the firmest evidence tends to come from these temporal periods. For example, some areas adjacent to the epicenter at ancient Maya sites have recorded densities as high as 240 structures per square kilometer, as is the case at La Milpa, in Northern Belize (Ford and Fedick 1988:10). Within the central portions of Tikal, which covers 9 square kilometers, archaeologists found an average of 235 structures per square kilometer (Rice and Culbert 1990a). At the site of Copan, viewed as a particularly dense settlement, the urban core is comprised of a striking 1449 structures per square kilometer (Ashmore 2007; Rice and Culbert 1990a). In the central group at Seibal, which covers 2.56 square kilometers, archaeologists found 177 structures per square kilometer (Willey et al. 1975). To summarize, the epicenter and core zones of ancient Maya sites are comprised of structures of different sizes and degrees of densities, with some epicenters and core zones spread over vast areas of the landscape, while others are more centralized, and in geographically limited locations.

In comparison to most epicenters, the peripheries of ancient Maya sites often yield lower structure densities, but higher population estimates, as they cover larger geographic areas. For example, at the site of Pacbitun, archaeologists found an average of 128 mounds per square kilometer in an area that covered 8 square kilometers (Healy et al. 2007:32). In the periphery of Tikal, one of the largest known Maya sites, covering 60 square kilometers, archaeologists found 39 mounds per square kilometer (Haviland 1981). Settlement survey in the Yaxha basin, which included an area of 6 square kilometers, revealed 72 structures per square kilometer (Rice and Rice 1980:445). At the site of Blue Creek, archaeologists found 256 contemporaneous structures within 16 square kilometers of surveyed land (Guderjan 2007:92). This provides a rather low figure of 16 mounds per square kilometer. Undoubtedly, this number would be higher if it strictly incorporated areas found closer to the epicenter, or if certain areas were removed, such as large agricultural tracts, which decreased the overall density.

This raises an important issue while attempting to compare structural densities at ancient Maya sites: that is, these numbers are largely contingent on the extent and the nature of the survey zone. Recently, Ashmore (2007:99) questioned whether it is reliable to compare raw structure counts from one site or region to another, as structural densities often relate to the topography of the area. For example, as already mentioned, the urban core of Copan is comprised of 1449 structures per square kilometer; however, archaeologists based this number on an area that only encompasses 0.6 square kilometers. When including a larger geographic area at Copan, one that covers a total of 24.6 square kilometers, the average density fell to 143 structures per square kilometer (Rice and Culbert 1990a). In fact, a number of recent studies emphasize population estimates, instead of average structure densities (Guderjan 2007; Tourtellot et al. 2003). These numbers are more suited for site comparisons; however, the settlement data at Ka'Kabish is still too limited to extrapolate even a preliminary estimate of population.

As mentioned earlier, Wall's fields are 1.5 km from the epicenter. In this area, archaeologists surveyed 0.92 square km of the landscape. In total, surveyors identified 30 mounded structures dated to the Late/Terminal Classic. Archaeologists at Ka'Kabish inflated this number, finding an average of33 structures per square kilometer. Although the data at Blue Creek includes a much larger area, with 16 mounds per square kilometer, Ka'Kabish seems similar to this site in structural density. In Blanco's fields, which cover 0.16 square kilometers immediately adjacent to the epicenter, archaeologists identified 15 structures dated to the Late/Terminal Classic. On average, archaeologists at Ka'Kabish found 94 structures per square kilometer. This indicates that peripheral areas of Ka'Kabish were less densely occupied than areas immediately adjacent to the epicenter.

*Mounds, Scatters, and Minimally Mounded Structures*

Similar to the findings in residential complexes at Blue Creek, archaeological survey of the remains surrounding Ka'Kabish also uncovered variability in both the size and the architectural form of structures in the settlement zone. Most commonly, these peripheral structures were comprised of domestic residences built on stone platforms, similar to most structures found during surface survey, which are usually between 1 to 3 m in height (Willey 1989:170-171). Archaeologists use these mounded structures in settlement surveys in the Maya subarea to estimate ancient population dynamics, using the "house mound count" method (Johnston 2004:146; Turner 1990:304-305; Willey 1981:388). As Johnston (2004:147) and Pyburn (1987:111) noted, these reconstructions are based on the assumption that the remains visible through surface-survey (i.e., structures built on platforms over 1 m tall), are representative of the domestic occupation of an area. However, as archaeologists more recently noted, these structures likely only represented a segment of the entire ancient population, as invisible (non-mounded) occupation may have existed at many ancient Maya centers, during specific periods of time (Harrison 1990:106; Healy et al. 2007:28; Johnston 2004:147; Lucero 2002:821).

One of the problems with the surface detection of ancient remains is that some ancient architectural components can be buried and almost invisible at ground level, or, in other cases, particular forms of occupation may have been constructed solely of perishable materials (i.e., pole and thatch structures), also decreasing the likelihood of modern detection. As Johnston (2002:21-27) noted, in the jungle setting of the Maya lowlands, including areas of Guatemala, Belize and Mexico, the average depth of the biomantle is roughly 30 to 40 cm. Processes such as bioturbation, colluviation, and alluviation can often bury low-lying structures entirely, leading to archaeological reconstructions that only focus on particular segments of ancient Maya society. Johnston (2004) attempted to address this problem by excavating several small structures exposed by a modern road construction, as well as by recent farming activities. As Johnston (2004:152) noted, these activities created a large strip of cleared land that cut through the rainforest, radiating outwards from the site center. In these plowed areas, several “invisible” structures were located, which indicated that invisible settlement is a reoccurring methodological problem in many current settlement studies.

In the settlement study at Itzan, Peten, Guatemala, Johnston (2004) distinguished between three types of ancient constructions: mounded structures, minimally mounded structures, and non-mounded structures or non-architectural artifact scatters. As previously mentioned, mounded structures are the most commonly identified residences, with large stone platforms that extend 1-3 m in height from the ancient surface. In most Maya settlement studies, there are also larger mounded structures that typically range from 4-6 m in height and sometimes cover more than 100 sq. meters (Healy et al. 2007:28; Willey 1981:390). So-called, “minimally mounded structures” are usually smaller than mounded structures, standing less than 30 cm in height. Archaeologists have found that these structures are surrounded by a limestone foundation and filled with an aggregate of smaller stones and pebbles, accompanied by a pole and thatch superstructure (Johnston 2004:167).

Lastly, it is increasing apparent that the ancient Maya constructed non-mounded structures directly on ancient flat surfaces, leaving little to no evidence today of past occupation. Instead of architectural remains, concentrations of artifacts, or artifact scatters, may sometimes indicate these areas of occupation.

At Ka'Kabish, survey strategies included the detection of mounded structures, minimally mounded structures, and non-mounded structures or non-architectural artifact scatters. Unlike many archaeological surveys, conducted in dense jungle settings, the agricultural clearing of the settlement zone at Ka'Kabish allowed surveyors to distinguish visually between these three architectural components. Similar to the site formation processes at Itzan, a modern road runs through the site of Ka'Kabish, with subsequent farming operations commencing along the base of this construction. Although these activities affected the preservation of the archaeological materials, these site formation processes were also helpful in identifying the occasional "invisible" remains.

Similar to other settlement studies in the Maya subarea, mounded structures were the most abundant architectural construction in Wall's fields, with approximately 90% of the structures following this form. In addition, similar to most studies, archaeologists at Ka'Kabish found a larger mounded structure, GF1-M1, which was 5 m in height. The most obvious group of minimally mounded structures was found in GF3, comprised of structures M1, M2, M3, and M4 (see Appendices I for their geographic location). Figures 65 and 66 show a comparison between a minimally mounded structure found at Itzan and a minimally mounded structure found at Ka'Kabish.

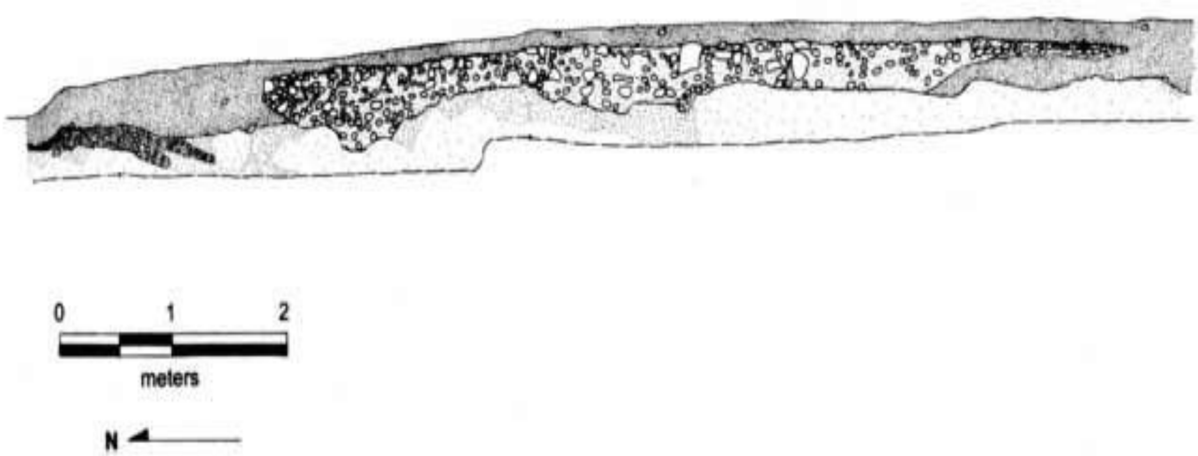


**Figure 65: Profile of Minimally Mounded Structure (Johnston 2004:157)**

**Figure 66: Minimally Mounded Structure at Ka'Kabish**

In Wall's fields, archaeologists defined approximately 10% of the structures as minimally mounded. On a cautionary note, these structures are sometimes difficult to identify, as archaeologists rely on small concentrations of stones and pebbles, limited amounts of ceramic materials, and lithic and faunal remains, to distinguish minimally mounded structures.

Along with identifying these minimally mounded structures, archaeologists have questioned the function of these constructions. For example, Webster et al. (2000:82-83) found similar smaller structures that he interpreted as "field huts," or storage houses which, he argued, were used by farmers at Copan for various agricultural purposes, such as storage. Archaeologists found these field huts further away from domestic residences, lacking archaeological indicators of domestic activities (i.e., obsidian blades and manos/metates). For functional purposes, archaeologists usually rely on archaeological assemblages, as well as architectural components, to differentiate between nonresidential and residential buildings (Brown and Sheets 2000; Inomata et al. 2002; Tourtellot 1983). In the case of Ka'Kabish, the archaeological assemblage is not yet large enough to determine the function of any of the minimally mounded structures. Further excavations will cast light on this issue. However, architectural components may suggest the function of four of the structures mentioned earlier – GF3-M1, M2, M3, M4. Patio groups, or four structures that are arranged orthogonally (Type 3), are commonly identified as residential structures in the Maya subarea (Ashmore 1981:48-50; Johnston 2004:163 Willey 1989). Archaeologists found four minimally mounded structures in the settlement zone arranged in this way, suggesting a residential function for these mounds.

For future study, Johnston (2004:168) concluded his article with several relevant questions regarding invisible settlement in the Maya subarea:

> "How abundant are Maya invisible structures? Were invisible houses occupied by a particularly poor or landless sector of Maya society…Are there significant spatial or chronological variations in the distribution and frequency of invisible structures?"

With further investigation of the settlement zone at Ka'Kabish, archaeologists potentially can address these questions. Farmers have cleared large areas of the periphery, opening new areas for agricultural purposes, which may provide additional windows into the composition and characteristics of these small ancient Maya structures. With continued survey and reconnaissance of the area, archaeologists can record the density and distribution of these structures, which will allow other archaeologists to apply these findings to their respective sites. It is possible that these minimally mounded structures and non-architectural residences made up a significant portion of ancient Maya populations.

*Burial in the Settlement Zone*

The dentition of individuals recovered from archaeological contexts has been used by archaeologists in the Maya subarea to reconstruct past diets (White 1999; White et al. 1993), and as a marker of elite status (Becker 1973; Smith 1972); although, a more recent study has questioned this conclusion (Havill et al. 1997). For example, Romero (1970) found an even distribution of dental modifications among low-status and elite individuals. Other archaeologists have focused on the distribution of dental modifications among male and female populations (Massey and Steel 1997; Saul and Saul 1997). These studies have often found an equal distribution of modifications among the sexes. For the purposes of this study, these discussions have highlighted the distribution of different forms of dental modification. Figure 67 presents some of the most common types of dental modification witnessed in the Maya subarea.

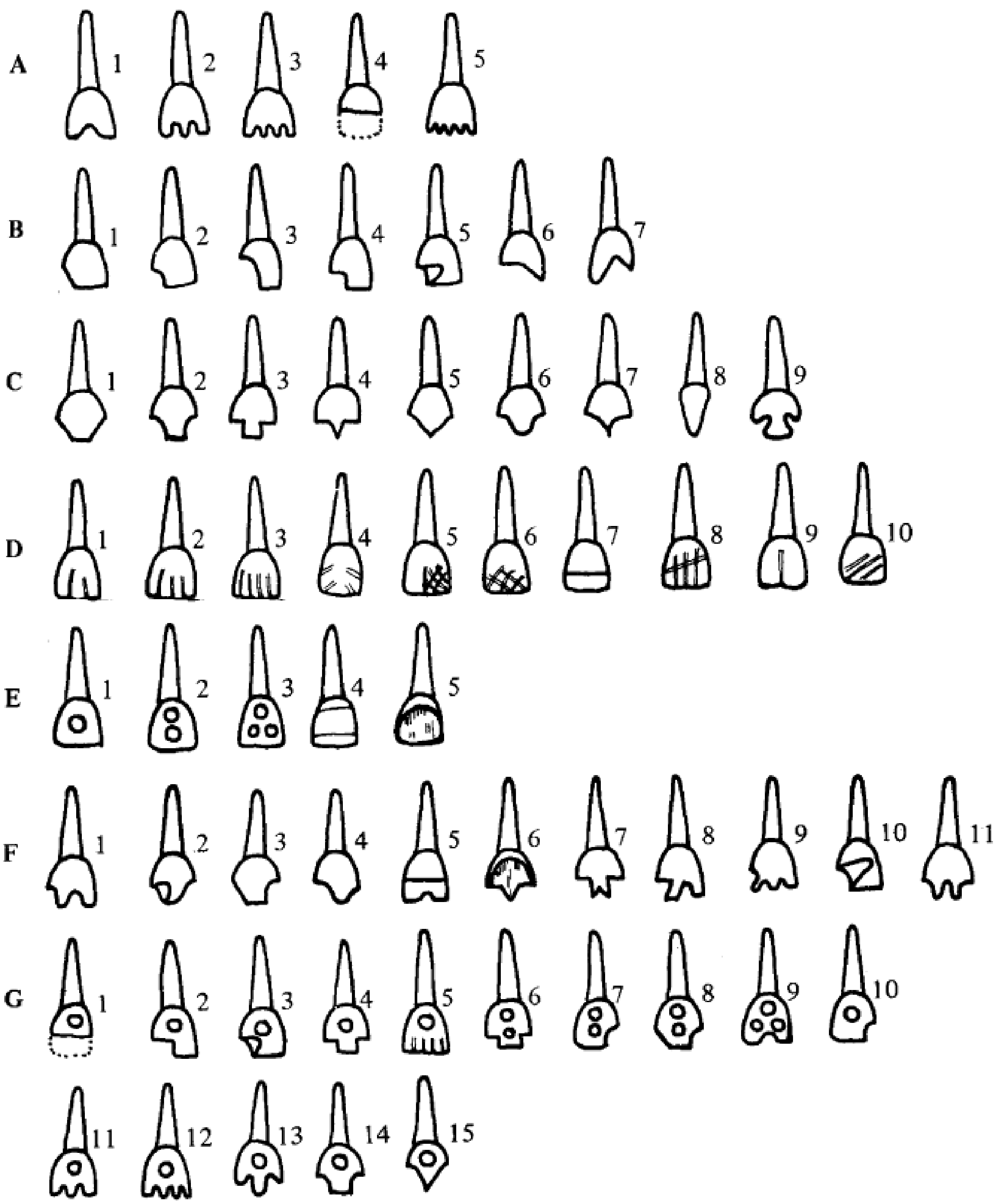


**Figure 67: Classification of Teeth with Dental Modification (Romero 1986:11)**

At this point, archaeologists have recovered the skeletal remains of only one individual from the settlement zone at Ka'Kabish. These remains were recovered 25 cm below the surface of a mounded structure (BF6-M7) situated close to the epicenter. Several samples from the burial are currently undergoing stable isotope analysis to reconstruct the palaeodiet of the individual. However, the results of these investigations are still pending. Excavation of the burial uncovered 23 teeth; four modified by dental filing. Dental filing has been traced to as early as the Early Preclassic period (1400-1000 BC), and commonly involves the alteration of the tooth by creating points or grooves (Williams and White 2006:139). The other common type of dental modification, dental inlay, involves drilling holes into specific teeth and placing materials, such as jade or pyrite, within these cavities. This form of alteration dates as early as the Middle Preclassic period (900-600 BC) (Romero 1970).

The two types of dental modification, or dental filing, recovered in the settlement zone at Ka'Kabish represented Romero's classification of types C4 and B4. Figure 68 shows an illustration of the teeth recovered from BF6-M7.

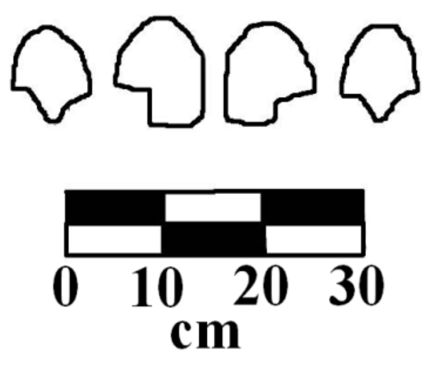


**Figure 68: Profile of Teeth Found at Ka'Kabish (B4 and C4)**

Archaeologists have found this form of dental modification portrayed in various iconographic images found throughout the Maya subarea (Williams and White 2006:139). Figure 69 is an illustration of the Sun God with T-shaped central incisors that are similar to those recovered at Ka'Kabish.

**Figure 69: Sun God with T-shaped Central Incisors (Williams and White 2006:141)**

In a recent study, Williams and White (2006) analyzed teeth recovered from various burials in the site core of Lamanai. The sample included the remains of 82 individuals from the Postclassic period. Through an analysis of the distribution of several types of dental modification, Williams and White (2006) found that B4, C4, and C5, were the most common forms of alteration (Figure 70). The authors argued that these dental modifications were most likely a symbol of social or political affiliation (Williams and White 2006:148). Lichenfeld (2001) also argued that the ancient Maya used these modifications to identify individuals from a region, or from a particular lineage.

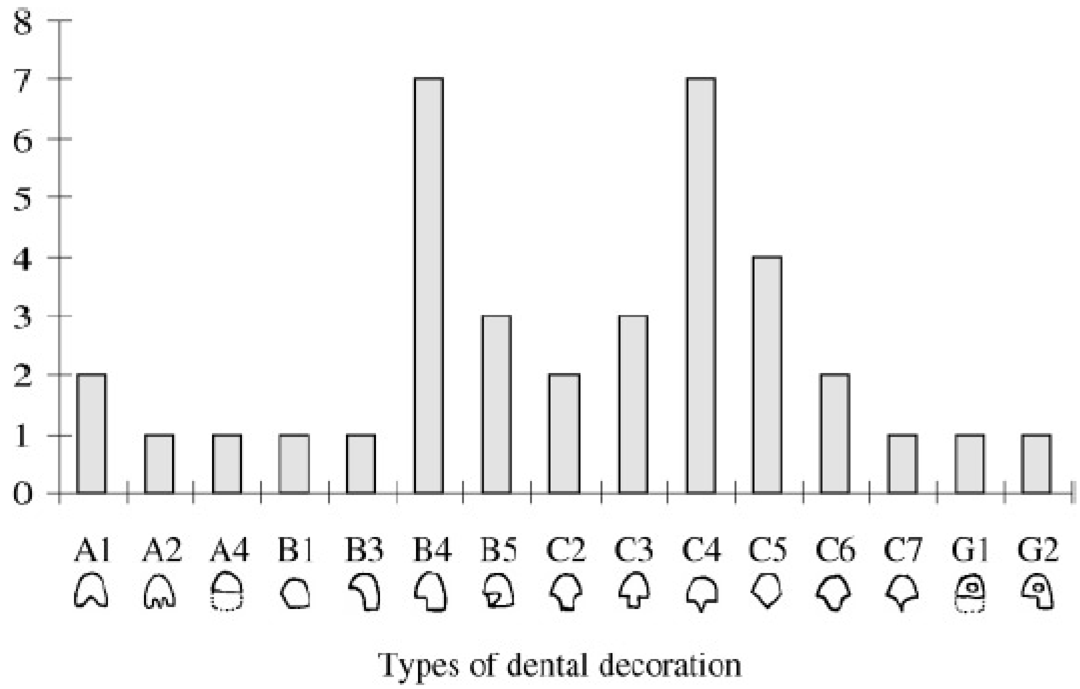


**Figure 70: Types of Dental Modification during the Postclassic at Lamanai (Williams and White 2006:145)**

With this in mind, the similarity between the most common types of dental alteration at Lamanai, and the teeth found at Ka'Kabish, may indicate a degree of social/political affiliation between these two sites.

*Preservation of the Settlement Zone*

One of the most striking observations in the settlement zone was the degree of variability witnessed in the preservation of the architectural and archaeological materials. The modern preservation of these materials was highly contingent on the attitude of the modern day property owners and their relationship with the archaeologist. The suitability of the landscape for agricultural processes also affected the archaeological materials, as the modern farmers often terraform particular areas to increase their yield. For example, a common practice in both of the fields under study at Ka'Kabish was to use a bulldozer to level areas with heightened elevations (i.e., mounded structures). Figure 71 demonstrates the affect these processes have on the landscape. Bulldozing activities displace the context of archaeological remains, but also serve to unearth various indicators of past occupation.

**Figure 71: Bulldozed Area in the Settlement Zone**

Similarly, the continued use of the land for agriculture slowly degrades, and sometimes erases, portions of the archaeological record. In Blanco's fields, this process was very evident, as the repeated plowing and removal of materials (such as cut stone), led to clear ambiguities in the data. For example, one of the goals of the research was to identify non-mounded areas of occupation (e.g., structures built on flat terrain). Theoretically, archaeologists assumed that scatters of artifacts that were concentrated in specific areas represented these structures. However, it was clear that some concentrations were, in fact, the result of modern agricultural activities, as materials from mounded structures were scattered through repeated plowing. Other activities, such as the creation of a road (which was constructed through an area of ancient occupation mid-way through the second field season), immediately affected the remains of mounded structures (Figure 72).

**Figure 72: Construction of a Road in the Settlement Zone**

Observations of the agricultural processes in Wall's fields have given a glimpse of the way these industries affect the archaeological record. First, agricultural workers scoured the fields to remove any large protruding stones. The ancient Maya used these stones in antiquity, especially in the case of minimally mounded structures, to create retaining walls for the construction fill of platforms, which are comprised of soil, smaller stones and pebbles. Without these retaining walls in place, agricultural processes distribute the construction fill of minimally mounded structures throughout the fields, making it more difficult to identify particular areas of occupation. In addition, following the harvesting season, farmers leave these fields fallow. Heavy rains slowly erode the top soil away, as small streams carry off soil from higher elevations, along with ceramic materials and small stones used for construction fill. These processes result in a line of ceramic materials deposited at the base of higher elevations (Figure 73).

**Figure 73: Flags Showing Concentration of Artifacts Distributed Along the Base of a Hill**

These modern site formation processes are important for ancient Maya centers that have long histories of agricultural use, as past agricultural intensification may also have erased many elements of the archaeological record.

# CHAPTER 7:
# CONCLUSION

> In spite of half a century of professing interest in settlement studies, we actually know very little about Maya settlement and the organizational systems that must have defined it. Central architecture has been mapped and excavated, and long-distance transects have been laid out and tested according to sampling designs. But large areas of non-epicentral architecture are rarely mapped in their entirety and archaeologically tested. We need this kind of archaeological data to be gathered first before we deign to understand Maya political systems and their relationships (Chase 2004:325)

Almost a decade later, this statement still accurately summarizes the archaeological climate of ancient Maya settlement studies. Even with consistent funding - supporting projects comprised of multiple on-site archaeologists - the mapping of non-epicentral architecture commonly requires years of study, and thousands of dollars, to complete. At some major ancient Maya sites, such as Lamanai, this work has yet to even be started. However, as Chase mentioned, with continued survey and reconnaissance of sites of all scales, archaeologists will gain a greater understanding of the organizational systems of the ancient Maya. These studies need to capture the complete composition of individual sites, rather than focusing on small transects radiating out from various centers. Future study at Ka'Kabish will build upon the foundationsprovided in this thesis, offering another example of the variability witnessed in the rise and fall of ancient Maya polities. Let us now return to the research questions raised in Chapter 1.

## Research Questions

*What was the density and distribution of occupation?*

Without taking the chronology of the site into consideration, surveyors in Wall's fields extrapolated 62 structures per square kilometer. In Blanco's fields, archaeologists extrapolated 169 structures per square kilometer. If ceramic indicators of chronology are included in this reconstruction, we extrapolated 25 structures per square kilometer that dated to the Late Preclassic or Early Classic in Blanco's fields. In Wall's fields, archaeologists found eight structures that dated to the Late Preclassic or Early Classic periods. Surveyors extrapolated these figures, finding 33 structures per square kilometer that dated to the Late, or Terminal Classic in Wall's fields. In Blanco's fields, we extrapolated 94 structures per square kilometer that dated to the Late, or Terminal Classic. Finally, in Wall's fields, we extrapolated three structures per square kilometer that dated to the Postclassic period. In Blanco's fields, we found 18 structures per square kilometer that dated to the Postclassic period.

These densities suggest several developmental trends for the site. First, throughout the chronological span of the settlement zone, areas closer to the site core were more densely occupied than the periphery. Secondly, ceramic analysis suggests that the site was more densely occupied during the Late to Terminal Classic Periods than earlier or later periods. Lastly, settlement densities dropped significantly during the Postclassic Period. Although these conclusions seem concrete, the methodological strategies used in the settlement zone, consisting of surface collections and typological comparisons, may have affected the resolution of these settlement dynamics. Future study at the site will allow archaeologists to re-evaluate these conclusions.

Surveyors have made several observations of the distribution of structures in the settlement zone. The most common form of settlement and organization, according to Ashmore and collegues (1994) typology of settlement, was represented by Type 1, consisting of isolated mounds less than 2 meters tall. The second most common form, Type 2, was comprised of informal arrangements of 2 to 4 structures, less than 2 meters tall. The third most common form consisted of 2 to 4 mounds formally arranged, with heights less than 2 meters. A single example of a Type 6 form of settlement, with 1 or more mounds with at least 1 with a height between 2-5 meters, was found in Blanco's survey zone. Finally, a Type 7 form of settlement, with 2 or more mounds with at least 1 with a height over 5 meters, was found in Wall's survey zone. With continued use of this typology, archaeologists will be able to compare the compositional characteristics of various sites in the Maya subarea.

*How long was the settlement occupied?*

Ceramic analysis has shown that areas of the settlement zone were occupied as early as the Late Preclassic (400 BC - 300 AD), and continued to be occupied until the Late Postclassic (AD 1250 – 1521), approaching the historic phase of ancient Maya history. Late Preclassic to Early Classic periods were indicated by the presence of Sierra Red ceramics at several mounds in the settlement zone. The Postclassic period was indicated by a red-slipped solid conical foot vessel, resembling Rita Red from Santa Rita, and a tripod support that also resembles Rita Red (Haines and Aimers 2011). Other objects from this assemblage included a frying pan censer handle from the Navula Unslipped system and an incised unslipped jar rim which resembles proto-historic Yglesias complex ceramics at Lamanai. (Haines and Aimers 2011).

*Did areas of settlement remain occupied following the collapse of the monumental core zone and, if so, for how long?*

Evidence from the site core suggests it was abandoned sometime during the Terminal Classic period.At this point, the latest material that was recovered from the site core is from Structure D-14. Excavations here uncovered a number of Late and Terminal Classic vessel fragments, including pieces that resemble the chalices at Lamanai (Aimers and Haines

2011). In comparison, evidence from the settlement zone suggests the area was inhabited at least 500 years after the collapse of the core, until sometime in the AD 1500s.

*What was the degree of variability in the size and organization of structures?*

Archaeologists recorded various forms of ancient Maya structures, ranging from artifacts scatters, and mounded structures, to minimally mounded structures.These structures varied in size, ranging from small rectangular constructions 5 m long by 7 m wide, to the largest structure in the settlement zone, which was 40 m long, and 26 m wide. On average, structures were 8.8 m wide and 7.2 m long. As far as height is concerned, most structures ranged from 1-3 m tall, although in two cases – GF1-M1 and BF1.5-M1 – structures were between 5-7 m tall. On average, structures were 0.6 m tall. Surveyors found several minimally mounded structures less than 0.3 m tall. Archaeologists found artifact scatters unaccompanied by mounded remains, suggesting that the ancient Maya may have constructed pole and thatch structures directly on the ancient surface. However, in some cases, these artifacts scatters were caused by modern site formation processes, such as bulldozing and plowing. Archaeologists at Ka'Kabish concluded that some of these artifact scatters did, indeed, represent ancient structures, as they had limestone materials that normally accompanied mounded or minimally mounded features.

*Is there material evidence of domestic activities?*

Various ceramic and lithic materials indicated domestic activities in the settlement zone. Archaeologists found numerous manos and metates, a bark beater, various forms of chipped stone tools, as well as a variety of ceramic dishes and plates, including several griddles or comals. Although it is difficult to determine the exact function of each individual structure, a majority of these structures likely served residential, or domestic, purposes. Archaeologists found very little evidence of faunal remains, as modern agricultural activities likely erased large portions of these materials. Future excavations of structures in the settlement zone will allow archaeologists to understand better the function of these constructions. None of the structures showed material culture or form to suggest more specialized functions (e.g., shrines, storage, etc.)

*Are there any material similarities between Ka'Kabish and its neighboring site, Lamanai?*

Archaeologists found several ceramics that had similarities to the materials found at Lamanai; particularly, Aimers identified ceramics from several typological phases at Lamanai dated to the Postclassic Period. The lack of archaeological survey and reconnaissance at Lamanai has precluded any comparisons between the density and distribution of structures with the settlement zone at Ka'Kabish.

Most notably, archaeologists at Ka'Kabish compared the dentition of an individual recovered from the settlement zone to the common dental alterations found at Lamanai. These investigations found that the individual at Ka'Kabish had teeth altered in a way that was common among populations at Lamanai. This suggests a socio-political, if not ethnic, or lineage, relation among the populations of both sites.

**Implications for Future Studies**

> Further complicating the interpretation of mapped surface remains, however, is the difficulty of identifying the function of structures based solely on surface form without excavation. Buildings are often arbitrarily designated as "domestic" and "ceremonial" because of the general difficulty in inferring more complex functions without extensive (and intensive) excavation (Chase 2004:322).

Again, these conclusions echo the methodological shortcomings of the settlement study at Ka'Kabish. Without excavations, archaeologists at Ka'Kabish lack a thorough functional understanding of the structures in the settlement zone. Added to this, the limited area of survey hinders comparisons with other sites on a regional scale. Without a larger survey area, it is difficult to draw conclusions about population size. For future considerations, archaeologists at Ka'Kabish need to increase the size of the survey zone, while making it an archaeological goal to add excavations to the study. These methodological pursuits will give archaeologists a greater understanding of the role of the settlement zone in relation to the monumental core.

**Concluding Remarks**

Although the archaeological setting of the Maya subarea is particularly suited to the methodological goals of settlement studies, with evidence of domestic occupation littered across the landscape, it is difficult to gain a larger understanding of the site without a full (or at least a more comprehensive) coverage survey, supported by intensive excavation. Furthermore, ceramic analysis based on surface remains, which are then compared to existing typologies, has several noticeable methodological limitations. Future ceramic studies of the site will benefit from seriation techniques aimed at defining the various local ceramic complexes found at Ka'Kabish. A well-defined site ceramic sequence is needed. Without a strong grasp of chronology, the recreation of developmental trends, or settlement dynamics, is tentative at best. It is likely that future studies of ceramics at Ka'Kabish will redefine some of the typological assumptions made throughout this thesis. Once this work is accomplished, the role of Ka'Kabish in the larger region of Northern Belize will be better illuminated, allowing archaeologists at the site to contribute to an understanding of the developmental variability of ancient Maya polities.

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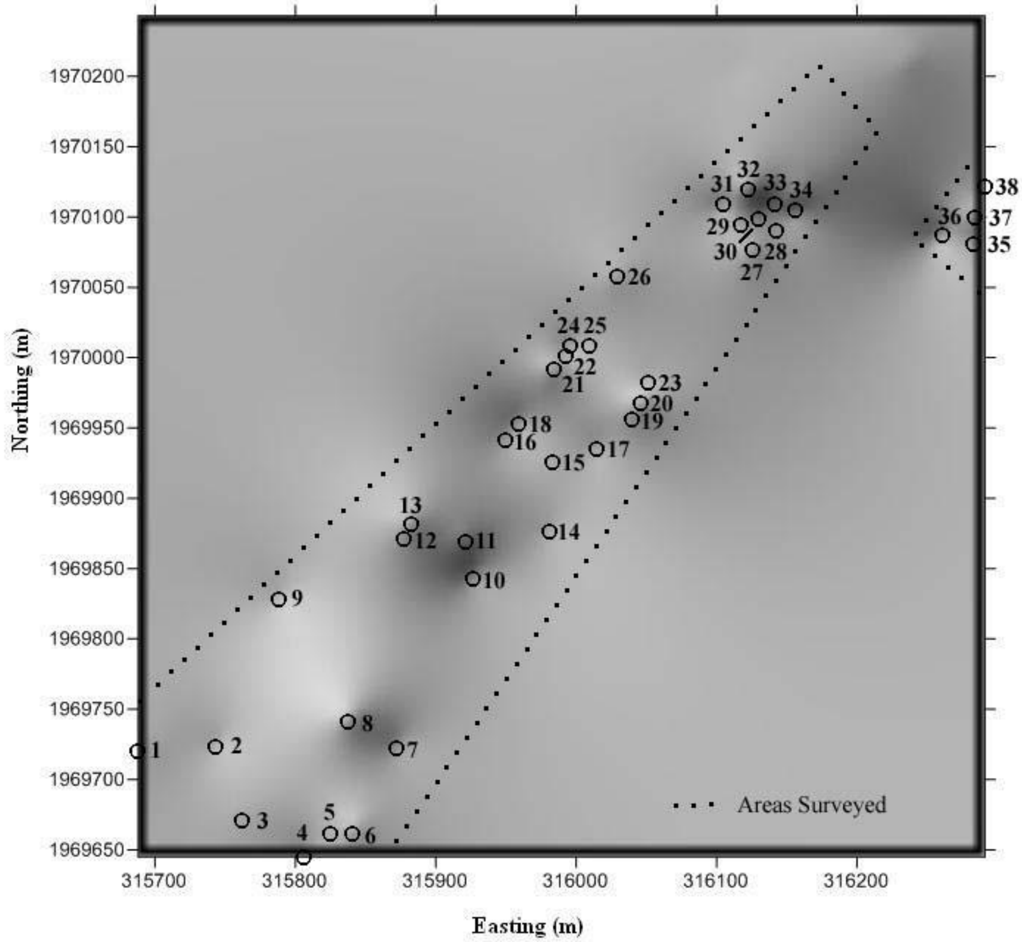
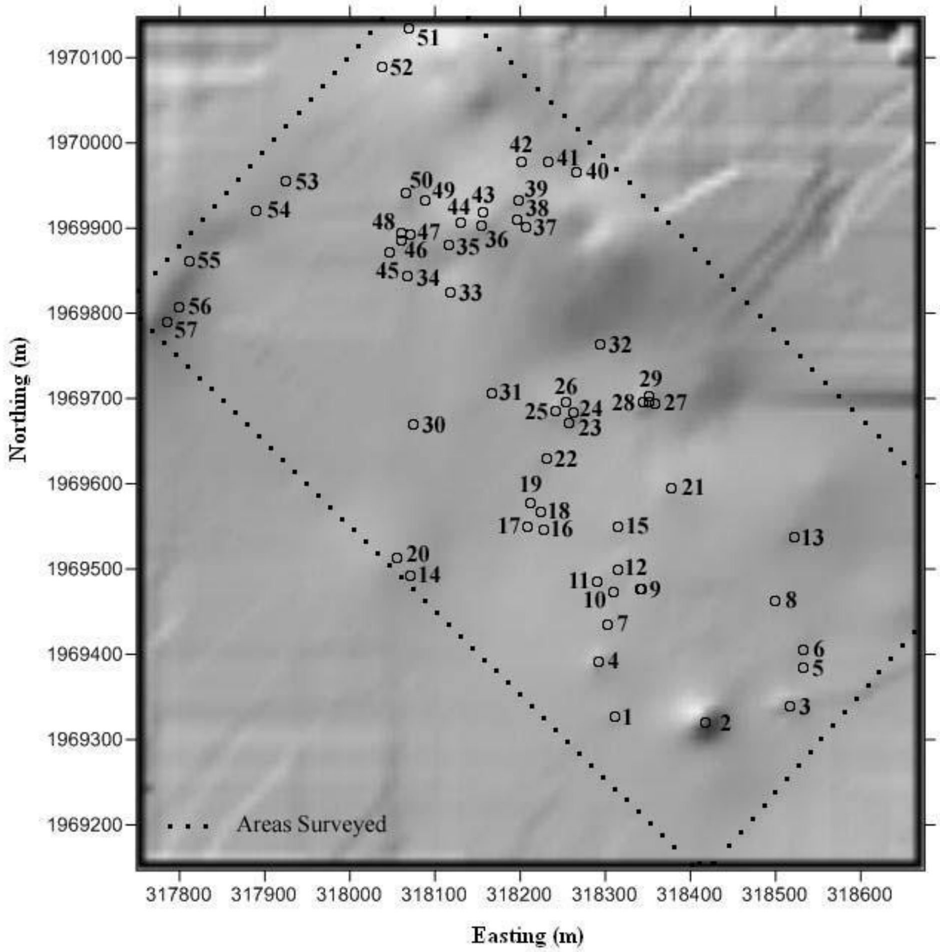
# APPENDIX A
# GEOGRAPHIC LOCATION OF STRUCTURES




| Number | Designation | Number | Designation |
|---|---|---|---|
| 1 | BF1-SC3 | 20 | BTL-M2 |
| 2 | BF1-SC2 | 21 | BSG1-M5 |
| 3 | BF1-SC4 | 22 | BSG1-M4 |
| 4 | BF1-SC5 | 23 | BSG1-M1 |
| 5 | BF2-SC1 | 24 | BSG1-M3 |
| 6 | BF1-SC1 | 25 | BSG1-M2 |
| 7 | BF2-M1 | 26 | BF6-M1 |
| 8 | BF1.5-M1 | 27 | BF6-M6 |
| 9 | BF3-M1 | 28 | BF6-M2 |
| 10 | BF4-SC1 | 29 | BF6-M4 |
| 11 | BF5-SC1 | 30 | BF6-M3 |
| 12 | BF5-SC2 | 31 | BF6-M5 |
| 13 | BTL-M1 | 32 | BF6-M7 |
| 14 | BC-F2-M4 | 33 | BF6-M8 |
| 15 | BC-F2-M2 | 34 | BF6-M9 |
| 16 | BC-F2-M3 | 35 | BC-F1-SC2 |
| 17 | BC-F2-M1 | 36 | BC-F1-SC1 |
| 18 | BC-F2-M5 | 37 | BC-F1-M1 |
| 19 | BTL-M3 | 38 | BC-F1-M2 |




| Number | Designation | Number | Designation | Number | Designation |
|---|---|---|---|---|---|
| 1 | GF1-M3 | 20 | GF1-M15 | 39 | GF2-M6 |
| 2 | GF1-M1 | 21 | GF1-M10 | 40 | GF2-M8 |
| 3 | GF1-M2 | 22 | GF3-M5 | 41 | GF2-M9 |
| 4 | GF1-M4 | 23 | GF3-P1-M4 | 42 | GF2-M10 |
| 5 | GF1-M9 | 24 | GF3-P1-M1 | 43 | GF2-M5 |
| 6 | GF1-M17 | 25 | GF3-P1-M3 | 44 | GF2-M3 |
| 7 | GF1-M5 | 26 | GF3-P1-M2 | 45 | GF2-M25 |
| 8 | GF1-M8 | 27 | GF3-G1-M3 | 46 | GF2-M24 |
| 9 | GF1-M13 | 28 | GF3-G1-M1 | 47 | GF2-M13 |
| 10 | GF1-M14 | 29 | GF3-G1-M2 | 48 | GF2-M12 |
| 11 | GF1-M6 | 30 | GF3-M7 | 49 | GF2-M11 |
| 12 | GF1-M12 | 31 | GF3-M8 | 50 | GF2-M23 |
| 13 | GF1-M7 | 32 | GF3-M6 | 51 | GF2-M21 |
| 14 | GF1-M16 | 33 | GF2-M1 | 52 | GF2-M20 |
| 15 | GF1-M11 | 34 | GF2-M14 | 53 | GF2-M19 |
| 16 | GF3-M4 | 35 | GF2-M2 | 54 | GF2-M18 |
| 17 | GF3-M1 | 36 | GF2-M4 | 55 | GF2-M17 |
| 18 | GF3-M3 | 37 | GF2-M22 | 56 | GF2-M16 |
| 19 | GF3-M2 | 38 | GF2-M7 | 57 | GF2-M15 |

| Wall's Fields | Lot | Northing | Easting | Width (m) | Length (m) | Height (m) |
|---|---|---|---|---|---|---|
| GF1-M1 | 36, 254 | 17.48.257 | 88.42.782 | 39 | 24 | 5 |
| GF1-M2 | 34, 310 | 17.48.273 | 88.42.726 | 11.5 | 20 | 1 |
| GF1-M3 | 53, 308 | 17.48.251 | 88.42.841 | 14.3 | 13.6 | 0.5 |
| GF1-M4 | 54, 307 | 17.48.286 | 88.42.855 | 21.7 | 15.5 | 1.5 |
| GF1-M5 | 31, 318 | 17.48.313 | 88.42.854 | 6.15 | 9 | 0.8 |
| GF1-M6 | 38, 314 | 17.48.337 | 88.42.862 | 10.4 | 10.6 | 1 |
| GF1-M7 | 43, 315 | 17.48.382 | 88.42.737 | 20 | 15.1 | 0.6 |
| GF1-M8 | 49, 203, 317 | 17.48.339 | 88.42.745 | 6.8 | 7.9 | 0.4 |
| GF1-M9 | 50, 208, 319 | 17.48.298 | 88.42.720 | 9.9 | 6.1 | 0.4 |
| GF1-M10 | 158, 312 | 17.48.401 | 88.42.820 | 12.9 | 7.4 | 1 |
| GF1-M11 | 156, 322 | 17.48.373 | 88.42.855 | 13.2 | 8 | 0.5 |
| GF1-M12 | 157, 354 | 17.48.346 | 88.42.851 | 12.1 | 11.3 | 0.3 |
| GF1-M13 | 45, 328 | 17.48.337 | 88.42.834 | 7.6 | 6.4 | 0.3 |
| GF1-M14 | 37, 329 | 17.48.331 | 88.42.853 | 16 | 10.5 | 0.3 |
| GF1-M15 | 47, 313 | 17.48.338 | 88.42.998 | 3 | 5 | 0.5 |
| GF1-M16 | 44, 311 | 17.48.326 | 88.42.986 | 7 | 3 | 1 |
| GF1-M17 | 316 | 17.48.311 | 88.42.722 | 7 | 7 | 1 |
| GF2-M1 | 79, 330 | 17.48.505 | 88.42.983 | 5.6 | 4.2 | 0.3 |
| GF2-M2 | 80, 331 | 17.48.539 | 88.42.986 | 6 | 6.1 | 0.4 |
| GF2-M3 | 81, 332 | 17.48.551 | 88.42.984 | 7.2 | 8.4 | 0.5 |
| GF2-M4 | 82, 333 | 17.48.551 | 88.42.969 | 6.2 | 7 | 1 |
| GF2-M5 | 83, 334 | 17.48.562 | 88.42.968 | 9 | 10 | 0.6 |
| GF2-M6 | 91, 335 | 17.48.572 | 88.42.946 | 9.7 | 10.4 | 0.8 |
| GF2-M7 | 92, 336 | 17.48.560 | 88.42.945 | 8.9 | 8.6 | 0.5 |
| GF2-M8 | 90, 337 | 17.48.592 | 88.42.911 | 6.2 | 6.9 | 0.6 |
| GF2-M9 | 86, 338 | 17.48.598 | 88.42.929 | 6.6 | 6.3 | 0.3 |
| GF2-M10 | 88, 339 | 17.48.596 | 88.42.945 | 6.1 | 5.9 | 0.6 |
| GF2-M11 | 93, 340 | 17.48.565 | 88.43.008 | 6.2 | 6.4 | 0.3 |
| GF2-M12 | 87, 341 | 17.48.542 | 88.43.019 | 10 | 11.1 | 0.5 |
| GF2-M13 | 89, 342 | 17.48.543 | 88.43.015 | 9.2 | 9.3 | 0.6 |
| GF2-M14 | 94, 346 | 17.48.515 | 88.43.016 | 6 | 7.4 | 0.3 |
| GF2-M15 | 104, 355 | 17.48.466 | 88.43.169 | 7.2 | 6.5 | 0.5 |
| GF2-M16 | 105, 356 | 17.48.477 | 88.43.160 | 7 | 6 | 0.3 |
| GF2-M17 | 106, 357 | 17.48.504 | 88.43.155 | 6 | 5.8 | 0.8 |
| GF2-M18 | 107, 358 | 17.48.542 | 88.43.117 | 5.5 | 7 | 0.7 |
| GF2-M19 | 108, 359 | 17.48.570 | 88.43.102 | 4.2 | 4 | 0.5 |
| GF2-M20 | 109, 360 | 17.48.645 | 88.43.048 | 4 | 4.6 | 0.4 |
| GF2-M21 | 110, 361 | 17.48.665 | 88.43.034 | 6.2 | 5.5 | 0.3 |
| GF2-M22 | 345 | 17.48.556 | 88.42.940 | 7 | 7 | 0.5 |
| GF2-M23 | 408, 412 | 17.48.582 | 88.42.984 | 6 | 5.4 | 0.8 |
| GF2-M24 | 409, 414 | 17.48.552 | 88.42.985 | 5.8 | 5.2 | 0.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| GF2-M25 | 410, 413 | 17.48.545 | 88.42.994 | 6.5 | 6.5 | 0.4 |
| GF3-M1 | 207,301 | 17.48.366 | 88.42.915 | 6 | 5 | 0.2 |
| GF3-M2 | 209 | 17.48.380 | 88.42.916 | 3 | 3 | 0.2 |
| GF3-M3 | 206 | 17.48.376 | 88.42.908 | 4 | 3 | 0.2 |
| GF3-M4 | 210 | 17.48.365 | 88.42.904 | 6 | 4 | 0.2 |
| GF3-M5 | 212 | 17.48.410 | 88.42.908 | 5 | 4 | 0.3 |
| GF3-P1-M1 | 211, 405 | 17.48.443 | 88.42.894 | 4.5 | 4 | 1.5 |
| GF3-P1-M2 | 298 | 17.48.447 | 88.42.889 | 3.5 | 3.5 | 1 |
| GF3-P1-M3 | 297 | 17.48.442 | 88.42.905 | 4 | 4 | 0.8 |
| GF3-P1-M4 | 296 | 17.48.434 | 88.42.896 | 4 | 4 | 1.1 |
| GF3-G2-M1 | 407 | 17.48.454 | 88.42.849 | 12 | 10 | 1 |
| GF3-G2-M2 | 303 | 17.48.459 | 88.42.846 | 5 | 5 | 0.8 |
| GF3-G2-M3 | 302 | 17.48.455 | 88.42.842 | 5 | 5 | 0.8 |
| GF3-M6 | 306 | 17.48.486 | 88.42.882 | 5 | 4 | 0.2 |
| GF3-M7 | 299 | 17.48.421 | 88.42.999 | 6 | 6 | 0.4 |
| GF3-M8 | 304 | 17.48.448 | 88.42.951 | 4 | 4 | 0.3 |

| Blanco's Fields | Lot | Northing | Easting | Width (m) | Length (m) | Height (m) |
|---|---|---|---|---|---|---|
| BF1-SC1 | 55 | 17.48.406 | 88.44.250 | 45 | 5.7 | 0 |
| BF1-SC2 | 32 | 17.48.439 | 88.44.306 | 15.7 | 15 | 0 |
| BF1-SC3 | 41, 378 | 17.48.437 | 88.44.337 | 13 | 9.5 | 0 |
| BF1-SC4 | 28, 380 | 17.48.411 | 88.44.295 | 20.2 | 12 | 0 |
| BF1-SC5 | 30, 376 | 17.48.397 | 88.44.270 | 20.4 | 12 | 0 |
| BF1.5 - M1 | 370, 377 | 17.48.449 | 88.44.253 | 10 | 10 | 5 |
| BF2-SC1 | 33 | 17.48.406 | 88.44.259 | 15.3 | 12.3 | 0 |
| BF2-M1 | 40, 381 | 17.48.496 | 88.44.281 | 5 | 5 | 0.3 |
| BF3-M1 | 52, 382 | 17.48.505 | 88.44.203 | 7.6 | 5.7 | 0.5 |
| BF4-SC1 | 29 | 17.48.519 | 88.44.206 | 11.3 | 10.2 | 0 |
| BF5-SC1 | 42, 384 | 17.48.573 | 88.44.136 | 22.7 | 14.5 | 0 |
| BF5-SC2 | 48 | 17.48.567 | 88.44.139 | 17.4 | 9.2 | 0 |
| BTL-M1 | 253, 386 | 17.48.526 | 88.44.228 | 7 | 7 | 0.3 |
| BTL-M2 | 258, 387 | 17.48.520 | 88.44.231 | 6 | 6 | 0.2 |
| BTL-M3 | 252, 388 | 17.48.439 | 88.44.233 | 6 | 6 | 0.3 |
| BSG1-M1 | 277, 365 | 17.48.581 | 88.44.133 | 2 | 2.2 | 0.5 |
| BSG1-M2 | 278, 366 | 17.48.595 | 88.44.157 | 4 | 4 | 0.5 |
| BSG1-M3 | 279, 367 | 17.48.595 | 88.44.164 | 2.5 | 2.5 | 0.7 |
| BSG1-M4 | 280, 368 | 17.48.591 | 88.44.166 | 6 | 6 | 0.5 |
| BSG1-M5 | 281, 369 | 17.48.586 | 88.44.171 | 6.5 | 6.5 | 0.5 |
| BF6-M1 | 260 | 17.48.622 | 88.44.146 | 7 | 7 | 1 |
| BF6-M2 | 259 | 17.48.640 | 88.44.082 | 5.5 | 5.5 | 1 |
| BF6-M3 | 257 | 17.48.644 | 88.44.089 | 4 | 4 | 1.4 |
| BF6-M4 | 261 | 17.48.642 | 88.44.096 | 4.2 | 4.2 | 1 |
| BF6-M5 | 256 | 17.48.650 | 88.44.103 | 7 | 5 | 1.5 |
| BF6-M6 | 269 | 17.48.632 | 88.44.091 | 3 | 3 | 1 |
| BF6-M7 | 270 | 17.48.656 | 88.44.093 | 8 | 7 | 1.3 |
| BF6-M8 | 272 | 17.48.650 | 88.44.083 | 5 | 3 | 0.8 |
| BF6-M9 | 273 | 17.48.648 | 88.44.074 | 4 | 4 | 0.9 |
| BC-F1-SC1 | 187 | 17.48.639 | 88.44.015 | 10 | 10 | 0 |
| BC-F1-SC2 | 188 | 17.48.636 | 88.44.002 | 10 | 6 | 0 |
| BC-F1-M1 | 186 | 17.48.646 | 88.44.002 | 8 | 5 | 0.3 |
| BC-F1-M2 | 189 | 17.48.658 | 88.43.998 | 6.2 | 6.3 | 0.5 |
| BC-F2-M1 | 191 | 17.48.555 | 88.44.153 | 15.3 | 10 | 0.2 |
| BC-F2-M2 | 192 | 17.48.550 | 88.44.171 | 7 | 6.5 | 0.3 |
| BC-F2-M3 | 193 | 17.48.558 | 88.44.190 | 7 | 5.3 | 0.3 |
| BC-F2-M4 | 194 | 17.48.523 | 88.44.172 | 10 | 4 | 0.4 |
| BC-F2-M5 | 255, 372 | 17.48.565 | 88.44.185 | 7 | 4 | 0.3 |

# APPENDIX B
# CHRONOLOGY OF STRUCTURES

| Blanco's Fields | Lot Numbers | Chronology | Defining Characteristics |
|---|---|---|---|
| BF1-SC1 | 55 | Early Classic | Fowler Orange-Red; Hermitage |
| BF1-SC1 | 55 | Classic? | Bichrome or polychrome |
| BF1-SC1 | 55 | Late Classic/Terminal Classic | Gifford 1976 Alexanders Unslipped |
| BF1-SC2 | 32 | Terminal Classic | Freshwater-Blue Creek Striated JAH |
| BF1-SC3 | 41 | Late Classic? | JOC |
| BF1-SC4 | 28 | Terminal Classic | Freshwater-Blue Creek Striated JAH |
| BF1-SC4 | 380 | No Date | No Data |
| BF1-SC5 | 30 | Late Classic/Terminal Classic | Cayo Unslipped System/Uaxactun Unslipped Ware |
| BF1.5-M1 | 370 | Terminal Classic Mode? | JOC |
| BF2-M1 | 381 | Terminal Classic | Blue Creek Striated JAH |
| BF2-M1 | 381 | Terminal Classic Mode? | JOC |
| BF3-M1 | 52 | Late Classic/Terminal Classic | Cayo Unslipped System |
| BF3-M1 | 382 | Terminal Classic | Blue Creek Striated |
| BF4-SC1 | 29 | Terminal-EPC? | BAP |
| BF5-SC1 | 42 | Postclassic | Navula System JOC |
| BF5-SC1 | 384 | Late Preclassic | Paso Caballo Waxy/Sierra/Puletan Red/Unslipped |
| BF5-SC2 | 48 | Postclassic | Yglesias Phase? Graham 1987:9i |
| BF5-SC2 | 48 | Postclassic | CIB Phase Graham 1987:7h,j,k,m,o |
| BC-F1-M1 | 186 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BC-F1-M1 | 186 | Late Classic Mode? | DFL |
| BC-F1-M1 | 186 | Terminal Classic | Dumbcane Striated/Calderitas Heavy Plain |
| BC-F1-M2 | 189 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BC-F2-M1 | 191 | No Date | No Data |
| BC-F2-M2 | 192 | No Date | No Data |
| BC-F2-M3 | 193 | Terminal Classic | Blue Creek Striated JAH |
| BC-F2-M4 | 194 | Terminal Classic? | Blue Creek Striated? Shoulders |
| BC-F2-M5 | 372 | No Date | No Data |
| BTL-M1 | 253, 386 | No Date | No Data |
| BTL-M2 | 258, 387 | No Date | No Data |
| BTL-M3 | 252, 388 | Terminal Classic | Blue Creek Striated JAH |
| BF6-M1 | 260 | Terminal Classic | Yaralum Paste Ware/Chamber/Red Neck Mother |

| | | | |
|---|---|---|---|
| BF6-M1 | 260 | Late Preclassic | Flores Waxy/Sierra/Sierra Red? DOC? |
| BF6-M2 | 259 | Postclssic | Unspecified/ Zakpah? DOC |
| BF6-M2 | 259 | Terminal Classic | Pine Ridge Carbonate/Vaca Falls/Roaring Creek Red |
| BF6-M2 | 259 | Terminal Classic | Roaring Creek/KIK/TAAK |
| BF6-M3 | 257 | Terminal Classic | Dumbcane Striated/Calderitas Heavy Plain/JR |
| BF6-M3 | 257 | Characteristic of TC? | BAP |
| BF6-M4 | 261 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BF6-M4 | 261 | Terminal Classic | Pine Ridge Carbonate/Vaca Falls/Roaring Creek Red |
| BF6-M4 | 261 | Terminal Classic | Pine Ridge Carbonate/Garburtt/Garbutt Creek Red |
| BF6-M4 | 261 | Terminal Classic | Yaralum Paste Ware/Chambel/Chambel Striated |
| BF6-M5 | 256 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BF6-M5 | 256 | Terminal Classic | Roaring Creek/TIK/TAAK DOC – See 286 |
| BF6-M6 | 269 | Terminal Classic | Pine Ridge Carbonate/Vaca Falls/Roaring Creek Red |
| BF6-M6 | 269 | Terminal Classic | Pine Ridge Carbonate/Garburtt/Garbutt Creek Red |
| BF6-M7 | 270 | Terminal Classic | Yaralum Paste Ware/Chambel/Chambel Striated |
| BF6-M7 | 270 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BF6-M7 | 270 | Terminal Classic | Pine Ridge Carbonate/Vaca Falls/Roaring Creek Red |
| BF6-M7 | 270 | Terminal Classic | Pine Ridge Carbonate/Garburtt/Garbutt Creek Red |
| BF6-M7 | 270 – V1 | Terminal Classic | Roaring Creek/TIK/TAAK DOC |
| BF6-M7 | 270 – V2 | Terminal Classic | Peten Gloss/Achote Group/Impressed/BOF |
| BF6-M7 | 286 | No Date | No Data |
| BF6-M8 | 272 | Terminal Classic | Blue Creek Striated JAH |
| BF6-M8 | 272 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| BF6-M8 | 272 | ? | Chaquiste Impressed DIC |
| BF6-M9 | 273 | Terminal Classic | Yaralum Paste Ware/Chambel/Chambel Striated |

| | | | |
|---|---|---|---|
| BSG1-M1 | 277 | Late Preclassic | Flores Waxy/Sierra DB |
| BSG1-M1 | 365 | No Date | No Data |
| BSG1-M2 | 278 | No Date | No Data |
| BSG1-M2 | 366 | No Date | No Data |
| BSG1-M3 | 279 | No Date | No Data |
| BSG1-M3 | 367 | Terminal Classic | Blue Creek Striated JAH |
| BSG1-M4 | 280 | No Date | No Data |
| BSG1-M4 | 368 | Late Preclassic | Flores Waxy/Sierra Group D/BOC |
| BSG1-M5 | 281 | Terminal Classic | Blue Creek Striated JAH |
| BSG1-M5 | 369 | Late Preclassic | Flores Waxy/Sierra D/BOC |

| Wall's Fields | Lot Numbers | Chronology | Defining Characteristics |
|---|---|---|---|
| GF1-M1 | 36 | No Date | No Data |
| GF1-M1 | 254 | No Date | No Data |
| GF1-M2 | 34 | Early/Late Classic? | Bichrome or Polychrome |
| GF1-M2 | 34 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M2 | 310 | No Date | No Data |
| GF1-M3 | 53 | No Date | No Data |
| GF1-M3 | 308 | Late Preclassic | Flores Waxy/Sierra/Sierra Red D/B OC |
| GF1-M4 | 54 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M4 | 307 | Late/Terminal Classic | Uaxactun Unslipped/Cayo/Cayo Unslipped JOC |
| GF1-M5 | 31 | Late Classic? | JOC EB |
| GF1-M5 | 318 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M6 | 38 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M6 | 314 | Late Preclassic | Flores Waxy/Sierra D/B FLB |
| GF1-M7 | 43 | Postclassic? | Part of Segmented Flange from Bowl/Jar/Dish |
| GF1-M7 | 43 | Preclassic/Classic? | DOC IB |
| GF1-M7 | 315 | No Date | No Data |
| GF1-M8 | 49 | Terminal Classic | Mount Maloney Black/Mt. Maloney Variety JOC/LE |
| GF1-M8 | 203 | No Date | No Data |
| GF1-M8 | 317 | No Date | No Data |
| GF1-M9 | 50 | Postclassic | Zakpah group/See Graham 1987:7a/Pendergast 1981 |
| GF1-M9 | 208 | No Date | No Data |
| GF1-M9 | 319 | No Date | No Data |
| GF1-M10 | 158 | Early Classic Mode? | DFL/FLB See Aguila Orange |
| GF1-M10 | 312 | No Date | No Data |
| GF1-M11 | 156 | No Date | No Data |
| GF1-M11 | 322 | No Date | No Data |
| GF1-M12 | 157 | No Date | No Data |
| GF1-M12 | 354 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M12 | 406 | No Date | No Data |
| GF1-M13 | 45 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M13 | 328 | No Date | No Data |
| GF1-M14 | 37 | Terminal Classic | Cayo Unslipped System JOC/EB |
| GF1-M14 | 329 | No Date | No Data |
| GF1-M15 | 47 | No Date | No Data |
| GF1-M15 | 313 | No Date | No Data |
| GF1-M16 | 44 | No Date | No Data |
| GF1-M16 | 311 | Terminal Classic | Blue Creek Striated JAH |
| GF1-M17 | 316 | No Date | No Data |

| | | | |
|---|---|---|---|
| GF2-M1 | 79 | Terminal Classic | Cayo Unslipped System JOC/GE |
| GF2-M1 | 330 | Early Classic Diagnostic? | AZ |
| GF2-M2 | 80 | Terminal Classic | Sisal Unslipped System JR See Masson 2005 Same as Dumbcane Striated/Tu-Tu Striated |
| GF2-M2 | 80 | Terminal Classic | Blue Creek Striated/See Masson 2005 Freshwater |
| GF2-M2 | 331 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M3 | 81 | No Date | No Data |
| GF2-M3 | 332 | No Date | No Data |
| GF2-M4 | 82 | Classic Period? | JOC/EB |
| GF2-M4 | 333 | Terminal Classic | Pine Ridge Carbonate/Garburtt/Garbutt Creek Red |
| GF2-M4 | 333 | Late Preclassic | Flores Waxy/Sierra? |
| GF2-M4 | 333 | Late Preclassic | Flores Waxy/Sierra? Z-Angle |
| GF2-M5 | 83 | Preclassic? | See Powis 2002;A27c/Unnamed Red on Cream |
| GF2-M5 | 334 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M6 | 91 | No Date | No Data |
| GF2-M6 | 335 | No Date | No Data |
| GF2-M7 | 92 | Early Classic? | Basal Flange? |
| GF2-M7 | 92 | Early Classic? | Angle Bowls/Bullard 1965 Excavation at San Estevan |
| GF2-M7 | 336 | No Date | No Data |
| GF2-M8 | 90 | No Date | No Data |
| GF2-M8 | 337 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M9 | 86 | No Date | No Data |
| GF2-M9 | 338 | Late Classic/Terminal Classic | Uaxactun Unslipped/Cayo/Cayo Unslipped JOC |
| GF2-M10 | 88 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M10 | 339 | No Date | No Data |
| GF2-M11 | 93 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M11 | 340 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M12 | 87 | No Date | No Data |
| GF2-M12 | 341 | No Date | No Data |
| GF2-M13 | 89 | No Date | No Data |
| GF2-M13 | 342 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M14 | 94 | No Date | No Data |
| GF2-M14 | 346 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M14 | 346 | Postclassic | Zakpah/Zakpah Orange-Red |

| | | | |
|---|---|---|---|
| | | | D/B OF Howie 2011 |
| GF2-M15 | 104 | Preclassic? | DOC |
| GF2-M15 | 355 | No Date | No Data |
| GF2-M16 | 105 | Early Classic? | FLB |
| GF2-M16 | 105 | Terminal Classic | Dumbcane Striated System JR |
| GF2-M16 | 356 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M17 | 106 | Terminal Classic? | JOC/IB |
| GF2-M17 | 357 | Terminal Classic Mode? | JOC |
| GF2-M18 | 107 | Postclassic? | JOH |
| GF2-M18 | 107 | Late Classic/Terminal Classic | Cayo Unslipped GE |
| GF2-M18 | 358 | Late Preclassic | DFL Sierra Group Form |
| GF2-M19 | 108 | No Date | No Data |
| GF2-M19 | 359 | Terminal Classic | Blue Creek Striated JAH |
| GF2-M20 | 109 | No Date | No Data |
| GF2-M20 | 360 | Late Classic? | Lamanai Style Polychrome |
| GF2-M21 | 110 | No Date | No Data |
| GF2-M21 | 361 | Terminal Classic Mode? | JOC |
| GF2-M22 | 345 | Late Preclassic | Flores Waxy/Sierra d/Rob |
| GF2-M22 | 345 | Late Preclassic | Flores Waxy Sierra |
| GF2-M22 | 345 | Late Preclassic | Flores Waxy/Sierra/Sierra Red FLB |
| GF2-M23 | 408 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| GF2-M23 | 412 | No Date | No Data |
| GF2-M24 | 409 | No Date | No Data |
| GF2-M24 | 414 | No Date | No Data |
| GF2-M25 | 410 | No Date | No Data |
| GF2-M25 | 413 | No Date | No Data |
| GF3-G1-M1 | 207 | No Date | No Data |
| GF3-G1-M2 | 209 | Terminal Classic | Blue Creek Striated JAH |
| GF3-G1-M3 | 206 | Terminal Classic | Yaralum Paste Ware/Chambel/Red Neck Mother |
| GF3-M4 | 210 | No Date | No Data |
| GF3-M5 | 212 | No Date | No Data |
| GF3-P1-M1 | 211 | Terminal Classic | Blue Creek Striated JAH |
| GF3-P1-M1 | 405 | No Date | No Data |
| GF3-P1-M2 | 298 | Terminal Classic | Blue Creek Striated JAH |
| GF3-P1-M2 | 298 | Late Preclassic | Flores Waxy/Sierra/Sierra Red D/B OC |

| | | | |
|---|---|---|---|
| GF3-P1-M3 | 297 | Terminal Classic | Blue Creek Striated JAH |
| GF3-P1-M4 | 296 | Terminal Classic | Peten Gloss/Palmar/Tunich Red-On-Orange D/B |
| GF3-M6 | 306 | No Date | No Data |
| GF3-M7 | 299 | Early Classic | Peten Gloss/Dos Arroyos FL |
| GF3-M7 | 299 | Late Preclassic | Flores Waxy/Sierra |
| GF3-M8 | 304 | No Date | No Data |
| GF3-G2-M1 | 407 | No Date | No Data |
| GF3-G2-M2 | 303 | No Date | No Data |
| GF3-G2-M3 | 302 | Terminal Classic | Blue Creek Striated JAH |
| GF3-G2-M3 | 302 | Postclassic | Tulum Red/Payil Red JVN |
| GF3-G2-M3 | 302 | Late/Terminal Classic | Peten Gloss Ware/Achote/Achote Black BFL |

| Designation | Late Preclassic/ Early Classic | Late Classic/ Terminal Classic | Postclassic |
|---|---|---|---|
| **BF1-SC1** | X | X | - |
| **BF1-SC2** | - | X | - |
| **BF1-SC3** | - | - | - |
| **BF1-SC4** | - | X | - |
| **BF1-SC5** | - | X | - |
| **BF1.5-M1** | - | - | - |
| **BF2-M1** | - | X | - |
| **BF2-SC1** | - | - | - |
| **BF3-M1** | - | X | - |
| **BF4-SC1** | - | - | - |
| **BF5-SC1** | X | - | X |
| **BF5-SC2** | - | - | X |
| **BC-F1-M1** | - | X | - |
| **BC-F1-M2** | - | X | - |
| **BC-F1-SC1** | - | - | - |
| **BC-F1-SC2** | - | - | - |
| **BC-F2-M1** | - | - | - |
| **BC-F2-M2** | - | - | - |
| **BC-F2-M3** | - | X | - |
| **BC-F2-M4** | - | - | - |
| **BC-F2-M5** | - | - | - |
| **BTL-M1** | - | - | - |
| **BTL-M2** | - | - | - |
| **BTL-M3** | - | X | - |
| **BF6-M1** | X | X | - |
| **BF6-M2** | - | X | X |
| **BF6-M3** | - | X | - |
| **BF6-M4** | - | X | - |
| **BF6-M5** | - | X | - |
| **BF6-M6** | - | X | - |
| **BF6-M7** | - | X | - |
| **BF6-M8** | - | X | - |
| **BF6-M9** | - | X | - |
| **BSG1-M1** | X | - | - |
| **BSG1-M2** | - | - | - |
| **BSG1-M3** | - | X | - |
| **BSG1-M4** | X | - | - |
| **BSG1-M5** | X | X | - |

| Designation | Late Preclassic/ Early Classic | Late Classic/ Terminal Classic | Postclassic |
|---|---|---|---|
| **GF1-M1** | - | - | - |
| **GF1-M2** | - | X | - |
| **GF1-M3** | X | - | - |
| **GF1-M4** | - | X | - |
| **GF1-M5** | - | X | - |
| **GF1-M6** | X | X | - |
| **GF1-M7** | - | - | - |
| **GF1-M8** | - | X | - |
| **GF1-M9** | - | - | X |
| **GF1-M10** | - | - | - |
| **GF1-M11** | - | - | - |
| **GF1-M12** | - | X | - |
| **GF1-M13** | - | X | - |
| **GF1-M14** | - | X | - |
| **GF1-M15** | - | - | - |
| **GF1-M16** | - | X | - |
| **GF1-M17** | - | - | - |
| **GF2-M1** | - | X | - |
| **GF2-M2** | - | X | - |
| **GF2-M3** | - | - | - |
| **GF2-M4** | X | X | - |
| **GF2-M5** | - | X | - |
| **GF2-M6** | - | - | - |
| **GF2-M7** | - | - | - |
| **GF2-M8** | - | X | - |
| **GF2-M9** | - | X | - |
| **GF2-M10** | - | X | - |
| **GF2-M11** | - | X | - |
| **GF2-M12** | - | - | - |
| **GF2-M13** | - | X | - |
| **GF2-M14** | - | X | X |
| **GF2-M15** | - | - | - |
| **GF2-M16** | - | X | - |
| **GF2-M17** | - | - | - |
| **GF2-M18** | X | X | - |
| **GF2-M19** | - | X | - |
| **GF2-M20** | - | - | - |
| **GF2-M21** | - | - | - |
| **GF2-M22** | X | - | - |
| **GF2-M23** | - | - | - |
| **GF2-M24** | - | - | - |

| | | | |
|---|---|---|---|
| **GF2-M25** | - | - | - |
| **GF3-G1-M1** | - | - | - |
| **GF3-G1-M2** | - | X | - |
| **GF3-G1-M3** | - | X | - |
| **GF3-M4** | - | - | - |
| **GF3-M5** | - | - | - |
| **GF3-P1-M1** | - | X | - |
| **GF3-P1-M2** | X | X | - |
| **GF3-P1-M3** | - | X | - |
| **GF3-P1-M4** | - | X | - |
| **GF3-M6** | - | - | - |
| **GF3-M7** | X | - | - |
| **GF3-M8** | - | - | - |
| **GF3-G2-M1** | - | - | - |
| **GF3-G2-M2** | - | - | - |
| **GF3-G2-M3** | - | X | X |

# APPENDIX C
# SUMMARY OF TEST-PIT EXCAVATIONS

| Blanco's Fields | Length | Width | Depth | Ceramic | Lithic | Faunal | Other Features |
|---|---|---|---|---|---|---|---|
| BF1-SC2 | 40cm | 35cm | 30cm | 0 | 0 | 0 | Water |
| BF1-SC3 | 50cm | 35cm | 35cm | 0 | 1 | 0 | Water |
| BF1-SC4 | 40cm | 35cm | 37cm | 0 | 0 | 0 | - |
| BF1-SC5 | 40cm | 46cm | 32cm | 1 | 1 | 0 | - |
| BF1.5-M1 | 45cm | 49cm | 48cm | 8 | 4 | 0 | - |
| BF2-SC1 | 40cm | 40cm | 39cm | 0 | 0 | 0 | - |
| BF2-M1 | 45cm | 40cm | 45cm | 6 | 1 | 0 | - |
| BF3-M1 | 50cm | 40cm | 45cm | 10 | 0 | 0 | - |
| BF4-SC1 | 42cm | 40cm | 36cm | 2 | 1 | 0 | - |
| BF5-SC1 | 55cm | 40cm | 40cm | 12 | 0 | 0 | - |
| BF5-SC2 | 44cm | 40cm | 40cm | 0 | 0 | 0 | Plaster |
| BC-F1-M1 | 40cm | 45cm | 35cm | 5 | 0 | 0 | Plaster |
| BC-F1-M2 | 35cm | 40cm | 40cm | 1 | 2 | 0 | - |
| BC-F2-M1 | 45cm | 40cm | 28cm | 3 | 2 | 0 | Plaster |
| BC-F2-M2 | 53cm | 46cm | 30cm | 6 | 2 | 0 | - |
| BC-F2-M3 | 35cm | 30cm | 25cm | 0 | 0 | 0 | Cut Stone |
| BC-F2-M4 | 40cm | 46cm | 27cm | 4 | 0 | 0 | - |
| BC-F2-M5 | 40cm | 32cm | 34cm | 15 | 0 | 0 | - |
| BTL-M1 | 50cm | 38cm | 35cm | 3 | 0 | 0 | - |
| BTL-M2 | 44cm | 40cm | 40cm | 1 | 0 | 0 | Plaster |
| BTL-M3 | 47cm | 40cm | 40cm | 3 | 0 | 0 | - |
| BF6-M1 | 50cm | 40cm | 40cm | 7 | 1 | 0 | - |
| BF6-M2 | 40cm | 30cm | 35cm | 5 | 0 | 0 | - |
| BF6-M3 | 40cm | 36cm | 38cm | 2 | 0 | 0 | - |
| BF6-M4 | 50cm | 50cm | 40cm | 0 | 1 | 0 | Cut Stone |
| BF6-M5 | 38cm | 40cm | 35cm | 0 | 0 | 0 | Cut Stone |
| BF6-M6 | 30cm | 40cm | 20cm | 0 | 0 | 0 | Plaster |
| BF6-M7 | 40cm | 40cm | 30cm | 0 | 0 | 0 | Burial |
| BF6-M8 | 50cm | 50cm | 40cm | 6 | 1 | 0 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BF6-M9 | 50cm | 60cm | 30cm | 8 | 0 | 0 | Cut Stone |
| SG1-M1 | 35cm | 40cm | 34cm | 0 | 0 | 0 | Plaster/Cut Stone |
| SG1-M2 | 44cm | 35cm | 40cm | 4 | 1 | 0 | Plaster |
| SG1-M3 | 50cm | 40cm | 40cm | 9 | 0 | 0 | - |
| SG1-M4 | 50cm | 40cm | 40cm | 6 | 0 | 0 | - |
| SG1-M5 | 45cm | 37cm | 42cm | 12 | 2 | 0 | - |

| Wall's Fields | Length | Width | Depth | Ceramic | Lithic | Faunal | Other Features |
|---|---|---|---|---|---|---|---|
| GF1-M1 | 74cm | 65cm | 45cm | 1 | 1 | 0 | Plaster |
| GF1-M1 | 83cm | 68cm | 35cm | 2 | 2 | 0 | Plaster |
| GF1-M2 | 40cm | 40cm | 35cm | 1 | 0 | 0 | - |
| GF1-M3 | 50cm | 40cm | 40cm | 14 | 0 | 0 | - |
| GF1-M4 | 40cm | 40cm | 40cm | 7 | 3 | 0 | - |
| GF1-M5 | 42cm | 42cm | 40cm | 0 | 0 | 0 | - |
| GF1-M6 | 50cm | 50cm | 40cm | 0 | 0 | 0 | - |
| GF1-M7 | 50cm | 50cm | 40cm | 7 | 0 | 0 | - |
| GF1-M8 | 40cm | 40cm | 40cm | 2 | 0 | 0 | - |
| GF1-M9 | 40cm | 50cm | 40cm | 0 | 0 | 0 | Plaster |
| GF1-M10 | 45cm | 40cm | 40cm | 5 | 0 | 0 | - |
| GF1-M11 | 45cm | 37cm | 35cm | 0 | 0 | 0 | - |
| GF1-M12 | 50cm | 37cm | 40cm | 1 | 0 | 0 | - |
| GF1-M13 | 40cm | 35cm | 35cm | 8 | 1 | 0 | - |
| GF1-M14 | 40cm | 40cm | 35cm | 3 | 0 | 0 | - |
| GF1-M15 | 50cm | 60cm | 45cm | 2 | 0 | 0 | - |
| GF1-M16 | 40cm | 40cm | 35cm | 5 | 0 | 0 | - |
| GF1-M17 | 50cm | 40cm | 40cm | 2 | 0 | 0 | - |
| GF2-M1 | 50cm | 50cm | 40cm | 11 | 0 | 0 | - |
| GF2-M2 | 50cm | 40cm | 40cm | 25 | 0 | 0 | - |
| GF2-M3 | 50cm | 37cm | 40cm | 1 | 0 | 0 | - |
| GF2-M4 | 50cm | 40cm | 40cm | 5 | 0 | 0 | - |
| GF2-M5 | 45cm | 40cm | 40cm | 4 | 0 | 0 | - |
| GF2-M6 | 50cm | 40cm | 40cm | 4 | 0 | 0 | - |
| GF2-M7 | 50cm | 45cm | 40cm | 1 | 0 | 0 | - |
| GF2-M8 | 50cm | 45cm | 43cm | 2 | 1 | 0 | - |
| GF2-M9 | 40cm | 35cm | 35cm | 5 | 0 | 0 | - |
| GF2-M10 | 50cm | 40cm | 40cm | 5 | 0 | 0 | - |
| GF2-M11 | 45cm | 40cm | 40cm | 8 | 0 | 0 | - |
| GF2-M12 | 50cm | 40cm | 45cm | 4 | 0 | 0 | - |
| GF2-M13 | 50cm | 40cm | 40cm | 7 | 0 | 0 | - |
| GF2-M14 | 50cm | 40cm | 40cm | 25 | 0 | 0 | - |
| GF2-M15 | 50cm | 40cm | 40cm | 7 | 0 | 0 | - |
| GF2-M16 | 50cm | 40cm | 40cm | 30 | 0 | 0 | - |
| GF2-M17 | 50cm | 40cm | 40cm | 10 | 0 | 0 | - |
| GF2-M18 | 50cm | 45cm | 40cm | 2 | 0 | 0 | - |
| GF2-M19 | 45cm | 40cm | 40cm | 4 | 0 | 0 | - |
| GF2-M20 | 50cm | 40cm | 45cm | 27 | 0 | 0 | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GF2-M21 | 45cm | 40cm | 40cm | 7 | 0 | 0 | - |
| GF2-M22 | 50cm | 40cm | 45cm | 3 | 0 | 0 | - |
| GF2-M23 | 65cm | 45cm | 30cm | 4 | 0 | 0 | Vessel/Cut Stone |
| GF2-M24 | 45cm | 50cm | 45cm | 4 | 0 | 0 | - |
| GF2-M25 | 40cm | 50cm | 40cm | 4 | 1 | 0 | - |
| GF3-G1-M1 | 65cm | 45cm | 40cm | 15 | 4 | 0 | - |
| GF3-G1-M2 | 40cm | 45cm | 45cm | 3 | 0 | 0 | Cut Stone |
| GF3-G1-M3 | 85cm | 85cm | 60cm | 20 | 10 | 0 | - |
| GF3-M4 | 60cm | 55cm | 40cm | 2 | 0 | 0 | - |
| GF3-M5 | 58cm | 52cm | 40cm | 10 | 0 | 0 | - |
| GF3-P1-M1 | 40cm | 50cm | 40cm | 0 | 0 | 0 | - |
| GF3-P1-M2 | 40cm | 40cm | 40cm | 20 | 0 | 0 | - |
| GF3-P1-M3 | 45cm | 40cm | 45cm | 5 | 0 | 0 | - |
| GF3-P1-M4 | 40cm | 40cm | 40cm | 4 | 0 | 0 | - |
| GF3-M6 | 40cm | 45cm | 40cm | 4 | 0 | 0 | - |
| GF3-M7 | 40cm | 40cm | 40cm | 1 | 3 | 0 | - |
| GF3-M8 | 40cm | 40cm | 35cm | 5 | 0 | 0 | - |
| GF3-G2-M1 | 43cm | 40cm | 40cm | 4 | 0 | 0 | - |
| GF3-G2-M2 | 40cm | 40cm | 35cm | 3 | 1 | 0 | - |
| GF3-G2-M3 | 40cm | 40cm | 35cm | 6 | 0 | 0 | - |

# APPENDIX D
# SUMMARY OF LITHIC MATERIALS

| Lot | Material | Category | Chaine | Class | Type | Object | Condition | Section | Qty |
|---|---|---|---|---|---|---|---|---|---|
| 189 | chert | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 189 | limestone | ground | tool | formal | | metate | frag | - | 1 |
| 189 | chert | chipped | manu | flake | secondary | bifacial thinning | frag | indeter | 1 |
| 187 | sandstone | ground | tool | formal | metate | | frag | indeter | 1 |
| 191 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 1 |
| 191 | chert | chipped | manu | flake | flake | secondary | whole | complete | 2 |
| 191 | chert | chipped | tool | | biface | axe | frag | proximal | 1 |
| 192 | chert | chipped | manu | flake | primary | general | whole | complete | 1 |
| 192 | chert | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 192 | chalcedony | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 377 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 5 |
| 55 | basalt | ground | tool | formal | | metate | whole | - | 1 |
| 328 | chalcedony | chipped | tool | formal | biface | blade | frag | distal | 1 |
| 32 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 1 |
| 32 | chalcedony | chipped | manu | flake | secondary | general | whole | indeter | 1 |
| 32 | chert | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 379 | limestone | ground | tool | | | mano | frag | - | 1 |
| 41 | chalcedony | chipped | manu | flake | indeter | indeter | frag | indeter | 2 |
| 41 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 3 |
| 380 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 381 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 2 |
| 383 | chert | chipped | manu | flake | primary | general | frag | complete | 1 |
| 383 | chert | chipped | tool | formal | biface | indeter | frag | indeter | 1 |
| 385 | chert | chipped | tool | formal | biface | scraper | frag | indeter | 1 |
| 48 | chalcedony | chipped | manu | flake | secondary | general | whole | indeter | 4 |
| 48 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 1 |
| 260 | chert | chipped | manu | core | unipolar | non-expended | whole | complete | 1 |
| 259 | chert | chipped | tool | formal | biface | stemmed macro blade | whole | complete | 1 |
| 257 | limestone | chipped | tool | formal | | metate | frag | | 1 |
| 260 | sandstone | ground | tool | | | mano | frag | indeter | 1 |
| 261 | chert | chipped | tool | formal | biface | stemmed macro blade | frag | distal | 1 |
| 270 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 6 |
| 270 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 4 |
| 286 | chert | chipped | tool | informal | non-shaped | utilized flake | whole | complete | 1 |
| 286 | limestone | chipped | manu | flake | primary | general | frag | indeter | 1 |
| 272 | chalcedony | chipped | tool | formal | biface | scraper | frag | distal | 1 |
| 272 | chalcedony | chipped | tool | formal | biface | stemmed macro | frag | medial | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | blade | | | |
| 273 | chert | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 277 | chert | chipped | manu | debitage | secondary | indeter | frag | indeter | 1 |
| 277 | chalcedony | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 366 | chert | chipped | manu | flake | primary | general | frag | indeter | 1 |
| 366 | chert | chipped | tool | formal | biface | axe | frag | medial | 1 |
| 278 | chalcedony | chipped | manu | flake | secondary | general | frag | indeter | 1 |
| 367 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 279 | chalcedony | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 369 | basalt | ground | | | | mano | frag | - | 1 |
| 369 | chert | chipped | tool | informal | non-shaped | utilized flake | whole | complete | 1 |
| 253 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 252 | chalcedony | chipped | manu | flake | secondary | general | frag | indeter | 1 |
| 254 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 3 |
| 254 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 36 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 1 |
| 312 | chert | chipped | tool | formal | biface | scraper | whole | complete | 1 |
| 158 | basalt | ground | tool | formal | | mano | frag | - | 1 |
| 158 | basalt | ground | tool | formal | | metate | frag | - | 1 |
| 158 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 1 |
| 156 | chalcedony | chipped | manu | flake | secondary | general | whole | indeter | 1 |
| 328 | chert | chipped | tool | formal | uniface | scraper | frag | proximal | 1 |
| 37 | chert | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 53 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 3 |
| 53 | chalcedony | chipped | manu | flake | secondary | general | whole | indeter | 1 |
| 307 | chert | chipped | tool | formal | biface | blade | whole | complete | 1 |
| 307 | chert | chipped | tool | formal | biface | macro blade | frag | medial | 1 |
| 307 | chert | chipped | tool | formal | biface | blade | frag | proximal | 1 |
| 318 | chert | chipped | tool | formal | biface | blade | whole | complete | 1 |
| 318 | chert | chipped | tool | formal | biface | scraper | frag | indeter | 1 |
| 318 | chalcedony | chipped | manu | preform | miss strike | indeter | whole | complete | 1 |
| 38 | chert | chipped | tool | formal | biface | general | frag | indeter | 1 |
| 38 | chalcedony | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 315 | chert | chipped | tool | formal | biface | laurel-leaf point | frag | proximal | 1 |
| 315 | chert | chipped | tool | formal | biface | chopper | whole | complete | 1 |
| 43 | basalt | ground | tool | formal | | mano | whole | - | 1 |
| 50 | chalcedony | chipped | manu | flake | tertiary | general | whole | indeter | 3 |
| 340 | chert | chipped | tool | formal | biface | axe | frag | distal | 1 |
| 341 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 1 |
| 341 | chert | chipped | manu | formal | general | misc | whole | complete | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 342 | chert | chipped | tool | formal | biface | blade | whole | complete | 1 |
| 356 | limestone | ground | tool | formal | | Bark Beater | frag | | 1 |
| 356 | chert | chipped | tool | formal | uniface | blade | frag | proximal | 1 |
| 358 | chert | chipped | tool | formal | biface | blade | frag | medial | 1 |
| 110 | basalt | ground | tool | formal | | mano | frag | - | 1 |
| 408 | chert | chipped | tool | formal | biface | laurel-leaf point | frag | complete | 1 |
| 413 | chert | chipped | manu | flake | primary | general | frag | indeter | 1 |
| 413 | chert | chipped | manu | flake | secondary | trimming | frag | indeter | 1 |
| 334 | chert | chipped | tool | formal | biface | blade | frag | proximal | 1 |
| 337 | chert | chipped | tool | formal | biface | axe | frag | distal | 2 |
| 337 | chert | chipped | tool | formal | biface | axe | frag | medial | 1 |
| 337 | chert | chipped | tool | formal | biface | axe | whole | complete | 1 |
| 301 | chert | chipped | tool | formal | biface | blade | frag | medial | 1 |
| 301 | chert | chipped | tool | formal | biface | blade | frag | proximal | 1 |
| 301 | chalcedony | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 303 | chert | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 207 | chalcedony | chipped | manu | core | bipolar | expended | frag | indeter | 1 |
| 207 | chalcedony | chipped | manu | flake | primary | general | whole | complete | 2 |
| 207 | chalcedony | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 207 | chalcedony | chipped | manu | debitage | shatter | misc | indeter | indeter | 1 |
| 209 | chert | chipped | manu | flake | primary | general | whole | complete | 1 |
| 209 | chert | chipped | manu | flake | secondary | trimming | whole | complete | 1 |
| 206 | chert | chipped | manu | flake | secondary | trimming | whole | complete | 2 |
| 206 | chalcedony | chipped | manu | flake | secondary | trimming | frag | indeter | 4 |
| 206 | chert | chipped | manu | flake | indeter | indeter | frag | indeter | 1 |
| 206 | chert | chipped | tool | formal | uniface | blade | frag | medial | 1 |
| 206 | chert | chipped | tool | formal | biface | cutting tool | frag | medial | 1 |
| 212 | chert | chipped | tool | formal | uniface | scraper | whole | complete | 1 |
| 299 | chert | chipped | manu | debitage | shatter | misc | frag | indeter | 2 |
| 299 | chert | chipped | manu | flake | primary | general | frag | indeter | 2 |
| 405 | chert | chipped | tool | formal | biface | blade | frag | medial | 1 |

APPENDIX E
RECORDING SHEETS

SITE NAME/ NUMBER:

RECORDER(S): Date:

DIMENSIONS: Length: m Width: m Height: m ☐ Measured ☐ Approx.

PRIMARY AXIS ORIENTATION:

STRUCTURE/ POTENTIAL: ☐ Mounded ☐ Minimally-Mounded ☐ Artifact Scatter

**LOCATION DETAILS**

☐ UTM ☐ GPS ☐ Legal LANDOWNER:

NORTHING EASTING:

DESCRIPTION OF SITE AND LOCATION:……………………………………………………………………………………………

……………………………………………………………………………………………………………………………………………

……………………………………………………………………………………………………………………………………………

**SITE BOUNDARY DEFINITION CRITERIA**

☐ Natural Boundary
☐ Decline in artifact density
☐ Decline in visibility
☐ Other……………………………………………………….
☐ Extent of the Structure
☐ Limit of survey area
☐ Arbitrary

Explain

**VISIBILITY ON SITE**

% Decreasing to

Nature/reason for visibility:

……………………………………………………………………

……………………………………………………………………

**CONDITION OF SITE:** ☐ good (in situ/ largely in situ) ☐ fair (some sections disturbed) ☐ poor (heavily disturbed) ☐ destroyed

Disturbance Factors: ………………………………………………………………………………………………………………

Assessment: ………………………………………………………………………………………………………………………

**SITE CONTENTS:**

No. of ARTIFACTS : Absolute Count DE ☐ Estimated ☐ per MAXIMUM m

COLLECTION STRATEGY: ☐ full collection ☐ visibly diagnostic PERCENTAGE COLLECTED (est.) %

MATERIAL COLLECTED: ☐ ceramic ☐ stone ☐ obsidian ☐ bone/shell ☐ botanical ☐ carbon

NOTABLE ARTIFACT(S):……………………………………………………………………………………………………

**WATER SOURCES IN PROXIMITY:**

☐ Cenote ☐ Lagoon/lake NORTHING: [ ] EASTING: [ ]
☐ Aguada ☐ Spring
☐ River ☐ Swamp DESCRIPTION: ……………………………………………………………………
☐ Creek ……………………………………………………………………

| | | | | |
|---|---|---|---|---|
| STATUS OF WATER SUPPLY: | ☐ permanent | ☐ seasonal | ☐ temporary | ☐ unknown |
| TYPE OF WATER: | ☐ fresh | ☐ brackish | ☐ unknown | |
| NATURE OF WATER SOURCE: | ☐ above ground | ☐ rain water | ☐ subsurface | ☐ unknown |
| WATER MOVEMENT: | ☐ still | ☐ flowing | ☐ constantly replenishing | |

**PHOTOGRAPHS:** ☐ yes ☐ no Photo code: [ ]

SKETCH PLAN an/or ADDITIONAL DESCRIPTION

**DATA ENTERED BY:** ……………………………………………… **DATE** ………………………………………………

**FILE NAME:**