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"Ancient Maya Territories, Adaptive Regions, and Alliances: Contextualizing the San Bartolo-Xultun Intersite Survey"

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Ancient Maya Territories, Adaptive Regions, and Alliances: Contextualizing the San Bartolo-Xultun Intersite Survey

A dissertation presented

by

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Ancient Maya Territories, Adaptive Regions, and Alliances: Contextualizing the San Bartolo-Xultun Intersite Survey

Abstract

This dissertation proposes a model of embedded heterarchies to explain changes in ancient Maya settlement patterns at multiple scales of analysis. An analytical hierarchy consisting of areas, territories, adaptive regions, and alliances is established and case studies are presented for each level. The principle data for this study was collected in a 25 km^2 survey universe between the Preclassic center of San Bartolo and the Classic center of Xultun. The San Bartolo-Xultun intersite survey used a stratified random block methodology as a way to obtain a more representative intersite survey sample than previous data acquired by other projects using transects. The survey also integrated high-resolution, multispectral IKONOS and QuickBird satellite imagery into a statistically relevant sampling strategy. This led to the refinement of proposed survey methods using new remote sensing technologies. All data was integrated in a Geographic Information System (GIS) in order to facilitate analysis at broader scales. Using the GIS in combination with archaeological rank order analysis, ethnohistoric data and ethnographic analogy, the Maya territory was defined as the principal unit of lowland settlement analysis. A territory is an area of land and population under the jurisdiction of a particular capital with the political autonomy to make or break alliances with other territories. The San Bartolo-Xultun territory is presented as a case study of this unit of analysis. Numerous territories with shared subsistence strategies and localized political economies form adaptive regions. The Three Rivers region of northeastern Guatemala and northwestern Belize is presented as a case study, incorporating the San Bartolo-Xultun data. At the broadest scale, lowland settlement patterns are examined from the perspective of the Tikal Alliance. Alliances are loosely unified groups of territories that share common interests. The Tikal Alliance was formed to consolidate exchange with Teotihuacan. By approaching ancient Maya settlement from the perspective of embedded heterarchies multiscalar analysis is facilitated. With this method research topics are more easily addressed according to their appropriate level of analysis. This way the concerns of humble Maya farmers are not addressed under the same research questions as those used to interpret high level political interaction amongst rulers.

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This dissertation is dedicated to my wife,
Ann Clair Seiferle-Valencia

Chapter 1: Introduction to the Dissertation and the Embedded Heterarchy Model

Introduction

Modern archaeological settlement pattern studies began with Gordon Willey's (1953) seminal study of the Virú Valley in Peru. Settlement patterns were quickly recognized as an important approach to archaeological research (Trigger 1989:285) and were used in interpretations of Mesopotamia (Adams 1965), China (Chang 1963) and Egypt (Butzer 1976). Beginning with Willey's own research in the Belize Valley (Willey et al. 1965), settlement pattern studies have been conducted throughout the Maya area for over fifty years. In that time there have been shifting theoretical orientations, introductions of new methodological approaches, and an ever increasing appreciation of the complexity of all aspects of Maya civilization. Over the last three decades there has been a steadily increasing archaeological interest in the earlier periods of cultural development, while at the same time epigraphic breakthroughs have led to profound understandings of topics ranging from Maya religion and worldview to detailed political histories of individual sites. Since the early 1990s, there have been major developments in the environmental sciences that have allowed detailed reconstructions of paleoclimatic and paleoenvironmental histories throughout the Maya area. There now exists an enormous amount of data collected by a range of different specialists concerning all aspects of ancient Maya culture and environment.

The goal of this dissertation is to integrate these multivariate data sets into a coherent hypothesis to explain the development of lowland Maya civilization at four different scales of increasing magnitude, each with its own intricacies and complexities. At the most local scale, primary data are used to examine the history of settlement within the San Bartolo-Xultun intersite area. At the next level these data are integrated into data from what I call the San Bartolo-Xultun territory in the northeast Peten, Guatemala. At the third scale, the San Bartolo-Xultun territorial data are integrated with comparative data collected from sites within the Three Rivers adaptive region (Dunning, Beach, Farrell, and Luzzadder-Beach 1998). Finally, settlement, environmental, archaeological, and epigraphic data from a larger grouping of territories, defined as the Tikal Alliance, are integrated to present a theoretical explanation for the development of Maya civilization throughout the lowlands from the Middle Preclassic Period (1000-400 B.C.) up until the “collapse” at the end of the Terminal Classic Period (A.D. 850-1100). Each level of analysis is designed to articulate current data into a coherent model that will generate future research questions and testable hypotheses for studies throughout the Maya area.

Theoretical Perspective

This dissertation research does not fall neatly into the processual or postprocessual theoretical paradigms advocated by many archaeologists from the 1960s to the present. Some of the more randomized and unbiased methods promoted by processualism were used in the survey design for the intersite area. Though, iconographic and epigraphic data were deemed to be the most useful data for discussing settlement at Xultun without conducting a long-term project at that site. The incorporation of ancient texts and art into settlement interpretation is a more postprocessual approach to the archaeological record. It is my view that all available data sets should contribute to the interpretation of the past in order to provide the most complete, holistic perspective.

Some of the broad underpinnings of the current work are presented in Chapter Two, documenting major trends and developments in archaeological theory as evidenced in the history of Maya archaeology. Of particular importance are the Copan (Fash 1991, 2001) and Petexbatun (Demarest 1997, 2004; Houston 1993) projects from the last couple of decades. The demonstrated success of these projects in integrating multivariate data sets have provided a model for the current research. Recent research in the Three Rivers region of northern Belize and the northeast Peten also provided testable hypotheses for the San Bartolo-Xultun intersite research (Scarborough et al., eds. 2003). This section discusses the high-level theories employed in this dissertation to develop a theoretical framework for the interpretation of settlement patterns at areal, territorial, regional, and interregional scales of analysis.

The theoretical perspective for this study draws on numerous approaches to interpreting the past. K. C. Chang (1968) argued that there did not need to be a single paradigmatic methodology to archaeology, and that different approaches be employed depending on the context and research goals. While settlement patterns are undoubtedly the most important approach to the present research, they are used within a holistic context. This is to say that the data from the settlement study is complemented by other data sets such as epigraphic and environmental data.

Scott Fedick (1996) presented an analysis of the ecology of the Maya lowlands using theories borrowed from landscape ecology. The goal of that study was to understand the heterogeneous nature of the Maya environment to better explain Maya land use patterns in what Fedick (ed. 1996) called the "Managed Mosaic." Recently, there have been arguments suggesting that ancient Maya sociopolitical organization was heterarchical (Scarborough et al., eds. 2003). It is my belief that there were heterarchical aspects to ancient Maya society that were embedded within an overall hierarchical framework.

There are two types of hierarchy with which the Maya archaeologist must contend. The first hierarchy is the *settlement hierarchy*, which encompasses the range of site types found within a study region. I have arranged these types hierarchically based on archaeological data, but have tried to incorporate Maya concepts of social organization into this hierarchy. The second hierarchy is the *physiographic hierarchy*, which is composed of progressively greater units of environmental analysis that geographers and ecologists use to study the environment of the Maya area. The ancient Maya were intimately aware of their environmental surroundings. Therefore I propose an *analytical hierarchy* based on theories developed by David L. Clarke (1972, 1977, 1979) concerning levels of settlement that incorporates aspects of both the settlement and physiographic hierarchies. I apply the heterarchical landscape ecology theory to the analytical hierarchy to present a new dynamic model (Marcus 1992a, 1993, 1998) based on the proposed concept of embedded heterarchies. This model is centered around the idea that individual units of equal status in a hierarchy interact with one another in embedded heterarchical networks. The dynamic aspect of this model is defined by interactions and changes that reorganize the composition (or structure) of different scales of the analytical hierarchy. Changes at key transitions over the course of Maya civilization can be identified archaeologically. Once these changes are isolated, patterns may be detected by examining categories of change through time and space. A recent edited volume on the lowland Terminal Classic roughly applies this approach for a single time period (Demarest et al. 2004).

In the following sections I define the levels of analysis in both the settlement and the physiographic hierarchies. This is followed by a discussion of David Clarke's theoretical approach to archaeology and the definition of a meaningful analytical hierarchy for the interpretation of Maya cultural processes as they relate to settlement. Once the analytical hierarchy is clearly defined, the landscape ecology theories of structure, function, and change are presented as theoretical tools to drive the model in a dynamic manner (Marcus 1993) that can explain patterns detected during spatiotemporal analysis.

Maya Settlement Hierarchies

Sites of different size and complexity in the Maya area have been recognized since the first muleback surveys in the early 20th century (Tozzer 1913). Different site types and organizational patterns were defined during the first true settlement pattern studies, beginning in the 1950s (Bullard 1960; Willey et al. 1965). In the 1970s, Joyce Marcus (1973, 1976) presented settlement hierarchies based on an analysis of hieroglyphic texts. In the 1980s, Richard Adams and Richard Jones (1981) presented a rank ordering hierarchy of Maya sites based on counts of courtyards. The site hierarchy that I define below uses a combination of a modified rank order analysis (Guderjan 1991) and epigraphic analysis, the methods for which are presented in Chapter Six. This hierarchy was generated from site data collected by numerous projects working in the

Three Rivers region of northeast Guatemala and northwest Belize, however I created the hierarchical divisions. There are seven identifiable site types that are organized into four scales of a settlement hierarchy. The four scales are: temporary settlements (field houses/temporary residence types); extended family groups (multiple courtyard and single courtyard types); minor centers (secondary center and tertiary center types); and capitals (major capital and minor capital types) (Table 1.1). A territory, the fifth level of settlement hierarchy, is made up of a capital and its hinterland population (minor centers and extended family groups). Territories are the fundamental unit of Maya sociopolitical organization due to their stability, which is supported hieroglyphically by long dynastic sequences and long settlement histories. Further support for the territory concept comes from an emic perception of settlement organization found in Classic hieroglyphs (Martin 2001a; Stuart and Houston 1994), ethnohistoric accounts (Roys 1947), Colonial dictionaries (Barrera Vásquez 1980), and among modern Maya people (La Farge 1947; Wisdom 1940). Groups of territories would sometimes join together in alliances either for the economic or political gain of the ruling class. The alliance is the sixth and final level of the Maya settlement hierarchy. Below I define each of the levels of the settlement hierarchy from the bottom, up: temporary settlements, extended family groups, minor centers, capitals, territories, and alliances.

Table 1.1. Organization of site types within the settlement hierarchy of a territory.

	Site Types	**Settlements**	
Smallest	Field houses/temporary residences	Temporary settlement	Territory
	Extended family, single courtyard Extended family, multiple courtyards	Extended family groups	
	Tertiary Center Secondary Center	Minor centers	
Largest	Minor Capital Major Capital	Capitals	

Temporary settlements

Temporary settlements represent the poorest settlement remains of the ancient Maya. Sites of this type generally consist of rectangles of rock cobbles that appear to be oriented as structure platforms, rather than representing rock piles produced while testing the quality of raw material. Despite their appearance as architectural features the associated material culture is little to none. Sites of this type are generally found in association with what have been interpreted as agricultural features. These features can either be terraces or linear rock formations assumed to have been related to cultivation (see Chapter Four). For this reason the sites are considered to be temporary residences or field houses.

Extended family groups

Extended family group sites are the most common site found in the Maya lowlands. These sites are scattered throughout the forest, but were probably loosely tethered to a nearby minor center. These sites are very small and often have no plastered architecture. The sites can consist of either single or multiple courtyard groups, however this distinction is one of size rather than function. The presence of multiple courtyards indicates a larger family that has either resided longer in the area or had a particularly great number of male children in one generation that led to an expansion of the settlement. This is in accordance with arguments for Maya matripatrilocal residence in which newly married couples live briefly with the woman's extended family before settling down with the man's extended family (Haviland 1968). While extended family group sites occasionally have a single monumental structure, usually a family temple, there are never ball courts or stelae associated with these settlements. Extended family group sites should not be confused with courtyard groups that are found within minor centers and capitals. Extended family group sites are only defined as such when they occur remote from any larger order settlement grouping.

Minor centers

In the modified rank order analysis that is presented in Chapter Six, both secondary and tertiary centers were identified statistically. The minor centers I define here are drastically different from those presented in settlement hierarchies that try to cover the entire Maya area (Adams and Jones 1981; Marcus 1976). Under no circumstances would a minor center (as defined here) have an Emblem Glyph. It is possible that there would be toponyms identifying minor centers, but they would definitely be subsumed under a capital center's Emblem Glyph. Each minor center exhibits some, but not all, of the following attributes: one or more public plaza, one or more courtyard groups, a ball court, one or more stelae (usually blank), and one or more monumental structure (> 10 m in height). From a sociopolitical standpoint, minor centers would have been managed by non-royal elites, probably *sajalob* in some regions (Jackson 2005:129-130). The minor centers would have had a number of extended family group sites loosely tethered to them in a hierarchical relationship.

I have lumped secondary and tertiary centers together as minor centers for two reasons. First, the distinction between the two seems to be one of size rather than function. Depending on the geography of a region there may be limited appropriate sized space for minor centers of any given size. Second, many sites that are here classified as minor centers have not been investigated other than brief reconnaissance or mapping. In terms of rank ordering this means that site scores may fluctuate to some degree, blurring the perceived division between secondary and tertiary centers. Minor centers played an important role in the organization of the territorial hinterland, and need to receive more attention in Maya archaeology, especially in the lowlands. Perhaps the most thorough investigations of minor centers in relation to a territorial capital have been in the Copan Valley. There the minor centers of Río Amarillo (Saturno 2000), El Raizal, and Los Achiotes (Canuto 2002) were all investigated as hinterland centers to the Copan capital.

Capitals

Capitals are the largest sites found in the Maya area and represent the heads of larger sociopolitical organizations known as territories. These are sites like Tikal, Calakmul, Copan, Yaxchilan, Naranjo, Piedras Negras, and other famous centers that have attracted scholars and tourists to the Maya area since the 19th century. In the rank ordering of sites presented for the Three Rivers region in Chapter Six, sites that scored as statistical outliers were classified as major capitals, while other statistically significant sites were classified as minor capitals. In terms of rank ordering, the attributes that define capitals are the presence of: one or usually more public plazas, multiple courtyard groups, one or more ball courts, one or more stelae (usually carved), and multiple monumental structures (> 10 m in height). In addition, every well investigated capital site that dates to the Classic Period has an Emblem Glyph signifying the presence of a *k'uhul ajaw*, or holy lord. Capitals were the home to the royal Maya court (Inomata and Houston 2001) and presented the stages for the performance of theatre state rituals (Demarest 1992).

Once again I have lumped two identified site types (major and minor capitals) into a single settlement category (capitals). As with minor centers, many minor capitals have not received the same amount of attention as the famous major capitals. More intensive investigation increases the overall site score of a minor capital and in the case of Dos Hombres revealed a possible Emblem Glyph (Adams et al. 2004). Another reason why the major/minor distinction may not be appropriate is a temporal factor. During the Late Classic many new sites emerged as territorial capitals as population expanded throughout the lowlands (see Chapters Six and Seven). These new capitals were every bit as independent as the older sites, but since they only had 250 years instead of 600-800 years to grow, they appear smaller despite functional similarities.

Territories

Territories are the settlement building blocks of Maya civilization. Territories are here defined as an area of land and population under the jurisdiction of a particular capital. In the terminology of heterarchy, as used by Scarborough and Valdez (2003), a territory incorporates a capital and its hinterland population. Territories may include two or more capitals if it can be demonstrated that no two were of an equal political rank during the same time period regardless of their comparative sizes.

The territory is a political entity for certain, but it is also a self-contained social and economic entity, which distinguishes it from a hegemonic polity or "superstate" (revised to "superpower") of the type argued for Tikal and Calakmul (Martin and Grube 1995, 2000). Territories were independently organized bodies composed of a capital, minor centers, and numerous extended family group sites. The territorial ruler, or *k'uhul ajaw*, was free to make or break alliances with other territories at any given time. What Martin and Grube (1995, 2000) call hegemonies were actually just large alliances composed of numerous territories loosely organized by a capital city (see below).

There is also a temporal aspect to consider when defining a territory. The territory is a flexible construct designed to incorporate the changing circumstances of its constituent sites (Marcus 1992a, 1993, 1998). The size, shape, and make-up of a territory are subject to change based on external and internal factors that influenced the fortunes of the capital(s), and by extension the royal elites of a territory. Chapter Six presents a couple of examples in which there was a shift in capitals within territories based on external influences that effected the original capital.

I believe that the territory is an emic construct that would have been recognized by the ancient Maya. Below I present ethnohistoric evidence for the existence of the territory concept as well as a hieroglyphic phrase that encompasses the idea of a territory. This is followed by ethnographic evidence from both the Q'anjob'al (La Farge 1947) and Chorti Maya of Guatemala (Wisdom 1940) that suggests the territory concept may have survived the Colonial Period in some regions and also provides clues as to how prehispanic territorial boundaries may be distinguished.

I argue that the territory was an indigenous concept that was the building block of ancient Maya civilization. There is no doubt that the Maya perceived themselves as hierarchically-organized, even if there were some exchanges that were heterarchical. Carnegie ethnohistorian Ralph Roys describes the organization of Yucatan when the Spanish first arrived:

> At the time of the conquest the Maya-speaking portion of the peninsula was divided into approximately eighteen territorial divisions, most of which might be designated as independent states. Certainly each of these subdivisions was independent of its neighbors. Some of them possessed a well-organized political system headed by a single ruler; others were more or less closely knit confederacies of towns or groups of towns; still others seem to have been merely collections of towns in a given area, whose

> relations with one another are largely a matter of conjecture. The Spanish conquerors and early settlers called these territorial divisions provinces (*provincias*), and I shall continue to give them this designation. In Maya we sometimes find the word *cuchcabal* employed, but the word really means jurisdiction and seems to be applied to the district subject to a single town or ruler [Roys 1943:11].

Roys' description suggests that either the Spanish did not fully understand the organization of settlement when they first encountered the Maya, or that the Maya were in a decadent state in which it was unclear who was in charge. I believe that the provinces that Roys describe as "a well-organized political system headed by a single ruler" is a reflection of the territory concept defined above and encompassed by the Yucatecan word *cuchcabal*. The fact that there were eighteen divisions suggests heterarchical relationships at the level of the *provincia*, as defined by Roys. Spanish resettlement programs in Colonial Yucatan, particularly the use of the *encomienda* system altered the preexisting indigenous system to varying degrees. Therefore, the most appropriate place to look for vestiges of the altered Yucatecan system is in the realm of linguistics, where terms for prehispanic political organization may be preserved in Colonial dictionary glosses. Joyce Marcus (1993) looked at many of the same sources that I cite here, and while there are similarities to our arguments we differ in the ways that we apply the ethnohistoric (and in my case ethnographic) evidence to the study of Preclassic and Classic sociopolitical organization.

The Diccionario Cordemex (Barrera Vasquez 1980:344) defines *kuchkabal* as "*tierra, partido o visita, sujetos a alguna cabecera o comarca así; regimiento o parcialidad; comarca o provincia, región; región, provincia, territorio jurisdiccional de pueblo*." All of these definitions imply a concept similar to a territory, which is represented by a capital and its hinterland population. The Cordemex (Barrera Vásquez 1980) records over a dozen words for different concepts of settlement including definitions for: territory, capital, city, town, hamlet, province, kingdom, land, fatherland, and nation. There is significant overlap in some of these definitions which can be explained by two factors. First, the 16th and 17th century Spanish had difficulty assigning one-to-one definitions to spatial concepts derived from an indigenous worldview completely unrelated to Western concepts of space. A second, related reason for the discrepancies was the nature of Maya hierarchy. The lattice-like framework of Maya sociopolitical organization (Demarest 1989, 1994) meant that an analytical unit could be at the head of a hierarchy at one level, while at the same time maintaining a heterarchical relationship with a similar entity located elsewhere. The concept of a sociopolitical entity being both dominant and interdependent at the same time is reflected at all levels of spatial hierarchy, with heterarchical exchange networks being embedded in each level (see below).

The question arises whether or not it is appropriate to apply ethnohistoric and modern (see Brown 1993) accounts of Maya sociopolitical organization to earlier periods in Maya culture history? In order to justify ethnohistoric analogy continuity needs to be demonstrated within the context of sociopolitical systems. The following section examines the concept of the *chan-kab'-ch'e'n*, or 'sky-earth-cave', found in the ancient Maya script. I argue that this is an emic term referring to the ancient territorial system. The two most common glyphic manifestations of this phrase, the *kab'-ch'e'n* and the *chan-ch'e'n*, make reference to the physical and cosmological aspects of territory respectively.

Much of the glyphic material relating to the issue of Classic concepts of territory is found in studies of Maya Emblem Glyphs (Berlin 1958; Marcus 1973, 1976; Mathews 1985, 1991) and place names in general (Stuart and Houston 1994). Peter Mathews (1991:29) has proposed that there were up to 60-70 independent states by the late 8th century AD in the Maya lowlands. Although, by the Late Classic most of these were also members of broader political alliances that behaved as shifting groups of affiliated sites similar to the "pulsating galactic polities" defined by Demarest (1992) and Marcus' (1992a, 1993, 1998) dynamic model. An Emblem Glyph therefore, represents a political entity that is independent in the sense that it is free to make or break alliances with other political entities, but the degree of this independence is contingent upon specific historical factors, which can be detected in the hieroglyphic record through warfare accounts and accession overseeing statements. Therefore, an Emblem Glyph is an indicator that at one point in a site's history it was the dominant center in its territory.

The translation of the Emblem Glyph sign is *k'uhul* X *ajaw*, or "holy X lord", with X representing the name of the territory under the holy lord's control (Stuart and Houston 1994:3-7). The presence of non-royal elite titles, particularly the *sajal* title, complicates matters, especially among sites along the Usumacinta River (Stuart 1985). *Sajalob* were in some cases in charge of minor centers, but do not appear to have ruled independent territories bearing their own Emblem Glyph (Houston 1993:147-148; Houston and Stuart 2001:61-64; Jackson 2005:129-130). Furthermore, the first appearance of a *sajal* title is not until the Late Classic (Jackson 2005:Figure 3.10a). To reiterate, this means that a site that bears an Emblem Glyph was the dominant center in its territory *at one point* in the site's history.

Another type of glyph dealing with sociopolitical organization is the place name or toponym (Stuart and Houston 1994). Place names are assigned to the constituent components of territories controlled by a *k'uhul ajaw*. Some of these would be directly associated with the minor centers defined above. A good example of the distinction between place names and Emblem Glyphs is found at Palenque. The Emblem Glyph of Palenque is translated as *K'uhul B'aak Ajaw*, or "Holy Bone Lord". A common place name found in Palenque's inscriptions is read as *Lakamha'* or "Big Water" (Stuart and Houston 1994:30). *Lakamha'* refers to the actual site of Palenque while *B'aak* represents the territory controlled by the Palenque divine lord (Martin and Grube 2000:157). Place name glyphs appear in a formula (Stuart and Houston 1994:7-18) that translates as *ut-iiy* X *chan-ch'e'n*, where X represents the glyph for a specific place name. Stuart and Houston (1994:13) translate this formula as "It happened (at) [the location]…", but give no translation for the *chan-ch'e'n* compound, which is sometimes substituted with a *kab'-ch'e'n* compound.

It is now known that *chan-ch'e'n* and *kab'-ch'e'n* translate as "sky-cave" and "earth-cave" respectively. There is one example from Tikal Stela 31 (Stuart and Houston 1994:Figure 9f) that reads *chan-kab'-ch'e'n* "sky-earth-cave", which may hold the key to understanding ancient Maya territories. I propose that the "sky-earth-cave" glyph compound corresponds to the idea of the territory defined above and that its two most common forms, the "sky-cave" and the "earth cave" represent different aspects of the territory concept. From the perspective of the Mesoamerican worldview the "sky-cave" and "earth-cave" are "metaphorical doublets" just like the concept of the Central Mexican *altepetl*, which translates as "the water(s), the mountain(s)" for the Nahua (Lockhart

1992:14; Martin 2001a:178).

According to Stuart (personal communication 2006) the phrase *ut-iiy* X *chan-ch'e'n* probably means "it happened at X, and everywhere above and everywhere below." This would anchor the toponym (represented as X) cosmologically in the Maya universe, with the physical location of the event clause acting as an *axis mundi* linking the underworld, earth, and heavens. In these phrases the toponym is replacing the *kab'*, "earth", of the "sky-earth-cave." The *kab'-ch'e'n*, or "earth-cave" compound seems to be a more literal term referring to a physical territory. The most common examples come from Yaxchilan where house dedications performed by royal women are often contextualized as having occurred "in the *kab'-ch'e'n*" of the current male ruler. The Nahua *altepetl* similarly embodies both cosmological and physical concepts of organization.

The glyphic compound *chan-kab'-ch'e'n* is analogous to the *kuchkab'al*, or provinces, described by Roys (1943) for Yucatan. It is significant that in both the Classic glyphic and Colonial ethnohistoric cases the root of the word for territory is *kab'*, or earth. *Kab'* is intimately linked to another important Yucatecan word for settlement, *kah* (Restall 1997). The term *kah* is found in the Cordemex and is glossed by various sources as: world, town, hamlet, or place (Barrera Vásquez 1980:280-281). The word *kab'*, which at its most basic definition refers to the earthly realm of Maya cosmology, often substitutes for *kah* in different dictionary glosses. *Kab'* itself shares the meaning of world or town with *kah*. There are also numerous places where *kab'* and *kah* are found to be interchangeable. For example, *pach kab'* and *pach kah* both mean district or suburb (Barrera Vásquez 1980:617). Elsewhere, *kakab'* and *kakah* both translate as hamlet or small town. Other Mayan languages, such as Q'anjob'al (Comunidad Lingüística Q'anjob'al 2003), display similar substitutions between words for "earth" and "hamlet".

The evidence in both the epigraphic and ethnohistoric records for emic terms of settlement is echoed among some living Maya groups. In Oliver La Farge's (1947) classic ethnography of the highland Q'anjob'al Maya of Santa Eulalia, Guatemala he discusses the cosmological significance of a sacred cave (*xab'olan*) called Yalan Na'. The name of this cave means "under the house", with the house referring to the church above in the center of the town (La Farge 1947:127). This is particularly important since in the Q'anjob'al language the word for land or earth (*tx'otx'*) can be used as a classifier or substitute for the word for hamlet. For example, the phrase "Nank'ultaq is a large hamlet." is glossed as: "*Tx'otx' Nank'ultaq ti, miman maqb'il yuj tx'otx'* (Comunidad Lingüística Q'anjob'al 2003:188)." *Tx'otx'* is the Q'anjob'al equivalent of Classic *kab'*, so that the *tx'otx'* of Santa Eulalia located above the *xab'olan* of Yalan Na' makes a *tx'otx'-xab'olan*, or *kab'-ch'e'n*. While I have not found a specific gloss of *tx'otx'-xab'olan* as a doublet, the underlying cosmological structure, as reflected in the modern community layout, is analogous to the ancient concept of the *kab'-ch'e'n*. The 'town center (church) over cave' structure replicates archaeological examples from the Classic Period at Dos Pilas (Brady 1997), and the Postclassic Period at Utatlan (Brady 1991).

The question arises whether it is appropriate to use modern ethnographic analogies when studying the Classic Period Maya. I do not believe that it is any less appropriate to search for surviving models among the ethnographic Maya than it is to look to the ethnohistoric Yucatecan Maya. The Yucatan Peninsula is drastically different from the southern lowlands in terms of geology, vegetation, and soil and the contact period Maya were greatly influenced by their contacts with later Mesoamerican cultures. Unless one takes the position that neither ethnohistoric nor ethnographic analogy are appropriate, which may be an irresolvable difference in paradigmatic perspective, I do not think you can honestly accept one as a valid source for models and not the other. The Q'anjob'al linguistic example establishes precedence that some aspects of ancient concepts of settlement may have survived, at least into the first half of the 20th century. The next section looks at possible structural analogies for Maya settlement among the Chorti of the 1930s.

Charles Wisdom's (1940:205-228) ethnography of the Chorti Maya discusses a settlement system whose focus is on the level of the *municipio* despite there being greater forms of organization such as the department and the nation of Guatemala. Each *municipio* has a capital *pueblo* and a series of subsidiary *aldeas* and rural *caseríos*. In my system the *municipio* is the territory, while the *pueblo* is the territorial capital. The *aldeas* are minor centers, while the *caseríos* are extended family group sites. In Guatemala the Chorti were a marginal group at the time of the conquest and avoided evangelization and resettlement efforts longer than most groups (Metz 1995:36-37). While the Chorti did eventually succumb to the Spanish conquest and were incorporated into *encomiendas*, many *aldeas* maintain their Maya (and sometime Nahua) names suggesting a deep history. There is evidence that some of the modern towns represent resettlements (which damages the ethnographic analogy), but it seems that many *pueblos* and *aldeas* were preserved under the *encomienda* system, including important *pueblos* such as Jocotán (Metz 1995:37, n.1; Torres Moss 1996:29-32).

Robert Carlsen (2001:258) cites Mary Louise Pratt's definition of transculturation as a process in which "subordinated or marginal groups select and invent from materials transmitted to them by a dominant metropolitan culture." Also, "while subjugated peoples cannot readily control what emanates from the dominant culture, they do determine to varying extents what they absorb into their own and what they use it for." Carlsen (2001) distinguishes transculturation from syncretism as being a more active process in which indigenous groups play a meaningful role in their transformation during the contact period. This is similar to the idea of dialogues posited by Burkhart (1989:3-14) in discussing the transformation of the colonial Nahua culture in which she believes indigenous people resisted both actively and passively.

Returning to the Chorti, it seems likely that the *municipio* system was something that was transculturated by the Maya. There are more hierarchical levels to the Guatemalan national settlement hierarchy than were acknowledged by the Chorti studied by Wisdom in the 1930s. In that time the "Indians, as well as most of the Ladinos of the Indian area, ha[d] no clear notion of what constitute[d] the Republic of Guatemala (Wisdom 1940:204)." Furthermore, while understanding the existence of the Guatemalan departments, and their own membership in the Department of Chiquimula, the Chorti "live[d] out their social and economic lives in areas much smaller than the department." It would seem that the *municipio* was chosen as the strongest level of affiliation and I believe that this was an active choice by the Chorti who transculturated the aspects of the Spanish settlement system that best reflected their own prehispanic settlement organization.

If the *municipio* system for the Chorti can be considered as a possible model for the prehispanic territory system, then the ways in which the Chorti perceive of boundaries between *municipios* may offer clues as to how we may determine boundaries when defining ancient territories. Even if one rejects ethnographic analogy for political structure, boundaries still seem to be derived from indigenous perceptions of landscape, rather than any Spanish notions of boundaries. For the Chorti, the only formal boundary markers between *municipios* are wooden slide-pole gates found on the major trails (Wisdom 1940:205-206). Otherwise, there are unmarked boundaries that are generally known by everyone by signs such as "a fallen tree, a slight rise in the trail, a large boulder, or the crossing of the trail by a stream (Wisdom 1940:206)." It is also noted that:

> The boundary is as much a social as a physical one. Each Indian who lives near the line knows to which *municipio* he belongs; nearly every Indian and Ladino over a wide area knows this about him, as well, so that the traveler can say that the line is "between this family and the next one farther on," the two families being perhaps a quarter-mile apart [Wisdom 1940:206, n.5].

This lends support to the argument that the ancient Maya had hinterland populations that were bound to a known capital and did not fluctuate in allegiance. Despite the fact that the modern *municipios* are Spanish constructs, they may well closely reflect the ancient indigenous system having been transculturated by modern groups.

Ancient Maya territories, or *chan-kab'-ch'e'nob*, were the building blocks of Maya society as early as the Late Preclassic Period. The San Bartolo-Xultun territory is defined in Chapter Five, exemplifying some of the flexible qualities of the territory definition given here. Chapter Six presents a case study for the Three Rivers region in which numerous territories are defined. This involves identifying territorial capitals and lower levels of the settlement hierarchy and then determining boundaries based on some of the Chorti concepts of boundaries.

Alliances

During various periods in the history of the Maya lowlands, numerous territories would group together in what I call alliances. The use of the term alliance here is intentionally mimicking the term Triple Alliance used in studies of the *excan tlatoloyan* of the Mexica (López and López 2000). The three Triple Alliance capitals of Tenochtitlan, Texcoco, and Tlacopan administered political control over subordinate regions in ways somewhat similar to how members of Maya alliances would have during times of unity. Three important characteristics of the Triple Alliance are relevant to the Maya alliances. First, the Triple Alliance was a political body that joined the ethnic system into the territorial system (López and López 2000:52). Second, the Triple Alliance generally respected the internal political order of the societies integrated within its sphere of influence, focusing instead on the collection of tribute (López and López 2000:52). Finally, the cultural influence of the Triple Alliance capitals was minimal outside of the nuclear area, choosing instead to respect the local ideological foundations of power in each of its subordinate regions (López and López 2000:52). These are three important themes that apply to varying degrees among the Classic Maya alliances. The major difference between the Maya alliances and the Aztec Triple Alliance was the degree to which the alliance could respond if a member decided to become independent again. To this end, the Aztecs were much more organized and prepared to retaliate with military force, as opposed to the Maya who had a more difficult time of maintaining control over member territories.

A capital could be in control of its own territory while at the same time being joined to another territorial capital during periods of alliances. For example, Early Classic Caracol was allied with Tikal at first, but displayed an act of political independence when the Caracol ruler joined up with Calakmul to attack his former ally (Martin 2001b, 2005a). Alliances were formed between members of the ruling elite of each territory, therefore I will briefly discuss the nature of Maya political interactions from the perspective of the territory. Territorial rulers interacted with the elites of other independent territories in the course of geopolitical developments across the Maya lowlands. In this regard it is important to note that all of the following arguments accept as true not only that Maya hieroglyphics have been successfully deciphered as a logosyllabic script (Coe 1992), but also that these inscriptions are generally historically accurate despite some inherent propaganda (cf. Marcus 1992b).

Two of the most important recent studies of Maya politics have been those of Demarest (1992, 2004), and Martin and Grube (1995, 2000). Demarest (1992) convincingly argues that Maya elites were involved in economic exchanges to acquire the paraphernalia necessary to perform the rituals of the "theatre state". Drawing analogies from southeast Asia, he argues that control was maintained over subordinate populations through the performance of ideology, which could only be done by the elites. He uses this ideological basis for power to argue that the Maya organized themselves into politically unstable galactic polities that pulsated in and out of brief periods of hegemonic expansion.

Martin and Grube (1995, 2000) express the same arguments regarding hegemony as Demarest (1992), but through hieroglyphic decipherment have identified two major powers that seem to have dominated most periods of expansion. These are what they call the superstates of Tikal and Calakmul, although they do concede that there were lesser hegemonies in other regions as well. In Martin and Grube's (2000) view, certain rulers of major centers became "overkings" of other rulers at smaller centers so that the dominant ruler could then act through an established local dynasty to accomplish sociopolitical goals. Importantly it is noted that during periods of hegemonic expansion there "was not an acquisition of territory per se, but rather an extension of [the] elite networks (Martin and Grube 2000:20)." This is similar to Demarest's (1992) arguments that elite exchange was crucial to political control.

Both Demarest (1992) and Martin and Grube (1995, 2000) point to the inherent instability of the pulsating galactic polity or superstate, with Demarest (1992:156) going as far as to argue that the Maya "existed in a state of dynamic instability". Marcus (1993:134), in another landmark paper, likewise refers to large regional states that "do not seem to have been long-term stable units." Still, it is unfair to characterize all Maya politics as unstable. Instead, the major issue is at what scale do we analyze Maya politics? If we focus our efforts on the broadest expansions of political entities in the history of the lowlands, then the Maya political system appears to be extremely unstable, with only brief periods of hegemonic unification. If however, we focus on the territory system as being the default form of organization, then the Maya political system appears to be extremely stable (Marcus 1993), with almost all of these entities lasting from 300 to over 700 years.

Due to the inherent instability of the so-called hegemonies, I have decided to refer to them as alliances. These alliances were temporary moments of broader unity that interrupted the otherwise stable geopolitical situation of independent territories. During times of expansion the "overking" of the expanding territory may have had some degree of control over a subordinate territorial capital, but the fundamental relationship was still heterarchical, being based on mutual benefits through economic and ideological exchange. In this sense the territorial ruler that initiates an alliance may be considered a "first among equals" rather than a de facto overlord. It is the removal of hierarchy that distinguishes the alliance from all previous models, whether they be hegemonies, regional states, or galactic polities. This sort of heterarchical relationship amongst united territories is better encompassed by the term 'alliance'. Chapter Seven examines how territories, especially during the Classic Period, would ally with one another to achieve common goals, while at the same time maintaining their inherent independence. The Tikal Alliance is presented as a case study.

Physiographic Hierarchies in the Maya Area

Just as the Maya organized themselves into sociopolitical hierarchies, the environment of the Maya area itself can be viewed in scale dependent hierarchical levels. The issue of scale is crucial when examining environmental diversity (Fedick 1996). It is exactly this issue that led Fedick (ed. 1996, 1996) to propose that the Maya exploited a heterogeneous landscape, which he referred to as the "Managed Mosaic". While Fedick (1996) was examining the amount of diversity at the most local scale, recent studies by Nicholas Dunning and colleagues (Dunning 1996; Dunning and Beach 1994; Dunning, Beach, Farrell, and Luzzadder-Beach 1998; Dunning et al. 2003) have shown that there is diversity at larger scales of analysis as well. Table 1.2. displays the hierarchical relationship of the physiographic categories defined below. This natural physiographic hierarchy does not conform in a one-to-one fashion with the Maya settlement hierarchy in the way one may expect in a model based on environmental determinism.

Table 1.2. Organization of categories within the physiographic hierarchy of the Maya area.

<table>
<tr><th>Smallest</th><th></th><th></th><th>Largest</th></tr>
<tr><td>Microenvironment</td><td rowspan="3">Physiographic Province</td><td rowspan="6">Adaptive Region</td><td rowspan="12">Maya Area</td></tr>
<tr><td>Microenvironment</td></tr>
<tr><td>Microenvironment</td></tr>
<tr><td>Microenvironment</td><td rowspan="3">Physiographic Province</td></tr>
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<tr><td>Microenvironment</td><td rowspan="3">Physiographic Province</td><td rowspan="6">Adaptive Region</td></tr>
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<tr><td>Microenvironment</td></tr>
<tr><td>Microenvironment</td><td rowspan="3">Physiographic Province</td></tr>
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Microenvironments

The first tier in the physiographic hierarchy is that of the microenvironment. Coe and Flannery (1964) first defined microenvironments in the 1960s. Examples of microenvironments as the smallest subdivisions in the Maya area are the numerous classes of *bajos* (seasonal swamps) that have been defined by Julie Kunen and others (Kunen et al. 2000). The ancient Maya exploited different microenvironments in unique ways. The analysis of microenvironments and their ecotones is particularly useful in understanding ancient subsistence strategies. Microenvironments also have a temporal aspect that can be understood through the use of paleoenvironmental studies, especially pedological and palynological investigations. The microenvironments encountered in the San Bartolo-Xultun intersite area are presented in Chapter Four.

Physiographic provinces

Physiographic provinces are natural divisions of the landscape based on studies of geology, pedology, hydrology, and other earth sciences (see Dunning et al. 2003 for a discussion). The Maya area is made up of a number of different soil and vegetation associations that can be separated based on physiography (Dunning et al. 2003). These associations may cause minor variability in adaptive strategies available within a given adaptive region (see below). Physiographic provinces are mostly natural, but may be effected by anthropogenic changes, particularly the long-term effects of an accretive approach to landscape engineering (Scarborough 2000). Archaeological variation within an adaptive region will often cross-cut physiographic provinces in some aspects but, in general, the boundaries between physiographic provinces accounts for some of this diversity. Physiographic provinces do not directly correspond to Maya cultural phenomena. The physiographic provinces of the Three Rivers adaptive region are presented in Chapter Six to explore some of the major natural boundaries that are used to help define territorial extents.

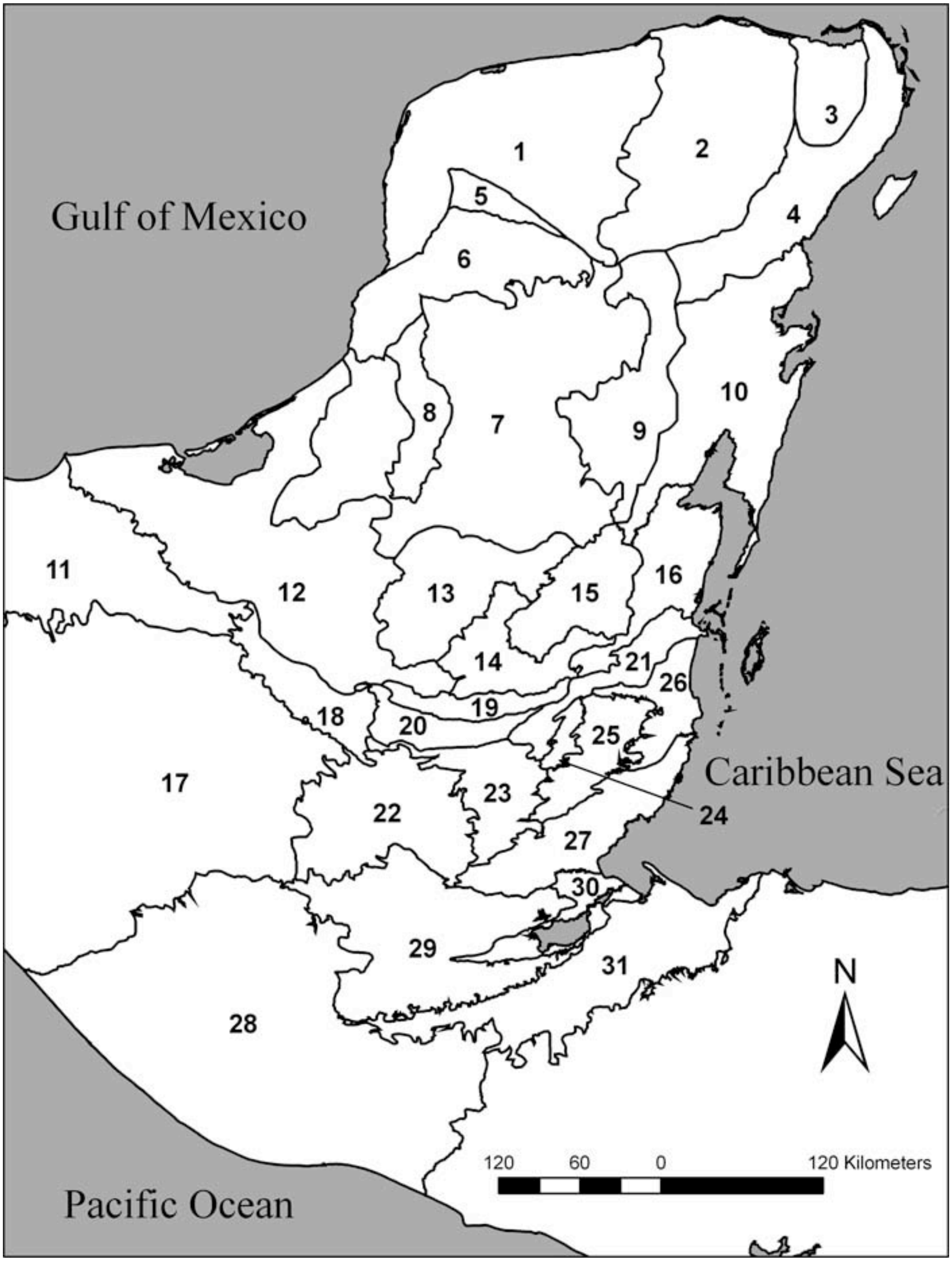
Adaptive regions

Archaeologists have long been aware of large regional divisions in the Maya area based on ecology (Hammond and Ashmore 1981) but these divisions have since been refined (Dunning and Beach 1994; Dunning, Beach, Farrell, and Luzzadder-Beach 1998; Fedick, ed. 1996). Previously, environmental diversity in the Maya area was considered in terms of broad divisions, such as the central lowlands or the Pacific coast and piedmont (Hammond and Ashmore 1981; Sharer 1994). Although, more recent data suggests that diversity occurred at a smaller scale in the Maya area and effected which subsistence strategies could be employed in any given region at any given time (Dunning and Beach 1994; Dunning, Beach, Farrell, and Luzzadder-Beach 1998; Fedick, ed. 1996; Gómez-Pompa et al. 2003). This diversity is tied to more stable features of the landscape, such as geology, hydrology, and localized climatic patterns.

Nicholas Dunning, Timothy Beach, Pat Farrell, and Sheryl Luzzadder-Beach (1998) have divided the Maya area into 27 *adaptive regions*, “areas within the greater Maya Lowlands that have environmental characteristics distinct from adjoining areas” (Dunning, Beach, Farrell, and Luzzadder-Beach 1998: 87). The divisions were made based on Wilson’s (1980) proposed divisions of the Yucatan Peninsula, physiographic regions of the southern lowlands (Dunning and Beach 1994), and data from recent paleoenvironmental work (Dunning, Beach, Farrell, and Luzzadder-Beach 1998). The numerous divisions made in this scheme are an extension of a new perception of the Maya environment being composed of a mosaic of resources (Fedick, ed. 1996).

Dunning, Beach, Farrell, and Luzzadder-Beach (1998) provide clear definitions of each of the adaptive regions, therefore an exhaustive discussion will not be presented here. Still, some modifications have been made to the original adaptive region map for the current study, due to the availability of better digital relief data then was available at the time of the original adaptive region study in 1998. Some changes were made at the suggestion of Dunning, while others represent my own expansion and revision of the initial study. First, the North Coast adaptive region and the Caribbean Reef and Eastern Coastal Margin adaptive region have been eliminated. Instead, the borders of adjacent adaptive regions have been extended to include the coast. In the new scheme the coasts have become a separate physiographic province (see above) within their respective

Figure 1.1. Adaptive regions of the Maya area (modified from Dunning, Beach, Farrell, and Luzzadder-Beach 1998). 1) Northwest Karst Plain, 2) Northeast Karst Plain, 3) Yalahau, 4) Coba-Okop, 5) Puuc-Santa Elena, 6) Puuc-Bolonchen Hills, 7) Central Hills, 8) Edzna-Silvituk Trough, 9) Quintana Roo Depression, 10) Uaymil, 11) Tabascan Coast, 12) Río Candelaria-Río San Pedro, 13) Mirador Basin and Northern Plateau, 14) Southern Plateau, 15) Three Rivers, 16) Río Hondo, 17) Chiapas Highlands and Piedmont, 18) Lacandon Fold, 19) Peten Itza Fracture, 20) Libertad Anticline, 21) Belize River Valley, 22) Río de la Pasión, 23) Dolores, 24) Vaca Plateau, 25) Maya Mountains, 26) Hummingbird Karst, 27) Karstic Piedmont, 28) Western Highlands and Piedmont, 29) Eastern Highlands, 30) Lake Izabal, 31) Motagua and Copan Valleys.


Gulf of Mexico
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adaptive regions. This change was made so that coastal sites would be within the same region as their nearby inland sites, filling a physiological niche within their adaptive region.

The original map of adaptive regions only included the Maya lowlands. Three highland adaptive regions (Chiapas Highlands and Piedmont, Western Highlands and Piedmont, and Eastern Highlands) have been added (Figure 1.1). Also, the Tabascan Coast adaptive region has been added in the northwest, while the Lake Izabal adaptive region has been added in the southeast. These all represent additions that were made by me so that the map would cover the entire Maya area. Dunning and I divided the Peten Karst Plateau into the Mirador Basin and Northern Plateau adaptive region and the Southern Plateau adaptive region. The decision to do this was based on a review of the digital elevation model which showed a clear ridge, which in other adaptive region contexts would have been considered a boundary. The above changes, now covering the entire Maya area, bring the total number of adaptive regions up to 31. Adaptive regions effected the subsistence strategies available to the ancient Maya through time and space. This meant that sites found within a single adaptive region shared at least a loose relationship based on a shared perception of the local environment. There is evidence that these relationships may have been even closer in some cases. Chapter Six presents a case study from the Three Rivers adaptive region to illustrate this point.

The Theoretical Approach of David L. Clarke

The settlement and physiographic hierarchies defined above were definitely related, but not in a one to one manner that would fit a more environmental deterministic model. In order to generate meaningful categories of analysis that will incorporate aspects of both hierarchies I turn to the theoretical work of David L. Clarke. By all accounts, Clarke was a brilliant thinker who passed away before achieving his full potential (Ashmore 2002:1180; Hammond 1979; Trigger 1989:316). Clarke began as a methodological innovator by introducing new quantitative methods to archaeology which he borrowed from other social and biological sciences (Clarke 1968; Trigger 1989:316). Yet, in the 1970s Clarke emerged as a major theoretical archaeologist, particularly in his writings on the archaeology of space and systemic interpretations of settlement (Ashmore 2002; Clarke 1972, 1977, 1979). Some of the tenets of his spatial theories are more applicable today given the development of Geographic Information Systems (GIS) that can manipulate spatial data in ways that could only be discussed theoretically in Clarke's time. What follows is a brief history of some of Clarke's major writings, which outline his theoretical approach to the archaeological record. Aspects of his approach are then applied to a consideration of the Maya area.

David Clarke can roughly be considered the European equivalent of Lewis Binford in that he was one of the leaders of the "New Archaeology" in British archaeology. Clarke approached everything from a spatial and systems perspective. For example, in his article on archaeology's "loss of innocence" (Clarke 1973) he treated the development of the discipline of archaeology from the 1950s to the 1970s as sequential reactions to internal and external stresses on the academic system. The external stress came from the "new methodology", which was really a number of scientific and mathematical methods that shared the philosophy of an empirical approach to building models that could simulate archaeological phenomena. The internal stress was the rapid increase in individual archaeologists as well as academic departments that the system had to accommodate. For Clarke, the “New Archaeology” was an interpenetrating set of new methods, observations, paradigms, philosophies and ideologies within a new environment. Clarke’s application of systems theory to concepts of space in the archaeological record are at the core of his approach.

Here the term *approach* is used to describe the way Clarke thought archaeology should be conducted in general, and the term *agenda* is used to define Clarke’s personal biases when implementing his approach. Clarke’s (1972) approach to archaeology is that the same data set should be explained by multiple models based on different assumptions then, based on the predictions of the various models, appropriate sampling strategies can be devised to test which of the tentative models most accurately reflects the data. The purpose of this approach was to build a general theory for archaeology, which Clarke referred to as “an undisciplined empirical discipline” (Clarke 1968:1).

Clarke’s agenda, which he most clearly articulated in his paper *Towards Analytical Archaeology* (Clarke 1979), is to explain archaeological data as a hierarchy of systems categories, with each system representing an archaeological entity (e.g. artifact, type, assemblage, culture, etc…) that is a member of the general system category for a specific hierarchical level. By accurately defining the properties of each general category of systems, Clarke (1979) believed that we should be able to link a limited range of social, linguistic, ethnic, geographical and temporal behavior to the hierarchical model. This agenda has been applied to the Maya area previously, most notably by Norman Hammond (1972) at Lubaantún. Recent developments in analytical spatial tools, such as

GIS, require a reapplication of Clarke's agenda to the Maya area incorporating more detailed spatial analyses than were possible in the 1970s.

The clearest application of Clarke's theories to the archaeological record comes from his own work in the Old World. In his study of European Iron Age society Clarke (1972) used a data set from the Glastonbury site that was excavated in the early twentieth century to experimentally test his *approach*. Although, he chose to implement his own *agenda* by taking one particular model to its explanatory limits in order to look at the consequences of his assumptions during the model building process. This means that he did not actually propose other explanations of the data set from the Glastonbury site in the Iron Age article (Clarke 1972) as his approach requires, but he believed that in the future there should be a number of other models with different assumptions to test against his own model.

Clarke (1972) first defined the assumptions he made in regard to the post-depositional process. He then built his model up from the matrix of element attributes that remain after the post-depositional process. He simultaneously analyzed the vertical and horizontal spatial relationships of the data, as well as the structural and artifactual relationships. As each type of analysis uncovered patterns, the new information modified the other analyses, thus the research itself acted as a dynamic system. From these four analyses Clarke (1972) discerned seven categories of structures at the site, consisting of 13 forms, each with its own polythetic "signature" (Clarke 1979:156-158). The next stage of research was to assume that the structural categories from the previous step were accurate and to search for a modular unit that was made up of the different structural categories.

At each stage of research there is a data set whose initial properties are based on the assumptions of the previous research step. There is an accumulation of assumptions as the model building process unfolds. Clarke (1972:801-803) related this process to the Chinese Box (or Russian Doll) where each box relies on the smaller boxes inside of it for its form. Ideally there would be multiple models, each with their own chain of assumptions, applied to the same Glastonbury data. He argued that if the models were compared, new sampling locations could be determined that would test the validity of the different assumptions. Clarke's approach is very appealing, but because he only implemented his agenda to build a model of Iron Age society, we do not get a sense of how different models would be compared or whether this would even be a fruitful endeavor. Nonetheless, in the present study an *analytical hierarchy*, incorporating aspects of both the settlement and physiographic hierarchies, is established to address issues of Maya settlement, and models are presented at four different scales of analysis (Chapters Four through Seven) prior to comparison.

Perceiving the Maya Area: A New Analytical Hierarchy

How scholars perceive divisions in the Maya area greatly effects their interpretations of cultural processes. In the early 20th century the Maya area was perceived as consisting of an Old Empire in the south and a New Empire in the north (Morley 1946). During the 1960s through the 1980s archaeologists noted regional variations in the Maya area, ranging from architectural styles to ceramic sphere divisions (Ashmore, ed. 1981). Recently distinct regions have been recognized based on the distribution of elite titles mentioned in the hieroglyphics (Stuart 1993). These examples serve to illustrate that how we perceive the Maya area effects the questions that we can address archaeologically.

In this study Clarke's concept of a nested hierarchy of analytical units for the archaeology of space and settlement provides the fundamental structure for the analysis of settlement patterns in the Maya area. The following proposed divisions were designed to place the San Bartolo-Xultun intersite survey, which represents the bulk of the raw data analyzed for this dissertation, into a series of increasing scales of analysis. This analytical hierarchy is derived from ecological (physiographic hierarchy) and archaeological (settlement hierarchy) interpretations, supplemented with the controlled use of epigraphic, ethnohistoric, and ethnographic data. Some of these divisions build on the previous work of other scholars, while others represent new divisions designed to facilitate interpretation at smaller scales of analysis. From narrowest to broadest, the divisions proposed for analysis are: the area, the territory, the adaptive region, and the alliance. With the exception of the area, the rest of these units were defined either as part of the settlement hierarchy or the analytical hierarchy. Below is a definition of areas and a brief revisit to the other analytical categories as they relate to the new analytical hierarchy.

Areas

The minimal units of spatial analysis in the Maya analytical hierarchy are areas, which represent the constituent components of a territory. Areas can be analyzed independently or as a representative portion of the total territory. Areas are a combination of settlement and microenvironmental components. For example, a minor center located on a *bajo* island would be an area of analysis that would incorporate the site as well as the different vegetation classes found in relation to the site. Another example of an area is the intersite area between two sites. An intersite area is a large tract of land made up of diverse terrain and vegetation types, which correlate with different forms of ancient settlement remains. It is the area concept, and the need to contextualize the San Bartolo-Xultun intersite area, that led to the formulation of this entire analytical hierarchy.

Areas can overlap depending on the archaeological questions being addressed. For example, a small site within an intersite area can be considered an area in and of itself. Areas can also be defined by minor physiographic constraints: a group of small islands within a single *bajo* could be considered an area for analysis. The area concept is flexible so that researchers can divide up territories into many configurations that will help to see the whole picture from multiple perspectives. In Clarke's (1972, 1979) terms this would facilitate the creation of different models to test and compare. The area divisions for the San Bartolo-Xultun territory are specific to this dissertation and other project members may choose to divide the territory differently. More than any other category in this hierarchy the area concept is a tool, applied subjectively by the researcher, to facilitate the analysis of a complex and diverse settlement system. Chapter Five presents the San Bartolo-Xultun intersite area as a case study for settlement pattern analysis at the areal scale.

Territories

The territory is the most crucial level in the analysis of settlement because it represents the largest, most stable independent sociopolitical organization of the ancient Maya (see above). A territory represents the sum of its constituent areas both in terms of microenvironmental and settlement diversity. The boundaries of the territory are determined by microenvironmental boundaries, physiographic province boundaries, and local physiographic features such as deep arroyos, rivers, and *bajos*. The placement of these boundaries are based on the spatial relationships between territorial capitals, which are identified by applying statistical analyses to sites in the settlement hierarchy. Once two adjacent capitals have been identified, the most appropriate territorial boundary can be drawn based on the physiography, rather than drawing Thiessen polygon lines at the halfway point between two sites (Hammond 1974; Mathews 1991).

Territories may be studied in two ways. The internal analysis of a territory consists of understanding the relationship of the minor centers to the capital, as well as looking at change internal to the territory through time. The external analysis of territories involves looking at the relationships between territories, focusing principally on interactions between royal elites and therefore, the territorial capitals. An example of an internal territorial analysis is presented in Chapter Five, with the San Bartolo-Xultun territory being the case study. External analysis of territories requires looking at larger scales of the analytical hierarchy.

Adaptive regions

Adaptive regions are "areas within the greater Maya Lowlands that have environmental characteristics distinct from adjoining areas" (Dunning, Beach, Farrell, and Luzzadder-Beach 1998: 87). Their boundaries are determined by their constituent physiographic provinces. Adaptive regions also define some degree of regional cultural affiliation. Sites within an adaptive region are all faced with subsisting in a shared environment. Maya living in an adaptive region requiring the successful exploitation of *bajo* resources had a different perception of their environment then other Maya groups living in an adaptive region made up of lacustrine watersheds. The shared communal perception of environment and subsistence strategies internal to the adaptive regions fostered localized cultural affiliation even if two territories were in political conflict. Chapter Six explores these adaptive regional affiliation networks by using the Three Rivers region as a case study.

Alliances

There were times, especially during the Classic Period, when Maya territories would ally themselves in larger groups expanding beyond adaptive regional boundaries. These macropolitical organizations have variously been called superstates (Martin and Grube 1995), overkingships (Martin and Grube 2000), galactic polities (Demarest 1992), and large regional states (Adams 1995; Marcus 1993). Nevertheless, even during these times of unity, the fundamental political organization of the Maya was at the level of the territory. I therefore have called these units of broader political affiliation alliances. This term reflects the nature of this political interaction, which was a union of territories formed for mutual benefit. Members of an alliance shared a common goal whether it be economic or military. Alliances were inherently unstable because they were simply an extension of elite political networks (Martin and Grube 2000:20) rather than a broader form of affiliation that may have effected more classes in the local sociopolitical hierarchy. Chapter Seven uses the Tikal Alliance as a case study to examine broad Maya settlement patterns from the perspective of a single political organization.

Clarke's Nested Hierarchies and Maya Sociopolitical Organization

The four-tiered hierarchy described above is an application of David Clarke's nested hierarchies of analytical units to the Maya area. In Clarke's (1972) Iron Age model he presented a four-tiered hierarchy, roughly equivalent to the four-tiered hierarchy presented here. A fifth tier in the Maya hierarchy would be the Maya area as a whole. The Maya analytical hierarchy encapsulates aspects of both the settlement and the physiographic hierarchies which were related, but not equivalent.

In Hammond's (1972) application of Clarke's theories to Lubaantún, he employed a four-tier hierarchy which included: 1) the ceremonial center; 2) the settlement area and exploitation area; 3) the 'realm' of control of Lubaantún; and, 4) the Maya Central Area. The first and second tiers of Hammond's hierarchy can either be conflated into a single area under my definitions or be assigned numerous areas based on the investigator's perception of the research universe. Hammond's third tier, or 'realm', is analogous to the territory concept used here. The Lubaantún model then posits that a number of different 'realms' would have made up the Maya Central Area (as defined by Thompson 1966: 19-27), which in turn represented a portion of the total Maya area. Hammond's (1972) study is to be applauded for its application of a locational model to Maya settlement studies.

The 'realm' and the territory are conceptually analogous as the building blocks of Maya settlement. I choose to use the term territory because it refers to the area of land under the capital's control as opposed to realm, which is a generic term for a kingdom. The territory term fits well with the spatial arguments made earlier regarding how these entities can be defined. Besides the change in terminology, the hierarchy used in this dissertation contains considerable refinement from the original Lubaantún model. The reasons for these refinements are a combination of more detailed analyses of Maya land use (Dunning and Beach 1994; Dunning, Beach, Farrell, and Luzzadder-Beach 1998, Fedick 1996) and vegetation patterns (Kunen et al. 2000) in recent years, as well as the successful application of GIS (Estrada-Belli 1998) and remote sensing technologies (Garrison et al. 2004; Saturno, Sever, Irwin, and Howell 2006; Saturno et al. 2007; Sever and Irwin 2003) to issues of Maya settlement. Further detail is added to the new analytical hierarchy by the incorporation of epigraphic data from Maya texts, which had not been deciphered when Hammond proposed his locational model.

Hammond (1991b) later referred to his work at Lubaantun (Hammond 1972) as a “bottom-upwards” approach because it began with the ecology and economic resources of the lowlands to define the “realm” of Lubaantun. He contrasts this with “top-down” approaches that have focused on the distributions of monuments and epigraphic evidence to define polities, and “sideways” approaches that use ethnographic analogy to accomplish the same goal. At first glance the territory concept represents an inherently “bottom-upwards” approach, which Hammond (1991b:15) himself criticized as being too dependent on spatial patterns. Although, the territory may also be considered “top-down” because the presence of Emblem Glyphs, as well as a modified form of rank order analysis (see Chapter Six) were crucial in determining around which sites territorial boundaries would be drawn. The territory concept is also, to a somewhat lesser degree, an example of the “sideways” approach because ethnographic analogy to modern Maya populations was used to determine where boundaries should be drawn. In this sense the territory concept used in this dissertation is the embodiment of a conjunctive approach as outlined by Fash and Sharer (1991).

The levels defined in the present analytical hierarchy are flexible for two reasons. First, it has been proven that the Maya lived within a dynamic environment that went through a number of natural and anthropogenic changes in the over two thousand years that represent the Middle Preclassic to Terminal Classic Periods (Dunning et al. 2002; Hansen et al. 2002). Therefore, the categories of analysis must be able to accommodate what was a changing landscape. Second, the Maya themselves were, and are, an adaptable culture that constantly adjusted to their changing surroundings as a cultural survival strategy (Farriss 1984). They are a dynamic culture (Marcus 1992, 1993, 1998) in an actively changing environment and any classificatory system of analysis must account for these two factors. In this sense the territory, in particular, is analogous to Clarke's (1968) concept of a polythetic entity where similar objects can be grouped together without having to be made up of identical attributes. Territories range in size and shape, and probably sociopolitical power and economic production, but remain identifiable as similar units. This is similar to the way that New York, New York, Kansas City, Missouri, and Little Rock, Arkansas are all called cities despite having populations ranging from over 7 million to under 200,000. Or how Delaware, California, and Hawaii are all considered to be states despite drastic differences in size, shape, and economy. This is not to imply that western forms of social organization should be imposed upon the ancient Maya, but rather to demonstrate some well-known flexible concepts.

The adaptability of the Maya was derived from their complex sociopolitical organization that functioned at a number of levels. The hierarchical units of analysis defined above do not have to reflect an exclusively hierarchical sociopolitical organization. That being said, the lowland Classic Maya were, in fact, a primarily hierarchically organized culture, but other forms of sociopolitical organization were present depending on the scale of analysis. The heterarchy concept as defined by Crumley (1987, 2003) has recently been applied to the Maya area, and in particular the Three Rivers region (Scarborough et al., eds. 2003). In this application heterarchy is considered to be a flexible concept that is not mutually exclusive of hierarchy but rather incorporates it (Scarborough et al. 2003).

Scarborough and Valdez's (2003: 8-9) application of heterarchy to the Three Rivers region implies that there were interdependent relationships between sites of all sizes even when one site politically controlled others. Though, a more likely scenario seems to be that interdependent, heterarchical exchange networks were embedded into what was a fundamentally hierarchical system. Arthur Demarest (1989, 2004:17-20) has described Mesoamerican civilizations as participating in a "lattice of ongoing exchanges of information, iconography, and scientific knowledge, moving in multiple directions between emerging elites in each region" (Demarest 2004:18). Here it is posited that Demarest's (1989, 2004) lattice concept can be applied to multiple levels in the analytical hierarchy.

For example, the areas that make up a territory, with the exception of the dominant center's area, probably maintained interdependent, heterarchical relationships with one another while at the same time being subordinate to and dependent on the territorial capital (Figure 1.2). Exchange with the capital in the form of tribute is not considered to be a heterarchical interaction even if the capital depends on the tribute for its survival and is reciprocating the exchange by providing certain goods, ritual services and protection to its dependents. This exchange cannot be considered heterarchical since there would be retribution if the dependent center refused to offer tribute. In a higher level of the lattice, the elites of a territorial capital participated in heterarchical networks with other territories within its adaptive region. Heterarchies were embedded within hierarchies in what, from the Late Preclassic onward, was a fundamentally hierarchical form of sociopolitical organization.

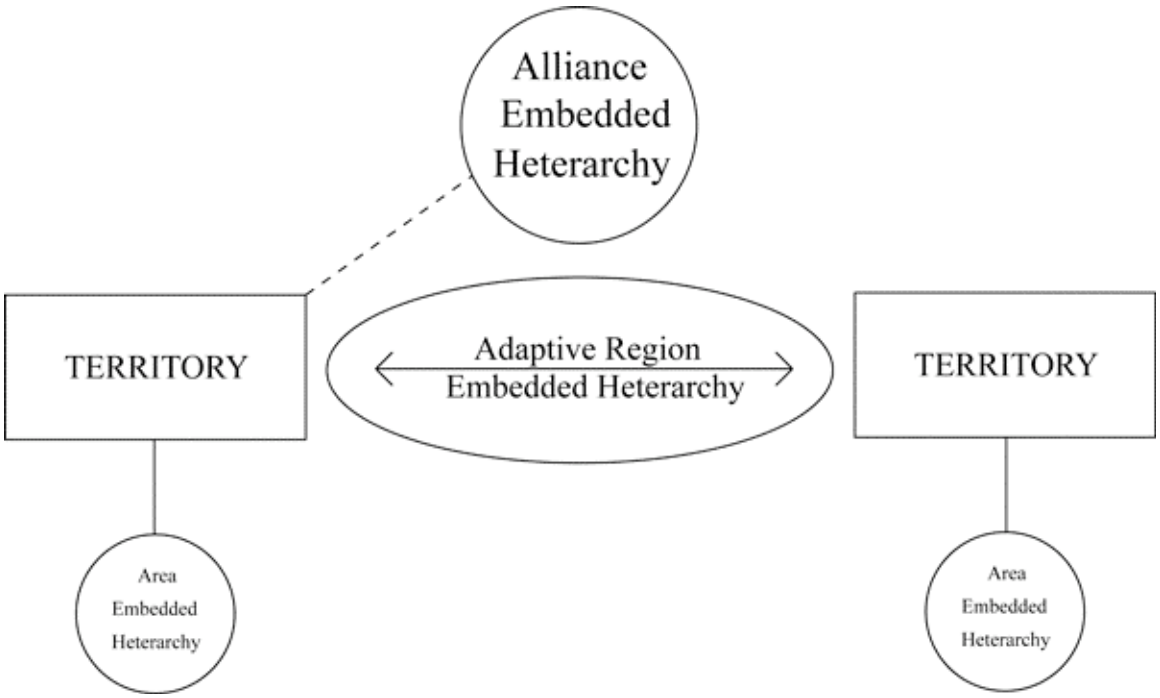

Figure 1.2. The Embedded Heterarchy Model

Landscape Ecology Theory, Heterarchy and Hierarchical Dynamics

David Clarke's theoretical perspective has provided the analytical structure for the current analysis. Nevertheless, the structure alone is not capable of explaining changes that occurred in over two thousand years of ancient Maya Preclassic and Classic culture. There needs to be a component of the theoretical framework that addresses the heterarchical aspects of Maya organization mentioned above. As part of the recent ecologically-based studies of the Maya area, Scott Fedick (ed. 1996) has interpreted the landscape as a managed mosaic of diverse resources. Fedick borrowed concepts from landscape ecology to explain spatial heterogeneity in the Maya landscape. Here landscape ecology, as a heterachically-oriented theory, is used to explain dynamics within the structural hierarchy. Given that the Maya incorporated both forms of sociopolitical organization into their settlement it is appropriate to combine hierarchy and heterarchy theories to explain change.

Landscape ecology is concerned with structure, function, and change in the heterogeneous landscape. The *structure* is the composition of all resources that make up the landscape. *Function* represents interactions in the environment, and *change* is seen as the environmental and human-induced changes that effect the structure and function (Fedick 1996:336). These concepts can be applied to the different levels of the analytical hierarchy presented above.

The *structure* of any given level in the hierarchy is equivalent to the sum of all of the units in the next lowest scale in the hierarchy. For example, the *structure* of a territory is equivalent to the total size and composition of all of its areas. In the broadest application of this principle, the *structure* of the entire Maya area is defined by the 31 adaptive regions of which it is composed. The *structure* concept of landscape ecology provides a theoretical link between the proposed hierarchical divisions, which are based on Clarke's work, and the more heterachically oriented landscape ecology theory.

Function within the proposed analytical hierarchy represents the day-to-day interactions that allowed the Maya to sustain themselves. This includes the heterarchical interactions between units within the same level in the hierarchy, as well as peaceful transactions made between units in a hierarchical relationship. An example of this latter form of transaction would be a ritually reciprocated tribute payment in which the elites receiving tribute provide ritual nourishment to their subjects. Theories of the heterogeneity of landscape argue against a higher level bureaucracy as a form of organization because in this type of environment adaptation occurs at the local level, based on the suite of resources available (Fedick 1996:338-342). This does not have to be true. The vast majority of recognized transactions were conducted in a heterarchical fashion especially among hinterland populations that represented a significant portion of the total populace. The concept of *function* can incorporate both heterarchical and hierarchical interactions as long as they do not alter the *structure* of the entities involved in the interaction.

Change is what happens when the *structure* of the hierarchy is effected. Alterations in the *structure* also cause changes in patterns of interaction as defined by the *function* concept. *Change* can refer to both environmental and anthropogenic changes that effect the *structure* of the hierarchy. Examples of environmental change are: drought, deforestation, erosion, el Niño events, or increased seasonality. Some of these environmental changes are actually anthropogenic (i.e. deforestation) or are natural processes accelerated by humans (i.e. erosion) but, because they represent changes to the physical environment, they are classified under environmental change. Anthropogenic changes to the *structure* of the settlement hierarchy often relate more to political events that *change* the relationships manifested within the hierarchy. Examples of these changes are: warfare, accessions of charismatic leaders, exogamous marriages, changing tribute patterns, changing trade routes, and entrance into an alliance.

Change represents major shifts in Maya settlement patterns. These shifts have been detected archaeologically by identifying ceramic associations with building phases and spatial distributions of architecture (Ford 1981, 1986; Haviland 1963; Puleston 1973, 1983; Willey et al. 1965). The concept of *change*, as defined in landscape ecology theory, provides a mechanism to explain these shifts in settlement patterns. Explanations are posited based on a holistic approach to interpreting the past. That is to say that physical geographical (remote sensing), paleoenvironmental, archaeological, and epigraphic data need to be considered to identify the factors most relevant to causing any given shift in settlement patterns. *Change* is always multicausal, but major factors can be isolated to categorize the type of change occurring at any given time, at any scale. Once these changes are isolated patterns may be detected by examining categories of change through time and space.

The Embedded Heterarchy Model: A Hierarchical Approach

The theoretical framework of areas, territories, adaptive regions, and alliances was designed to place data from the San Bartolo-Xultun intersite area in a regional context. This analytical hierarchy incorporates many scales of analysis with multiple entities from one level joining together to form a single entity at a higher level. The territory is the fundamental building block of the Maya area, and there is evidence that this was the case during the Classic Period, even during moments of broader political alliance. The intersite area can only be considered in terms of the two dominant centers to which it was related: San Bartolo and Xultun. While people living within the intersite area were undoubtedly dependent upon these two centers, especially Xultun, they also would have maintained heterarchical exchange networks with other areas within the territory in order to diversify their resource base (Dunning et al. 2003).

A lattice-like exchange network (Demarest 1989, 2004) subsumed under the control of a large center is here defined as an *embedded heterarchy*. At the most basic level, embedded heterarchies were the sustaining force of every territory in the Maya area. The hinterland population harvested resources from throughout the territory providing for themselves as well as the population of the territorial capital. An embedded heterarchy also existed among the territorial elites within adaptive regions. This heterarchy manifests itself in shared elite material culture as well as in the exchange of ideas resulting from a common perception of local regional environmental diversity. Ideational exchange is evinced not only in texts and iconography, but also in site planning principles (Ashmore 1986, 1989, 1991, 1992; Ashmore and Sabloff 2002; Houk 1996, 2003). These exchanges highlight regional idiosyncrasies in sociopolitical organization as well as ideological variability. During the periods of large alliances, interregional groups of territories made up an embedded heterarchy whose interactions contributed to a sense of shared affiliation with the larger alliance. Other territories chose to maintain their independent status. The organizational principles of the embedded heterarchy model are diagrammed above in Figure 1.2.

Embedded heterarchies were the driving force behind a predominantly hierarchical system. The complexity of this form of organization requires a theoretical model that can account for both types of relationships. In this study the heterarchically-based landscape ecology theory is considered to be embedded within an analytical hierarchy of settlement units derived from David Clarke's (1979) concept of a nested hierarchical model for archaeological taxonomy. The landscape ecology concepts of structure, function, and change are used to explain order in the analytical hierarchy. The change concept is particularly important for tracking spatial and temporal variability as well as providing a mechanism for explaining major shifts in settlement through time. The conflation of these two approaches created 'hierarchically nested heterarchies'. I have simplified this term, instead calling it the embedded heterarchy model.

The remainder of this dissertation examines methodological issues pertaining to the remote sensing and GIS applications in Maya archaeology while simultaneously presenting four case studies for each of the levels in the analytical hierarchy defined in this chapter. Chapter Two looks at the long histories of research in various fields that contributed to the conception of this dissertation. The history of settlement pattern research, particularly in the Maya area, as pioneered by Gordon Willey (1953; Willey et al. 1965), provided the background for integrating the San Bartolo-Xultun intersite data into the broader context of lowland Maya settlement organization. The history of remote sensing in tropical environments aided in structuring the research design for the field component of this investigation (Garrison et al. 2004; Saturno et al. 2006; Saturno et al. 2007; Sever 1990, 2000). The history of the role of environmental studies in the Maya lowlands helped in clarifying the complex issues debated by scientists from other fields and facilitated the integration of environmental data into the settlement interpretations at all levels (Fedick, ed. 1996; Gómez-Pompa et al. 2003; Pohl, ed. 1985). Summaries of previous studies in these three areas—settlement patterns, remote sensing, and environment—are given, followed by a history the San Bartolo Regional Archaeological Project of which the current study was a part.

New methodologies were implemented in this research that will have implications for future investigations of Maya settlement patterns. New remote sensing technologies were systematically integrated into the settlement survey of the San Bartolo-Xultun intersite area (Garrison et al. 2004; Sever and Irwin 2003; Saturno et al. 2007). Part of the research design of this project was to test the accuracy of interpretations developed by the San Bartolo Regional Archaeological Project for the IKONOS and QuickBird satellite images, provided by Thomas Sever and Daniel Irwin of the Marshall Space and Flight Center, NASA. These images combined with topographic data provided by the Shuttle Radar Topography Mission (SRTM) were used to refine the definition of what the survey universe should be for the investigation of a Maya intersite area as originally defined by Dennis Puleston (1974). The use of a high-resolution Global Positioning System (GPS) in combination with more traditional methods of ground survey influenced the survey sampling strategy in the San Bartolo-Xultun intersite area and demonstrated the advantage of surveying stratified random blocks distributed throughout the newly defined survey universe, as opposed to the more conventional method of transect survey (Garrison 2005a, 2006). Remote sensing data were also used to generate broader categories of settlement analysis as defined in the theoretical framework of the dissertation. The research design and stages of field research are presented in Chapter Three in conjunction with the methodological issues encountered throughout the duration of the investigation.

Chapters Four to Seven examine the San Bartolo-Xultun intersite area, the San Bartolo-Xultun territory, the Three Rivers adaptive region, and the Tikal Alliance using the embedded heterarchy model defined above. This model has been designed to explain the role of the San Bartolo-Xultun intersite area in a broader context and to generate future research questions in Maya archaeology. The bulk of the primary data for this dissertation come from four field seasons of survey and excavation (2002-2005) conducted as part of the San Bartolo Regional Archaeological Project. During this time an intersite survey between San Bartolo and Xultun (a large uninvestigated site to the south) was carried out to investigate issues of population dynamics in the region and to test new remote sensing based methodologies (Garrison 2005a; Garrison et al. 2004). An excavation program that sampled cultural remains and environmental zones in a series of 56 test pits accompanied the intersite survey program. The intersite settlement and excavation data are presented in Chapter Four as a case study for the investigation of an area in the analytical hierarchy.

In addition to the intersite investigation, the site of San Bartolo, famed for its Late Preclassic murals, was mapped and numerous excavations by members of the project were conducted throughout the site addressing various research questions (see Chapter Two). The intersite data is used in conjunction with survey and excavation data from San Bartolo, epigraphic and iconographic data from Xultun (Garrison and Stuart 2004), and environmental data from the region (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006) to present a complete picture of settlement dynamics in and around the San Bartolo-Xultun territory. The bulk of this data and its accompanying interpretations are presented in Chapter Five as a case study of an ancient Maya territory.

Chapter Six integrates the San Bartolo-Xultun territory data with recent research carried out in the Three Rivers adaptive region of Belize and northeast Guatemala (Adams 1999; Guderjan, ed. 1991; Hammond and Tourtellot 2004; Scarborough et al., eds. 2003), providing a comparative database to examine overall settlement patterns within the adaptive region in which San Bartolo is also located. Using a modified rank ordering system of sites (Guderjan 1991a), combined with statistical analyses, territorial capitals are identified and boundaries are drawn. This analysis is used to model the cultural and ecological history of the Three Rivers region as a case study of an adaptive region.

The settlement interpretation of the overall adaptive region from Chapter Six is then placed within the wider context of lowland Maya settlement patterns as seen from the perspective of the Tikal Alliance. Chapter Seven considers the settlement history of a broad swath of the Maya lowlands defined by those sites that at one point allied themselves with Tikal. Interactions among these sites, as well as with the great metropolis of Teotihuacan shaped the course of Maya civilization. A model for the development of lowland Maya civilization from the Middle Preclassic to the end of the Terminal Classic from the perspective of the Tikal Alliance is presented with the goal of stimulating new research ideas while supporting the embedded heterarchy model.

Overall conclusions are presented in Chapter Eight. Methodological conclusions related to intersite archaeology and remote sensing are summarized. Interpretive conclusions relating to the use of scales of analysis in archaeology, as well as the archaeology of transitional periods are presented using examples from the models proposed in Chapters Four through Seven. Finally, some ideas for future research designs and hypotheses are presented as an outgrowth of the data and interpretations presented in this dissertation.

Chapter 2: History of Research – Settlement Patterns, Environmental Studies, Remote Sensing, and the San Bartolo Regional Archaeological Project

Introduction

This chapter outlines the history of archaeological research that provides the methodological and intellectual context of this dissertation. The map in Figure 2.1 shows most of the major sites mentioned in this chapter. Studies concerned with settlement patterns, environment, and remote sensing are highlighted to present the multidisciplinary trajectory of the current investigation. This is followed by a history of the San Bartolo Regional Archaeological Project. Finally the contributions of the history of research to the current study are synthesized.

This chapter is primarily focused on the Maya area with references to work in other areas of Mesoamerica. The Maya participated in a wider Mesoamerican interaction sphere (Kirchhoff 1943) and comparisons with the other cultures that coexisted and interacted with the Maya are essential to our understanding of their history. Excellent, comprehensive, and current summaries of Mesoamerican settlement pattern studies are provided by Nichols (1996) and Kindon (2002). Trigger (1989) places settlement pattern studies within their overall theoretical context in the history of archaeology. Dena Dincauze (2000) provides a good overview of the use of environmental studies in archaeology and Thomas Sever (1990, 2000) has done extensive research into the history of remote sensing applications in archaeology. The current summary is not intended to be exhaustive but rather to indicate what projects have had influences on the present work.

The three fields of settlement patterns, environment, and remote sensing studies have been incorporated into research in the Maya area since the early 20th century. Here

Figure 2.1. Map of the Maya area showing locations of most major sites mentioned in text.

Dzibilchaltun
Labna
Tulum
Río Bec
Calakmul
Nohmul
Pullrouser
Swamp
Cuello
Río Azul
La Milpa
El Mirador
San Bartolo
Xultun
Palenque
Uaxactun
Nakum
Tikal
Holmul
Piedras Negras
Motul de
San Jose
Yaxha
Barton Ramie
Yaxchilan
Ucanal
Caracol
Altar de
Sacrificios
Seibal
Dos Pilas
Machaquilá
Lubaantun
Copan

historical development of these subjects is divided into four periods each characterized by different levels of multidisciplinary integration and theoretical paradigms. The major divisions between periods are marked either by influential projects that represent paradigm shifts in archaeological theory and methodology, major interpretive or technological breakthroughs, or both. I created the divisions used here to represent key moments in the development of Maya archaeology that contributed to the orientation of the current research.

The Descriptive Period (before 1954) is characterized by studies that were concerned with the basic cataloging of archaeological and environmental traits in the Maya area. Perhaps the most important contribution of these early projects was the establishment of a working cultural chronology for the Maya area. Although they were not the only institution making early contributions to the development of Maya archaeology, scholars of the Carnegie Institute of Washington's Division of Historical Research had a profound effect on Maya studies during the first half of the 20th century.

The Processual Period (1954 to 1985) is marked by the inception of the Belize Valley settlement survey by Gordon Willey in 1954 (Willey et al. 1965). The Belize Valley project was the first to systematically collect settlement data within the context of a goal-oriented research program defined by explicit theoretical underpinnings. Willey did not consider himself to be a processualist (William Fash, personal communication 2007), but his settlement pattern approach would be adopted by many archaeologists involved in the theoretical revolutions of the 1960s. In terms of Maya archaeology, the Belize Valley survey was a major shift away from the descriptive studies conducted primarily by the Carnegie Institute of Washington. Studies during the Processual Period were strongly influenced by the scientific orientation of archaeological theory that was prevalent as part of the “new archaeology” (Binford 1962). The “new archaeology”, or processualism, saw a shift away from the descriptive archaeology that had been standard during the previous period and replaced it with a focus on describing, and explaining culture change. The theoretical paradigm advocated by the “new archaeology” was developed by archaeologists studying hunter-gatherer societies and was difficult to apply to more complex societies in its original form (Sabloff 1983). Nonetheless, the application of more rigorous, scientific methodologies to the archaeological record sparked new developments in interpretations. This time period saw the first true multidisciplinary research in the Maya area, conducted within the context of modern archaeology.

The Processual Period gave way to the Contextual Period (1985 to late 1990s) in 1985 with the inception of the Copan Mosaics Project, directed by William Fash of Harvard University. The Copan Mosaics Project and its successor, the Copan Acropolis Archaeological Project, set out to integrate iconographic and textual data with more familiar archaeological data in a conjunctive approach to Maya archaeology (Fash and Sharer 1991). These projects developed out of a succession of projects at Copan that followed Gordon Willey’s (1980) original call for a more holistic approach to Maya studies. These included Willey’s own project, as well as multidisciplinary projects directed by Claude Baudez (1983) and William Sanders (1986). Fash’s projects and the Contextual Period in general coincide with the emergence of the ‘postprocessual critique’ in archaeology in which Ian Hodder proposed contextual archaeology as an alternative to processualism (Hodder 1982, 1985, 1986). This approach attempted to more thoroughly integrate the humanistic aspects of cultures into archaeological interpretation. This placed the Copan work within the broader framework of emerging archaeological theory. Postprocessualism developed as a response to what many viewed as the scientific excesses of processual archaeology. An intensified reliance on abstract statistical methods and materialistic interpretations by the "new archaeology" led postprocessualists to adopt methods that attempted to address cognitive (Renfrew and Zubrow 1994) and ideological aspects of culture.

In the Maya area, a significant factor in the transition from the Processual Period to the Contextual Period was the rapid decipherment of Maya hieroglyphic writing and the resultant great increase in ideological and political data (Coe 1992; Stuart 1992). The new data provided by the decipherment of Maya glyphs demanded a new approach to integrating the increasingly multivariate data sets now available. Projects that characterize the Contextual Period successfully changed the orientation of their research to incorporate this new ideological and historical information.

The final historical period is the Contemporary Period, which begins in the late 1990s and continues to the present. The boundary between the Contextual and Contemporary Periods is not as clear as the divisions between other periods because this final shift is marked by the gradual incorporation of new highly technological tools into the methodological approaches of projects. The same focus on a holistic approach is maintained but with the aid of such tools as Geographic Information Systems (GIS), Global Positioning Systems (GPS), and a slew of new remote sensing technologies that are effecting the way in which projects are conceived and managed. The current research, as a part of the San Bartolo Regional Archaeological Project, was conceptualized within this intellectual environment.

The Descriptive Period (before 1954)

The Descriptive Period was characterized by early exploratory investigations and large scale projects primarily concerned with establishing cultural chronology. This period has sometimes been referred to as the Carnegie Period in Maya archaeology (Ashmore and Willey 1981). While the Carnegie Institute of Washington (CIW) was undoubtedly the dominant institution at the time, this designation detracts from other important contributions made during this formative academic period, particularly those of the Peabody Museum of Harvard University, the University Museum of the University of Pennsylvania, and the Middle American Research Institute of Tulane. The CIW Division of Historical Research was housed next door to the Peabody Museum so while the institutions were independent of each other, their scholars maintained close collegial relationships.

Projects during this period were highly descriptive in nature. Settlement pattern, environment, and remote sensing studies were all oriented towards describing what the ancient Maya were like, and the nature of the world in which they lived. Important investigations into Maya settlement were realized during the Descriptive Period (see below). Since the projects did not have explicit theoretical orientations towards settlement patterns, however much of the modern value of these studies has come from applying the old data to new models. Some of the most important contributions of this period were the identification of the kinds of structures that the Maya built at their sites and how these changed over time and space.

Perhaps the first early settlement pattern study was that of Edward H. Thompson at Labna, who investigated small mounds to prove that they were not communal dwellings but instead represented private homes (Thompson 1892). Thompson assumed that small mounds represented the houses of the ancient Maya based on their great numbers. This concept, which argues that the most common settlement type represent the houses of ordinary people, has since been termed the *principle of abundance* and is still influential today (Ashmore and Willey 1981:6). Thompson also compared his archaeological findings to modern Maya households, thus making an early ethnographic analogy to support his archaeological interpretations. Another important early study was that of Alfred M. Tozzer, of the Peabody Museum, who noted housemounds from muleback during his early work based at the Classic site of Nakum (Tozzer 1913). Tozzer's study may be considered the first intersite survey as he noted mounds between major centers, rather than just focusing on the monumental architecture of sites. Tozzer's study was limited by his methodology: muleback surveys are not systematic as they follow pre-existing trails and visibility is limited due to the dense jungle vegetation (Rice and Puleston 1981). Between 1910 and 1914, Raymond Merwin worked at the site of Holmul in the eastern Peten, Guatemala. This project represented the first stratigraphic excavation of a Maya site and provided a great amount of data for early chronological studies of Maya settlement (Merwin and Vaillant 1932). Ashmore and Willey (1981:6) also cite early work in the southeast Maya area (Gordon 1896; Hewett 1912) and at

Tulum (Lothrop 1924) as important early settlement patterns studies prior to the huge projects of the Carnegie Institute of Washington.

A major breakthrough in regional settlement data collection came from Sylvanus G. Morley's monument-finding expeditions in the 1920s and 1930s in which he created site maps and described the ruins he visited as part of his documentation of Maya hieroglyphic inscriptions (Morley 1920; 1937-1938). Morley's explorations, on behalf of the CIW, helped give an idea of the distribution of large Maya sites with inscriptions throughout the lowlands of the Peten as well as the Copan Valley.

J. Eric S. Thompson (1931, 1939) can be credited with the early investigation of smaller Maya sites in what was formerly British Honduras (now Belize). Thompson's awareness of different sizes of settlements demonstrated an early interest in understanding relationships between centers and settlement hierarchies. Another Carnegie scholar, Oliver Ricketson, surveyed four cruciform transects radiating out of the center of Uaxactun as an early attempt at a settlement pattern survey (Ricketson and Ricketson 1937). Ricketson's settlement data was then analyzed by Robert Wauchope who used excavation and ethnographic analogy to argue for the domestic function of mounds peripheral to Uaxactun's center (Wauchope 1934, 1938). Wauchope proved that most small mounds were housemounds based on their domestic artifact assemblages and similarities to modern Maya houses. His study was more rigorous and more intensive than Edward Thompson's earlier excavations at Labna.

Environmental studies were as equally descriptive in nature as their contemporary archaeological counterparts. Mary Pohl (1985) characterizes the Descriptive Period as one of exploration and early data collection in highlighting cooperation between archaeologists and environmental scientists. O. F. Cook made an early trip to the Peten to make botanical collections in 1922 (Pohl 1985:3). Just as archaeologists were concerned with describing the types of structures that made up a Maya site, biologists were interested in describing the species and other aspects of ecology that made up the lowland environment.

The Carnegie archaeologists were complemented by a team of environmental specialists from the University of Michigan Museum of Zoology. Pohl (1985:3) notes that data was collected on vegetation (Bartlett 1935; Lundell 1937), mammals (Murie 1935), birds (van Tyne 1935), herpetofauna (Stuart 1935), fish (Hubbs 1935), and mollusks (Goodrich and van der Schalie 1937). The data collected by these scholars were primarily of modern specimens and the work was conducted under what is now known to be the erroneous assumption that the environment was the same as it had been during the period of ancient Maya occupation. The idea of a static lowland environment was suggested by Page (1933) and was quickly accepted by archaeologists because a static environment would remove an otherwise complex variable from models of cultural development. This was consistent with uniformitarian principles defined by 19th century geologist Charles Lyell, which argued for long periods of stability, which is how archaeologists developed stratigraphic principles for interpreting the past (Trigger 1989:92-93). A notable exception to this assumption was the work of C. Wythe Cooke at Uaxactun, which was published two years before Page's paper (Cooke 1931). In his investigations into *bajos* around that site, Cooke presented the hypothesis that the *bajos* were once lakes that had been filled in by erosion caused by Maya subsistence practices. This theory has been revived recently (Dunning et al. 2002), calling attention to the fact that complex debates concerning the environment of the Maya area need to be understood by archaeologists so that ecological data can be critically integrated into models and hypotheses.

The Descriptive Period also saw the first use of aerial photography in the Maya area as a remote sensing technique. Alfred V. Kidder and Col. Charles A. Lindbergh took aerial photographs of the Maya lowlands during a five day reconnaissance mission (Deuel 1969:187-213; Kidder 1930). Sever and Irwin (2003:113) call attention to the following quote in which Kidder described the purpose of the flights:

> And above all things we wished to get an idea of what the Maya country really looks like, for in spite of the fact that archaeologists have for many years been pushing their way into that region, they have been so buried in the welter of forest, their outlook has been so stifled by mere weight of vegetation, that it has been impossible to gain a comprehensive understanding of the real nature of this territory, once occupied by America's most brilliant native civilization [Kidder 1930:194-195].

This quote suggests the descriptive nature of studies that characterize this period. From the perspectives of archaeology, environment, and remote sensing, researchers were just trying to "get an idea" of what they were investigating through the collection and description of artifacts, species, and images.

If one figure could be considered as an embodiment of the Descriptive Period it would be Alfred V. Kidder, the director of the CIW Division of Historical Research. Kidder was responsible for organizing the archaeological expeditions to the Maya area but he was also instrumental in forming a partnership with the University of Michigan Museum of Zoology and inviting Lindbergh to conduct the aerial reconnaissance over the Peten. Kidder, prior to his work in the Maya area, had constructed the taxonomic system for ceramic classification in the American Southwest highlighting the chronological orientation of the period (Kidder 1924). The Descriptive Period provided an invaluable database that would be used to structure future projects in the Maya area. Still, both the Carnegie Institute and Kidder. personally, were eventually criticized for their lack of theoretical orientation in their approach to the archaeological record (Kluckhohn 1940; Taylor 1948).

Walter W. Taylor's (1948) critique of Kidder and other cultural historical archaeologists was a precursor to the focus on cultural processes that would become the hallmark of the "new archaeology" of the 1960s and later (Trigger 1989:275-279). Also toward the end of this period Gordon Willey was conducting the first systematic settlement pattern study in the Virú Valley of Peru following the suggestion of the cultural ecologist Julian Steward. It was the innovative Virú Valley research (Willey 1953) that earned Willey a job at Harvard as Alfred Tozzer's successor in the Maya area.

The Processual Period (1954-1985)

The Processual Period is characterized by scientific, problem-oriented regional projects in both the Maya area and Mesoamerica as a whole. Processualism, as a paradigm (Kuhn 1962) was not defined until Binford's (1962) work in the 1960s. Yet, following Taylor's (1948) critique of descriptive archaeology a number of new approaches were developed that were precursors to the formal processual movement. In the Maya area, this trend begins with Gordon Willey's Belize Valley settlement pattern study, which had its first season in 1954 (Willey et al. 1965). Willey's focus was on site interactions and changes in settlement patterns (Willey and Phillips 1958). Models drawing on ethnohistory and ethnology from Mesoamerica and beyond were used to explain regional settlement dynamics. The Processual Period also saw a growing interest in reconstructing the paleoenvironment, challenging the assumption that the environment in which the ancient Maya existed had remained static from the start of the Holocene up until the present. New airborne remote sensing technologies were applied to the issues of subsistence systems and the debate over intensive versus extensive agriculture (Harrison and Turner 1978; Siemens and Puleston 1972).

The settlement pattern approach developed by Willey (1953) in Peru and subsequently employed in the Old World, notably in Mesopotamia (Adams 1965), provided a new methodology for investigating the past at a time when there was a growing dissatisfaction with the state of theory in archaeology (Taylor 1948). Some scholars considered settlement pattern studies to be a new archaeological theory to be used at the highest level of interpretation (Rouse 1968). K. C. Chang (1968) argued that there did not need to be a single paradigmatic methodology to archaeology and that settlement patterns were just one methodology that could be appropriate in some situations. Willey (1968) espoused Chang's perspective, arguing that settlement studies represented a new approach within the "new archaeology" and that they did not stand on their own as a new theory. The idea of settlement patterns as one of multiple strategies for interpreting the past is the sense in which they are implemented in the current study.

The Belize Valley project had four specific goals that oriented survey and excavation: 1) to examine the relationship of occupations to natural environments; 2) to learn the nature and function of buildings composing habitation communities; 3) to understand the form, size, and spacing of habitation communities in relation to one another and to ceremonial centers; and, 4) to consider these problems in a chronological perspective (Willey et al. 1965). The explicitness of these goals was a deviation from previous patterns of research characterized by the CIW projects and others. Most of the work was conducted at the small site of Barton Ramie which had been cleared for farming. Although, survey and excavation were carried out on a smaller scale throughout the Belize River Valley giving the project a regional orientation, rather than a site-centric bias.

William Bullard, who was a member of the Belize Valley project, conducted his own muleback survey of the northeast Peten in 1958 (Bullard 1960). At this time Uaxactun was the northernmost known site in the northeast Peten. The survey included over 250 km of trails, although the actual area covered is estimated to have been 6.25 km^2 due to the width of the trails traversed and the visibility from those trails (Rice and Puleston 1981:130). Using his survey data, Bullard proposed a three-tier typology for Maya settlement consisting of: house ruins, minor ceremonial centers, and major ceremonial centers. This typology was organized into a settlement hierarchy of clusters, zones, and districts (Bullard 1960, 1964). These interpretations were based on the belief that the ancient Maya sustained themselves exclusively on extensive, relatively unproductive milpa agriculture and, therefore, had low populations. Although some of his assumptions were disproved very shortly after his publications, Bullard’s study was one of the first, along with Sanders’ (1960) Quintana Roo survey, to address Maya political organization archaeologically even before Tatiana Proskouriakoff made her important discoveries regarding the historical nature of Maya texts (Proskouriakoff 1960, 1963, 1964). While Maya inscriptions form the primary basis of our current understanding of Maya politics (Marcus 1976; Martin and Grube 2000; Stuart 1993), Bullard sought to tackle this issue archaeologically using settlement pattern studies.

Major issues were brought to the forefront of Maya studies by the publication of the map of Tikal (Carr and Hazard 1961). Issues of settlement density and subsistence systems dominated the field during the Processual Period as a result of irrefutable data that disproved the earlier theory that Maya sites had been vacant ceremonial centers. The great numbers and dense configurations of housemounds in the Tikal map suggested that the Maya had true cities but in a settlement pattern that was more dispersed than in other areas of early urbanism, such as Mesopotamia, Egypt, or the Indus Valley (Lamberg-Karlovsky and Sabloff 1995). A second issue was: if the ancient populations were so much denser than previously thought, what subsistence system could have supported the higher populations? Settlement patterns are an excellent analytical tool for looking at ancient populations, with ancient agricultural systems forming a vital part of the overall settlement system. Even so, environmental studies are needed in order to determine what crops were grown at what time and to confirm the interpretations of the agricultural system. The relationship between these two issues forced more problem-oriented, interdisciplinary research to be conducted during the Processual Period.

Members of the University of Pennsylvania Tikal Project, especially William Haviland, Dennis Puleston, Robert Fry, and Ernestene Green made great contributions to the understanding of Maya settlement that was emerging in the 1960s as a part of the "new archaeology". In a report to the National Science Foundation, these authors described the Tikal Sustaining Area, which was defined as the whole area surrounding Tikal that would be necessary to sustain the large estimated population (Haviland et al.

1968). Haviland conducted extensive excavations of residential compounds (Haviland 1963, 1965). Puleston conducted a cruciform peripheral survey of Tikal as well as the first defined, systematic intersite survey in the Maya area between Tikal and Uaxactun (Puleston 1973, 1974, 1983). Fry directed a major test pitting program that accompanied Puleston's survey (Fry 1969), while Green investigated the small center of Navajuelal within the Tikal National Park boundaries (Green 1970). This project began a period of intense data gathering in lowland archaeology that had been called for by Willey (1956a:113-114) and Vogt (1956:181-182) in the 1950s. Haviland (1966) felt this was necessary in order to test new theoretical models that were being presented on Maya social organization.

The Middle American Research Institute's Dzibilchaltun project, directed by E. Wyllys Andrews IV, in northern Yucatan, provided a second strong case for dense Maya settlement and urbanism during the Classic Period (Kurjack 1974). While the Postclassic site of Mayapan was acknowledged as a dense settlement, it was generally believed that Classic occupation in the northern lowlands was relatively light. The Dzibilichaltun survey and test pitting program disproved this assumption. Kurjack (1974) also studied the different architectural forms present, which was made easier by the thin Yucatecan soil that had made for unusually good preservation. He concluded, like the Tikal archaeologists, that Maya social organization was highly complex with many classes arranged in a social hierarchy. This meant that Tikal could not be considered the exception to the rule and that the pattern of dense settlement was present in both the southern and northern lowlands during the Classic Period.

Gordon Willey had different ideas about the nature of Maya social organization and directed projects in the Pasión region to collect data for his own models. Willey's project at Altar de Sacrificios (Willey and Smith 1969) was, at the time, still operating under the assumption that the Maya subsisted on swidden agriculture and utilized a two class model of Maya social organization with elites supported by a large peasantry (Ashmore and Willey 1981). The Pasión work is credited for its regional, rather than site-centered investigation, which was more in line with the original approach to settlement pattern studies. The Tikal and Dzibilchaltun work, while important, focused mostly on large, individual sites.

The interest in collecting settlement data was not restricted to the Maya lowlands. Ken Brown (1975) conducted a settlement survey in the Valley of Guatemala in the mid-1970s as part of his doctoral research at The Pennsylvania State University. This study focused on the site of Kaminaljuyu and the surrounding settlement. Brown's (1975:293-294) most important arguments were that the Valley of Guatemala functioned as a "polypolitical port of trade" and that the valley was not conquered by Teotihuacan. This was one of a number of studies from the 1970s that were interested in unraveling the complex relationship between the Guatemalan highlands and Teotihuacan (Sanders and Michels 1977).

As the interests of archaeologists diversified and the amount of settlement data from all over the Maya area increased, archaeologists began to commit themselves to models that differed from one another. Using ethnographic analogy from his work in Zinacantan, Chiapas, Evon Vogt suggested that the ancient Maya were egalitarian and used a rotating system of *cargos* like the modern Tzotzil (Vogt 1961, 1964). In this system, members of the community would take turns filling positions of authority in the town government and then return to their normal agricultural lifestyle. The other extreme of these models was the social hierarchy proposed by the Tikal and Dzibilchaltun archaeologists, in which there were numerous societal levels in a complex hierarchy. Willey's position fell somewhere in the middle of these two. Michael Coe (1957, 1965) generated models based on ethnographic comparison and ethnohistoric analogy that could be considered somewhere between Vogt and Willey's positions. In order for the model advocating greater social complexity to gain more favor, it had to be proven that the Maya had the means to support the proposed large populations.

Environmental studies in the early part of the Processual Period were similar to those of the Descriptive Period. The Tikal project invited environmental scientists to study herpetofauna (Stuart 1958), mammals (Rick 1968), birds (Smithe and Paynter 1963) and soils (Olson 1969). Some of these scholars had already participated in the earlier Carnegie work. Large scale soil studies in both the Peten (Simmons et al. 1959) and Belize (Wright et al. 1959) during the late 1950s provided a major database for the investigation of Maya agriculture. William Sanders, who had completed his doctoral dissertation on cultural ecology in Central Mexico (Sanders 1957), defined what he considered to be the cultural ecology of the Maya lowlands (Sanders 1962, 1963). He made more practical application of his theories of cultural ecology in the Teotihuacan Valley (Sanders 1965), in the first of a number of large survey programs in Central Mexico.

Members of the Tikal project during the 1960s began to propose subsistence alternatives that may have been exploited by the Maya, such as root crops (Bronson

1966) and breadnut (*ramon*) (Puleston 1968). Ursula Cowgill took soil samples from modern milpas and compared them with data from two lake cores and a soil pit excavated in the Bajo de Santa Fe (Cowgill and Hutchinson 1963). Cowgill and Hutchinson (1963) argued that milpa agriculture was more productive than had been previously assumed and that it could have supported the large estimated populations. They also challenged Cooke's hypothesis that *bajos* were silted in lakes.

In the 1970s, partly due to the intensification of the debate over the nature of Maya agriculture, a number of projects were started that were specifically designed to integrate archaeological records of settlement with environmental and subsistence data. The Central Petén Historical Ecology Project (CPHEP) was started by Edward Deevey in 1972 and was designed to examine forest genesis and change in the tropics. The ancient Maya were considered just one of many factors in these dynamic environmental processes (Rice 1996). This project focused on the Lakes Region of the Peten dominated by the enormous Lake Peten Itza. Archaeologists Don and Prudence Rice studied settlement patterns as part of this environmentally-oriented project. The survey program used was innovative because it employed transects placed in randomized locations extending outward from Lakes Yaxha and Sacnab (Rice 1976; Rice and Rice 1980). The environmental portion of the program focused on the coring of the lakes to interpret the effects the ancient Maya had on the ecosystem as well as to record long-term changes in plant life through palynological studies (Brenner 1983; Deevey et al. 1979; Vaughan 1979). Some of the results and subsequent use of data collected by the CPHEP have been questioned, even by its own project members (Rice 1996). Still, the CPHEP stands out as the first modern project to integrate archaeological and environmental data in a diachronic perspective within the context of a problem-oriented research design.

Other projects during this period exhibited a greater awareness of possible data sets to be investigated. At the most basic level this meant the inclusion of more diverse specialists in archaeological projects. For example, zooarchaeologist Mary Pohl worked at Seibal, Tikal, and other sites to identify faunal remains in archaeological contexts. This data contributed to knowledge of non-agricultural subsistence means (Pohl 1976) as well as the use of animals in ritual contexts (Pohl 1976, 1983).

Norman Hammond began numerous projects in Belize in the 1970s, beginning with his work in southern Belize at Lubaantun. Hammond's goal was to examine settlement patterns while incorporating data such as resources and topography (Hammond 1975). Hammond also started the Corozal Project in northern Belize. Like the projects of Gordon Willey, the work of the Corozal Project was regional, resulting in the identification of dozens of new archaeological sites (Hammond 1974). This in turn led to important site-oriented projects at Nohmul and Cuello. The Nohmul project integrated data from geological and soil surveys (Hammond 1974), while the Cuello project included both a zooarchaeologist and a palynologist to examine the subsistence of one of the earliest known Maya settlements (Pohl 1985:5).

Remote sensing was another tool with which archaeologists were able to investigate the issue of intensive agriculture in the Maya lowlands. Aerial photography continued to be used in the Maya area, aiding in survey during the Belize Valley project (Willey et al. 1965). Aerial photos were used in a limited manner by the Tikal project, as Puleston noted the drawbacks of their use in areas of dense jungle vegetation (Puleston

1973:68-70). He recognized the utility of photographs for identifying the largest sites but found that they were useless for detailed settlement mapping. The Tikal project successfully used aerial photos to identify the 25 and 50 meter contour interval around Tikal, which improved the accuracy of topographic lines on the settlement maps (Puleston 1973:69).

Aerial reconnaissance did prove to be important in the study of Maya agriculture when Alfred Siemens discovered ridged fields during a flight over the Río Candelaria (Siemens and Puleston 1972). Subsequent discoveries of possible agricultural features in *bajos* in Quintana Roo (Harrison 1977) and in northern Belize (Puleston 1977) led to an increased interest in Maya alternatives to milpa subsistence. Bruce Dahlin and Siemens (Dahlin 1978; Dahlin and Siemens 1984) attempted to ground-truth possible canals that they spotted in an aerial reconnaissance of the Bajo de Santa Fe. Despite difficulty locating canals on the ground they did note that, "[o]ne important fact stands out from our air reconnaissance activity, and that is that the ancient Maya were quite definitely altering their *bajo* landscapes to their advantage" (Dahlin and Siemens 1984:164). Dahlin (1978) used his data to refute Cowgill and Hutchinson's (1963) suggestion that *bajos* were always seasonal swamps and never had standing water, echoing Harrison's (1977) criticism of the same report. Dahlin and Siemens (1984) suggested that further applications of remote sensing may contribute to our knowledge of the extent of raised field agriculture and canals in the lowlands.

In the late 1970s and early 1980s, Richard E. W. Adams introduced a new remote sensing technique to the study of Maya settlement patterns with the use of radar mapping (Adams et al. 1981). This process involved mounting a radar antenna on the an airplane that then flew systematic patterns to collect data over a given area. NASA used Synthetic Aperture Radar (SAR), in which the antenna was modified so that it could cover a larger area at a higher resolution. Collaborating with Walter Brown at NASA, Adams and Patrick Culbert used SEASAT radar images to identify what they thought were canal systems in large *bajos* near lowland Maya sites (Adams et al. 1981). These proposed canal systems were claimed to have covered huge portions of the lowland Maya area and were used to argue for raised field agriculture as the primary means of Maya subsistence that supported the large estimated populations (Adams 1980; Adams et al. 1981; Adams and Jones 1981). Unfortunately the putative canal systems were nowhere near as extensive as Adams and colleagues believed. Adams, in his assessment of settlement patterns in the Pasión River drainage had modified his original estimates to say that only 20% of the identified "features" represented canals (Adams 1983). One of the problems was a processing artifact that created the grid pattern that were originally thought to be canals (Pope and Dahlin 1989). Another problem was the poor resolution of SEASAT, which produces images of 1:250,000. To their credit, Adams, Brown, and Culbert (1981) acknowledged some of the limitations of their method in the original study. The SAR technology available for the SEASAT radar had a resolution of 1:250,000 (Adams et al. 1981:1460), which is significantly less than the 3 meter resolution provided by present-day Airborne Synthetic Aperture Radar (AIRSAR), or even the 90 and 30 meter data sets generated by the Shuttle Radar Topography Mission (Lillesand et al. 2004:712-714).

The combination of data on wetland agriculture provided by archaeology and remote sensing led to even more focused projects examining ancient Maya subsistence.

B. L. Turner, II, who had studied terracing as a form of intensive agriculture in the Río Bec region (Turner 1974a, 1974b), joined Harrison to study ancient agriculture in Pulltrouser Swamp, Belize (Turner and Harrison 1981, 1983). Pulltrouser Swamp forms the eastern boundary of the Nohmul settlement area (Hammond et al. 1985) and the Pulltrouser data was integrated into the research design of Hammond's project. Turner and Harrison's team identified evidence for maize and cotton remains in raised fields at Pulltrouser. The project employed a team of environmentalists examining macrobotanicals, pollen, mollusks, and soils (Turner and Harrison 1981). Although this study was not conducted in a pure *bajo* environment, it did prove that the Maya were exploiting some forms of wetlands for intensive agricultural purposes. Siemens and Puleston began a similar multidisciplinary study in northern Belize, focused on the Río Hondo and specifically the site of Albion Island (Puleston 1977; Siemens 1977).

From the late 1970s and onward, environment was integrated into all serious studies of Maya settlement. Anabel Ford (1981, 1986) conducted an intersite survey between Tikal and Yaxha, in which she statistically analyzed densities of settlement in relation to different vegetation classes and topography. At the Late Preclassic site of Cerros in Belize, environment and the control of water as a resource was examined as part of the settlement pattern study (Scarborough 1980, 1983; Scarborough and Robertson 1986). Turner and colleagues defined ecological zones in the Copan Valley that have been integral to settlement studies in that region (Turner et al. 1983). The Copan project also successfully used aerial photographs to analyze settlement patterns since much of the region had been cleared of forest (Leventhal 1979).

The end of the Processual Period is best characterized as a time of regrouping. This took the form of the publication of numerous topical edited volumes, a trend that began in the early 1970s and intensified throughout the decade. The School of American Research (SAR) hosted a series of conferences that led to publications of the state of research on the Maya collapse (Culbert 1973), the rise of Maya civilization (Adams 1977), and, most importantly for the present research, lowland Maya settlement patterns (Ashmore, ed. 1981). In his summary review of this last volume, Gordon Willey (1981:388) suggested that Harrison and Turner's (1978) edited volume on pre-Hispanic Maya agriculture be used as a companion volume to the settlement compilation. Willey was keenly aware of the intimate relation between agriculture and settlement patterns and may have been trying to bring the two back together with his comments. Environmental and subsistence data were summarized again in a volume edited by Mary Pohl (ed. 1985).

Lowland Maya Settlement Patterns (Ashmore, ed. 1981) addressed major issues that had arisen since Haviland's call for more data gathering in the mid-1960s (Haviland 1966). Hammond and Ashmore (1981) provided a brief summary of geology, topography, soils, climate, hydrology, flora and fauna, demonstrating an increased awareness of the importance of all environmental factors and their relationship to settlement. The authors also presented a correlation of ceramic phases that had been defined in different regions at the time. All three SAR conferences were concerned with different macro-regions in the Maya area and Hammond and Ashmore (1981) gave the final divisions made by the seminar participants based on a wide range of cultural attributes. Recognition of regional variation is crucial to our understanding of cultural developments in the Maya area, as will be argued in this study.

Ashmore (1981) addressed issues of method and theory that were interfering with communication and comparison among those studying settlement patterns in different regions. She provided a basic typology for settlement patterns, using the archaeological feature as the minimal unit of settlement rather than the more commonly used housemound. In this view, a feature could be a *chultun*, rock pile, quarry, housemound or any other ancient remain found during the course of archaeological survey. Ashmore's paper helped to clear up a great amount of inconsistency that had arisen among scholars studying the same subject.

In addition to providing a number of up to date regional summaries of Maya settlement, the SAR settlement volume also produced a number of new models to be tested against the data that had been collected over the last decade. Adams and Smith (1981) presented a model based on examples of feudalism from Europe, Japan, and Africa. Sanders (1981) also looked to Africa to make ethnographic analogies with the ancient Maya. Freidel (1981) put forward a "pilgrimage-fair" model, which he described as a synthetic analogy, combining periodic markets with ritual circles into a single, hypothesized institution.

The need for new models was echoed in another settlement pattern symposium that was held in Gordon Willey's honor (Vogt 1983a, 1983b; Vogt and Leventhal 1983). Sabloff (1983) felt that a major problem was that Mayanists had not made the paradigmatic shift to the "new archaeology". While acknowledging that the developers of processualist archaeology studied hunter and gatherer cultures, he argued that

Mayanists needed to develop their own middle range theory to deal with issues in the archaeology of complex societies. New approaches were on the way, with new research being conducted at Copan.

The Contextual Period (1985-late 1990s)

The mid-1980s marked an increase in the application of postprocessual archaeological theory (Hodder 1982, 1985, 1986). Sometimes called contextual archaeology (Trigger 1989:348; Willey and Sabloff 1993), this approach to the archaeological record means the consideration of all aspects of a culture in order to understand each part of it. This is partially similar to Taylor's (1948) conjunctive approach, but there is an increased emphasis on ideational aspects of culture in the postprocessual critique. The conjunctive approach (as originally proposed by Taylor (1948)) also lacked the power to explain cultural processes and change, something to which both the "new archaeology" and postprocessualism are deeply committed (Trigger 1989:275-279).

In some ways, a more holistic approach to the archaeological record has been advocated for a long time (Marcus 1983; Trigger 1989). J. Eric S. Thompson was a strong advocate of the integration of ideological and material culture in the interpretation of the ancient Maya (Thompson 1970). Joyce Marcus attempted to integrate readings of Emblem Glyphs into more processual models of settlement patterns (Marcus 1973, 1976). William Fash, while working on Gordon Willey's project at Copan, integrated texts, ethnohistory, and ethnography into his interpretation of processes of Maya state formation in the Copan Valley (Fash 1983). The main difference during the Contextual

Period was that ideological and historical factors were given explanatory power in archaeological models. For example, the demise of Waxaklajuun Ub'aah K'awiil of Copan at the hands of K'ahk' Tiliw of Quirigua explains the resultant lapse in activity at Copan (Fash 2001).

Willey (1980) made the first explicit call for a more holistic approach to Maya archaeology in a lecture given to the Royal Anthropological Institute in London, which was later published. He argued that "history and process are not antithetical goals in archaeology; rather, they are bound together in close complement that can only be pried apart at a loss to each (Willey 1980:250)." Through a discussion of subsistence, settlement patterns, sociopolitical organization, and ideology, Willey (1980) advocated the integration of different data sets in order to make archaeology more 'holistic'. For Willey (1980:263) there was "no very useful nor meaningful line separating 'science' and 'humanism' in archaeology" and the best interpretations would include aspects of both disciplines.

Following Willey's (1980) proposal for a more holistic approach, the start of the Contextual Period in Maya archaeology is marked by the inception of Fash's own project, the Copan Mosaics Project, and its successor, the Copan Acropolis Archaeological Project. These projects sought to systematically integrate ideational concepts into interpretations of Copan's history, following Willey's (1980) holistic approach (Fash 1988; Fash and Sharer 1991; Fash 1998). They also had a spirit of cooperation despite differences in theoretical approach between investigators. This allowed projects from Northern Illinois University, Harvard, the University of Pennsylvania, Tulane, and The Pennsylvania State University to all work together at the same time. In addition, Honduran archaeologists were equal participants in the collaborative work, helping to develop the field of archaeology within Honduras and develop international collaborative scholarship. The Copan projects were among the first to incorporate specialists in iconography and epigraphy to fully integrate rapidly developing decipherments into ongoing interpretations at Copan. The modern history of the decipherment is an important aspect of the Contextual Period.

In the early 1970s Ian Graham (1975) was commissioned to start a project to document all known Maya hieroglyphic inscriptions into a corpus that could be used by scholars working on the decipherment (Stuart 1992). Graham had already published an account of his exploration of such sites as El Mirador, Machaquilá, and Kinal (Graham 1967) and his skills at reconnaissance, mapping, photography, and drawing made him the ideal person to take on this laborious task. The Harvard Peabody Museum Corpus of Maya Hieroglyphic Inscriptions has provided an essential database for those working on the decipherment of the Maya script. Intensification of work at Palenque in the early 1970s and the start of the Palenque Round Tables also provided a major stimulus for the decipherment of texts (Coe 1992).

Breakthroughs in reading the glyphs began with the recognition of the syllabic nature of certain aspects of the script as presented by Yurii Knorosov (1952). As an increasing number of syllables were deciphered, readings were given of texts, particularly at Palenque (Schele and Mathews 1974). The decipherment began to intensify in the mid-1980s, with important works by David Stuart (1984, 1987). Schele, Stuart, Nikolai Grube, Karl Taube, and Barbara Fash all made important contributions to the understanding of texts and iconography at Copan. We now understand Maya writing to be a logosyllabic script of which 90% of extant texts can currently be read by epigraphers. However, this high percentage is a reflection of the high number of repetitive, formulaic dedicatory texts (Alexandre Tokovinine, personal communication 2007).

The Copan projects have been exemplary in their flexibility to incorporate new data. This was particularly important during the decipherment when new readings were being circulated faster than they could be published. Fash (1991, 2001) published a synthesis of work at Copan in 1991 and then revised the same synthesis to include important new breakthroughs that occurred in the 1990s. The ability to incorporate a broad range of data sets into flexible, dynamic interpretations of the archaeological record is a hallmark of the Contextual Period following the "cross-cutting, self-correcting strategy" proposed by Fash and Sharer (1991:170).

Another important project of this time period was directed by Arthur Demarest, Stephen Houston, and Juan Antonio Valdez. The Vanderbilt Petexbatun Regional Archaeological Project was designed to address the issue of the Maya collapse in an entire region (Demarest 1997). The work in the Petexbatun region was set up by epigraphic and settlement studies conducted by Peter Mathews (Willey and Mathews 1991) and Stephen Houston (1993). The regional project was divided into a series of subprojects, each with its own principle investigator (Demarest 1997). These subproject directors included other Ph.D.s, graduate students, and a number of prominent Guatemalan archaeologists. The project was interdisciplinary in nature and covered topics such as ecology, subsistence, nutrition, exchange systems, epigraphy, site abandonments, intersite interactions, caves and cosmology. Like the Copan project, not all of the investigators were of the same theoretical perspective (Demarest 1997) and, despite some major disagreements, the archaeologists were able to present a comprehensive picture of the Late and Terminal Classic Periods in the Petexbatun region.

Environmental studies were fully integrated into the large, multidisciplinary studies that characterize the Contextual Period. In Copan, the work of Turner and colleagues (Turner et al. 1983) had been incorporated into interpretations since before Fash's projects. New environmental studies, particularly pertaining to agriculture and the consequences of deforestation were also integrated into the work at Copan (Abrams et al. 1996; Abrams and Rue 1988; Rue 1989; Rue et al. 2002). These studies suggest that deforestation, combined with an unchecked increase in settlement on the most fertile soils of the Copan Valley, led to a destabilization of the Copan ecosystem and contributed to the collapse of the state at that site (Fash 2001).

The ecology subproject of the Petexbatun project was directed by Nicholas Dunning, who collaborated with Timothy Beach, David Rue, Alan Covich, and Alfred Traverse. Dunning had successfully applied studies of ancient soils to settlement pattern research in the Puuc region (Dunning 1992) and was brought in to conduct similar research in the Pasión region. In Petexbatun, researchers found only equivocal evidence for drought (Dunning et al. 1997) despite claims for large scale droughts in other parts of the Maya area, particularly the northern lowlands (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). Paleoecological evidence did, however, indicate progressively severe deforestation and environmental disruption from the Preclassic to Late Classic periods (Dunning, Rue, Beach, Covich, and Traverse 1998). Dunning and Beach (1994) also made important studies of ancient terracing in the Petexbatun region. This would eventually lead to their development of ideas of regional variability and adaptive regions throughout the Maya lowlands in relation to subsistence practices (Dunning 1996; Dunning and Beach 1994; Dunning, Beach, Farrell, and Luzzadder-Beach 1998).

One area in which the Contextual Period was lacking was in the application of remote sensing. Aerial photography continued to be used, and was applied systematically to the Copan Valley survey (Webster 1985:42-45). The radar mapping of the early 1980s was generally considered to be a failure by most archaeologists. Pope and Dahlin (1989) thoroughly debunked Adams' proposed canal systems in their own application of Seasat synthetic aperture radar (SAR) and airborne SAR run by the Jet Propulsion Laboratory (JPL) at NASA. They argued that the swamps of northern Belize and southern Quintana Roo were not viable analogies for the more interior swamps of the Peten. This meant that arguments for intensive agriculture, demonstrated at sites such as Pulltrouser Swamp and Albion Island, could not be applied to the Peten heartland. Pope and Dahlin (1989) suggested that the Maya settled on *bajo* edges due to the potable water availability in the form of natural and man-made *aguadas* (clay-lined depressions that usually hold water through the dry season). While addressing the issue of potable water sources is important (Haberland 1983), Pope and Dahlin (1989) gave no alternative hypothesis to explain how the Maya would have supported such large population densities.

Thomas Sever began a trend towards remote sensing revival with his dissertation work at Chaco Canyon, New Mexico, and Arenal, Costa Rica (Sever 1990). Sever investigated Anasazi roads and prehistoric footpaths in these two regions, respectively. He developed image analysis techniques for identifying linear features in a number of remote sensing media, including infrared aerial photographs, and TIMS imagery (McKee et al. 1994). These technologies, as well as others, were then applied to the Maya area in the late 1990s, marking the gradual transition to the Contemporary Period.

The Contemporary Period (late 1990s-present)

The boundary between the Contextual Period and the Contemporary Period is not as distinct as those between the other periods, which coincided with major paradigmatic shifts in archaeological theory. The Contemporary Period is instead marked by the increased inclusion of new technologies into archaeological field methods and interpretation. Contemporary research in the Maya area has continued in the tradition of the Contextual Period and the Copan and Petexbatun projects. The Contemporary Period is characterized by the incorporation of new tools for data collection and organization that are changing field methodologies. There has also been a trend towards community development in Maya archaeology as projects have often bound themselves to specific towns in carrying out their fieldwork. The current study, as part of the San Bartolo Regional Archaeological Project, has been involved in both of these trends.

The use of the Global Positioning System (GPS) has been successfully employed all over the world by projects studying environments and settlement from South America (Binford et al. 1997) to China (Underhill et al. 1998). In the Maya area, most projects doing some form of reconnaissance use GPS. Ian Graham used one of the first commercially available GPS units during his work for the Corpus of Maya Hieroglyphic Inscriptions project (Ian Graham, personal communication 2003). The current, extremely high accuracy of some GPS units has led some projects to use GPS alone to conduct parts of their surveys (Timothy Murtha, personal communication 2004). At San Bartolo, I used high-resolution GPS in conjunction with more conventional total station survey to generate settlement maps.

Another important technological development was the invention of Geographic Information Systems (GIS). GIS allows users to integrate complex spatial data sets in a layered format. The most popular software packages available now are ESRI™ ArcINFO and Leica Geosystems'™ ERDAS Image Analyst, both of which were used in the present study. Software allows one to analyze a diverse range of topics such as viewshed, nearest neighbor, Thiessen polygons, slope, and cost-efficiency among others. The quality and accuracy of data sets are a major issue in the use of GIS (Maschner 1996:3). This is because all analysis done by a GIS software package is the "consequence of previous decisions and actions" (Tschan et al. 2000:29). This means that there can be any number of specifically chosen algorithms underlying a function that the archaeologist can use with the click of a button. Data resolution is particularly important to understand. A digitized 1:50,000 topographic map will calculate elevations down to millimeters once the topographic lines are interpolated into a raster format. The raster then gives an illusion of high resolution (Maschner 1996:3) even though the underlying data is still generated from the original 1:50,000 map. As another example of potential data problems, viewshed and line-of site analyses are generated based on the Digital Elevation Model (DEM) available. In the Maya area one has to take a position on how much standing forest may have been obstructing lines of sight since the DEM will not account for this variable (Tschan et al. 2000). It is important that as GIS is incorporated into Maya studies that scholars are aware of the biases and limitations of the software and data sets they use. GIS is a software that was developed for geographers and then appropriated by archaeologists so researchers must remember that the programs were not designed for archaeological analysis and proper caution should be taken when using software for data analysis (Tschan et al. 2000).

GIS has been used by archaeologists since the late 1980s (Allen et al. 1990). But, the first study in the Maya area specifically designed to incorporate GIS into a regional project was Francisco Estrada-Belli's (1998) dissertation work on the Pacific Coast of Guatemala in the mid-1990s. Estrada-Belli (1998) integrated his survey and test pitting data into a UNIX-based GRASS GIS to look at increasing complexity through time on the Pacific coast. Armando Anaya Hernández (1999) also used GIS in his dissertation work along the Upper Usumacinta. Anaya (1999), using an IDRISI GIS, incorporated human physiological preferences into his construction of cost-surface analyses between sites. Since those study, there have been major developments both in GIS software packages and in personal computer processors that allow larger data sets to be integrated in more complex ways.

Some of the best available raster data sets have been generated by new remote sensing technologies. New high-resolution satellite imagery such as IKONOS and QuickBird data generate large files that can now be handled by commercially available computers. The digital elevation model (DEM) is one of the most important data sets in any GIS and its resolution will greatly influence any spatial analyses performed for a given region. A DEM is a digital version of a topographic map with the digital resolution being dependent on the raw data source. In GIS software packages the DEM can be manipulated to display an area in 3-D, thus giving a better perspective of the research area. With new synthetic aperture radar technology in the form of JPL's AIRSAR, there is now high-resolution elevation data available for portions of the Maya area. Furthermore, its canopy penetrating capabilities has the potential to give an actual picture of Maya topography and not simply a view of the vegetation elevations (although this has yet to be realized). Broader elevation coverage has been provided by the Shuttle Radar Topography Mission (SRTM). GIS has been described as the "context" within which remote sensing data sets, such as these, can become useful for regional analysis (Madry and Crumley 1990:367-368).

A number of recent projects have been exemplary in the integration of these new technologies into their research. Some of these are addressing very specific problems. The Tikal earthworks project, directed by David Webster, Timothy Murtha, Horacio Martinez, Jay Silverstein and Kirk Straight, have used GPS and GIS to try to reconstruct the portions of the earthworks that either were not mapped by Puleston or have been eroded away. This project is trying to confirm the date of the earthworks as well as determine their function (Webster et al. 2004; Webster et al. in press). Other projects are integrating new technologies into large regional projects. The Yalahau Regional Human Ecology Project is conducting survey and test pitting operations in a 5000 km^2 area to try to understand the regional exploitation of one of northern Yucatan's wettest areas (Amador and Glover 2005).

Thomas Sever has been a pioneer in reestablishing the use of remote sensing data sets in the Maya area. Sever and others have used remote sensing satellite imagery to investigate past and present social phenomena in Guatemala (Reining et al. 2000; Sever 1998). Recently, Sever and Daniel Irwin teamed up with Patrick Culbert and Vilma

Fialko to investigate *bajo* communities near Tikal using remote sensing and archaeology (Kunen et al. 2000; Sever and Irwin 2003). This research is also concerned with environmental studies. Nicholas Dunning has been carrying out soil analyses throughout the *bajos* under investigation. Also, ground-truthing efforts have been made to identify vegetation types in satellite imagery, as well as reclassify the different types of *bajo* vegetations encountered in the Peten.

The San Bartolo Regional Archaeological Project

This section presents the history of the San Bartolo Regional Archaeological Project since the discovery of the San Bartolo ruins in March of 2001 by William Saturno. Saturno, then working for Ian Graham and the Corpus of Maya Hieroglyphic Inscriptions project of the Peabody Museum of Harvard University, was tracking down rumors of carved stelae reported in the region. Due to the overconfidence of Saturno's guides, the small group soon found themselves stranded without any water. Saturno entered a large looter trench and tunnel of a pyramid he had come upon while the group searched for water, with the goal of seeking relief from the hot, dry-season sun. Much to his surprise he found an exposed portion of an intricately painted, polychrome mural that had been undercut when looters removed the wall that had supported the murals during their tunneling operations. Saturno dated his discovery stylistically to the Late Preclassic and confirmed this assessment with ceramics collected from the looters' backfill. The structure containing the murals was named Las Pinturas. The murals depict some of the earliest renditions of Maya perceptions of creation and the centering of their cosmology (Saturno et al. 2005).

In May of 2001 Saturno returned to San Bartolo with epigrapher David Stuart, archaeologist Hector Escobedo, artist Heather Hurst, mural conservators, and a crew from the National Geographic Society (Saturno et al. 2001). Surveyors from the *Instituto de Antropología e Historia de Guatemala* (IDAEH) created a sketch map of the ruins. The goal of this expedition was to document the oldest, best preserved murals found in the lowlands and to assess the potential for a large scale multidisciplinary project at the site. Funding for the project was obtained from the Peabody Museum, National Geographic, and the Foundation for the Advancement of Mesoamerican Studies (FAMSI) and permission was obtained from IDAEH for a five-year interdisciplinary regional project in the Ixcanrío Basin.

The San Bartolo Project was modeled after the Copan projects of which Saturno (2000) was a member in the 1990s. The multidisciplinary approach at San Bartolo was inspired by the work of the Copan Acropolis Archaeological Project. The same can be said for the close relationships between archaeologists and conservators at San Bartolo, which was a hallmark of the Copan investigations. In addition to Saturno, San Bartolo project members Karl Taube, David Stuart, Heather Hurst, and Harriet Beaubien all participated in the Copan projects to varying degrees. Saturno sought to bolster the holistic approach by applying a series of new technologies to field methods at San Bartolo. This included the use of high resolution GPS and remote sensing data, the use of digital scanning to record the murals, and the establishment of a Wi-Fi network in the San Bartolo field camp to quickly relay results to colleagues and the public.

The results of the first five field seasons of work at San Bartolo (2002-2006) have been published in preliminary reports to IDAEH (Urquizú and Saturno 2002, 2003, 2004, 2005, 2006), a full-length monograph on the north wall murals (Saturno et al. 2005), and in numerous papers published in the proceedings of the annual Guatemalan archaeological symposium. The project has grown in size every year since its inception as diverse personnel from numerous disciplines have made contributions to our understanding of San Bartolo and its regional context. Here, I present a summary of work at the site to date. Individual technical reports may be found in the edited government reports (Urquizú and Saturno 2002, 2003, 2004, 2005, 2006).

Mapping and regional reconnaissance have been a major priority of the San Bartolo Project since its first season. This research has been complemented by remote sensing data provided to the project by NASA. At the start of the 2003 season Saturno identified a spectral signature in IKONOS satellite imagery that indicated the presence of Maya settlement. Survey work was conducted to confirm the signature and later the signature was used to discover new settlements. I have been involved in survey work during all four years of my participation on the project. A preliminary map of the site, including 104 of its structures was made in 2002.

In 2003 IKONOS satellite imagery, provided by NASA, was used to identify the extent of the San Bartolo settlement, confirming Saturno's identification of the settlement signature. Most of the projected extent of the architecture was mapped during the 2004 and 2005 seasons (Figure 2.2). Regional reconnaissance has been undertaken since the 2003 season. Using remote sensing technologies, as well as information from local informants, project members have found eight sites in the region (Figure 2.3).

Survey and reconnaissance also has been conducted in the intersite area between San Bartolo and its larger neighbor, Xultun, to the south. In 2003 a baseline between the

Figure 2.2. Site map of San Bartolo.

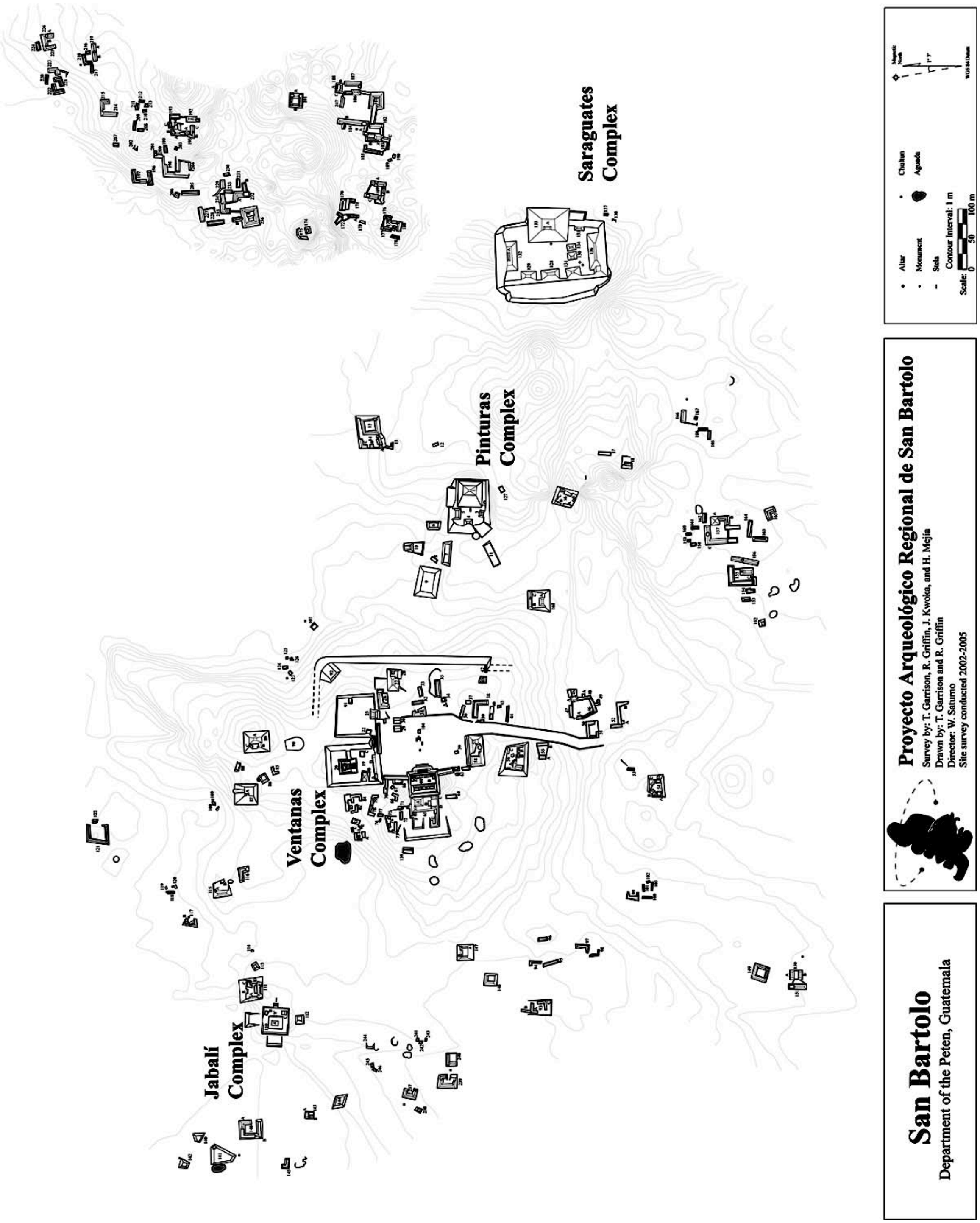
Jabalí Complex
Ventanas Complex
Pinturas Complex
Saraguates Complex
San Bartolo
Department of the Peten, Guatemala
Proyecto Arqueológico Regional de San Bartolo
Survey by: T. Garrison, R. Griffin, J. Kwoka, and H. Mejia
Drawn by: T. Garrison and R. Griffin
Director: W. Saturno
Site survey conducted 2002-2005
Altar
Monument
Stela
Chultun
Aguada
Contour Interval: 1 m
Scale: 0 50 100 m

Figure 2.3. Regional Map of San Bartolo Project concession showing known sites.

two sites was cut and the small center of Chaj K'ek' Cue was discovered using IKONOS imagery. Chaj K'ek' Cue was the subject of preliminary testing during the following season. In 2004 and 2005 a stratified random sample of survey blocks was mapped to test the interpretation of satellite imagery and identify types of settlements in the intersite area. The survey was accompanied by a test pitting program in 2005 in order to obtain a view of the development of settlement through time and space.

The site of San Bartolo is defined by four major architectural groups running roughly southeast to northwest. The Saraguates Complex in the southeast is the most monumental group at the site. There is a small ball court in the Saraguates plaza. The

Pinturas Complex houses the famous Late Preclassic murals. The Ventanas Complex dominates the northern side of the Great Plaza and has four major construction phases with an additional four remodelings. The western side of the plaza is flanked by the Tigrillo palace compound. There is a ball court in the northeast corner of the plaza. To the far northwest is the Jabalí Complex, which is a small triadic pyramid group. In addition to these major architectural groups, there is a north-south causeway running south out of the Great Plaza and the large Las Plumas residential compound to the west of it.

One of the major goals of the first seasons of work at San Bartolo has been the definition of the major architecture of the sites. The Pinturas Complex (Strs. 1 to 5) has been the focus of much research and funding. Conservation has been an integral part of the mural excavations since Saturno's discovery in 2001. At this point, the north and west walls of Pinturas Sub-1 (the mural room) have been exposed and conserved and much of the collapsed south and east walls have been excavated and transported to Antigua, Guatemala for analysis and conservation. In addition, excavations to define the numerous substructures of the complex have been undertaken in the last couple of seasons. Test pitting in the Pinturas plaza as well as trenching operations in the smaller superstructures (Strs. 2 to 5) have yielded important information about the architectural sequence and construction techniques.

The Las Ventanas Complex (Strs. 19A to 19D, Str. 20), is another major architectural group at the site, dominated by a large pyramid (Str. 20) with a stone window preserved in the superstructure. To a great extent the investigations at Las Ventanas has been done in an effort to understand its complex construction history. A deep test pit in the plaza in front of Structure 20 has yielded material dating to the early Middle Preclassic, exposing the great time depth of occupation at San Bartolo. Excavations were also placed perpendicular to the existing looter tunnels in an effort to find monumental masks found commonly on substructures at other Late Preclassic Maya sites. These were encountered in 2004, but in a state of great erosion.

The palace at San Bartolo has been given the field designation El Tigrillo (Str. 60). Since 2003, large scale excavations have been conducted at the palace in an effort to define its final phase architectural form and overall construction sequence. Over the last three seasons all of the looter trenches have been cleaned and documented and tunneling operations and test pits have defined the building phases. Notably, the final phase of the palace is believed to be a Late Classic remodeling of a centuries long abandoned Late Preclassic substructure. The palace also yielded the first intact burial at San Bartolo in 2004.

The Jabalí Complex was discovered in 2003 while returning from surveying around the northwest corner of the San Bartolo site delimitation. GPS coordinates taken at the time of discovery were compared against IKONOS images as a field test of the settlement signature. The complex is a small triadic pyramid group consisting of Structures 110A to 110C. It was mapped in 2004 when major excavations began there. Much of the early work was oriented towards cleaning the looter trenches that pervade the group. Horizontal exposure of the Jabalí plaza revealed a depression that may have been a water storage feature. In 2005 a Late Preclassic, possibly royal, tomb was excavated beneath the Jabalí plaza, giving corroborating evidence to depictions of kingship found in the west wall murals.

The ballcourt at San Bartolo (Strs. 29 and 30) is one of the most severely looted features at the site. Structures 29 and 30 are basically shells of debris held together by roots of the *ramon* (breadnut) tree. During the first field season test pitting was done in the court alley to try to define the construction sequence. In 2003 the bases of the structures were defined, but further attempts at excavation were impossible due to the extent of the looting.

The Las Plumas group is a large residential group just south of the Great Plaza and west of the causeway. Plumas consists of Structures 56A to 56C and has been extensively excavated since 2004. After cleaning of the looter trenches, large portions of Structures 56A and 56B were exposed. Plumas gives some of the best evidence at San Bartolo for a Late Classic reoccupation of the site centuries after the abandonment in the Late Preclassic.

The Los Saraguates Complex (Strs. 128 to 136) is the largest and most impressive construction at the site. Misidentified in 2003 as a hill, it was not fully documented until 2005 when the whole complex was cleared and mapped. The complex was discovered based on interpretations of IKONOS satellite imagery made by Saturno. Saraguates is constructed directly on top of a natural rise in the bedrock, which no doubt contributes to its size. Preliminary testing of the Saraguates construction phases was done during the 2005 season while more extensive excavations were conducted during the 2006 season.

There have been other, smaller scale, excavation programs at San Bartolo as well. In 2003, a test pit was dug into the Great Plaza at the base of the Tigrillo structure. The complexity of the plaza floor sequence warranted more intensive excavations the following season. In 2004, a test pitting program was conducted in the Great Plaza to securely date the plaza sequence and to examine the plastering techniques used to repeatedly resurface an area of almost 12,000 m^2. In 2005, the causeway running south out of the Great Plaza was also sampled by test pitting.

Excavations have been conducted in some of the smaller structures at San Bartolo since the 2003 season. Structures 82, 83, and 84 to the west of Las Ventanas were excavated extensively in 2003. These are the humblest structures excavated to date at San Bartolo and also give evidence of a Late Classic reoccupation at the site. In 2005, looter trenches were cleaned in the medium-sized Structure 38 and a few small test pits were excavated. While this dissertation reports on preliminary settlement patterns at San Bartolo, a large scale structure excavation program would obviously greatly refine the generalized patterns presented for the site here.

In 2004, a lithic workshop was identified adjacent to Structure 86. The workshop was sampled, yielding millions of pieces of chert debitage. In 2005, investigations into lithic technology in the region continued with the excavation of five chert rock piles around San Bartolo. It was determined that these were formed as part of an early process in lithic production. Testing of a chert quarry in the intersite area was also done in 2005. The importance of chert to the regional political economy is a significant topic that will require further investigation.

Investigations of the remains of ritual activities at San Bartolo have been conducted since the first field season. In 2002 shallow excavations were made around the three stelae in the center of the Great Plaza. Deeper probes in the same area were made in 2005. Also in 2002 a large ceramic deposit was found on top of a potbellied monument (Monument 1/Structure 63). More intensive excavations of Structure 63 in

2003 demonstrated the great antiquity of that locus as a sacred locale at San Bartolo. Structure 63 was also the first excavation to yield evidence of Late Classic activity (but not occupation) at the site. Other potbellied monuments also received superficial testing in 2002 (Monuments 2 to 4). Since the 2004 season excavations have been conducted in search of Late Preclassic dedicatory caches at most of the major architectural groups. While there has only been limited success in this investigation to date, the excavations in the front of Structure 1 did locate a broken, carved stela, probably Late Preclassic in date.

Interdisciplinary research has been of major importance at San Bartolo, especially in terms of the regional investigation. Remote sensing and Geographic Information Systems experts from NASA have been directly involved in regional research, as discussed in the summary of mapping and reconnaissance above. In 2005, environmental data was collected for the San Bartolo region by Nicholas Dunning and his students. The San Bartolo *aguada* was excavated to a depth of about three meters. Soil test pits were dug in the *bajo* west of San Bartolo, as well as in the intersite area. Terraces found in the intersite area were also tested for soil analysis. Sediment cores were taken from the Los Tambos *aguada* just south of Xultun, as well as from the Tintal *aguada* northeast of San Bartolo. Important pollen data found in the cores and soil pits has been used to reconstruct aspects of the paleoenvironment at San Bartolo. This data is integral to the regional interpretation of settlement patterns.

This summary of investigations at San Bartolo is designed to put the intersite research within the context of a multidisciplinary project. The spectacular Preclassic murals at San Bartolo have brought widespread attention and recognition to the project. The project research described above has been designed to place this important discovery within a regional archaeological context so that the murals can be appreciated from more than just an iconographic and artistic perspective. The data from excavations at San Bartolo are the basis for interpretations of the site settlement patterns presented in later chapters. Although, a project designed to systematically excavate the smaller structures at San Bartolo would probably provide a more refined view of the site's history. Since the second scale of interpretation made in this dissertation represents the entire San Bartolo-Xultun territory, the gross data from San Bartolo investigations combined with the systematic intersite settlement date will be sufficient for this level of analysis.

Settlement Patterns, Environment, and Remote Sensing in the San Bartolo-Xultun Intersite Area

Current research by San Bartolo Project is descendant from the long history of interdisciplinary research in the fields of archaeological settlement patterns, environmental studies and remote sensing presented at the beginning of this chapter. Regional investigations, under the direction of William Saturno, have been utilizing remote sensing imagery in site reconnaissance since 2003. The same can be said of the more localized research I conducted in the San Bartolo-Xultun intersite area. Sever and Irwin have been directly involved in the application of new technologies in the San Bartolo region, providing both the imagery and the necessary technological resources to process data.

Prior to the 2005 season, environmental data from adjacent projects in northwestern Belize were used as proxy data for the San Bartolo region. Nicholas Dunning's investigations have greatly enriched our perception of the ancient ecology. Pollen data from excavations and sediment cores were analyzed by John Jones to aid in the reconstruction of the paleoenvironment (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006). Having diachronic environmental data is crucial to the analysis of archaeological settlement patterns since in Willey's original definition, "settlements reflect the natural environment, the level of technology on which the builders operated, and the various institutions of social interaction and control which the culture maintained (Willey 1953:1)". It is now clear that the environment of the Maya lowlands is dynamic, therefore it is vital to incorporate environmental changes into interpretations of settlement change in order to have a more accurate picture of past developmental processes.

The settlement data for the present study was generated during four seasons (ten months) of fieldwork in the San Bartolo region and eight months of laboratory work in Antigua, Guatemala. Settlement data comes from the mapping of the site of San Bartolo as well as a series of 40 stratified random blocks (measuring 250 x 250 m) mapped between the sites of Xultun and San Bartolo. A more detailed summary of the specific methodologies used in the San Bartolo survey is given in Chapter Three. Settlement pattern, environmental, and remote sensing data sets are integrated with textual and iconographic data to present a dynamic settlement history for the San Bartolo-Xultun intersite area at four increasing scales of analysis in Chapters Four through Seven.

Chapter 3: Intersite Areas and Research Design

Introduction

The San Bartolo-Xultun intersite survey blended new and old technologies to provide a comprehensive survey strategy designed to reflect the microenvironmental composition of the area as well as provide a representative sample of the settlement. Working in the Peten has often been referred to as a "green hell" (Rice and Puleston 1981), which was confirmed over four seasons of reconnaissance, survey, and excavation around San Bartolo. Remote sensing technologies have been developed that are greatly improving the archaeologist's ability to visualize the Maya area and its settlement. The San Bartolo Project has integrated numerous remote sensing technologies, provided by NASA, into its regional investigations. The intersite survey is the first project to use some of these new technologies in a systematic manner.

This chapter begins by looking at the concept of the intersite area as a methodological issue that needs to be reconsidered based on the new technologies available to the archaeologist. This critique justifies the use of stratified random block surveys instead of the more conventional intersite transect surveys. This is followed by an introduction to the remote sensing technologies implemented in this research, giving a history of their use by the San Bartolo project. There is a discussion of how remote sensing was used to divide the San Bartolo-Xultun territory into 15 areas of research as part of the analytical hierarchy established in Chapter One. Finally, there is a detailed discussion of the survey and excavation strategies employed in the intersite area, since these data represent the principle raw data collected for this dissertation.

Rethinking the Intersite Concept[1]

During the San Bartolo-Xultun intersite survey, the use of new technologies in field methodologies led to a reconsideration of the concept of the intersite area and how it is represented in archaeological interpretations. An intersite area is a large tract of land made up of diverse terrain and vegetation types, which correlate with different forms of ancient settlement remains. The following discussion details major intersite transect surveys conducted in the northeast Peten since the 1970s and compares and contrasts those programs with the present research around San Bartolo. I suggest that stratified random block surveys should replace transect surveys as the standard methodology for intersite archaeology.

For well over a century the monumental sites built by the ancient Maya have been the subject of intensive investigation. This site-centric research bias has often been at the expense of regional studies that incorporate data from the areas between sites. This was especially true prior to the 1970s with a few exceptions. Muleback surveys made by both Alfred Tozzer (1913) and William Bullard (1960) took the settlement found between major sites into consideration. These surveys were not systematic and no effort to draft detailed maps of intersite settlements were made. Though, Bullard (1960) did incorporate intersite settlements in his discussion of ruins encountered and they contributed to his formulation of a three-tiered site hierarchy consisting of house ruins, minor ceremonial centers, and major ceremonial centers.

The first formal definition of an intersite area was given in a seminal article by Dennis Puleston (1974). Puleston argued that to define an intersite area one must first

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[1] The following discussion on the concept of the intersite area was presented at the 71st Annual Meeting of the Society for American Archaeology (Garrison 2006).

define what is considered to be a site. Using Willey and Phillips' (1958) definition he noted that there was very little required to define a site other than a fairly continuous coverage of ancient settlement. To this Puleston (1974) added that "household sites" (or plaza groups) combine to form "community sites", which are what the public would consider to be an archaeological site like Tikal or Copan. Using Tikal as an example he defined the boundaries of the site based on natural, emic, and etic criteria. Large *bajos* to the east and west create natural boundaries for Tikal, while earthworks to the north and south provide emic delimitations. Etic site boundaries are defined by a drop-off in settlement density. At Tikal, this drop-off is conveniently delimited by the earthworks.

Having defined what he meant by a site (although the site definition for Uaxactun is much less clear), Puleston surveyed a transect between Tikal and Uaxactun, which was complemented by a test pitting program of the settlement encountered. Using this methodology he was able to note changes in settlement densities between sites as well as determine general trends in intersite settlement chronology. This study (Puleston 1974) became the standard for subsequent intersite investigations, many of which were between Tikal and other sites.

Anabel Ford (1981, 1986) surveyed an enormous 28 km, 500 m wide transect between Tikal and Yaxha. Due to time constraints the excavation program associated with the survey was cut short leading to a Tikal-centric bias. In total 23 test pits were excavated, but 10 of these were within the Tikal earthworks. According to Puleston's (1974) definition this means that only 13 test pits were excavated in what was considered to be the intersite area. This may not have given a representative sample of the intersite chronology. Ford (1981, 1986), using a stratified random sample, eliminated scrub *bajos* from her survey and excavation sample under the then prevalent assumption that they were not used by the Maya. Recent research (Fialko Coxemans 1996; Kunen et al. 2000) has demonstrated that this assumption is unfounded and may be a bias in the Tikal-Yaxha intersite data.

The Programa Regional Triangulo-Intersitio is part of the Proyecto Triangulo, a Guatemalan project directed by Vilma Fialko. Fialko (1996) noted the problems with the use of a stratified random sample in transect surveys because it distorts the possible intersite occupation. Fialko (1996) employed a total coverage methodology, as opposed to a stratified random sample, in surveying over 55 km of 500 m wide transects between Yaxha, Nakum, Naranjo, and Tikal. Despite this, the transects themselves still represent samples of the intersite areas that they traverse. Fialko (1996) created a four-tiered typology for intersite settlements based on components present (such as number of plazas, chultuns, stelae, quarries, etc…) and the volume of construction activity (as quantified by fill volume, areas cut by chultuns or quarries, etc…). She then used natural features to establish site boundaries and associations.

There have been other intersite surveys in the Maya area, but the ones by Puleston (1974), Ford (1981, 1986), and Fialko (1996) are the most relevant to the research at San Bartolo. All three of these surveys were transect surveys in which a straight line was drawn between two sites and surveyed at a width of 250-500 m. Each study also implemented an excavation program to give a chronological perspective to the survey data. Puleston's survey focused on changes in settlement densities between site and intersite areas, but did not address settlement configurations internal to the intersite area. Ford's survey had numerous problems with sampling, the greatest of which was trying to use a stratified random sample along a transect, but the idea of stratifying the survey universe was an important contribution. Fialko's survey was the most exemplary, addressing settlement configurations internal to the intersite area, as well as providing complete survey coverage of all terrain and vegetation types encountered.

The problem with using a transect for an intersite survey, even in a well-designed and executed project such as Fialko's, is that a straight line does not accurately represent the environmental or settlement diversity in the area between two sites. Large archaeological sites such as Tikal and Xultun cover multiple square kilometers, therefore the area between two sites is multiple kilometers wide and is made up of a diverse range of terrain and vegetation types. Recent investigations in the Maya lowlands have demonstrated that different forms of settlement are present in different vegetation types. A representative sampling strategy of the total intersite area is necessary in order to obtain the most accurate picture of ancient intersite settlement. In the following hypothetical example the survey universe for the intersite area between Site 1 and Site 2 consists of four vegetation types: A, B, C, D. The relative percentages of the vegetation are shown in the schematic drawing in Figure 3.1. But, when a transect is cut between the two sites the relative percentages represented change (Figure 3.2). The changes in percentages between the survey universe and the transect clearly display the distortion caused by using an intersite transect. Vegetation C, the second most prominent vegetation, is reduced by 22%, while Vegetation D, which may represent a unique ecological niche, is absent from the transect altogether. Furthermore, Vegetation B shows an increase of 25%, which could distort interpretations of how the intersite area was used if there are cultural associations with vegetation types. Ford (1981, 1986) was

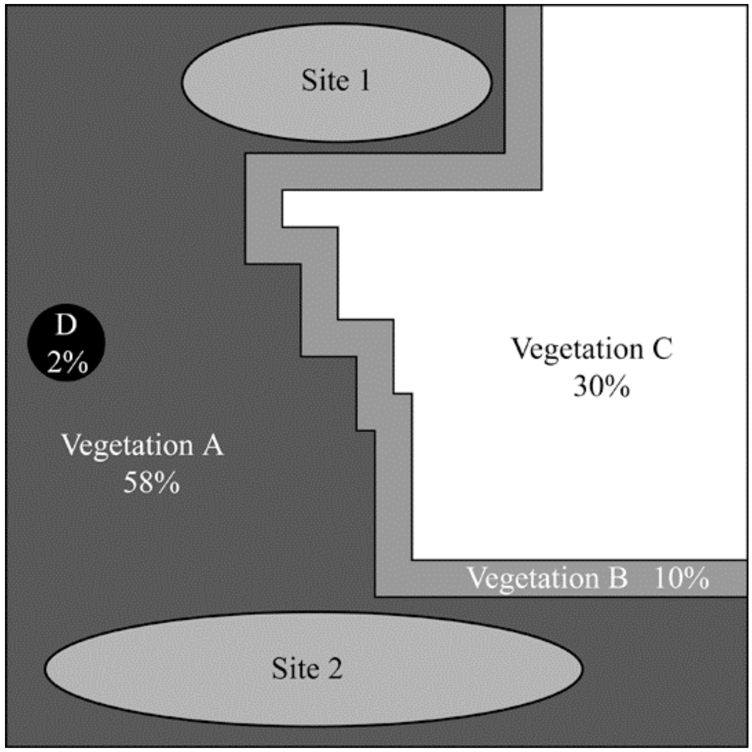


Figure 3.1. Schematic drawing of vegetation between two sites. Percentages represent the total area covered by each vegetation class.

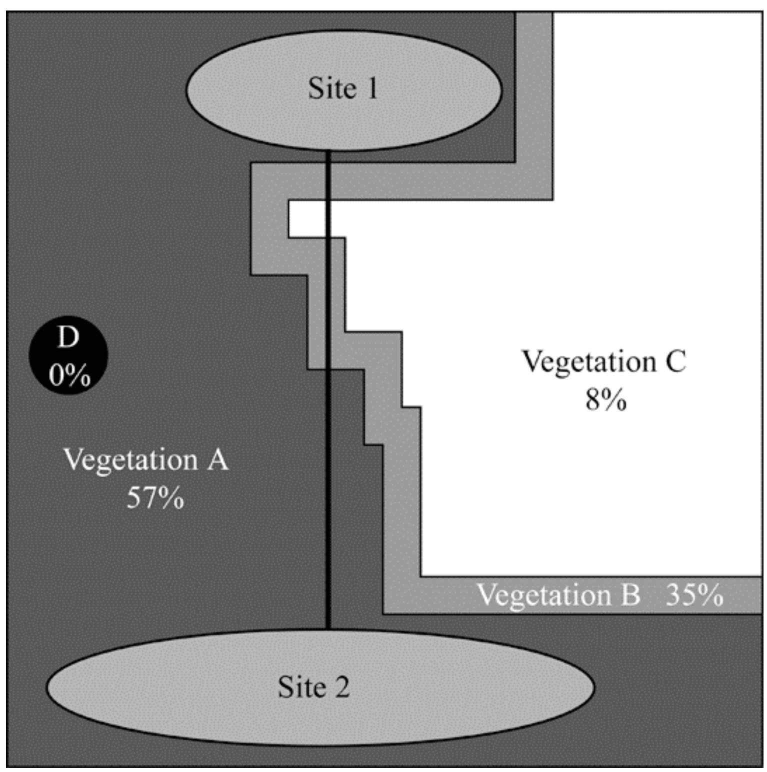


Figure 3.2. Schematic drawing of vegetation between two sites with a survey transect cut through the intersite area. Percentages represent the relative amount of each vegetation class crossed by the transect.

correct to employ a stratified random sample between Tikal and Yaxha, the problem was constraining the sample to a transect.

Puleston (1974) argued that two factors were responsible for the lack of intersite settlement data in the Maya area: 1) the "site orientation" of archaeology; and 2) the dense vegetation that prohibits free-range surveys and the use of aerial photography. The first of these problems has been addressed by a number of regionally-oriented projects with the Petexbatun Project (Demarest 1997; 2004) being exemplary in this trend. The latter of Puleston's suggested problems has been more difficult to address. Aerial photographs can only be used to find the largest structures built by the ancient Maya if the surrounding vegetation has not been cleared. New remote sensing data, like the IKONOS and QuickBird satellites, can be used for the identification of capitals and minor centers (see Chapter One for definitions) in some regions, but they do not work as well for smaller settlements. As always, the thick vegetation of the Peten remains a physical obstacle to regional survey in the Maya lowlands.

Intersite archaeology in the Maya area unfortunately has not changed much in the over 30 years since Puleston originally defined intersite areas. All projects use a combination of survey and excavation so that data is obtained pertaining to both time and space, but rarely are the statistical limitations of their methodologies explicitly discussed in the final report. More recent projects are incorporating sophisticated paleoenvironmental data and new remote sensing technology thanks to the broad participation of NASA in Maya studies. This includes the Marshall Space and Flight Center's work with the San Bartolo Project and the Bajo Communities Project, directed by Patrick Culbert and Fialko. NASA's Jet Propulsion Laboratory has also been working with projects along the Usumacinta and in the Petexbatun and helped coordinate an AIRSAR mission over portions of the Maya area. The utility of these data will be drawn into question if representative sampling strategies are not implemented. New technologies demand the implementation of new methods in intersite archaeology.

For survey, Ford (1981, 1986) was correct to suggest the use of stratified random sampling as a survey technique in the lowland Maya environment. Though, Fialko (1996) was justified in her critique of this method when used in the context of a transect. When stratified random sampling is used in a block survey within the context of a broadly defined intersite area the results are more representative than even a total coverage transect. Random block surveys have been used successfully in the peripheral surveys of both Copan (Fash 1983; 1986) and La Milpa (Rose 2000; Tourtellot et al. 2003). The Copan survey had the advantage of aerial photographs in stratifying the survey universe (Leventhal 1979) whereas the La Milpa survey has been using GPS and GIS in conjunction with more traditional survey methods (Tourtellot et al. 2003). Peripheral surveys are designed to sample the more sparsely settled areas around major centers. An intersite survey is really just the combination of two peripheral site surveys so it is appropriate to use the successful methodologies employed at both Copan and La Milpa in intersite archaeology as well.

Puleston (1974) is to be commended for calling attention to the need for intersite studies. For a long time transect surveys were the most efficient means to investigate an intersite area. Having said that, stratified random block surveys provide a more accurate picture of what truly represents an intersite area. Remote sensing technology permits representative stratification and GPS units facilitate the ability to survey in blocks distributed over the survey universe. The methods employed in the San Bartolo-Xultun intersite survey have led to a reassessment of how intersite areas are defined. Intersite areas can be defined as large tracts of land made up of diverse terrain and vegetation types which correlate with different kinds of ancient settlement remains. Only by stratifying a large survey universe and representatively sampling its components can an accurate picture of intersite settlement be obtained. New technologies often lead to new methodologies in archaeology. Remote sensing and GPS will facilitate the collection of regional survey data in the Maya lowlands, providing a better picture of how the Maya distributed themselves over the landscape and used its resources.

Remote Sensing Technologies

Reconnaissance and survey throughout the San Bartolo-Xultun territory have implemented old and new technologies to develop new field methods. New technologies require the development of new methodologies so that archaeology may continue to advance as a discipline. Remote sensing technologies were provided to William Saturno and the San Bartolo project by NASA in a collaborative effort. Thomas Sever and Daniel Irwin, both of NASA, have been working in the field with the San Bartolo Project to address their own research goals as well as aid in the integration of remote sensing technologies in the project research. Other summaries of some of these technologies have been published previously (Garrison et al. 2004; Sever and Irwin 2003). While there is a long history of remote sensing applications in the Maya area (see Chapter Two), this chapter only focuses on the most recent developments and applications. A summary of satellite technology specifications is given below in Table 3.1.

Table 3.1. Resolution, cost, and scene size of remote sensing satellite technologies.

Satellite	Multispectral Band Resolution	Panchromatic Band Resolution	Cost per km^2	Scene Size in km^2
Landsat	30 m	15 m	$0.01-0.02	34,225
IKONOS	4 m	1 m	$25.20	121
QuickBird	2.44 m	0.61 m	$117	272.25

Landsat TM/ETM

Landsat satellite imagery has been available to the public since 1982 when the Landsat Thematic Mapper (TM) was launched. The Landsat TM had 30 m multispectral (including near-infrared) resolution (Sever and Irwin 2003:115). This means that each pixel in an image represents a 30 m area on the ground. The Landsat Enhanced Thematic Mapper (ETM) was launched in 1999 and included a panchromatic band that had a 15 m resolution that could be used to sharpen the resolution on the multispectral bands (Sever and Irwin 2003:115). A sample Landsat scene is shown in Figure 3.3. The Landsat satellite had many advantages first of which was its cost. Landsat imagery can be purchased at between $275 to $600 per scene at landsat.org, or approximately $0.01 to $0.02 per km^2, with each scene representing approximately 34,225 km^2. Recently, Landsat imagery for the Maya area and Central America has been made available for free via the SERVIR (2006) website hosted by NASA. The large size of a single Landsat scene has its advantages in that it allows for an entire region to be analyzed in a single shot. The systematic and repetitive collection of the Landsat data allows for comparative imagery depending on seasons or general climate trends. Sever and Irwin (2003:115) cite the example of locating Maya causeways, which appear more clearly when there is a difference in moisture between the vegetation on the causeway and other vegetation. The seven multispectral bands of the Landsat ETM are three more than the higher resolution satellites currently in orbit. This permits more ways of manipulating the imagery by

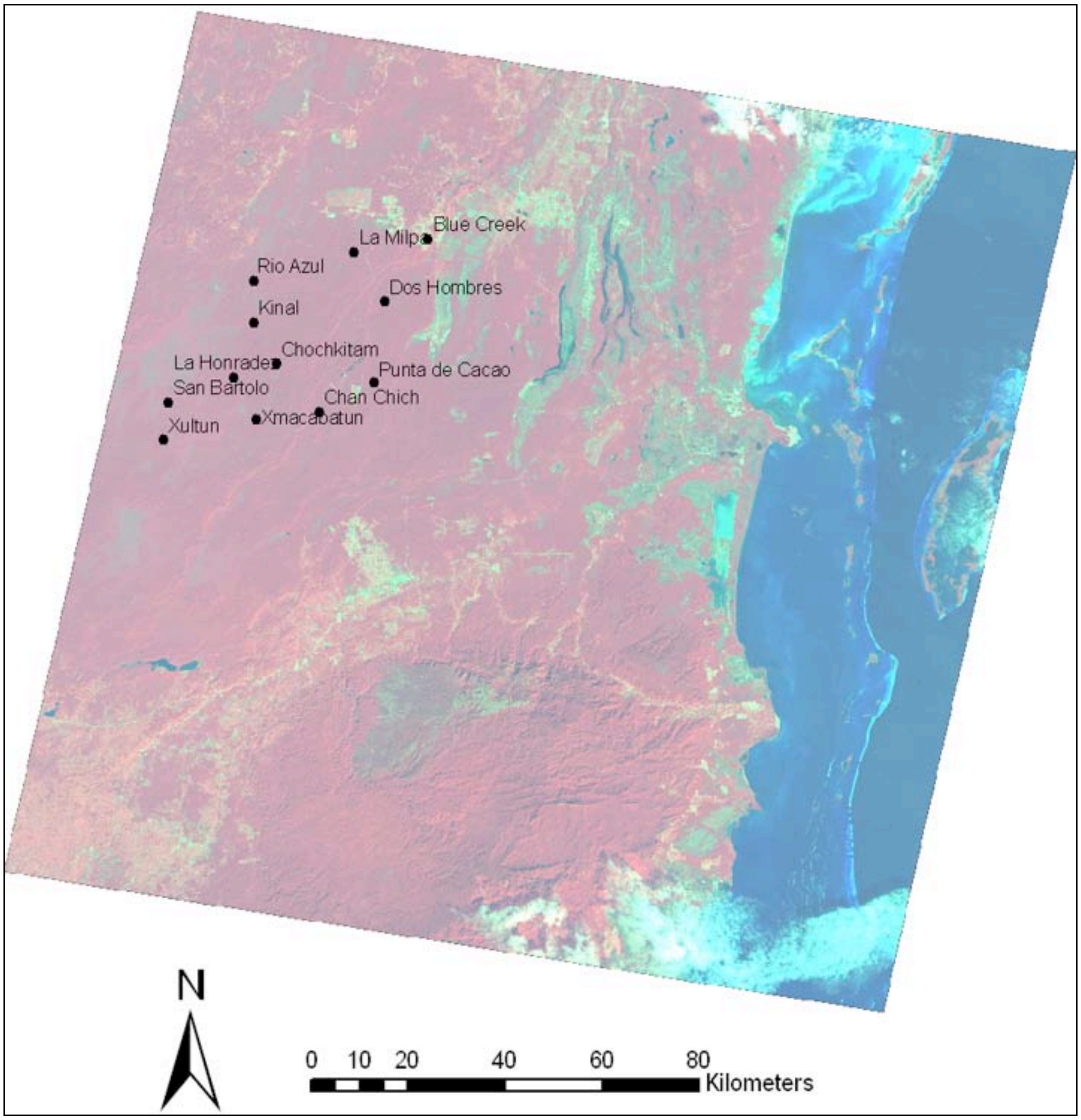


Figure 3.3. Example of Landsat image in False Color Composition (RGB, 4, 3, 1). Major sites of the Three Rivers region indicated.

shifting different bands. The manipulation of color bands has been crucial in the use of satellite imagery at San Bartolo. Unfortunately, the Landsat ETM satellite has a design lifetime of five years and has begun to falter. The next satellite launch is not scheduled until 2009 with the introduction of the NPOESS C-1 satellite. The Goddard Space and Flight Center (2005) of NASA is working to assure that there is no loss in data continuity.

IKONOS

The IKONOS high-resolution satellite was launched in the fall of 1999. The satellite produces images in four multispectral bands (red, green, blue, and near-infrared) at a resolution of 4 m. It also has a 1 m resolution panchromatic band that can be used to sharpen the multispectral imagery (Sever and Irwin 2003:116). Figure 3.4 depicts an IKONOS scene acquired over San Bartolo and Xultun. The IKONOS satellite acquires 121 km^2 scenes and because it is a commercial satellite its acquisitions are made to order. This means that unlike Landsat, the IKONOS data are not systematic and repetitive. Furthermore, a new acquisition in a foreign country requires a minimum of 100 km^2 to be acquired at $25.20 per km^2, or a minimum purchase of $2520 (prices quoted from NPA Satellite Mapping (2005)). This is 1260 to 2520 times greater the cost per km^2 of the lower resolution Landsat imagery. Despite this cost difference, IKONOS does have substantial analytical advantages over Landsat. The resolution of IKONOS is so great that archaeologists were able to identify individual stelae in images of Tikal National Park, Guatemala (Sever and Irwin 2003:Figure 3). When used in conjunction with high-resolution GPS it is easy to navigate to an exact location in an image, such as an individual tree or a dried up arroyo stream bed. The manipulation of multispectral bands led Saturno to identify a signature in the imagery showing the location of ancient Maya sites otherwise obscured by vegetation (Garrison et al. 2004; Saturno et al. 2006; Saturno et al. 2007). The clarity of the IKONOS imagery allows for better vegetation and landscape analyses than are possible with the Landsat (although see Chapter Five for some problems with high resolution). While the high cost of the technology remains a drawback, IKONOS images can be used in conjunction with larger Landsat scenes to provide higher resolution data in chosen areas.

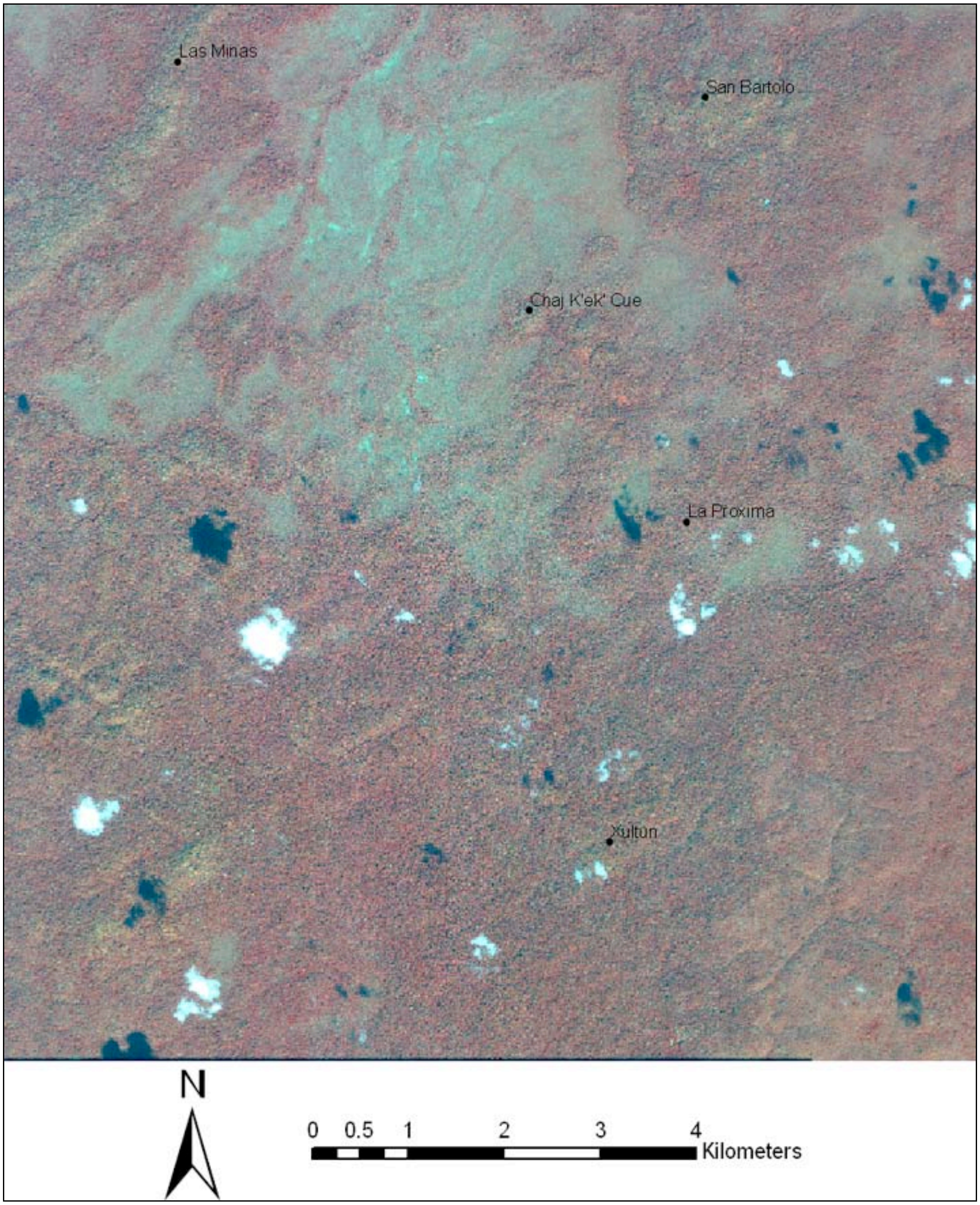


Figure 3.4. IKONOS scene (RGB, 4, 3, 1) covering San Bartolo and Xultun.

QuickBird

The QuickBird satellite provides the highest resolution satellite imagery commercially available (although GeoEye-1 will supersede it in the fall of 2007). The satellite was launched by DigitalGlobe™ in 2001 and provides scenes that are 272.25

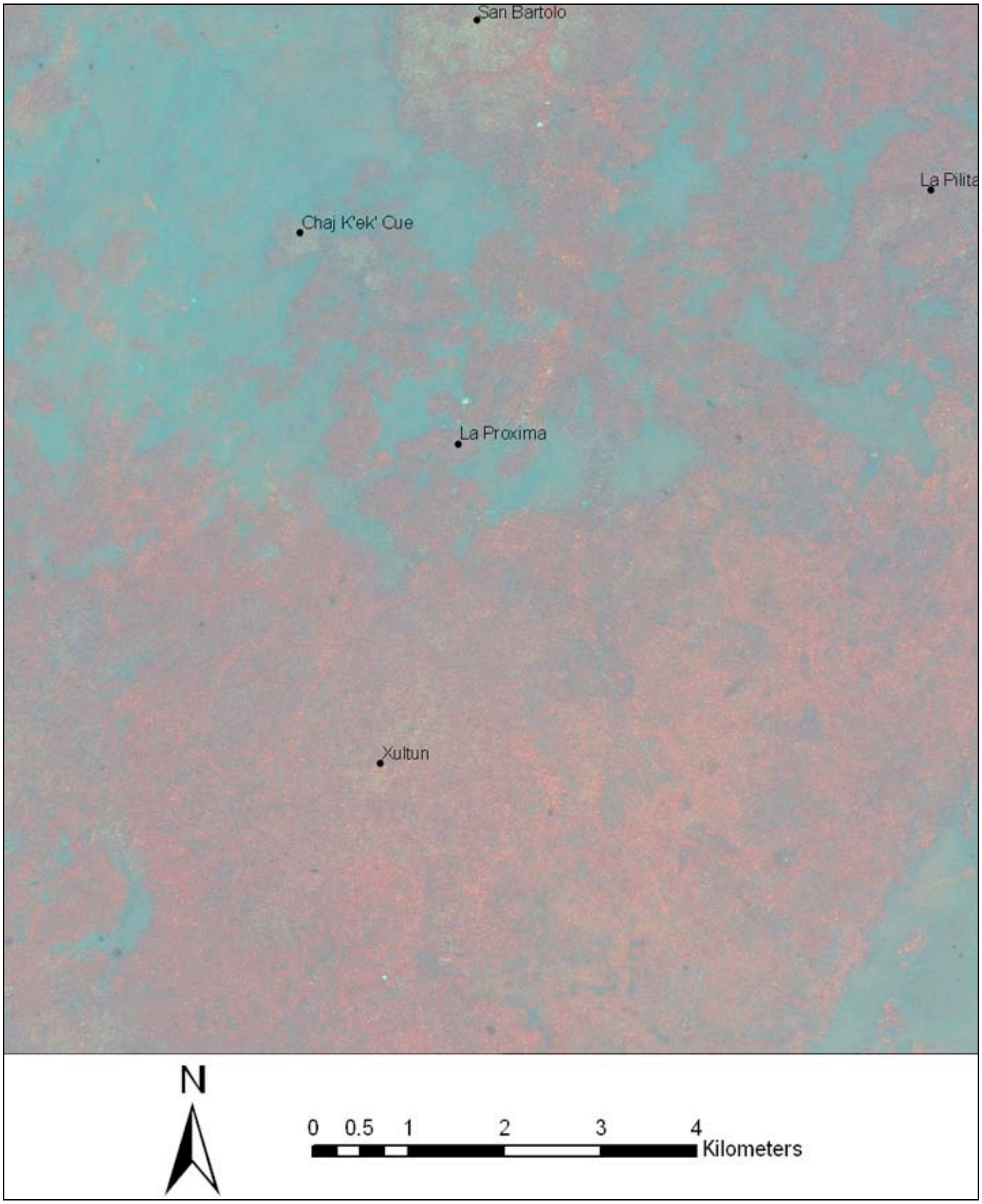


Figure 3.5. QuickBird scene (RGB, 4, 2, 1) covering San Bartolo and Xultun.

km^2, or 16.5 km on a side. The QuickBird satellite uses the same hardware as the IKONOS (with minimal spectral variation due to different production runs), but because it flies at a lower orbit, it provides imagery at a higher resolution (Burgess Howell, personal communication 2007). The multispectral bands of the QuickBird have a maximum resolution of 2.44 m, while the panchromatic band has a resolution of 61 cm. Figure 3.5 shows a portion of the multispectral QuickBird data acquired over San Bartolo and Xultun. Vegetation differences in QuickBird imagery are striking. Narrow logging roads and survey *brechas* can be seen in the imagery. The cost of QuickBird data is still extremely high. An international acquire requires a minimum of 150 km^2 at $117 per km^2 for a total of $17550 (prices quoted from DigitalGlobe 2003). This is 4.64 times more expensive than IKONOS imagery and 5850 to 11700 times more expensive than Landsat ETM images. The San Bartolo Project has benefited from the generous sharing of imagery by the Marshall Space and Flight Center through the NASA Data Purchase Program and a Space Act Agreement signed by William Saturno. At this time the cost of QuickBird imagery seems to outweigh the benefit of new acquires. Nevertheless, the San Bartolo research provides a trial use of QuickBird data so that it can be smoothly integrated into future applications once the cost goes down.

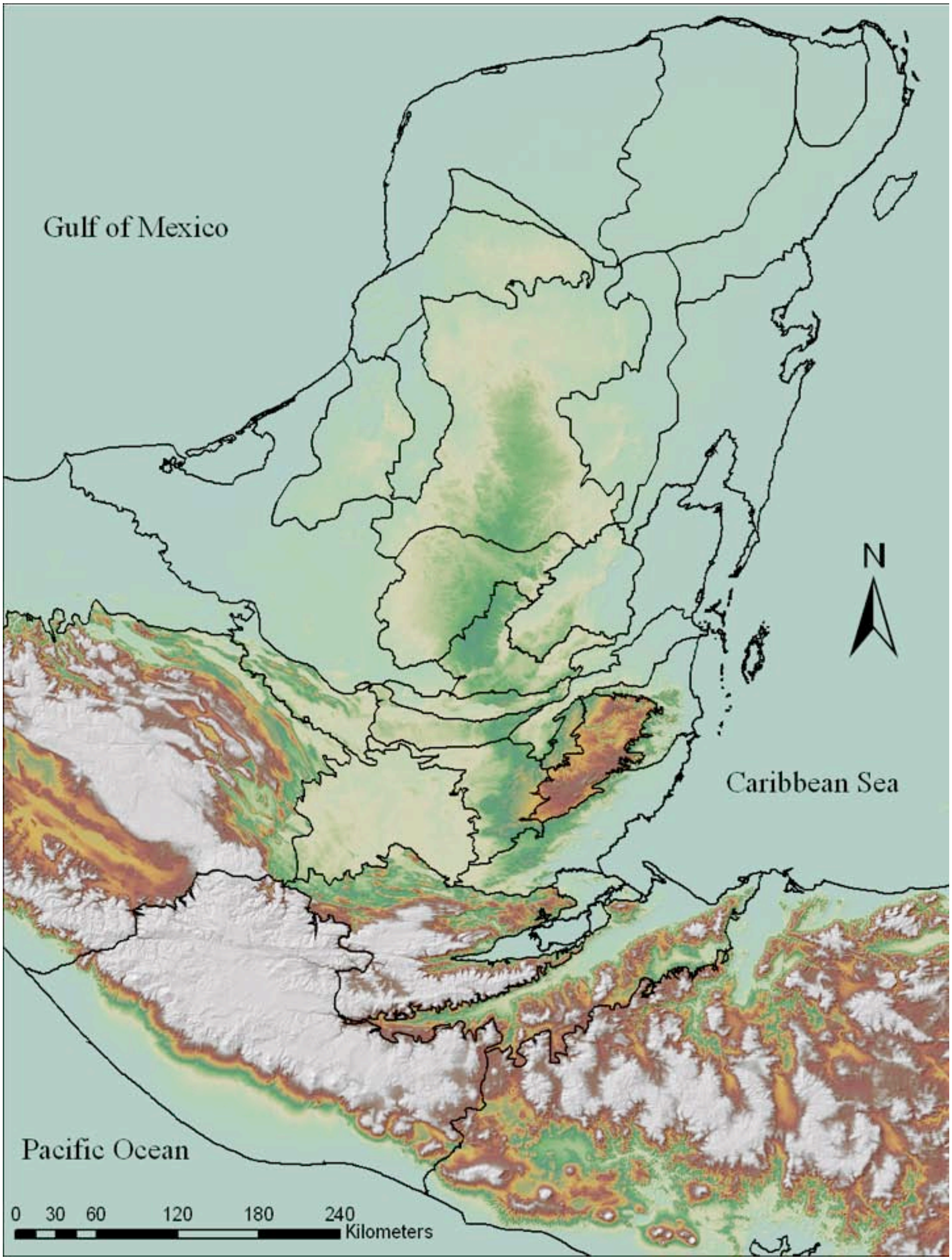
AIRSAR

In 2004, Robert Sharer, Jeffrey Quilter, and Charles Golden, through a grant from the National Science Foundation (NSF), arranged for an Airborne Synthetic Aperture Radar (AIRSAR) acquisition over large tracts of the Maya area (Charles Golden, personal communication 2005). AIRSAR is descendant from the SEASAT-SAR that was used in earlier remote sensing applications in the Maya area (Adams et al. 1981). NASA originally developed the Synthetic Aperture Radar (SAR) to map the surface of Venus. Doppler radar is made up of a number of different bands (L-, S-, C-, X-, and K-band) that were designated in World War II. The original SAR radar used an L-band (24 cm wavelength) because it was believed that this band would be the best to penetrate the thick atmosphere around Venus (Jet Propulsion Laboratory 2005). The current AIRSAR DC-9 aircraft was built late in 1987. AIRSAR uses L-band (24 cm wavelength), C-band (5.6 cm wavelength), and a P-band (68 cm wavelength) polarimeter that measures the polarization of light. The use of these three bands of radar is what makes AIRSAR so powerful. AIRSAR, as opposed to earlier SAR applications, is supposedly capable of penetrating the forest canopy and in dry regions it can penetrate light soil layers, revealing ancient drainages (Jet Propulsion Laboratory 2005). While the 2004 mission had some problems acquiring over some specific sites, a significant amount of lowland data was acquired. The Digital Elevation Model (DEM) generated by the AIRSAR mission has a horizontal resolution of 3 m and a vertical resolution of 1.5 m. This means that individual ruined Maya structures could hypothetically be seen in the AIRSAR data. DEM's are arguably the most important data layer in a Geographic Information System (GIS), but they are dependent on the resolution of available topographic data. AIRSAR has assured that high-resolution elevation data will be used in spatial analyses in covered areas of the Maya world as seen in recent publications (Golden and Scherer 2006; Saturno et al. 2006).

Shuttle Radar Topography Mission (SRTM)

In February, 2000 a single space shuttle mission collected single-pass radar interferometry data for 80% of the planet's land surface using C-band and X-band

Figure 3.6. Shaded relief map of Maya area created from SRTM data. Adaptive region divisions shown


Gulf of Mexico
Caribbean Sea
Pacific Ocean
N
0 30 60 120 180 240
Kilometers

antennas (Lillesand et al. 2004:712). The resultant elevation data for this mission has been made public in the form of free digital elevation models (DEM). The DEM's that cover the United States were released at a resolution of 30 m, while all international data has been released at a resolution of 90 m (Lillesand et al. 2004:713). While the SRTM data is relatively coarse, it does provide elevation data in a single format that covers the entire Maya area. Figure 3.6 shows a shaded relief map created using SRTM data. This data was instrumental in defining adaptive regions and territorial boundaries for this dissertation research.

Remote Sensing Technologies at San Bartolo

William Saturno and the San Bartolo Project began a relationship with NASA before the first full field season in 2002. GPS points taken by Saturno when he discovered San Bartolo were plotted onto a Landsat scene to visualize his reconnaissance route. I have used Landsat imagery, combined with SRTM data, to divide the San Bartolo-Xultun territory into proposed research areas. The 2004 AIRSAR mission missed most of San Bartolo, Xultun, and the intersite area, but did acquire over the large *bajo* island to the northwest and was used during reconnaissance in 2004, and for more detailed analyses by Saturno and colleagues (2006). IKONOS satellite imagery has been the most widely used remote sensing technology by the project in the field. QuickBird data has been used extensively in the laboratory setting.

On Decmber 16, 2002, the IKONOS satellite acquired scenes over San Bartolo, Xultun, and the large *bajo* island to the northwest of San Bartolo. Images were given to the project in both true color and in a pseudo true color compositions (labeled on the imagery as False Color Composition). Images are rendered in a software package through the use of color guns (DigitalGlobe 2005). The color guns are labeled Red, Green, and Blue, corresponding with the standard multispectral bands of the satellite imagery. The IKONOS multispectral bands are numbered: Blue = 1; Green = 2; Red = 3; Near-infrared (NIR) = 4. In a true color image each multispectral band is assigned to its corresponding color gun (but the NIR band is not used) and the image is rendered as: True Color Composition (RGB/3, 2, 1). The RGB represents the order of the color guns and the numbers represent the band assigned to each gun.

To create a false color image multispectral bands are placed in different combinations into the color guns. NASA provided a false color image to the project in which the NIR band is assigned to the Red gun, the Red band is assigned to the Green gun, and the Blue band is assigned to the Blue gun (but the Green band is not used). This image is called: False Color Composition (RGB/4, 3, 1). In this false color image the types and density of vegetation found on elevated terrain appears bright red, which contrasts clearly with the turquoise scrub *bajo* vegetation. Vegetation appearing in these colors in the imagery can be used as proxies for elevation.

In 2003 Saturno checked the GPS coordinates of San Bartolo against the true color imagery and noted that the vegetation appeared to have a yellowish tint to it in the region of the site. During the same year, Griffin and I went to examine a *bajo* peninsula to the south of San Bartolo to see if Saturno's identification of a settlement signature was correct (Figure 3.7). Using the false color imagery a small site was discovered on the peninsula and GPS points were taken in various plaza groups to be georeferenced to the satellite imagery. The discovery of the peninsula site, which was named Chaj K'ek' Cue,

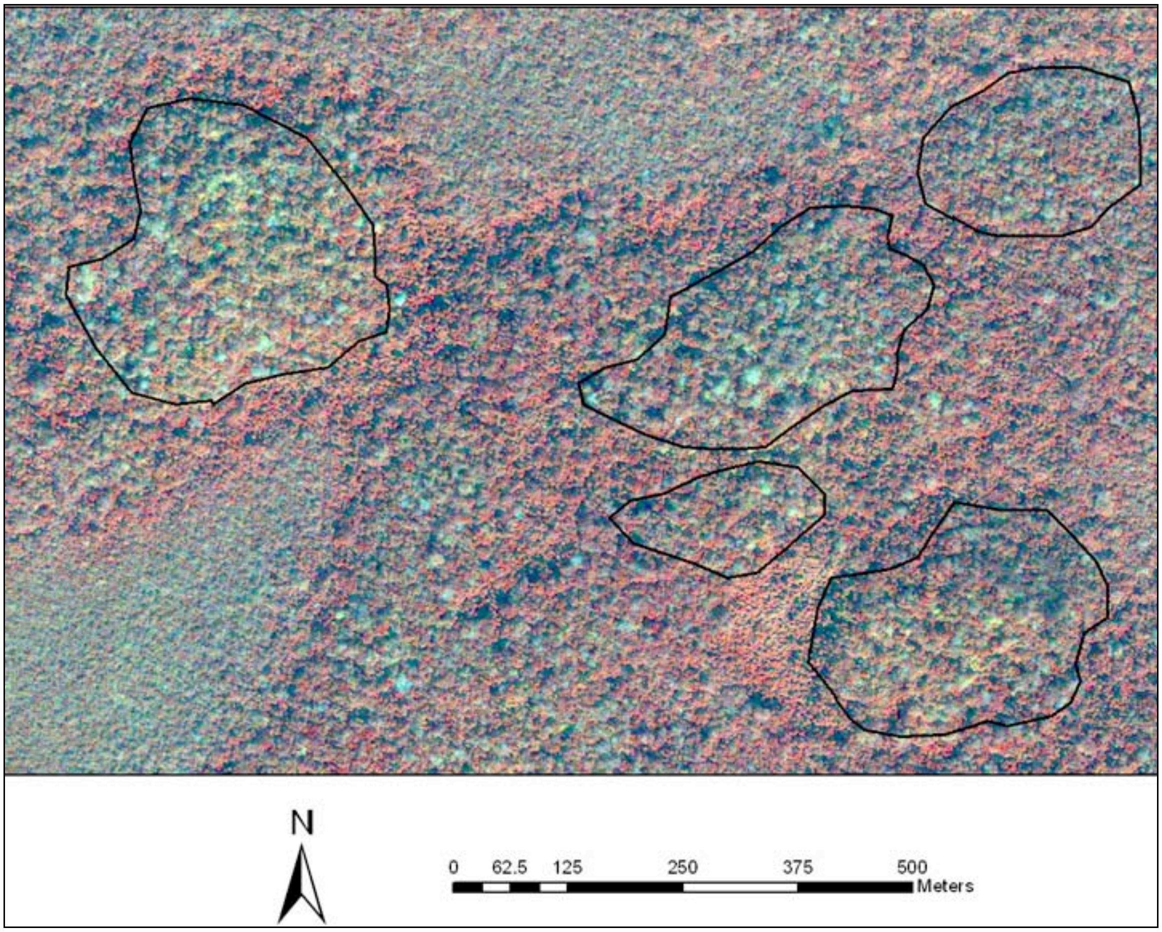


Figure 3.7. Example of settlement signature at Chaj K'ek' Cue.

was the first independent discovery of a site using the IKONOS imagery, and coincidentally had very little evidence of illicit looting. Figure 3.8 shows the Chaj K'ek' Cue site map overlaid on IKONOS imagery.

The signature was found in printed images without consulting the underlying data. Subsequent refining of the digital data has only further highlighted the vegetation difference seen over settlement (William Saturno, personal communication 2007). The signature on the false color imagery is more refined than in the true color composition, and is composed of clusters of yellow and light blue pixels. These clusters have a textured appearance so that the areas where there are settlements have the appearance of being raised above the rest of the imagery. Since the identification and refinement of the

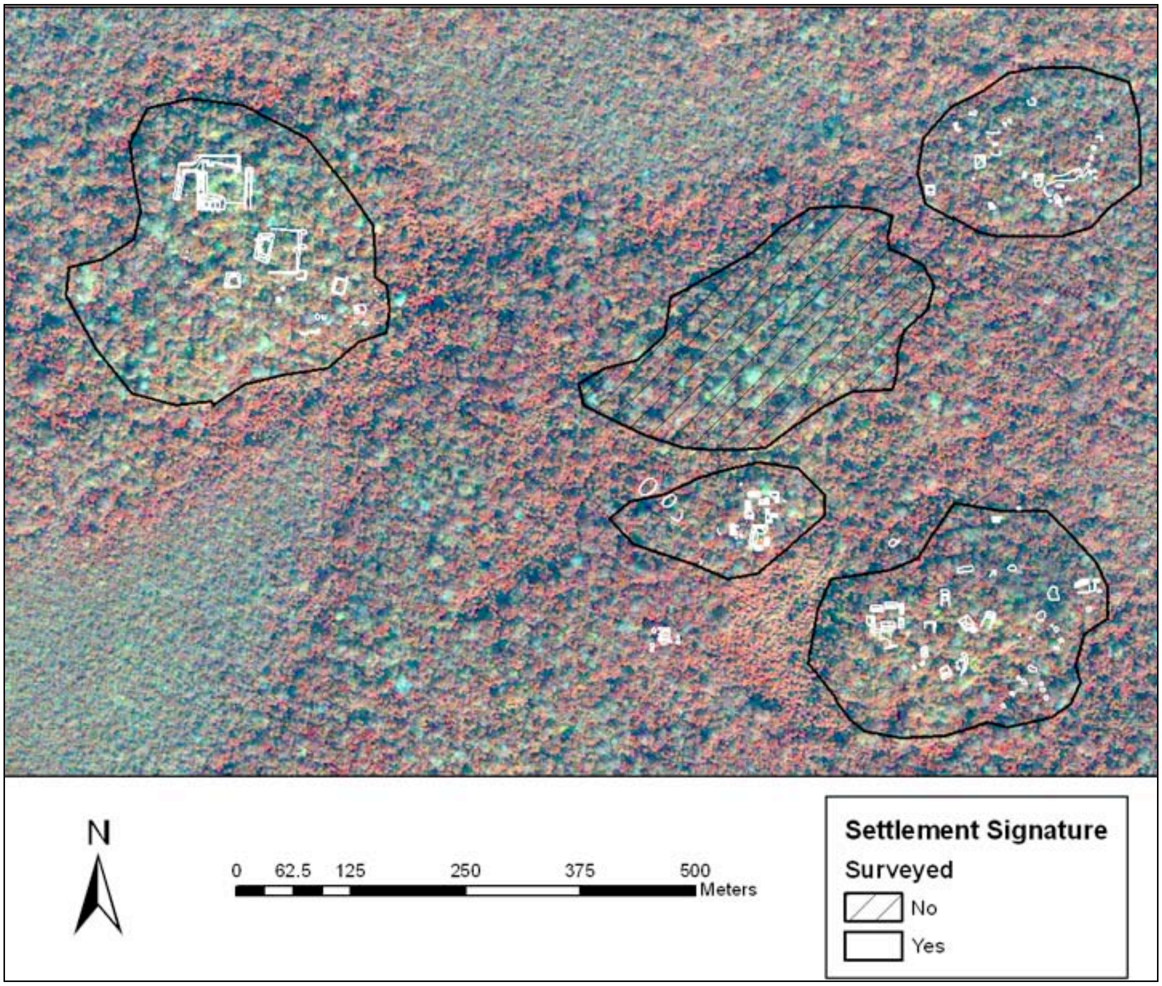


Figure 3.8. Map of Chaj K'ek' Cue overlaid on IKONOS imagery.

settlement signature in 2003, IKONOS imagery has been used in numerous reconnaissance and survey efforts, and has been systematically tested for accuracy in the San Bartolo-Xultun intersite survey. The signature also appears in QuickBird imagery, but appears better in a different band combination (RGB, 4, 2, 1) than in IKONOS (Burgess Howell, personal communication 2007). It is important to note that the settlement signature does not actually depict ancient Maya archaeological remains. The signature represents the remotely sensed reflection of light off of vegetation at different wavelengths (Lillesand et al. 2004:12-20). The settlement signature identifies certain types of stressed vegetation that are frequently found growing on Maya settlement around

San Bartolo. As such, it can be used as a proxy for the identification of site locations in this region.

Areas of the San Bartolo-Xultun Territory: Reconnaissance and Survey

The survey data for this dissertation was collected during four field seasons from 2002 to 2005. Research involved work for the overall project, as well as more specific research related to settlement between San Bartolo and Xultun. Survey efforts for the project were focused on the site of San Bartolo itself, the small *bajo* peninsula site of Chaj K'ek' Cue, and the intersite area. Reconnaissance around San Bartolo was conducted to discover new settlements either through the use of remote sensing imagery or by talking with local informants. All survey and reconnaissance on the project has been a collaborative effort, conducted over multiple seasons with work being done by numerous researchers and students. I was directly involved in all phases of this research, directing most of the project survey work and some reconnaissance operations when Saturno was unable to participate himself. All of the data collected contributes to the understanding of the territorial culture history and also contributes to the results and interpretation of the intersite study.

Landsat satellite imagery, combined with a shaded relief map generated from SRTM data, was used to divide the San Bartolo-Xultun territory into 15 areas of analysis (Figure 3.9). The 15 areas were generated based on an analysis of the settlement signature combined with perceived natural boundaries seen in the data. Each of these areas consists of a different configuration of microenvironments, with the most common types being well-drained uplands, varieties of scrub *bajo*, and varieties of palm *bajo*.

Most of the boundaries between areas also represent microenvironmental boundaries, but not always. Other boundaries include river and *arroyo* beds and major topographical changes. The transitional spaces between microenvironments have been found to be productive areas for settlement investigation (see Chapter Five). Since the area concept is an analytical tool, the 15 areas I define here may be perceived differently by other scholars, thereby generating different models from the same region.

The areas are listed in the caption to Figure 3.9. Of these areas, the San Bartolo, San Bartolo-Xultun Intersite, and Chaj K'ek' Cue areas have been intensively investigated in the form of reconnaissance, survey, excavation, and paleoenvironmental investigation. The Xultun area has been extensively reconnoitered and has had some survey (Morley 1937-1938; Von Euw 1978) and paleoenvironmental investigations (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006), as well as epigraphic study (Garrison and Stuart 2004; Houston 1986). The Isla Oasis, K'ak' Quij Kwaribaal, and Oxtun areas have received heavy reconnaissance. The Ixcan Bajos area has received light reconnaissance and some paleoenvironmental study (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006). Finally, the Hormiguero, Itz'ul Islands, Las Minas, Azucar Islands, Noticiero, and Ixcan Bend areas have all been the subject of brief reconnaissance trips.

Reconnaissance

Between 2003 and 2005 numerous sites were discovered within a 12 km radius of San Bartolo through chance discovery, local informants, and use of satellite imagery (Figure 1.2). In 2003 it was confirmed that the site of Xultun was not located where it is shown on the 1:50,000 topographic maps published by the Instituto Geológico Nacional

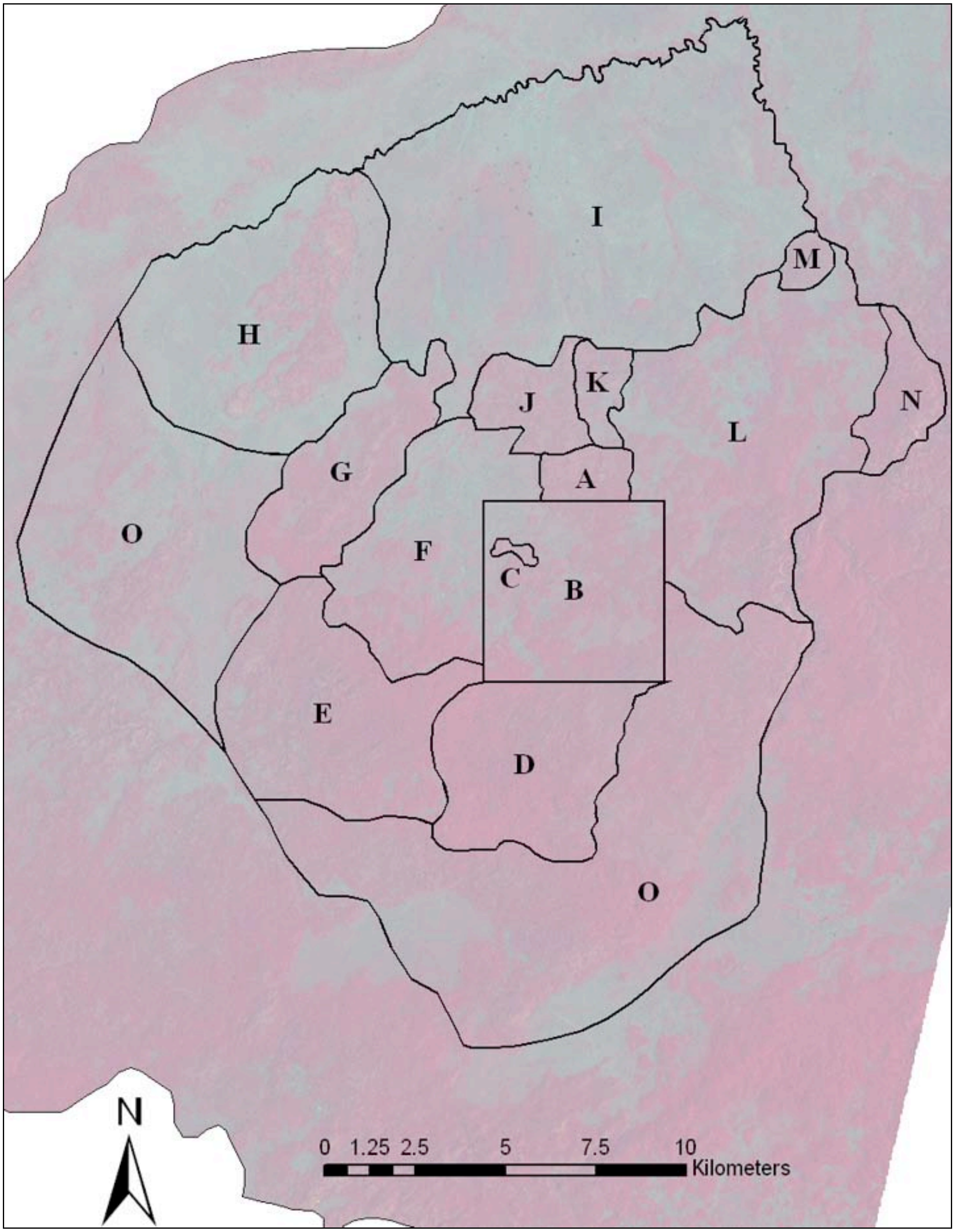


Figure 3.9. Areas of analysis in the San Bartolo-Xultun territory. A) San Bartolo area; B) San Bartolo-Xultun intersite area; C) Chaj K'ek' Cue area; D) Xultun area; E) Hormiguero area; F) Itz'ul Islands area; G) Las Minas area; H) Isla Oasis area; I) Azúcar Islands area; J) K'ak' Quij Kwaribaal area; K) El Noticiero area; L) Ixcan Bajos area; M) Oxtun area; N) Ixcan Bend area; and O) Unclassified area.

(IGN) and a party was organized to investigate the area where IGN had originally labeled the site. Approximately 10 km east of San Bartolo I reconnoitered a large Classic Period site. This site, labeled as Xultun on the IGN maps, has since been named Xixi (Garrison 2003a). Xixi has a large palace compound (Figure 3.10), an E-Group, a long north-south causeway, multiple pyramids, and at least one blank standing stela. The large size of the site, and the numerous ticks acquired on the way to it, prevented the mapping of Xixi, which had been severely looted with the largest pyramid in danger of structural collapse. Xixi is outside of the San Bartolo-Xultun territory and was a secondary center in the La Honradez territory (see Chapter Six). Xixi was located with the aid of a local informant from Uaxactun.

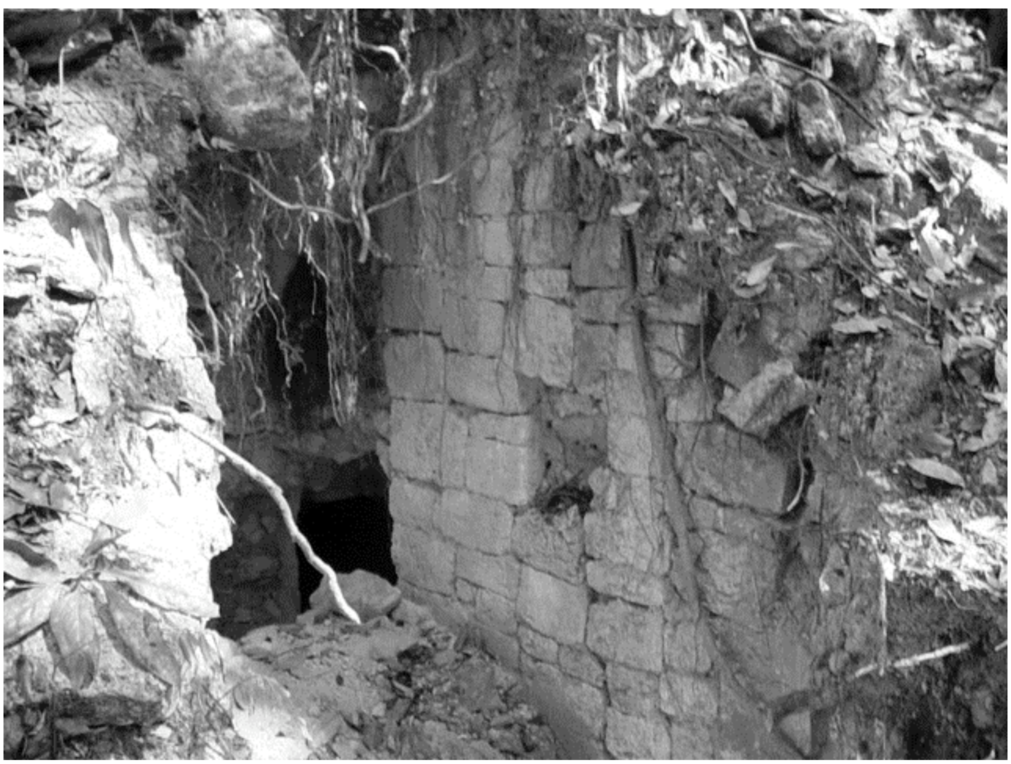


Figure 3.10. Looter trench in palace compound at Xixi.

Regional reconnaissance has led to the discovery of eight archaeological sites within the San Bartolo-Xultun territory. Three of these sites were found during general exploration, while the other five were discovered using remote sensing technology. The same local informant who helped locate Xixi led us to a very small site composed of two plaza groups, one of which had a large circular depression cut into the bedrock (Figure 3.11). This site was named La Pilita and is located in the Ixcan Bajos area.

Figure 3.11. Bedrock depression at La Pilita.

The small site of Oxtun was discovered in 2003 while cutting a road to the Ixcan Río so that water could be brought to the San Bartolo archaeological camp. This site is within 100 m of the dry river bed and watering holes and has numerous plaza groups. Both Late Preclassic and Late Classic sherds were visible in looter backdirt (Figure 3.12). There were three stelae at the site, one was still standing, and none showed evidence of carving. It is presumed that these are the stelae that Saturno was originally looking for when he discovered San Bartolo in 2001. Oxtun has been given its own area designation.

The small site of La Próxima (named by Barbara Fash) is in the intersite area and was seen from the road to camp during the 2002 season. The site was finally reconnoitered at the end of the 2005 season and consists of a small temple mound (approximately 3 m tall) and a couple of very low mounds loosely arranged in a courtyard.

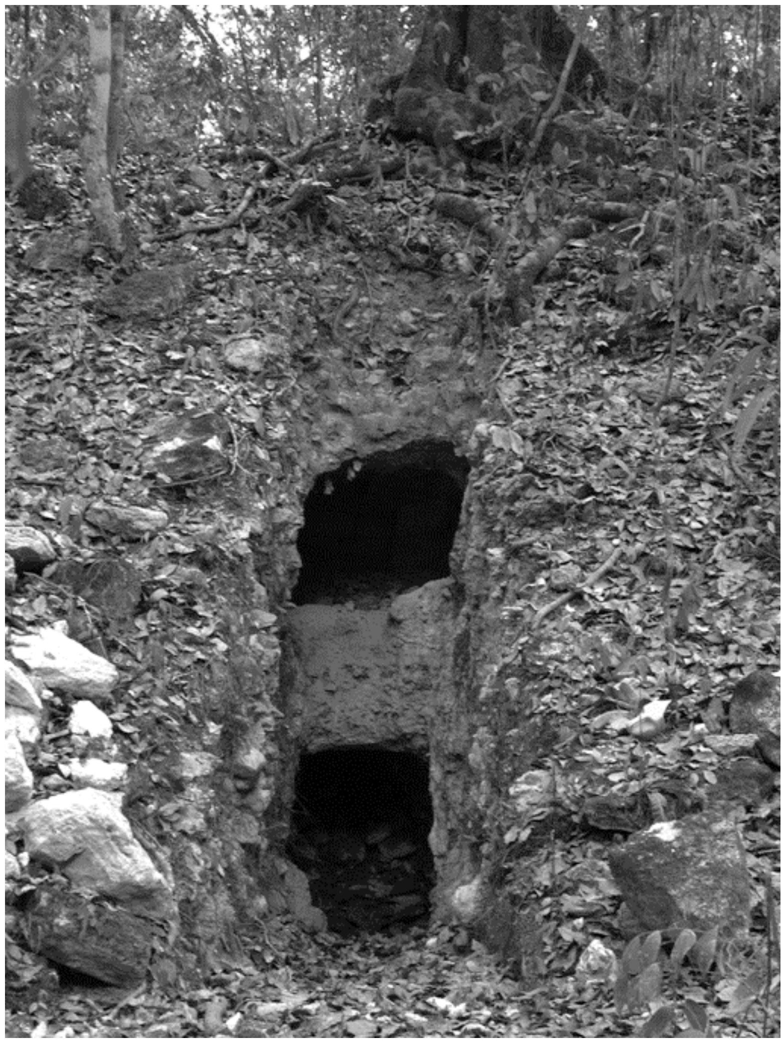


Figure 3.12. Looter trench at Oxtun.

The rest of the sites that have been discovered were done so using IKONOS satellite imagery provided to the project by NASA. In 2003, IKONOS imagery was tested successfully for the first time with the discovery of the *bajo* peninsula site of Chaj K'ek' Cue. This site represents its own area, but it can also be considered part of the San

Bartolo-Xultun Intersite area. Three major groups of architecture were discovered and all were found to match-up well with the newly identified settlement signature.

Further field tests that season led to the discovery of extensive settlement on the large *bajo* island northwest of San Bartolo. The *bajo* island itself has been named Isla Oasis, while the site name La Prueba refers to the settlement covering the island. On a previously published map the northern portion of the island was labeled under the vague name of Las Ruinas (Pope and Dahlin 1989: fig. 7). But, since the site had received no on-the-ground investigation until the 2003 visit, and the ruins are quite extensive, the name La Prueba is here replacing Las Ruinas and incorporates all settlement on the island. During this trip a site was also discovered on an island to the southwest, which was given the name of Las Minas for the high number of limestone quarries in relation to visible architecture.

In 2004, a return trip was made to Isla Oasis to further document the extent of settlement and test remote sensing technologies. On this trip, led by Saturno and Sever, a stereo image of IKONOS false cover, overlain on raw AIRSAR data in an anaglyph format was used to guide reconnaissance. Using 3-D glasses, the most likely areas for settlement were identified in the images and programmed into a high-resolution GPS unit. In each case settlement was found where predicted, confirming that the IKONOS imagery covering this region did provide a signature for identifying dense concentrations of architecture by proxy. The site of K'ak' Quij Kwaribaal (known in Spanish as Casa Pintadas) was discovered by Joshua Kwoka while cutting the *brecha* for this 2004 trip. This site has been given its own area designation and consists of several plaza groups but is dominated by a single two-story structure that still has a corbel vault intact. There are eroded stucco masks on the sides of this structure. Kwoka also found small plaza groups in another area that bore the settlement signature in the IKONOS imagery.

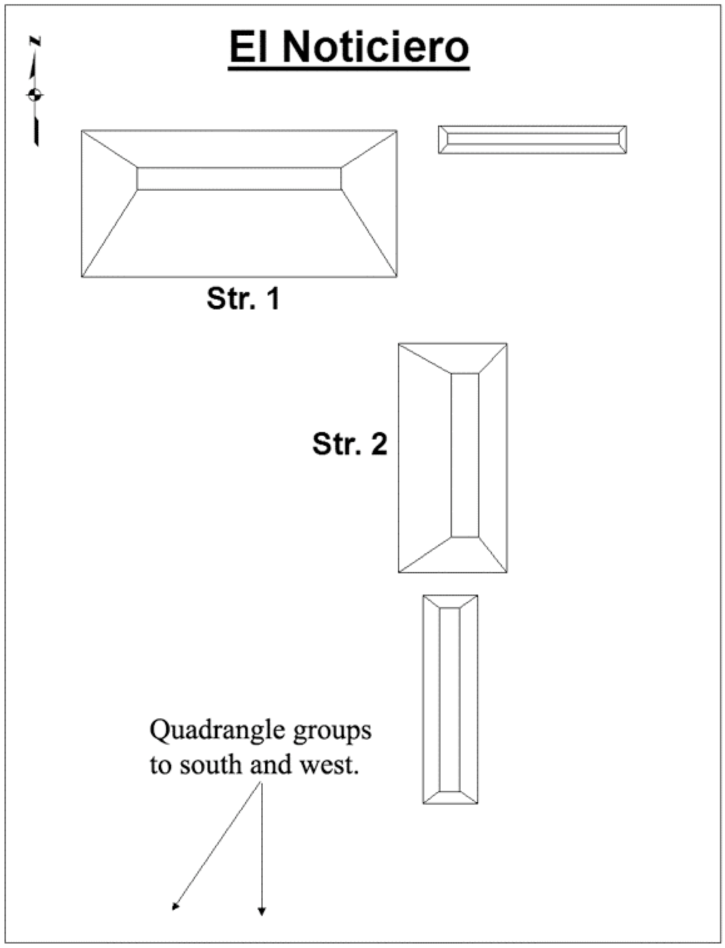


Figure 3.13. Sketch map of El Noticiero by Joshua Kwoka.

In 2005, reconnaissance to the north of San Bartolo resulted in the discovery of the small site of El Noticiero, which consists of several plaza groups and was given its own area designation (Figure 3.13). As the San Bartolo Project moves into the next phase of research it is certain that the project's regional map will be improved, furthering our understanding of settlement patterns and dynamics. The work of identifying settlement in the wider region continues as new advances are being made in the satellite interpretation by Saturno and project members. While this dissertation treats the San

Bartolo-Xultun intersite area, territory, and the wider Three Rivers adaptive region, a test-pitting program combined with architectural investigations that sampled all of the new sites discovered by the project would provide a richer settlement history than the preliminary work that is presented here.

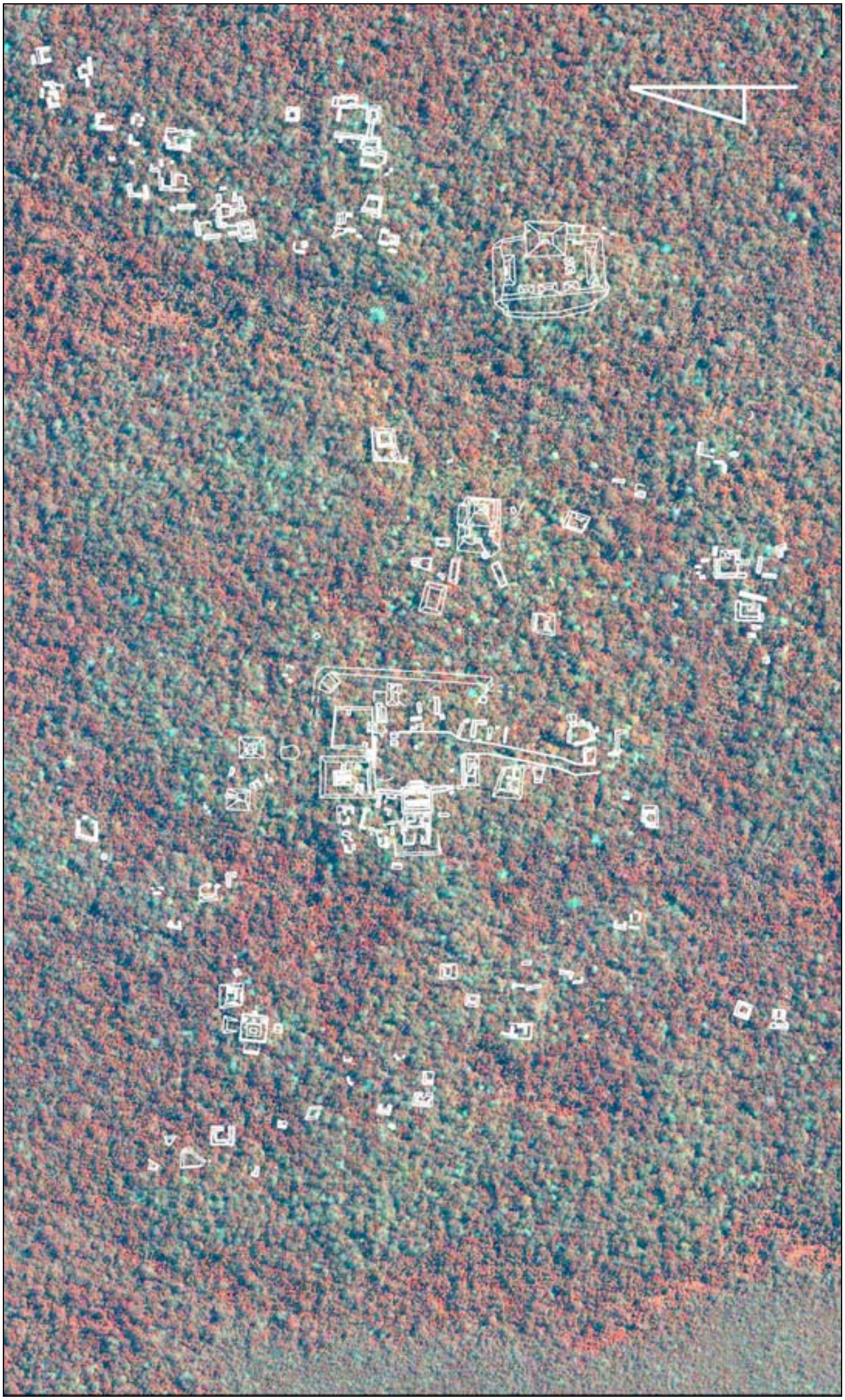
Survey

Total station survey has been conducted around San Bartolo since the inception of PROSABA in 2002. The survey has concentrated on three principal areas: San Bartolo, Chaj K'ek' Cue, and the Xultun-San Bartolo intersite area. The San Bartolo site survey, conducted from 2002 to 2005, employed evolving field methods as the importance of NASA's remote sensing data became apparent to the survey team. Chaj K'ek' Cue was surveyed mostly during the 2003 season, with some refinements made in 2004. The intersite area survey began in 2003 but had major methodological changes in 2004 and the vast majority of the investigation was conducted during the 2005 season. The San Bartolo and Chaj K'ek' Cue surveys are detailed below, followed by a separate section describing methods used in the intersite area.

<u>San Bartolo</u>

The map of San Bartolo has grown in size and density over the four field seasons at the site. What was once considered to be a small Late Preclassic site is now understood to be a medium to large sized center with major occupation in the Late Preclassic followed by an almost total site abandonment in the Early Classic Period, with evidence for a significant residential Late Classic reoccupation of the site. The site is named for the *chiclero* (gum-tapper)/looter camp and *aguada* west of the Ventanas Group

Figure 3.14. San Bartolo map overlaid on IKONOS imagery.



that was previously named San Bartolo (St. Bartholomew) after the patron saint of tanners. Large scale excavations have been conducted throughout the site (see Chapter Two), and it was surveyed between 2002-2005 (Figure 3.14).

Hector Mejía and I made the first instrument survey map in 2002 by using a Topcon™ GTS-229 total station and a three-man crew (Garrison and Mejía 2002). The site had not been cleared of vegetation and, due to the short length of the season, survey was conducted in an exploratory fashion. A datum was set up just south of the ballcourt (Strs. 29 and 30) and survey transects were cut opportunistically to best position the total station to survey visible architecture. Once the major architecture was recorded, short reconnaissance trips were made to find other structures. Once survey was completed for the season the survey team re-walked the map and noted additions and changes to be made in following seasons. Another goal was to record the 200+ looter trenches located throughout the ruins. In this process 22 looted vessels, most in close association with open looter trenches, were collected, catalogued, and stored.

Robert Griffin and I (Garrison 2003b) made corrections to the original site map in 2003. The palace (Str. 60) was the focus of major remapping to prepare for excavation the following season. The *aguada* just west of the Ventanas (Str. 20) pyramid was also mapped. Excavation data from both the palace and Structures 82-84 were incorporated into the architectural plan on the map. All new survey data was tied into the original ballcourt datum. Before the 2003 season an IDAEH survey crew placed a delimitation *brecha* around San Bartolo. The area of the delimitation consists of 4 km^2 and represents the portion of the site that is officially protected. A major architectural group, Jabalí, was discovered while returning from reconnaissance along the delimitation. This discovery was checked against work with IKONOS satellite imagery interpretation to confirm the identification of ancient settlement through remote sensing.

In 2004, major architecture at the Pinturas and Ventanas Complexes was resurveyed since much of the undergrowth had been cleared from the site and finer details became clearer to the survey team (Garrison and Kwoka 2004). The IKONOS imagery was used to record the extent of settlement to the north and northwest of the Ventanas Complex, following the successful overlaying of the Chaj K'ek' Cue map on the settlement signature during the 2003 season (Figure 3.8). This was achieved by finding the extents of the signature in the imagery and carrying a hand-held Garmin™ GPS unit during survey to make sure all of the ground indicated in the data was covered. Brief reconnaissance trips were made to areas outside of the settlement signature seen in the satellite imagery to confirm that no architecture was being missed using this method. The 2004 season also included the survey of the Jabalí Complex and surrounding structures. There were 23 structures (Strs. 105-127) added to the final map during the 2004 season and the entire map was redrafted, eliminating Structures 21, 24, 25, 61, 62, 69, and 80.

The 2005 season was dedicated to the survey of the peripheral settlement of San Bartolo, as well as the largest architectural group at the site, the Saraguates Complex (Griffin and Kwoka 2005). Following methods developed during the intersite survey in 2004 (see below), an AshTech ProMark2™ high-resolution GPS unit (accuracy up to 1 cm) was used to establish survey benchmarks for the total station. The survey was once again guided by IKONOS satellite imagery and all structures were found to lie within the settlement signature at San Bartolo. In total, 120 structures were mapped (Strs. 128-247), completing the site survey of San Bartolo.

Chaj K'ek' Cue

The minor center of Chaj K'ek' Cue was discovered and surveyed in 2003 (Garrison 2003a). The Chaj K'ek' Cue area is embedded in the intersite area and can be considered either as a separate analytical unit or as a part of the overall intersite settlement. The site is located on a peninsula jutting westward into the Bajo Itz'ul, approximately 2.5 km southwest of San Bartolo. Robert Griffin (2004) conducted preliminary excavations and a little additional mapping in Group A during the 2004 field season. The site was mapped off of a baseline transect that was cut and surveyed between San Bartolo and Xultun during the 2003 season. All survey was done with a total station and GPS points were taken on the benchmarks to tie the map into the remote sensing data (Garrison 2003a).

San Bartolo-Xultun Intersite Survey and Reconnaissance

In 2002, plans were formed to investigate the region between San Bartolo and Xultun to understand the relationship between the two sites and to specifically address the coincidence of the abandonment of San Bartolo in the Late Preclassic and the putative rise of Xultun in the Early Classic (Garrison 2005b). This research was conducted in anticipation of a large scale project to be conducted at Xultun sometime following the work at San Bartolo. Survey and reconnaissance in the zone between Xultun and San Bartolo was conducted from 2003 to 2005. The goals of this research were as follows:

- Survey a transect connecting San Bartolo to Xultun

- Create a survey design that systematically tests the IKONOS settlement signature identified by the project
- Total station survey 10% of the survey universe, sampling each stratified class

These goals developed dynamically in response to new technological developments and obstacles encountered during the research process. I directed the intersite survey, but it would not have been completed without the assistance of dozens of researchers, students, and workers who participated in this investigation over three field seasons. The San Bartolo Project director, William Saturno, has been instrumental in facilitating the intersite research and the use of remote sensing technology in every aspect. A technical report of this research has been published (Garrison 2005c) and professional papers have been presented outlining some of the following methods (Garrison 2005a, 2006).

The San Bartolo-Xultun Transect

Intersite surveys have been transect surveys since they were defined by Dennis Puleston (1974) during his research between Tikal and Uaxactun. A transect survey involves surveying a straight line between two sites, placing benchmarks at regular intervals, and surveying settlement within a set distance from either side of the baseline. Intersite surveys have been conducted between Tikal and Uaxactun (Puleston 1974), Tikal and Yaxha (Ford 1981, 1986), Tikal and Nakum (Fialko Coxemans 1996), Yaxha and Nakum (Fialko Coxemans 1996), Yaxha and Naranjo (Fialko Coxemans 1996), Río Azul and El Pedernal (Black and Suhler 1986), the Becan and Rio Bec areas (Adams 1981), and in the Petexbatun region (O'Mansky and Dunning 2004). Some of these have been formal transect survey, whereas others have been informal walking surveys. An intersite survey between Ek Balam and Chichen Itza (Ringle et al. 2004) was called a transect survey by archaeologists, but the transect was 20 km wide rather than the more standard 250-500 m and therefore does not fall into the same category as the others.

The original goal of the San Bartolo-Xultun intersite survey was to do a transect survey similar to previous intersite surveys. A permanent benchmark was set at the southwest corner of the San Bartolo delimitation *brecha* as a starting point of the transect. The transect was oriented to magnetic south and was designed to be 8 km in length. It was surveyed using a Topcon™ GTS-229 total station and survey stakes were shot in at exactly every 100 m (Figure 3.15). Points were shot at major changes in topography and vegetation and notes were taken on vegetation changes based on the knowledge of Anatolio López, a former *chiclero* and assistant to Ian Graham of the Corpus of Maya Hieroglyphic Inscriptions project. The five-man work crew could cut anywhere between 300 and 1000 m in a day depending on vegetation. At 6600 m the transect passed 100 m west of Xultun Group A. Having reached the southernmost major architectural group of Xultun it was decided to terminate the transect 400 m later for a total of 7 km. Points were taken on the corners of major architecture in Xultun Group A to accomplish the goal of linking the San Bartolo map to the Corpus' Xultun map (Von Euw 1978).

The San Bartolo-Xultun baseline transect was completed with three weeks remaining in the 2003 field season. It was during this time that the minor center of Chaj K'ek' Cue was mapped. During the course of the Chaj K'ek' Cue mapping it became clear that logging activity by Arbol Verde had intensified in the intersite area. The intersite area is part of the San Bartolo Project's regional concession, but it is not protected from logging in the same way that the delimited sites of San Bartolo and Xultun are. On the southern portion of the baseline, the datum stakes that had been

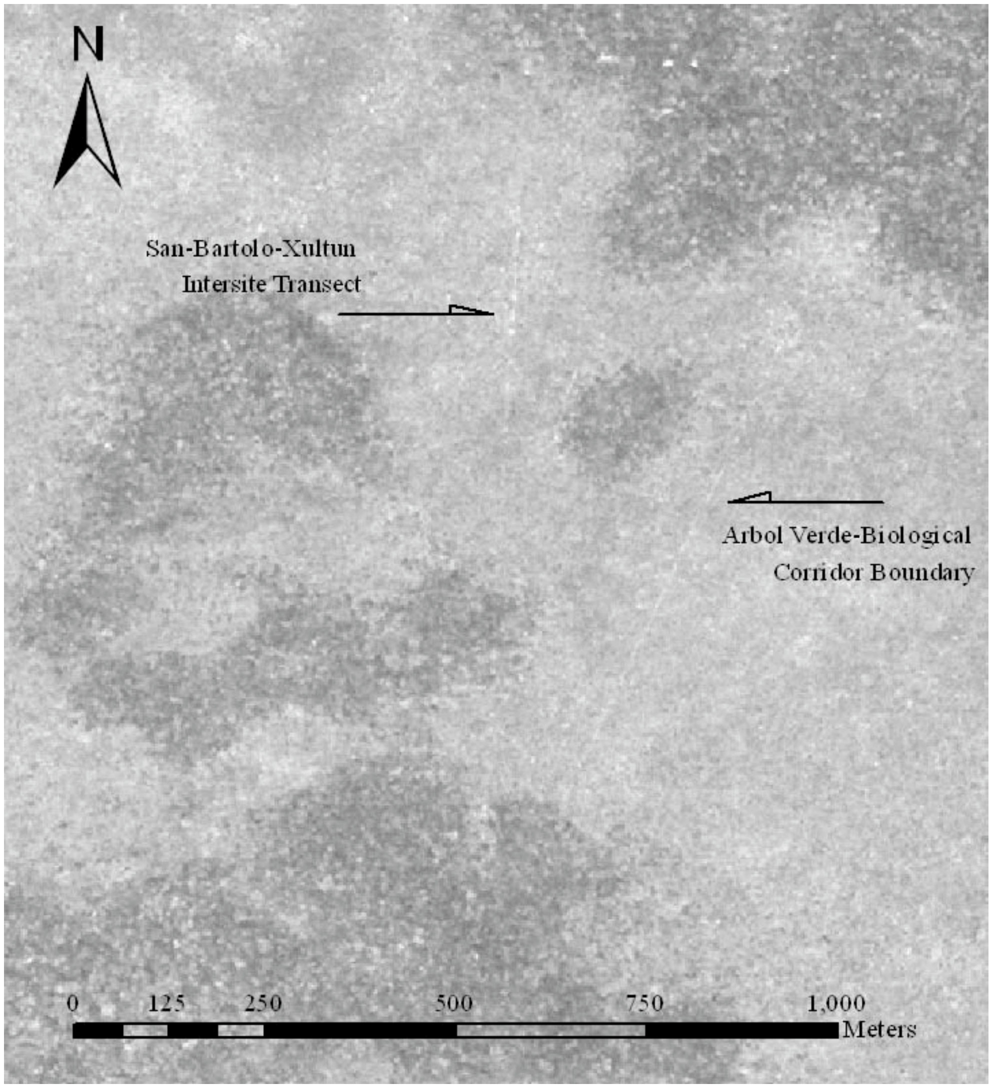
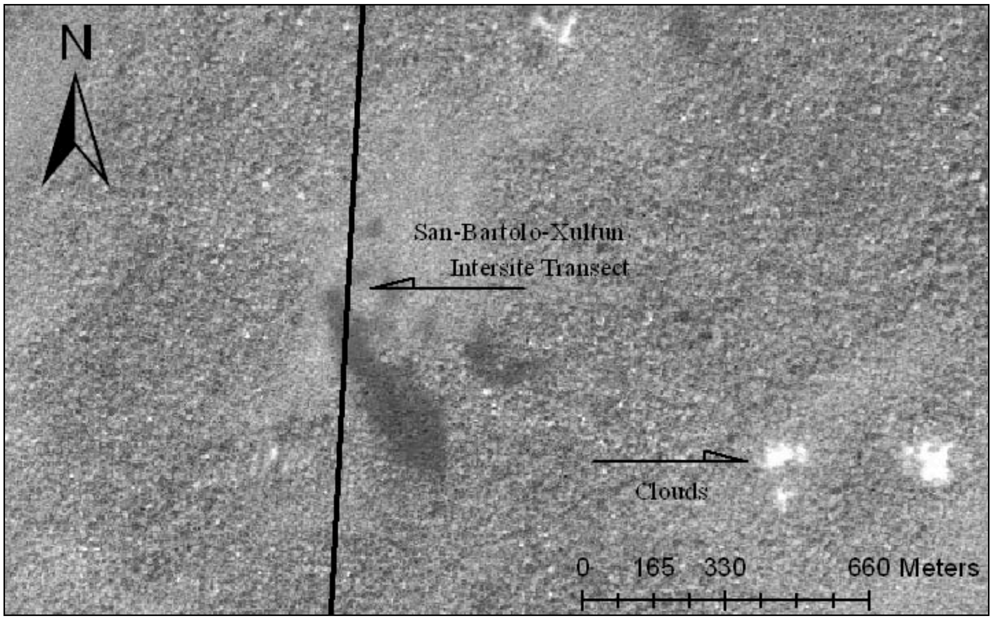
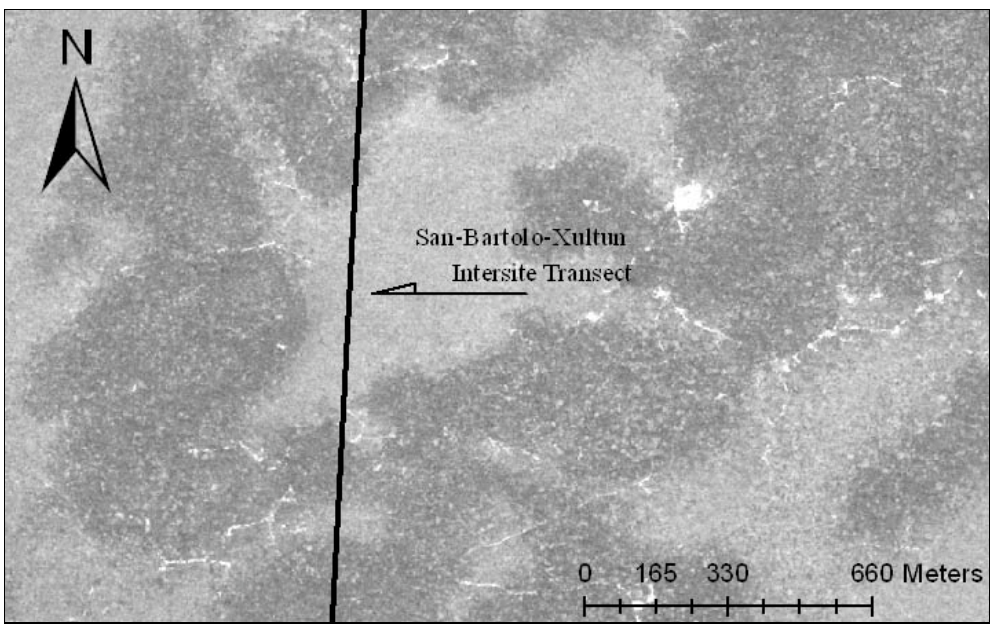


Figure 3.15. Portion of the San Bartolo-Xultun intersite transect seen in QuickBird imagery. Red band displayed here.

carefully placed at 100 m, were knocked out by the Arbol Verde tractors (Figure 3.16a, b). The San Bartolo-Xultun transect served the purpose of connecting the two sites and it also familiarized us with the different terrain and vegetation types that could be expected to be encountered in the intersite area as well as associated settlement. For all that,, following the destruction of portions of the transect by logging activity (Figure 3.17) it was decided that a new methodology would have to be implemented to complete the intersite survey. This decision was made both because of the destruction of the intersite transect and because of the inadequacy of a transect survey for obtaining a representative sample.



a.



b.

Figure 3.16. a. IKONOS image of southern area where the intersite transect passed (acquired December 16, 2002); b. QuickBird image of same area showing logging roads (acquired April 19, 2003).

Figure 3.17. Mahogany cut down in the intersite area.

IKONOS and the Intersite Survey Design

The IKONOS satellite imagery was used to discover the site of Chaj K'ek' Cue in the intersite area and other sites around Xultun and San Bartolo. The success of the settlement signature identified in IKONOS imagery combined with the destruction of the San Bartolo-Xultun baseline transect prompted a new survey design that would systematically test the satellite imagery while at the same time being independent of a transect. The latter was especially necessary as logging operations continued to increase in the intersite area in 2004. Another goal of the design was to sample a broader area between the two sites in an effort to redefine what is meant by an "intersite area" (see below). Crucial to the new survey design was the use of a total station in conjunction with a high-resolution GPS.

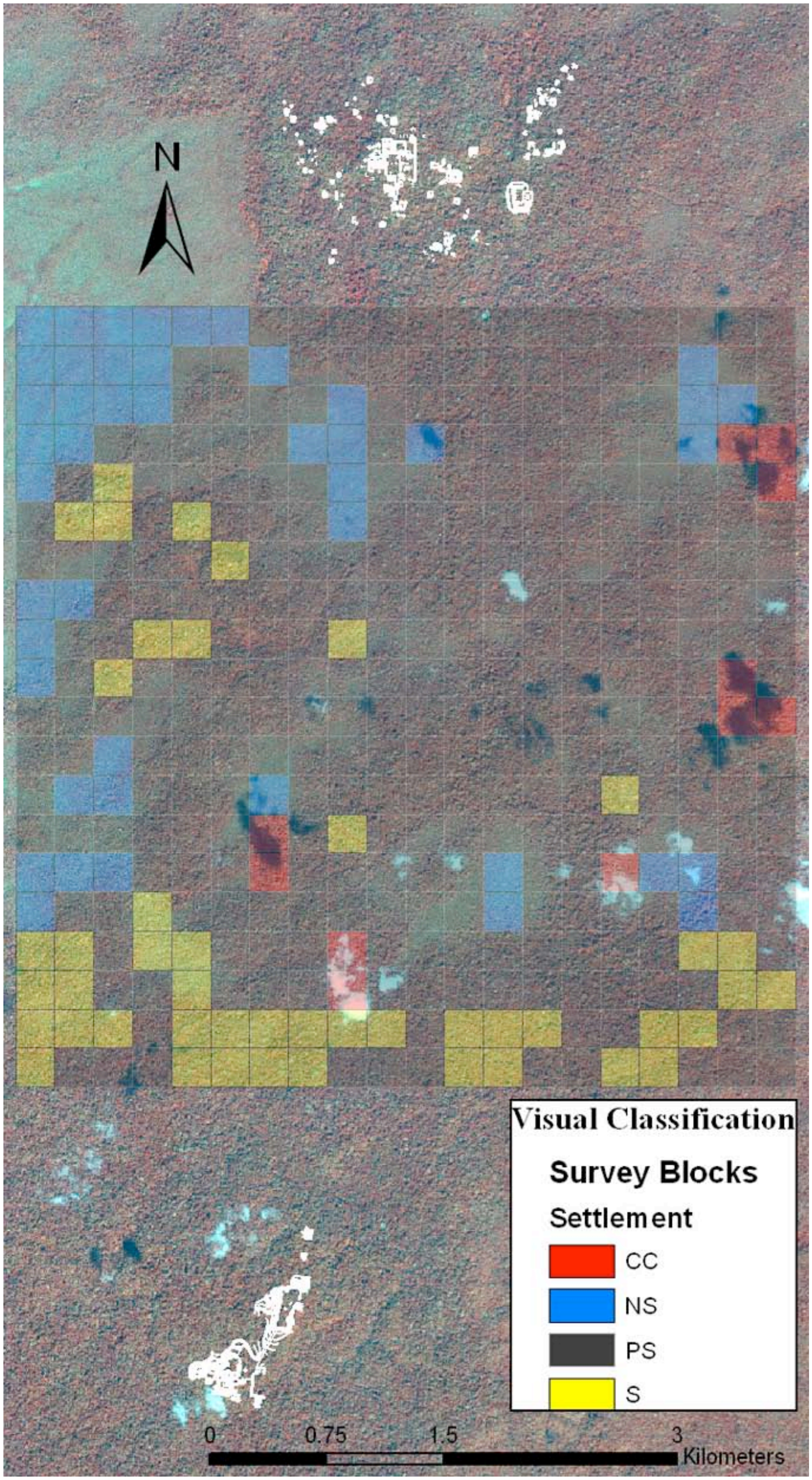
The Ashtech ProMark2 Survey System is a high-resolution GPS survey kit that has a resolution of about 1 cm (Thales Navigation 2002). The accuracy of the IKONOS and QuickBird imagery (1 and 0.61 m respectively) required the use of a GPS unit that had a resolution at least as high as the imagery. The ProMark2 was selected for its cost, and inclusion of two units in the package. The accuracy of the ProMark2 meant that any total station survey data could be tied into the satellite imagery just as accurately as if it were off of a baseline survey. This technological development allowed for a survey design that easily covered a broad area, and rapidly linked the survey and remote sensing data sets.

I decided that a stratified random block survey would be the best strategy to test the accuracy of the IKONOS settlement signature, while at the same time covering the widest range of terrain types and vegetation diversity. The survey universe was defined as a 25 km^2 (5 x 5 km^2) area based on the locations of the major architectural groups at Xultun and San Bartolo, the apparent size of the two sites based on satellite imagery, and the diversity of the terrain and vegetation between the two sites. The survey universe was divided into 250 x 250 m^2 survey blocks that were numbered in a boustrophedonic sequence (right to left and left to right in alternate lines) beginning in the northwest corner. These 400 blocks were then stratified into four tiers of possible settlement density based on a visual image interpretation (Lillesand et al. 2004:193-329) of IKONOS satellite imagery printed out at a 1:5000 scale. Using the False Color Composition (RGB/4, 3, 1) for interpretation the tiers are: Cloud Cover (CC) – the survey block is covered by a cloud or a cloud shadow in the IKONOS imagery; No Settlement (NS) – no remains of ancient settlement are believed to be in the block; Partial Settlement

(PS) – settlement is believed to occupy a portion of the block, but there are distinct areas where there is definitely no settlement; and Settlement (S) – settlement is believed to be present in over 75% of the survey block (Figure 3.18). The blocks in each tier were then also numbered in a boustrophedonic sequence based on settlement classification. The settlement classification, tier block number, and overall block number were combined to uniquely designate each of the 400 survey blocks in the survey universe. For example, survey block PS-17-24 is believed to contain Partial Settlement (PS). It is the seventeenth in a boustrophedonic sequence of all squares believed to contain Partial Settlement. It is the twenty-fourth of all possible survey blocks numbered to 400 in a boustrophedonic sequence. This classification was based on the assumption that yellow and light blue pixels scattered throughout the intersite area represented a weaker version of the settlement signature. Some of the problems encountered due to this assumption are discussed in the following chapter.

The IKONOS satellite interpretation resulted in the creation of 11 Cloud Cover (CC) blocks, 45 No Settlement (NS) blocks, 298 Partial Settlement blocks, and 46 Settlement (S) blocks. It was decided that a 10% sample, totaling 40 squares needed to be surveyed to collect data that would be comparable to existing intersite transect surveys. If the 40 squares had been in a contiguous straight line between two sites, it would have been a transect 10 km long and 250 m wide. A sampling strategy was implemented to test the IKONOS satellite imagery interpretation. All squares where clouds or cloud shadows hindered interpretation were eliminated from the sample pool. A 10% sample of each of the three remaining tiers in the hierarchy was selected by creating random number tables on the internet (Random.org 2004). This yielded 5 No

Figure 3.18. Classification of intersite area based on visual interpretation of IKONOS.


N
Visual Classification
Survey Blocks
Settlement
CC
NS
PS
S
0
0.75
1.5
3
Kilometers

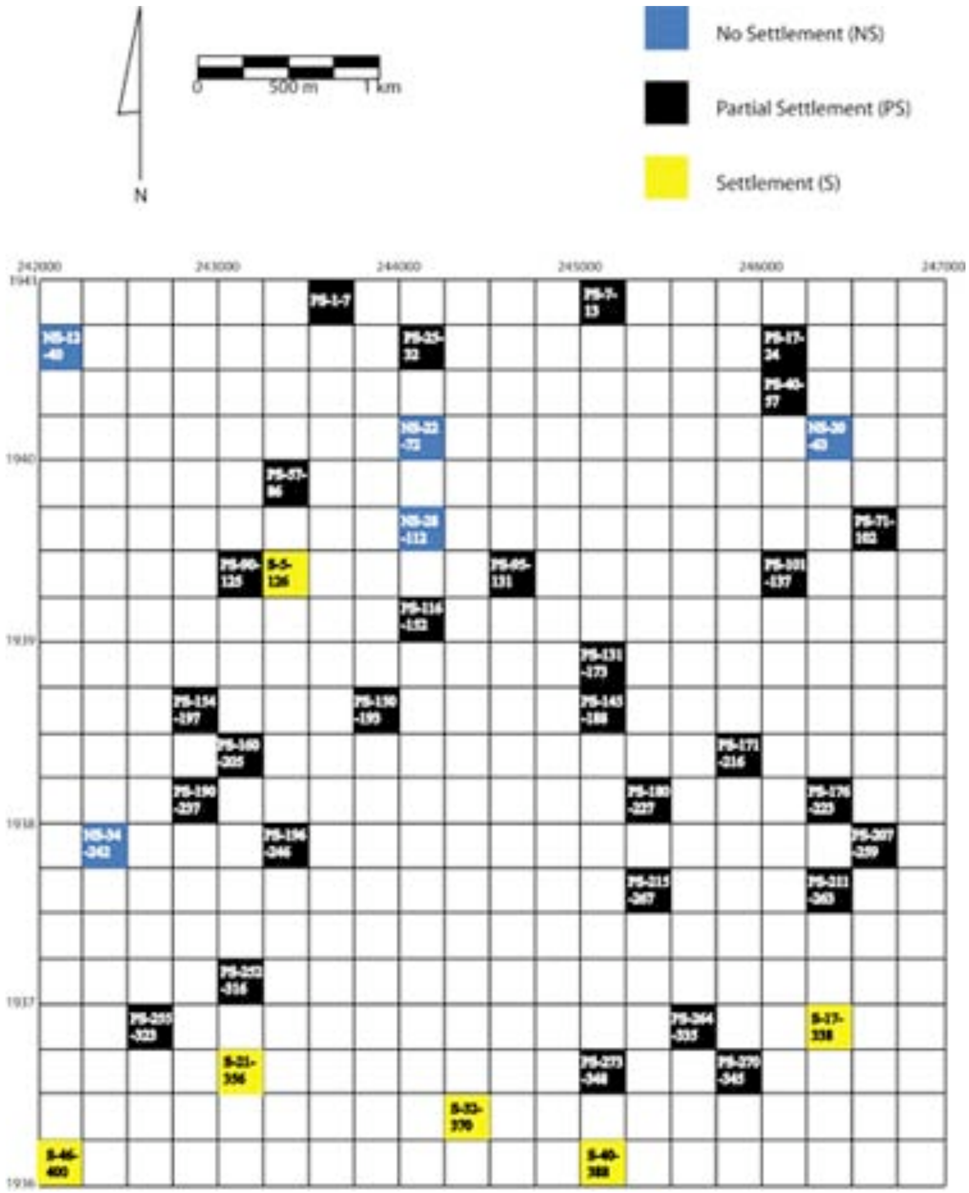


Figure 3.19. Distribution of blocks in survey sample over universe.

Settlement (NS) blocks, 30 Partial Settlement (PS) blocks, and 5 Settlement (S) blocks. Due to the clustering of Settlement (S) blocks at the Xultun end of the survey, one Partial Settlement (PS) block was subtracted and a Settlement (S) block (S-5-126) was added to the survey so that there would be at least one surveyed Settlement (S) block in the true intersite area. This was also justified by the fact that many of the Cloud (C) blocks eliminated from the sample appeared to be in areas that might have denser settlement.

Table 3.2. List of blocks in survey sample.

Settlement	Tier #	Sq. #
NS	12	40
NS	20	63
NS	22	72
NS	28	112
NS	34	242
PS	1	7
PS	7	13
PS	17	24
PS	25	32
PS	40	57
PS	57	86
PS	71	102
PS	90	125
PS	95	131
PS	101	137
PS	116	152
PS	131	173
PS	145	188
PS	150	193
PS	154	197
PS	160	205
PS	171	216
PS	176	223
PS	180	227
PS	190	237
PS	196	246
PS	207	259
PS	211	263
PS	215	267
PS	252	316
PS	255	323
PS	264	335
PS	270	345
PS	273	348
S	5	126
S	17	338
S	21	356
S	32	370
S	40	388
S	46	400

The total sample consisted of 5 No Settlement (NS) blocks, 29 Partial Settlement (PS) blocks, and 6 Settlement (S) blocks. The blocks selected for survey are listed in Table 3.2. The distribution of the survey sample across the survey universe is depicted in Figure 3.19.

Survey Methodology

The San Bartolo-Xultun intersite survey was conducted over two field seasons with 10 surveyed in 2004 and 30 surveyed in 2005. In each survey square vegetation types were recorded and descriptions of the terrain were made and compared against predictions in each of these categories made prior to survey based on satellite imagery interpretations. The blocks were surveyed in no particular order. The survey produced forty settlement maps (Appendix A) that were overlaid on satellite imagery in the ESRI™ ArcINFO 9.2 Geographic Information System (GIS).

The regional survey grid used Universal Transverse Mercator (UTM) coordinates, which are used on the IGN 1:50,000 topographic maps as well as on the IKONOS satellite imagery. This facilitated georeferencing of survey maps in the GIS because UTM is a global coordinate system. All global coordinate systems reference a datum, which "is a mathematical definition of the three-dimensional solid (generally a slightly flattened ellipsoid) used to represent the surface of the earth (Lillesand et al. 2004:48)." The Guatemalan IGN 1:50,000 topographic maps use the 1927 North American Datum (NAD 27). The survey data was collected using the 1984 World Geodetic System datum (WGS 84) because this is the most compatible datum with the Global Positioning System (GPS) and is the datum on which all of the NASA remote sensing data was recorded. This means that there is an approximately 200 m north-south discrepancy between the topographic maps and the satellite imagery. This problem is easily corrected in a GIS through coordinate transformations and georeferencing.

The process of surveying a settlement block always began with the IKONOS satellite imagery. The UTM coordinates of the center of the square to be surveyed were programmed into a handheld GPS unit. The survey crew would use logging roads and existing *brechas* to get as close to the square as possible, then the handheld GPS and a Brunton compass would be used to get to the approximate center of the square. Once near the center, the high-resolution GPS antenna was connected to the handheld unit,

Figure 3.20. Transferring the GPS from the Rover Rod to the tripod (photo by Trevor Emond).

which was then affixed to a stadia rod. The high-resolution GPS unit, attached to a Rover Rod, was used to get as near to the exact center of the survey block as possible, taking into consideration trees and other obstructions that might interfere with subsequent steps in the survey process. Once at the center of the block, a stake with a nail in the center was driven into the ground at the spot of the stadia rod. The high-resolution antenna was then mounted onto the total station tripod over the center of the stake (Figure 3.20). The GPS was allowed to sit for at least 15 minutes to acquire an exact GPS point for the location of the datum. The GPS coordinates were recorded into a field notebook and the GPS unit and antenna were broken down and the total station was set up. The UTM coordinates acquired by the GPS unit were then entered directly into the total station so that all measurements would be taken within the UTM grid system. This facilitated georeferencing later on in the GIS.

Figure 3.21. Surveying with total station in the intersite area (photo by Horacio Martinez).

All mapping in the survey blocks was done with Topcon™ total stations (Figure 3.21). The GTS-229 was used in 2004 and the GTS-226 in 2005. The GTS-226 is slightly more accurate and faster to set up because it has tilt corrections on both the X and Y axis as opposed to the GTS-229 which only corrects on the X axis. Using the total station as a guide, workers cut four transects to the cardinal directions radiating out from the center datum. If the center datum was in the exact center of the block each transect would measure 125 m. If the center datum was slightly off center, corrections would be made while cutting the transects. For example, if the center datum was 2 m south of center, the north transect was cut 127 m while the south transect was cut 123 m. This assured that all settlement was mapped within the desired 250 x 250 m^2 block. The transects broke the block down into four smaller quadrants that were then reconnoitered for any sign of settlement by the whole survey crew. The types of features that were selected for mapping were architectural remains, including mounds and platforms, and resource remains, including rock piles of chert, chultuns, quarries, and terraces. Field sketches were made of the locations of all mapped features in Blueline™ A90 Physics notebooks. Vegetation and terrain changes were noted and compared in the field to paper copies of the IKONOS 1:5,000 False Color Composition (RGB/4, 3, 1) images. It took an average of about two days to map each block. No Settlement (NS) blocks would take less than half a day, whereas blocks with dense settlement could take three to four days to complete.

All data was stored on the total station's onboard computer and was downloaded using the TDS SurveyLink software program, where it was converted into Microsoft ™ Excel and AutoDesk™ AutoCAD compatible files for data manipulation. All mapped features were drawn using AutoCAD based on field sketches. All maps were imported into ESRI™ ArcINFO GIS where they were transformed into shapefiles and compared against various remote sensing data sets (see Chapter Five). This methodology was found to be quite rewarding in terms of the diversity of ground covered by the survey design and the speed in which survey could be completed. The integration of high-resolution GPS units and remote sensing data with more conventional survey methods provided a better understanding of settlement in relation to the regional terrain and vegetation.

San Bartolo-Xultun Intersite Excavation Program

During the 2005 season an excavation sampling program was implemented to complement the intersite survey. The goal of the test pitting program was to obtain chronological data for as many survey blocks as possible while simultaneously testing a diverse range of feature types represented in the intersite area. These test pits basically provided "excavated surface collections" (Sanders 1960:161). Looter trenches that appeared to have datable ceramics were cleaned and all sherds were collected (Figure 3.22). Excavations were 1 x 1 m and were excavated to bedrock (Figure 3.23) or, in the cases of test pits into scrub *bajos*, down to a sterile clay layer (Figure 3.24). There were a couple of 1 x 2 m trenches that were excavated when larger architecture was present (Figure 3.25). This was so that it was certain that the juncture between the architecture and any plaza floors would be easily encountered. In cases where standing architectural features (besides floors) were uncovered they were not removed.

The intersite excavation program was Operation 11 of the San Bartolo Project. Sub-Operation A was the cleaning of looter trenches and Sub-Operation B was the test pit program. Bags were labeled by provenience number, block number, and artifact type.

For example, SB11B-14/Level 2/PS-264-335/ceramic is San Bartolo (SB), Operation 11, Sub-Operation B, Unit 14, Level 2 (10-20 cm) in survey block PS-264-335 and contains ceramic material. This system is in accordance with the project provenience system set up by lab manager Patricia Rivera. Each excavation unit was either surveyed in directly with the total station or was referenced to an existing benchmark using a tape and compass.

Figure 3.22. Looter trench in the intersite area (photo by Julio Cotom).

Figure 3.23. Excavation to bedrock in the intersite area.

Figure 3.24. Excavation in scrub *bajo* to sterile level.

Figure 3.25. Excavation trench in the intersite area (photo by Julio Cotom).

Eleven looter trenches were cleaned and surface collected, although ten of these were in the same survey block (PS-270-345) which contained more settlement than was predicted and had one particularly large plaza group. At least one out of 56 total test pits was excavated in each of the 40 survey blocks. Five of the 56 were excavated by Nicholas Dunning of the University of Cincinnati, as part of his paleoenvironmental studies for the project. Multiple test pits were sometimes excavated in a single block when it was believed that better chronological data could be obtained by opening another unit. Test pits were not placed randomly. The excavation crew traveled with the survey crew during the 2005 season. Upon arriving at a new survey block a brief reconnaissance was made and I selected an excavation location. There was no systematic search for middens because it was believed that sampling a midden would provide the chronology for a single structure, whereas sampling of plazas or other open areas could provide a broader chronology for the block.

Originally, test pits were excavated in 10 cm levels, however, once it became clear that there was generally very little material in most units, levels were excavated by natural strata. Each day artifact bags were turned in to the field lab for processing and storage. Summaries of excavations are given in Appendix A. The final artifact totals for the intersite excavations can be found in Table 3.3. The ceramic material that was excavated was generally in a poor state of preservation. Some blocks yielded no chronological material at all, despite multiple test units. Based on the goals of the excavation program, artifact analysis focused on the ceramic material (Appendix B), while other classes of artifacts were washed, cursorily examined, and stored in the project lab house in Antigua, Guatemala.

Table 3.3. Artifact counts from excavations in the San Bartolo-Xultun intersite area.

Ceramics	3,942
Whole Vessels	1
Lithics	39
Obsidian	10
Ground Stone	2
Figurine Fragments	4
Shell	3714
Bone	4
Carbon Samples	10
Burnt Clay or Earth	101

The intersite excavation program was successful in its sampling of a broad range of features spread throughout the survey universe. The poor condition of the ceramic material meant that only general trends in chronology could be ascertained. Given the overarching goal of the survey to understand the general settlement trend, especially the relationship between Xultun and San Bartolo, the chronological data were sufficient.

Conclusions

The methodology of the San Bartolo-Xultun intersite survey evolved over the course of three seasons. What started out as a standard transect survey connecting two sites became a stratified random block survey that reconsidered the concept of the intersite area in the Maya lowlands. The methodology was designed to systematically test the use of new remote sensing technologies, while at the same time creating a data set that would be comparable to other intersite surveys. The combination of GPS technology with traditional total station survey was integral to this process. The new methods as well as the redefined concept of the intersite area presented above are all part of a general trend in archaeology involving the incorporation of new technologies into holistic approaches to the archaeological record in an effort to better understand past ways of life.

Remote sensing technologies have been integral to the investigation of the San Bartolo-Xultun territory and beyond. IKONOS satellite imagery in particular has led to the identification of a settlement signature in false color imagery covering this region. This signature has facilitated the discovery of five new archaeological sites within the territory. Landsat imagery has been used to divide the territory into manageable areas of analysis, including the San Bartolo-Xultun intersite area. In the following chapter I will present some of the limitations of IKONOS and the settlement signature, as well as demonstrate some of the successful applications of QuickBird data to settlement pattern analysis.

Chapter 4: The San Bartolo-Xultun Intersite Area

Introduction

This chapter presents the raw data from the San Bartolo-Xultun intersite research and examines the settlement internal to the area. The first section defines the intersite area in terms of its microenvironmental components and types of archaeological remains encountered. The second section examines settlement data in relation to remote sensing data, particularly IKONOS and QuickBird imagery and proposes a refined methodology for the future integration of remote sensing in archaeological survey. This is followed by a discussion of the use of population estimates in the Maya lowlands and a proposed population estimate for the intersite area. Finally, the ultimate goal of the chapter is to give a diachronic perspective of how people lived in the hinterland of the large centers by presenting a cultural and ecological history of the San Bartolo-Xultun intersite area and examining this history using the landscape ecology concepts of structure, function, and change.

Definition of the San Bartolo-Xultun Intersite Area

Vegetation

The San Bartolo-Xultun intersite area is covered by dense vegetation of numerous classes, which represent microenvironments within the area. Microenvironments were first used as analytical units in Mesoamerican archaeology by Coe and Flannery (1964). More recently Kunen and colleagues (2000) have revisited microenvironments in their analysis of *bajos* in the Maya lowlands. In this most recent study scholars revised Cyrus Lundell's (1933, 1937) original *bajo* classifications of *tintal* and *escobal* in favor of the more general terms of scrub and palm *bajos*. Both scrub and palm *bajo* classes were then further broken down into subtypes that are species specific based on the dominant vegetation in a particular *bajo* (Kunen et al. 2000:17-21, fig.3).

The *bajo* microenvironments in the San Bartolo-Xultun intersite area generally follow Kunen and colleagues' (2000) classification with a few exceptions. For palm *bajos*, both the *escobal* (derived from *Crysophilia argentes* Bartlett) and *botonal* (derived from *Sabal mayarum*) varieties are represented in the intersite area. Though,, unlike in many Maya lowlands areas, there are no *corozal* (derived from *Orbignya cohune*) *bajos* found between San Bartolo and Xultun. Additional palm *bajo* types were identified by Anatolio López, a former *chiclero* (gum-tapper). These include: *guayabillal* (species unknown); *bejucal* (derived from dense stands of entangled vines); and, *julubal* (derived from *Aphelandra deppeana*).

For scrub *bajo* classes, *pucteal* (derived from *Bucida buceras*), *tintal* (derived from *Haematoxylum campechianum* L.), and *huechal* (derived from *Scleria* sp.) are all represented in the San Bartolo-Xultun intersite area (Kunen et al. 2000:fig.3). *Navajuelal* (derived from *Cladium jamaicense*) is another scrub *bajo* class frequently encountered in the intersite area. More commonly there are microenvironments of mixed scrub and mixed palm *bajos* where multiple species are found frequently. Although,, in general the transition between scrub and palm classes is very clear on the ground. The exception to this is the *pucteal* to palm *bajo* transition where the *pucte* tree is found frequently within the palm *bajo* itself.

The palm and scrub *bajo* classes are to be distinguished from the well-drained upland forest, which is referred to as the *montaña*. These upland forests are composed of a number of hardwood species such as: mahogany (*Swietenia macrophylla*), cedar (*Cedrela odorata*), chicozapote (*Manikara archras*), black poisonwood (*Metopium browneii*), manchich (*Lonchocarpus castilloi*), gumbo limbo (*Bursera simarouba*), and breadnut (*Brosimum alicastrum*). In the San Bartolo-Xultun intersite area, many of the economic species, such as cedar and mahogany are rare due to logging activities. Though,, species such as poisonwood and breadnut remain abundant.

During archaeological survey in the intersite area microenvironmental classes were recorded and compared to expected vegetation hypothesized based on analysis of IKONOS satellite imagery. Kunen and colleagues (2000:17) had hoped to match *bajo* classifications to vegetation classes observed in Landsat TM imagery. While successfully isolating *bajo* and upland differences (Kunen et al. 2000:fig.2), it appears that smaller divisions were difficult for members of the Bajo Communities Project. I hoped that using higher resolution remote sensing data would help improve classification efforts, but much of the variety observed during survey is difficult to see as patterns in the imagery. Some of the difficulties encountered in classifying remote sensing data are discussed later in the chapter.

Archaeology

Archaeological investigations in the San Bartolo-Xultun Intersite and Chaj K'ek' Cue areas were conducted from 2003-2005 (Garrison 2003a, 2004, 2005c; Griffin 2004). The intersite area was chosen for investigation in the hope that an analysis of settlement pattern data would help elucidate the complex relationship between San Bartolo and Xultun. To carry out this analysis, survey, excavation, and paleoenvironmental data were integrated with remote sensing technology to provide the most complete picture of what life was like for the Maya living in this hinterland area through time. The major methodological issues encountered in terms of survey and excavation strategies were presented in Chapter Three.

The surface settlement remains of the San Bartolo-Xultun intersite area are generally homogeneous with the exception of the site of Chaj K'ek' Cue, where some larger settlement is found. Settlement recorded during survey categorized as being either architectural remains or resource remains. Architectural remains consist of housemounds and platforms, while rock piles, quarries, chultuns, and terraces represent resource remains. During excavation a number of material classes were recovered in association with settlement remains including: ceramics, figurines, chipped stone artifacts, ground stone artifacts, shell, bone, and burnt mud or clay.

Paleoenvironmental studies within the San Bartolo-Xultun intersite area were directed by Nicholas Dunning (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006) during the 2005 season. Investigations were carried out not only within the intersite area but in other areas in and around San Bartolo as well. The intersite area paleoenvironmental studies focused on excavations of terraces rising out of a small scrub *bajo* (Bajo Majunche), as well as soil pits within the *bajos* themselves. Research was also carried out to investigate the fluvial geomorphology of an arroyo stream in the northeast portion of the intersite area to understand how changes in water flow may have been effected by changes in land use or regional climate (Dunning, Jones, Chmilar, and Blevins 2006). Within San Bartolo, two *aguadas* were excavated to determine the use history of the depressions. One *aguada* at Xultun (Los Tambos) was cored to examine what was probably the main water source for the Xultun population. An additional *aguada* (Tintal) was also cored in the Ixcan Bajos area to obtain regional environmental data. A soil pit in the portion of the Bajo Itz'ul that borders San Bartolo to the west as well as an excavation at the point where an arroyo discharges into this same *bajo* also contribute to the ecological portion of the history presented below. Since paleoenvironmental data inform on a broader geographical scale than many archaeological data sets, data from all of Dunning's investigations around San Bartolo are integrated into interpretations. However, only the intersite operations are reported in this section since Dunning himself has reported (Dunning et al. 2005) and presented (Dunning et al. 2006) his own research in detail.

The intersite survey universe was conceived of as a perfect square, so as to be easily georeferenced to the UTM grid system. Though, the 25 km^2 area defined for the intersite survey includes small portions of both the southern San Bartolo periphery and the northern Xultun periphery. During the survey 7.5% (n=3) of the 40 block sample was in the San Bartolo periphery, 67.5% (n=27) was in the actual intersite area, and 25% (n=10) was in the Xultun periphery. The following subsections define the survey, excavation, and paleoenvironmental data as they are manifested in the San Bartolo-Xultun intersite area. The features found during survey are broken down in terms of relative percentages in which they were encountered in the intersite area and the two site peripheries.

<u>Architectural Remains: Housemounds</u>

There are thousands of small and medium sized mounds found throughout the San Bartolo-Xultun intersite area (Figure 4.1). But, not all of these can fairly be categorized as housemounds. In fact, many are simply rock piles resulting from early stages of stone tool production (see below). When housemounds are encountered they are usually not arranged in formal groups, with some exceptions. In total there were 236 mounds in the sample, of which 63.6% (n=150) were in the intersite area, 5.9% (n=14) were in the San Bartolo periphery, and 30.5% (n=72) were in the Xultun periphery.

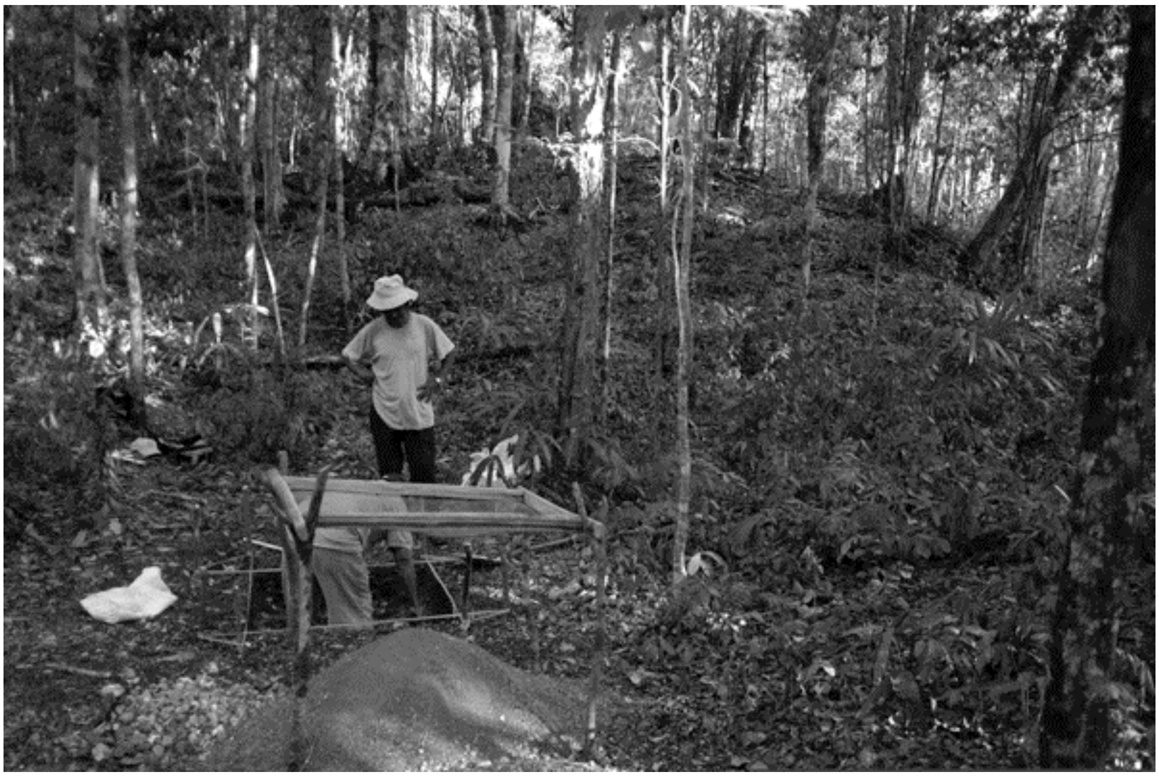


Figure 4.1. Large housemound in Chaj K'ek' Cue Group C, with excavation into plaza in the foreground.

Housemounds were distinguished from rock piles during survey based on criteria of shape and composition. Mounds that consisted of crushed limestone and chert cobbles were considered to be housemound platforms, an interpretation that was confirmed during excavation. Amorphous mounds composed of broken chert cobbles were classified as rock piles. Chert mounds that were particularly rectangular in form, or at a 90° angle to a similar chert mound, thereby delimiting a formal space, were classified as housemounds. My classifications would benefit from much more extensive excavations to absolutely confirm their validity, but all test units on the edges of mounds confirmed the classification they were originally assigned. In some instances chunks of burnt mud or clay were found during excavations indicating a packed earthen floor once covered some of the mounds.

Architectural Remains: Platforms

There are dozens of platform remains in the San Bartolo-Xultun intersite area. These platforms are manifested in two different forms. First, there are stand-alone platforms, often supporting one or more superstructures. Second, there are leveling platforms. These platforms serve to flatten the natural slope of the terrain, either to support superstructures, or perhaps to provide a level planting surface for agricultural activities. Both platform types generally are composed of loose cobble fill over a base layer of crushed gravel. In a few instances stuccoed surfaces were found in platform excavations, but generally these had eroded. As with the housemounds, there is evidence of packed earth or mud floors in some of the platform excavations. In total there were 37 platforms of which 75.7% (n=28) were in the intersite area, 5.4% (n=2) were in the San Bartolo periphery, and 18.9% (n=7) were in the Xultun periphery.

Resource Remains: Rock Piles

The most common feature encountered in the San Bartolo-Xultun intersite area is the chert rock pile (Figure 4.2). The rock piles take one of two forms in the intersite area. The first form is a true "pile", generally small (approximately 2 x 3 m), ovoid or round in shape, and less than 50 cm above the surface. Excavations of a sample of these rock piles in the San Bartolo periphery not only confirmed that they were created by the Maya, but also that they most likely were related to early stages in stone tool production (Kwoka and Griffin 2005). The second form of rock pile encountered is long and linear, sometimes with numerous parallel and perpendicular branches being connected to the

Figure 4.2. Corner of rock pile composed of chert cobbles.

main feature. I chose not to distinguish these linear features as berms since in many cases they did not appear to function as such. The most likely scenario is that these linear rock piles are somehow related to intensive agriculture in the intersite area, and based on superficial examination they appear to be composed of discarded chert cobbles that were tested for stone quality. Both forms of rock piles are frequently found in association with each other and it seems likely that the linear features may have been constructed following the accumulation of smaller rock piles. . In total there were 280 rock piles recorded in the intersite survey of which 77.9% (n=218) were in the intersite area, 10.7% (n=30) were in the San Bartolo periphery, and 11.4% (n=32) were in the Xultun periphery.

Resource Remains: Quarries

There are two types of quarries found in the San Bartolo-Xultun intersite area. Limestone quarries are by far the most common, representing 94.1% (n=32) of all quarries surveyed. The limestone quarries are generally small and seem to reflect local construction material needs, rather than any organized form of export. A few of these quarries represent excavations into flat bedrock, but more commonly stone was removed from a slope or natural depression. During the survey of the San Bartolo-Xultun transect Griffin and I (Garrison 2003a) noted partially cut blocks still in place in some quarries, but none of these were encountered during the intersite survey.

Chert is a replacement mineral that occurs naturally in limestone throughout the Maya area, and was the most common material used in stone tool production. In the intersite area chert is found as isolated boulders, as cobbles lining arroyo beds, and in quarries. Chert quarries represent 5.9% (n=2) of the total quarries surveyed and excavations were conducted in one of these cases (Figure 4.3). The chert just below the surface of the quarry was found to be covered in a heavy coat of iron oxide (hematite) powder. Joshua Kwoka, who directed the excavation, noted numerous large flake blanks that had been prepared on site. This would have been an initial step in the knapping process before these blanks were carried back to workshops to be made into stone tools. The high quality of the quarry chert in comparison to boulder and arroyo bed chert suggests that quarries may have been the preferred source of material for stone tool making in the area. Additional chert quarries were noted in the intersite area during reconnaissance (but were not registered as part of the intersite survey) suggesting that high quality chert may have been an abundant resource for the hinterland population

(Griffin et al. 2006). In total there were 34 quarries recorded in the intersite survey of which 50.0% (n=17) were in the intersite area, 2.9% (n=1) were in the San Bartolo periphery, and 47.1% (n=11) were in the Xultun periphery. Of these, one of the chert quarries was found in the intersite area, and the other in the Xultun periphery.

Figure 4.3. Flake blanks recovered during excavation of chert quarry.

Resource Remains: *Chultuns*

Chultuns are cisterns carved out of the limestone bedrock, presumably used for resource storage (Figure 4.4). Puleston (1968) argued that *chultuns* were used to store breadnuts as a famine crop based on experimental archaeology conducted in the Tikal periphery. I agree that *chultuns* were for storage, but I believe that more common crops could have been stored in the ancient cisterns despite Puleston's failed experiments. We do not know what kind of perishable storage containers the Maya may have used to hold staple crops such as corn, beans, and squash in addition to the ceramic vessels that were certainly used. I am not aware of any surviving examples of Classic Maya basketry or

Figure 4.4. *Chultun* excavation from the intersite area. Note the capstone still in place.

animal skin sacks that may have helped to preserve stored food. In the Bonampak murals *kakaw* is shown to be carried in large sacks when it is brought as tribute. Another argument to support *chultuns* as staple crop storage facilities is the high incidence of *chultuns* in the site peripheries and intersite area compared to the sites themselves. For example, the minor center of Chaj K'ek' Cue has 19 known *chultuns* (five of which were mapped as part of the intersite survey) as compared to the 15 known for the territorial capital of San Bartolo. Half of the San Bartolo *chultuns* seem to be in peripheral residential settlement areas. This suggests that peripheries and intersite areas were using the cisterns for some sort of mass storage, and agricultural surplus seems to be the most likely candidate. One *chultun* was excavated in its entirety (Figure A.29) as a typical example of an intersite *chultun*. The *chultuns* found during survey varied in diameter as well as surface treatment. In general they were unlined, but there were a few that had plaster around the neck, with the best example being in Chaj K'ek' Cue Group A. Lined *chultuns* may have been used to store water (McAnany 1990), but this has never been convincingly demonstrated in the southern lowlands. In total there were 23 *chultuns* recorded in the intersite survey of which 69.6% (n=16) were in the intersite area, 4.3% (n=1) were in the San Bartolo periphery, and 26.1% (n=11) were in the Xultun periphery.

Resource Remains: Terraces

Remains of Maya terraces have been known to archaeologists since the first half of the 20th century (Dunning and Beach 1994:52). Intense investigations of terraces have been carried out in the Río Bec region (Turner 1974b) and around Caracol (Healy et al. 1983) since the 1970s. More recently Dunning and Beach (1994) have synthesized the current understanding of ancient Maya terracing throughout the lowlands and portray terracing as a technological innovation aimed at the active conservation of the physical landscape. Terraces can be difficult to detect during survey due their low protrusion on the surface (Johnston 2002), but once one is located there are usually a series of the features nearby.

Terracing was found on two different types of terrain during the intersite survey. The best preserved terraces were on the scrub *bajo* margins. These terraces are *bajo* margin contouring terraces (Nicholas Dunning, personal communication 2007) and are generally long, running parallel to one another as they follow the natural contour of the terrain (Figure 4.5). The slope where the terraces are located is very low (±3°)(Dunning, Jones, Chmilar, and Blevins 2006). They would have prevented soil runoff into the scrub *bajo* and were constructed of chert cobbles placed over large boulders which anchored the terraces in place. The second location in which terracing occurred was on the steeper slopes transitioning between *bajos* and uplands. Most notably these terraces were found at what was considered the divide between the intersite area and the site peripheries of San Bartolo and Xultun. Terraces on steep slopes were generally placed closer together than the ones on *bajo* margins. The construction methods used to build the second type of terraces are unknown because no examples were excavated. Both forms of terracing

Figure 4.5. Excavation of *bajo* margin contouring terrace.

represent intensive agriculture strategies that were most likely developed toward the end of the Early Classic to exploit an environment that had changed significantly since the Late Preclassic. By placing the terraces on slopes near the transition to *bajos* the ancient Maya could have easily harvested the nutrient rich soil found at the base of the slopes in order to fill the terraces. The presence of this rich soil has been found in many contexts and is believed to be the result of Preclassic soil erosion (Dunning et al. 2002; Dunning et al. 2003).

Terracing, combined with the linear rock pile features noted above, suggest an engineered landscape (Scarborough 2000) in which the ancient Maya applied numerous strategies to maximize the productivity of the terrain. Agricultural features are extremely difficult to date due to the lack of ceramic material found in association. Based on the ceramics found in excavations of settlement near terracing and other agricultural features, the majority of them date to the Late Classic Period when Maya populations were at their maximum extent in the lowlands (Culbert and Rice 1990). San Bartolo reached its maximum extent in the Late Preclassic, but Xultun was at its maximum extent during the Late Classic. Most of the terraces were probably constructed by the Xultun hinterland population as well as the reduced Late Classic population at San Bartolo. In total there were 65 terraces recorded in the intersite survey of which 35.4% (n=23) were in the intersite area, 18.5% (n=12) were in the San Bartolo periphery, and 46.2% (n=30) were in the Xultun periphery.

<u>Material Classes: Ceramics</u>

Ceramic analysis for the San Bartolo-Xultun intersite survey was conducted by the San Bartolo project ceramicist, Patricia Rivera, and her assistants. Details of the ceramic analysis are presented in Appendix B. Operations SB11A and SB11B yielded 3,942 potsherds of which the 3,736 (94.8%) from SB11B were analyzed. Sherds from SB11A came from looter trenches and were of low priority for the ceramics lab due to their lack of stratigraphic context. Of the ceramics analyzed, 56% (n=2,094) were classified as unidentified, with the majority assumed to date to the Late Classic based on stratigraphy. But, the unidentified sherds only represent 39.5% of the total weight of sherds analyzed.

The sherds from the intersite area that were not weathered beyond recognition were still in extremely poor condition, often only having vestigial remains of slip. Further complicating matters was the domestic context of many of the ceramics since domestic types span longer time periods than fancier types, such as polychromes. Of the identified sherds (n=1642), 0.1% (n=2) date to the Middle Preclassic, 34.8% (n=572) date to the Late Preclassic, 0.4% (n=7) date to the Early Classic, and 64.4% (n=1057) date to the Late Classic. The implications of the distribution of the ceramics are incorporated into the culture history of the San Bartolo-Xultun intersite area presented at the end of the chapter.

Material Classes: Figurines

During excavations four figurine fragments were recovered in the intersite area. Of these, three were so eroded that they could only be identified as heads. The fourth figurine fragment, which actually came from the Xultun periphery, was a nose fragment with hollow nostrils, which may have come from the Guatemalan highlands during the Late Preclassic (Patricia Rivera, personal communication 2005).

Material Classes: Chipped Stone Artifacts

Thousands of pieces of chert were recovered during the San Bartolo-Xultun intersite excavations, but the vast majority of these were discarded in the field by the project lab manager after cursory examination. Of the chert artifacts that remained, I identified 39 as stone tools during the fall of 2006. In addition to the chert artifacts, ten pieces of obsidian were recovered during excavations, with preliminary analysis performed by Joshua Kwoka in 2005. Many of the chert artifacts seem to be related to agricultural activities, with many bifaces and blank bifaces being recovered. The obsidian artifacts consist of nine prismatic blades or blade fragments and one polyhedral core rejuvenation flake. Based on visual sourcing by Kwoka, seven of the pieces are believed to have come from the San Martin Jilotepeque or Ixtepeque obsidian sources, while three are almost certainly from the El Chayal source. All three believed to be from the El Chayal source come from the same unit (SB11B-26) in a survey block (S-5-126) that includes part of the site of Chaj K'ek' Cue.

Material Classes: Ground Stone Artifacts

There were two ground stone artifacts found during the intersite excavations. The first is a granite *mano*, found directly on top of bedrock in front of a housemound in the Xultun periphery. This *mano* had to have been acquired through exchange networks with the highlands. I propose that Caracol, in the Vaca Plateau adaptive region, was responsible for distributing the resources of the Maya Mountains to other lowland territories (see Chapter Seven). The other ground stone artifact recovered is a small, highly polished piece of limestone, found on the surface of a ruined platform in the intersite area. The function of this artifact is unclear, although it may have been a polisher for making ceramics or some other activity.

Material Classes: Shell

There were thousands of shells and shell fragments recovered during the intersite excavations. Of these, 98.9% (n=3,672) came from the same excavation unit (SB11B-2). This deposit, which may have been inverted stratigraphically, was a midden generated during the harvesting of small snails from the nearby *bajos* to exploit as a food resource. These snails could not be identified to species by our project shell analyst (Ortiz 2006), but it is clear that they are neither the large apple snail (*Pomacea flagelata*), nor the spiral shaped jute snail (*Pachychilus* sp.), which are known to have been commonly consumed by the Maya. The rest of the shells found in the intersite area seem to have been of the same species as the main deposit, indicating that these snails were commonly exploited by the rural population living in the hinterlands of major sites.

Material Classes: Bones

Four bone fragments were found during the intersite excavations. The pieces were so small that they could not be identified, except to say that they almost certainly came from mammals. In addition, numerous human remains were found discarded at the sides of looter trenches. I decided to rebury these remains due to their disturbed context and the fact that they did not contribute to the overall operation goal of obtaining chronological data.

Material Classes: Burnt Mud/Clay

Excavations placed on the edges of chert piles that were thought to be housemounds yielded great numbers of chunks of burnt mud or clay. The larger pieces of this burnt material were distinctly flat, and there were even some instances in which

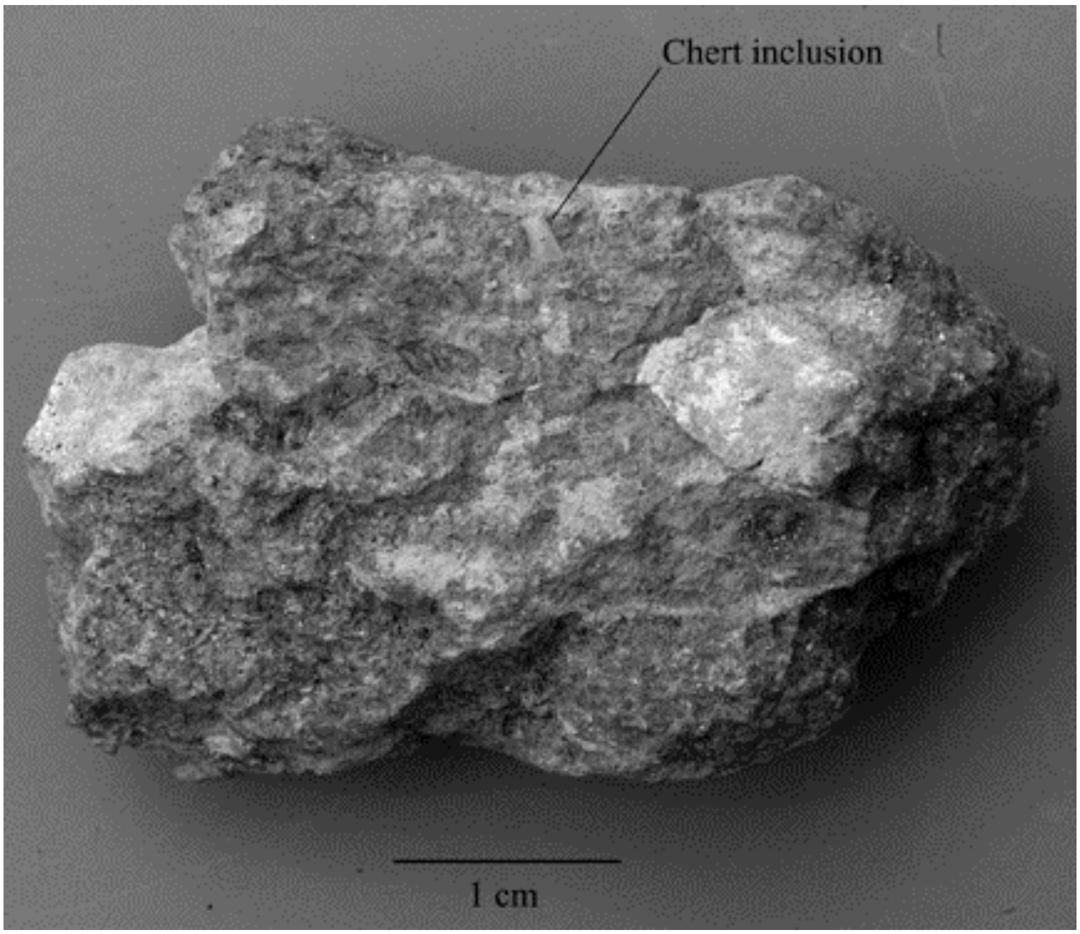


Figure 4.6. Piece of burnt mud or clay with chert fragment embedded.

small pieces of chert remained stuck into the hardened mud or clay (Figure 4.6). The material was so abundant in these contexts that only small samples were collected to take to the laboratory. I believe that this material represents the fragmented remains of a hardened mud floor surface that covered some of the chert piles so that they could serve as housemounds. The harsh environment may have precluded the survival of any daub or other indicative material for perishable structures especially given the poor state of the ceramics recovered. The form and alignment of these mounds are further evidence for a housemound designation. Packed mud floors would also explain why there are high concentrations of domestic materials around many mounds that show no evidence of having been plastered. It seems that not all Maya may have had the resources to cover their floors with a coat of stucco. Another alternative is that these mounds represent crudely assembled field houses, but that would not necessarily explain the presence of domestic ceramics.

Paleoenvironmental Data: Bajo Majunche

During the 2005 season Nicholas Dunning excavated a soil pit (SB11B-52) into the Bajo Majunche, 15 m east of the lowest terrace in survey block PS-150-193. During this excavation a buried paleosol (Ab horizon) was found at a depth of 90 cm. This paleosol, or *ek luum* (Beach et al. 2006), yielded a radiocarbon date of 920-800 cal B.C. (2 sigma) and also contained preserved ancient pollen (Dunning, Jones, Chmilar, and Blevins 2006). The pollen counts and relative percentages of recovered pollen are presented in Table 4.1. The implications of this paleoenvironmental data are presented in the various cultural and ecological histories presented in this and following chapters.

Table 4.1. Pollen counts and relative percentages from Ab horizon in Bajo Majunche

Taxon	Count	Percentage
Aquatics		
Cladium	14	7.0
Cyperaceae	19	9.5
Nymphea	2	1.0
Typha	5	2.5
Non-Arboreal		
Acalypha	1	0.5
Asteraceae	3	1.5
Poaceae	8	4.0
Polygonaceae	2	1.0
Arboreal		
Anacardiaceae	1	0.5

(Table 4.1. continued)

Apocynaceae	1	0.5
Arecaceae	2	1.0
Bursera	4	2.0
Caesalpiniaceae	1	0.5
Cedrela	2	1.0
Coccoloba	2	1.0
Combretaceae	30	15.0
Fabaceae	1	0.5
Guazuma	2	1.0
Hippocratea	2	1.0
Hirea	1	0.5
Liquidambar	1	0.5
Mimosa	2	1.0
Moraceae	44	22.0
Pinus	17	8.5
Quercus	6	3.0
Sapindaceae	1	0.5
Sebastiana	1	0.5
Spondias	4	2.0
Verbenaceae	1	0.5
Viburnum	1	0.5
Zanthoxylum	3	1.5
Indeterminate	7	3.5
Unknown A	4	2.0
Unknown P	5	2.5
TOTAL	**200**	**100.0**

Paleoenvironmental Data: Bajo Itz'ul

A soil pit (SB11B-50) excavated in survey block NS-34-242 in the Bajo Itz'ul uncovered a pre-Maya paleosol. A radiocarbon date of bulk humates (organic material) from the Ab horizon ranged from 5240-4960 cal B.C. (2 sigma). Although, it is unclear at what time this paleosol would have been buried by the current clay C horizon (Dunning, Jones, Chmilar, and Blevins 2006).

Paleoenvironmental Data: Fluvial Geomorphology

In 2005 Dunning and I excavated two trenches (SB11B-55 and SB11B-56) on either side of the arroyo cutting through survey block PS-17-24 in the northeast portion of the intersite area (Figure 4.7). Alluvial deposits on either side of the arroyo channel are asymmetrical, which is typical (Dunning, Jones, Chmilar, and Blevins 2006). The ancient soil preserved on the north side yielded a date of 3020-2880 cal B.C. (2 sigma) and the carbon used for this date was almost certainly created by some natural event, rather than very early settlers. There are a number of depositional events recorded in the stratigraphy of the arroyo banks, including a possible hurricane event, but unfortunately none of these events are datable (Dunning, Jones, Chmilar, and Blevins 2006).

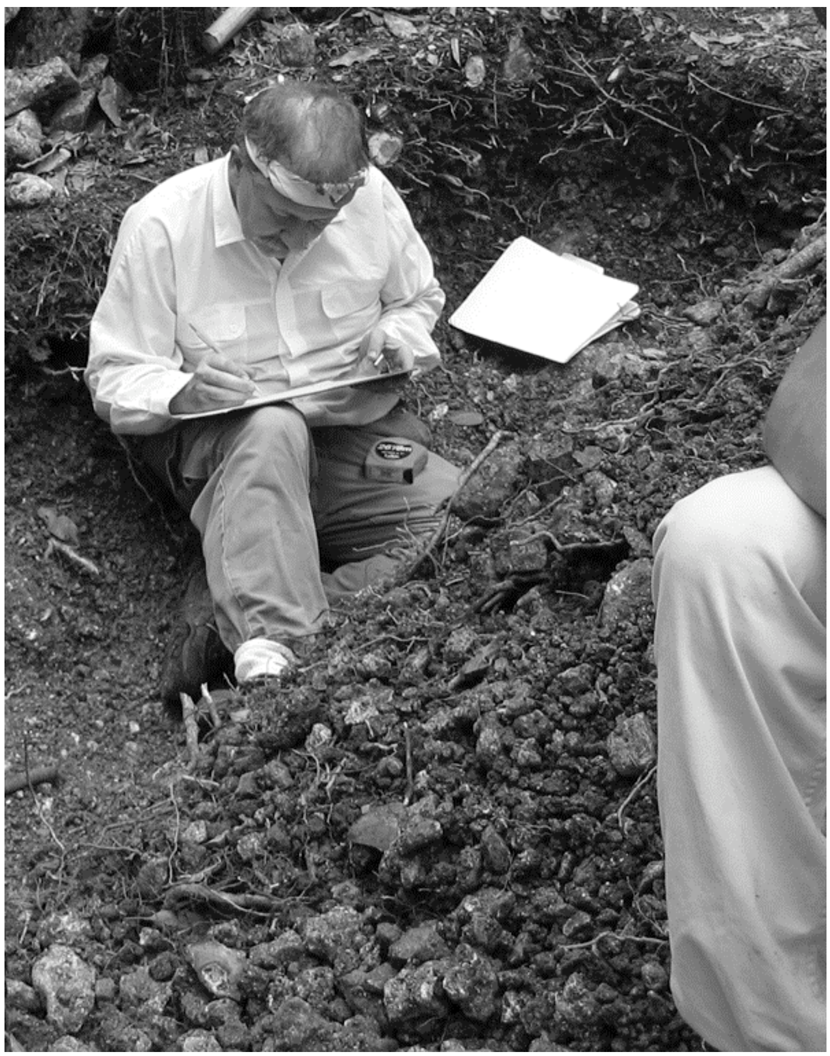


Figure 4.7. Nicholas Dunning drawing soil profiles in arroyo trench.

Remote Sensing and Intersite Settlement

The San Bartolo-Xultun intersite survey was designed not only to address archaeological questions, but also to refine the settlement signature identified in IKONOS satellite imagery in 2003 (Garrison et al. 2004; Saturno et al. 2006; Saturno et al. 2007). The methodology for designing the survey was presented in the previous chapter. This section examines some of the remote sensing issues surrounding the intersite survey and looks at the settlement maps in relation to remote sensing data sets.

The IKONOS settlement signature manifests itself in a false color (RGB, 4, 2, 1) image as dense concentrations of yellow and light blue pixels. These clusters have a texture that appears to be raised out of the scene. In the intersite area, the site of Chaj K'ek' Cue was easily identifiable using the signature. Robert Griffin and I discovered the site in 2003 in the first successful field test of the settlement signature. The intersite survey classification of No Settlement, Partial Settlement, and Settlement, was based on the presence of less dense clusters of the yellow and light blue pixels throughout the intersite IKONOS scene. The initial classification of the IKONOS imagery was done with a 1:5000 scale printed image for two reasons. First, I wanted to test the practicality of using remote sensing images in a field setting. Second, we did not have access to a GIS in the field until the 2005 season.

Remote sensing sensors record the reflected light off of canopy vegetation in multiple bands, each of which covers a certain range of wavelength frequencies (Lillesand et al. 2004). During survey, vegetation patterns were recorded in each survey block to better understand what we were actually seeing in the IKONOS scene. Areas of scrub *bajo* and *montaña* uplands are fairly easy to distinguish in the remote sensing imagery, however palm *bajos* present problems. There are a number of different types of palm *bajos* in the intersite area (see above) and they are found at various elevations and on different slopes. Using field notes, scrub *bajos*, palm *bajos*, and *montaña* classes could be distinguished in blocks that were actually surveyed (Figure 4.8). The areas and relative percentages of vegetation classes for each survey block are shown in Table 4.2. The "camp" class from PS-7-13, as well as the "bacadilla" class from PS-264-335, show

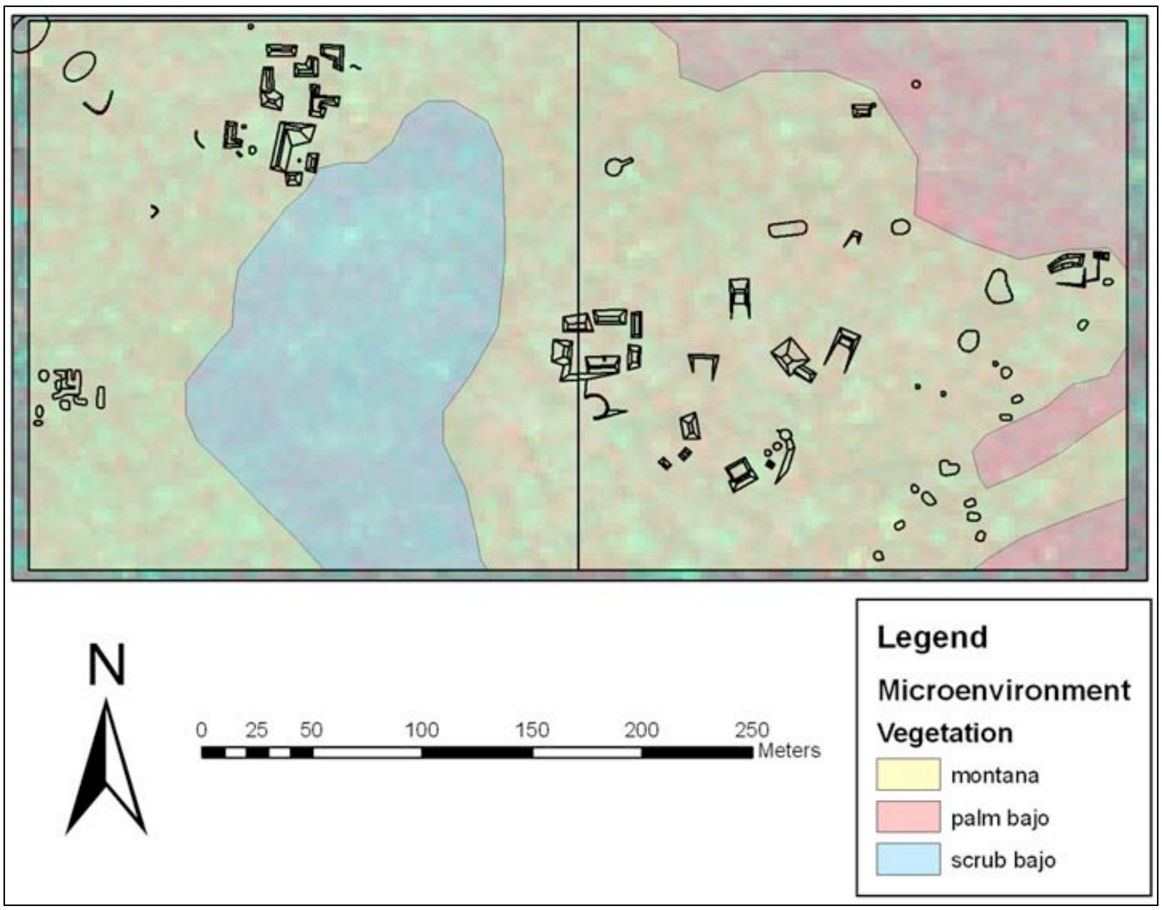


Figure 4.8. Example of vegetation classes in two adjacent survey blocks (PS-90-125 and S-5-126)

up distinctly in satellite imagery, but are really just deforested palm *bajos*. Included in the table are the counts of the various architectural and resource remains encountered during survey.

Table 4.2. Vegetation classes (area and relative percentage), architectural remains, and resource remains encountered during the San Bartolo-Xultun intersite survey.

PS-1-7

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	14,546.95	23.28%	1	0	0	1	1	0
palm bajo	11,055.07	17.69%	0	0	0	0	0	0
scrub bajo	36,897.98	59.04%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**1**	**0**	**0**	**1**	**1**	**0**

PS-7-13

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
camp	2,608.14	4.17%	0	0	0	0	0	0
montaña	40,649.36	65.04%	3	1	2	0	0	1
palm bajo	19,242.5	30.79%	1	0	0	0	0	0
Totals	**62,500**	**100.00%**	**4**	**1**	**2**	**0**	**0**	**1**

PS-17-24

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	17,272.95	27.64%	0	0	42	0	0	2
palm bajo	25,377.21	40.60%	0	0	0	0	0	0
scrub bajo	19,849.84	31.76%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**0**	**42**	**0**	**0**	**2**

PS-25-32

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	15,808.26	25.29%	5	1	18	0	0	11
palm bajo	15,973.53	25.56%	4	0	10	0	0	0
scrub bajo	30,718.21	49.15%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**9**	**1**	**28**	**0**	**0**	**11**

NS-12-40

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
scrub bajo	62,500	100.00%	0	0	0	0	0	0

PS-40-57

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	28,591.01	45.75%	1	0	37	0	1	0
scrub bajo	33,908.99	54.25%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**1**	**0**	**37**	**0**	**1**	**0**

NS-20-63

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
scrub bajo	62,500	100.00%	0	0	0	0	0	0

NS-22-72

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
scrub bajo	62,500	100.00%	0	0	0	0	0	0

PS-57-86

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	30,702.16	49.12%	8	2	16	3	4	3
palm bajo	9,232.66	14.77%	1	0	1	0	0	0
scrub bajo	22,565.18	36.10%	0	0	0	0	0	0

(Table 4.2. Continued)

Totals	**62,500**	**100.00%**	**9**	**2**	**17**	**3**	**4**	**3**
PS-71-102								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	44,242.87	70.79%	4	1	13	0	1	3
palm bajo	18,257.13	29.21%	1	0	5	0	0	0
Totals	**62,500**	**100.00%**	**5**	**1**	**18**	**0**	**1**	**3**
NS-28-112								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
scrub bajo	62,500	100.00%	0	0	0	0	0	0
PS-90-125								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	41,441.5	66.31%	10	0	13	4	1	0
scrub bajo	21,058.5	33.69%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**10**	**0**	**13**	**4**	**1**	**0**
S-5-126								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	46,362.84	74.18%	18	6	19	3	4	0
palm bajo	16,137.16	25.82%	0	0	1	0	0	0
Totals	**62,500**	**100.00%**	**18**	**6**	**20**	**3**	**4**	**0**
PS-95-131								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	49,928.49	79.89%	8	1	2	0	1	0
palm bajo	12,571.51	20.11%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**8**	**1**	**2**	**0**	**1**	**0**
PS-101-137								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	41,290.66	66.07%	16	6	10	0	1	0
palm bajo	21,209.34	33.93%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**16**	**6**	**10**	**0**	**1**	**0**
PS-116-152								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	29,308.77	46.89%	7	0	1	0	0	0
palm bajo	23,068.92	36.91%	0	0	0	1	0	0
scrub bajo	10,122.31	16.20%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**7**	**0**	**1**	**1**	**0**	**0**
PS-131-173								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	36,151.21	57.84%	0	0	0	0	0	0
scrub bajo	26,348.79	42.16%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**0**	**0**	**0**	**0**	**0**
PS-145-188								
Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	62,500	100.00%	0	0	0	0	0	0

(Table 4.2. Continued)

PS-150-193

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	12,928.93	20.69%	13	2	1	0	0	0
palm bajo	36,779.9	58.85%	8	1	10	0	0	12
scrub bajo	12,791.17	20.47%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**21**	**3**	**11**	**0**	**0**	**12**

PS-154-197

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	5,366.15	8.59%	0	2	0	0	1	0
palm bajo	15,122.96	24.20%	0	0	0	0	0	0
scrub bajo	42,010.89	67.22%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**2**	**0**	**0**	**1**	**0**

PS-160-205

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	15,543.45	24.87%	4	3	0	0	0	1
palm bajo	30,980.09	49.57%	1	1	7	0	0	0
scrub bajo	15,976.46	25.56%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**5**	**4**	**7**	**0**	**0**	**1**

PS-171-216

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	30,040.38	48.06%	0	0	0	0	0	0
scrub bajo	32,459.62	51.94%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**0**	**0**	**0**	**0**	**0**

PS-176-223

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	35,545.06	56.87%	4	0	5	3	1	0
palm bajo	26,235.36	41.98%	0	0	3	0	0	0
scrub bajo	719.58	1.15%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**4**	**0**	**8**	**3**	**1**	**0**

PS-180-227

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	19,884.36	31.81%	13	1	7	0	1	0
palm bajo	34,318.94	54.91%	0	0	0	0	0	0
scrub bajo	82,96.7	13.27%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**13**	**1**	**7**	**0**	**1**	**0**

PS-190-237

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	22,554.88	36.09%	2	1	0	0	0	2
palm bajo	15,744.17	25.19%	0	0	2	0	0	0
scrub bajo	24,200.95	38.72%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**2**	**1**	**2**	**0**	**0**	**2**

NS-34-242

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
scrub bajo	62,500	100.00%	0	0	0	0	0	0

(Table 4.2. Continued)

PS-196-246

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	7,165.52	11.46%	2	0	0	0	0	0
palm bajo	29,648.06	47.44%	0	0	0	0	0	0
scrub bajo	25,686.42	41.10%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**2**	**0**	**0**	**0**	**0**	**0**

PS-207-259

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	40,511.57	64.82%	27	1	22	3	0	0
palm bajo	21,988.43	35.18%	1	0	1	0	0	0
Totals	**62,500**	**100.00%**	**28**	**1**	**23**	**3**	**0**	**0**

PS-211-263

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	11,889.27	19.02%	0	0	0	0	0	0
scrub bajo	50,610.73	80.98%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**0**	**0**	**0**	**0**	**0**

PS-215-267

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	4,232.23	6.77%	1	0	0	0	0	0
palm bajo	43,233.94	69.17%	0	0	0	0	0	0
scrub bajo	15,033.83	24.05%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**1**	**0**	**0**	**0**	**0**	**0**

PS-252-316

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	10,098.05	16.16%	3	1	4	0	0	0
palm bajo	33,592.66	53.75%	0	0	0	0	0	0
scrub bajo	18,809.29	30.09%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**3**	**1**	**4**	**0**	**0**	**0**

PS-255-323

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	15,153.64	24.25%	12	1	6	0	0	0
palm bajo	47,346.36	75.75%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**12**	**1**	**6**	**0**	**0**	**0**

PS-264-335

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
palm bajo	60,390.34	96.62%	0	0	0	0	0	0
bacadilla	2,109.66	3.38%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**0**	**0**	**0**	**0**	**0**	**0**

S-17-338

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	24,996.77	39.99%	3	1	0	2	1	0
palm bajo	37,503.23	60.01%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**3**	**1**	**0**	**2**	**1**	**0**

PS-270-345

(Table 4.2. Continued)

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	53,165.49	85.06%	16	0	0	6	4	0
palm bajo	9,334.51	14.94%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**16**	**0**	**0**	**6**	**4**	**0**

PS-273-348

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	45,108.32	72.17%	13	2	0	1	0	0
palm bajo	17,391.68	27.83%	0	0	0	1	0	0
Totals	**62,500**	**100.00%**	**13**	**2**	**0**	**2**	**0**	**0**

S-21-356

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	11,149.79	17.84%	0	0	0	0	0	0
palm bajo	30,495.8	48.79%	13	0	3	1	1	0
scrub bajo	20,854.41	33.37%	0	0	4	0	0	0
Totals	**62,500**	**100.00%**	**13**	**0**	**7**	**1**	**1**	**0**

S-32-370

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	4,425.81	7.08%	1	0	4	0	0	1
palm bajo	56,805.37	90.89%	1	0	1	0	0	0
scrub bajo	1,268.82	2.03%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**2**	**0**	**5**	**0**	**0**	**1**

S-40-388

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	19,314.19	30.90%	5	1	3	2	0	7
palm bajo	43,185.81	69.10%	0	0	7	1	0	5
Totals	**62,500**	**100.00%**	**5**	**1**	**10**	**3**	**0**	**12**

S-46-400

Vegetation	Area (m2)	Relative %	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
montaña	18,636.18	29.82%	5	1	0	2	0	17
palm bajo	43,863.82	70.18%	0	0	0	0	0	0
Totals	**62,500**	**100.00%**	**5**	**1**	**0**	**2**	**0**	**17**

In terms of identifying the settlement signature in the more rural portions of the Maya area, the intersite survey did not produce new data or leads to follow. The scattered yellow and light blue pixels were generally more of an indicator of upland terrain with thin topsoil, then they were of actual architecture or plastered surfaces. This proves that the settlement signature is excellent for identifying capitals and minor centers (see Chapter One), but that for the more dispersed extended family groups different survey methods need to be used for small site identification.

Since vegetation classes in the intersite area were easier to distinguish than the settlement signature, I worked with remote sensing specialists Thomas Sever and Burgess Howell at the Marshall Space and Flight Center, NASA to see how image interpretation software would identify vegetation classes in multispectral scenes. In 2006 we experimented with the IKONOS data, but found that every classification produced a “salt and pepper” appearance with no clear continuity in vegetation classes (Figure 4.9). We determined that in this case the high resolution of the data was actually hindering classification because details, such as tree shadows, were receiving their own classifiers.

In 2007, we decided to experiment with the QuickBird imagery, which had not been available at the time of the intersite survey design. Even though the QuickBird is of a higher resolution than the IKONOS, our QuickBird scene was much cleaner (i.e. no clouds) then the IKONOS and it seemed like there would be more options for data manipulation. I will briefly discuss the technical data processing performed on the QuickBird imagery before presenting the results of the analyses.

First, four contiguous tiles of DigitalGlobe™ QuickBird multispectral data were identified as containing the entire intersite survey universe, as well as the main portions of the sites of San Bartolo and Xultun. The data was acquired by the satellite on April 19, 2003, as confirmed by the visibility of the San Bartolo-Xultun intersite transect and the San Bartolo helipad in the scene. The four tiles were mosaicked into a single data set at the original multispectral resolution (2.8 m). The resultant scene contained the standard red, green, blue, and NIR bands and was cropped to the coordinates of the intersite area corners (Figure 4.10). A vegetation index band was generated using the

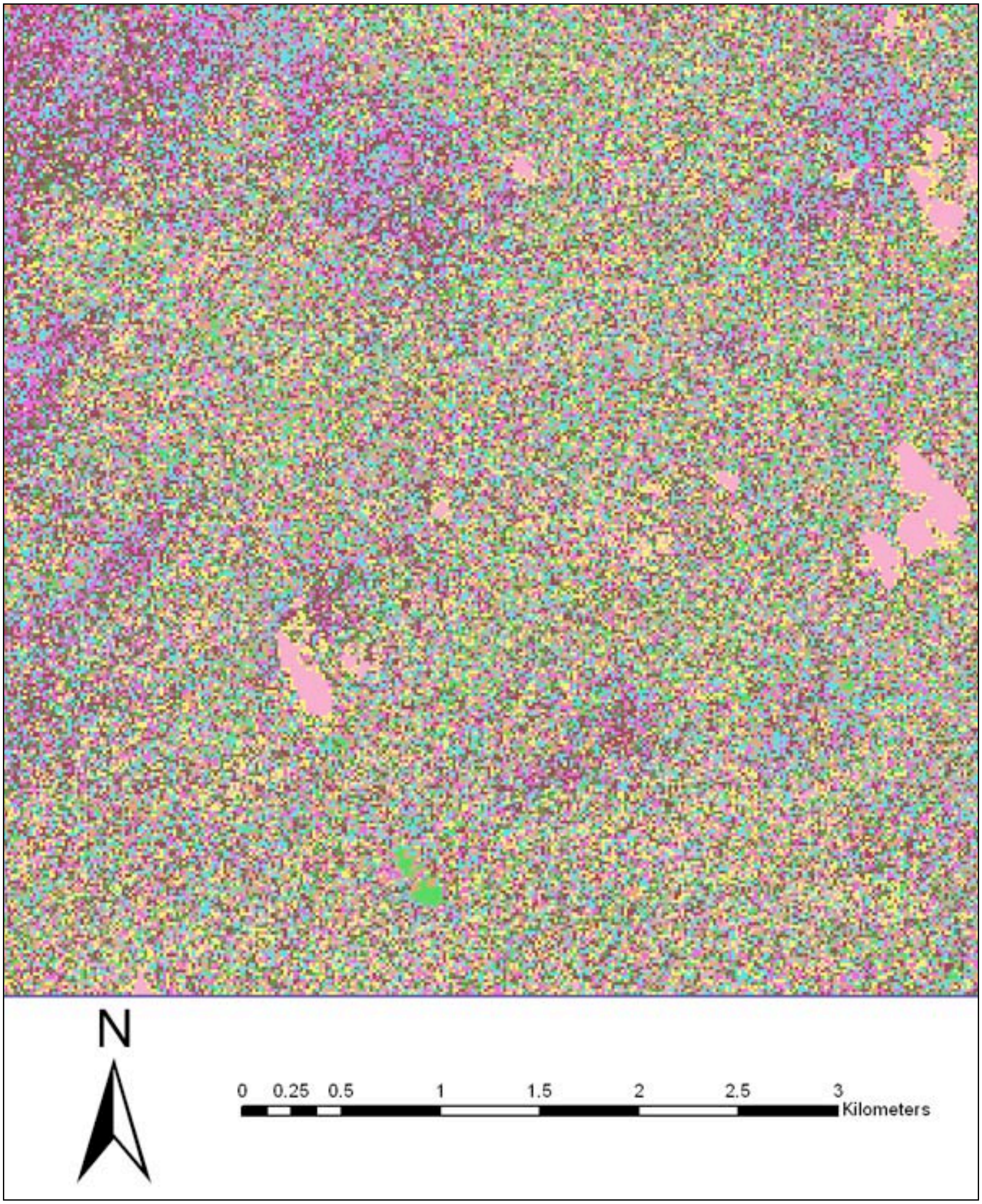


Figure 4.9. 8-class IKONOS classification displaying "salt and pepper" appearance.

standard formula for a Normalized Difference Vegetation Index (NDVI)(Jensen 2005:310-315; Rouse et al. 1974). The equation for the NDVI band is:

NDVI = (NIR band - red band) / (NIR band + red band)

The newly generated NDVI band was added to the data set as a fifth band.

All of the bands (R, G, B, NIR, NDVI) were then resampled by performing an affine transformation on the data set. The affine transformation was chosen because it

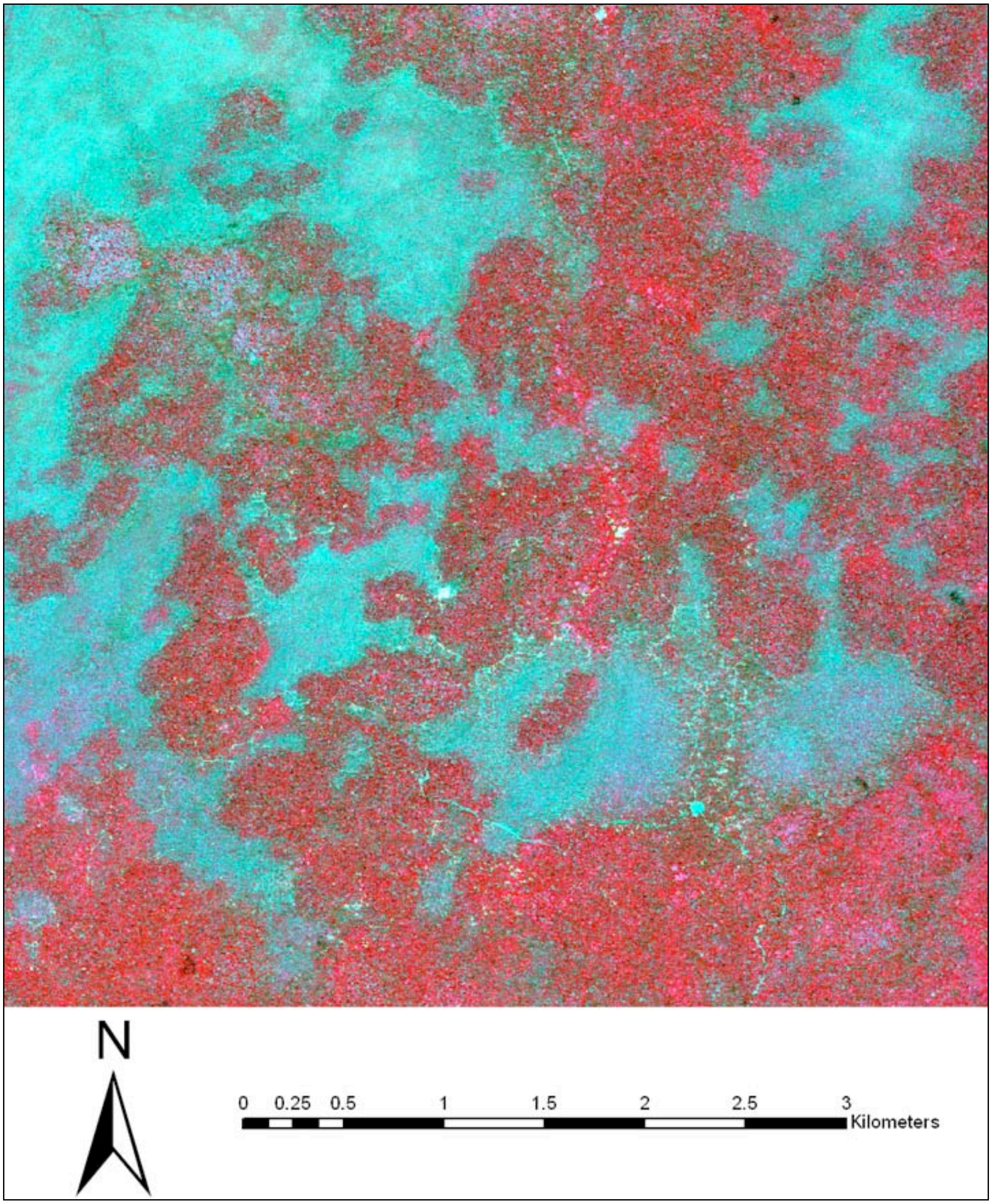
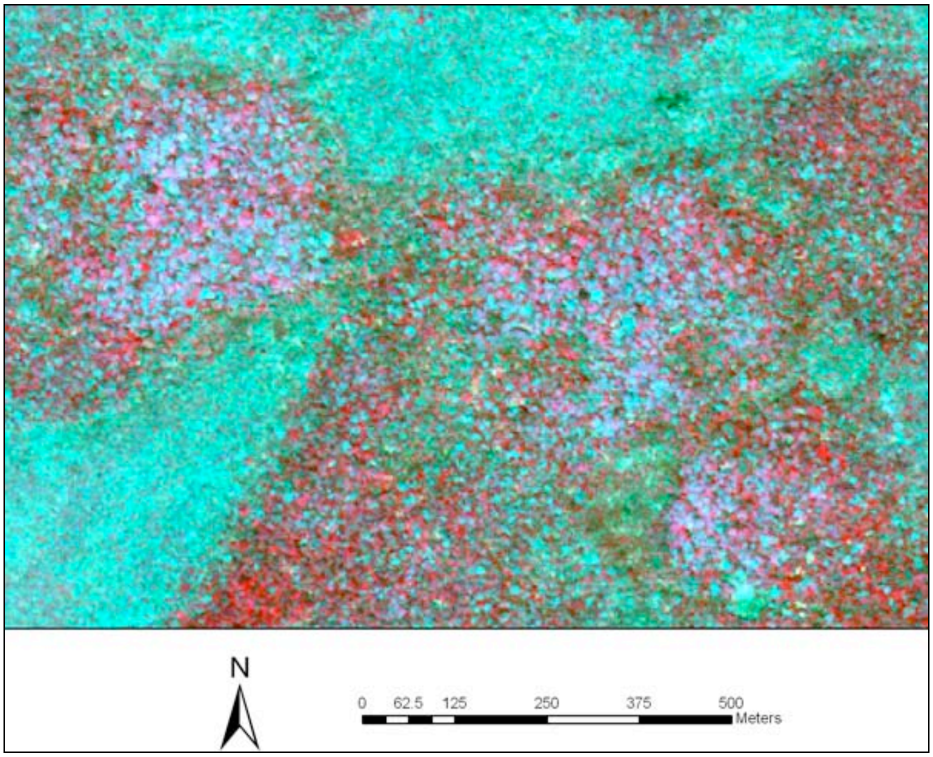
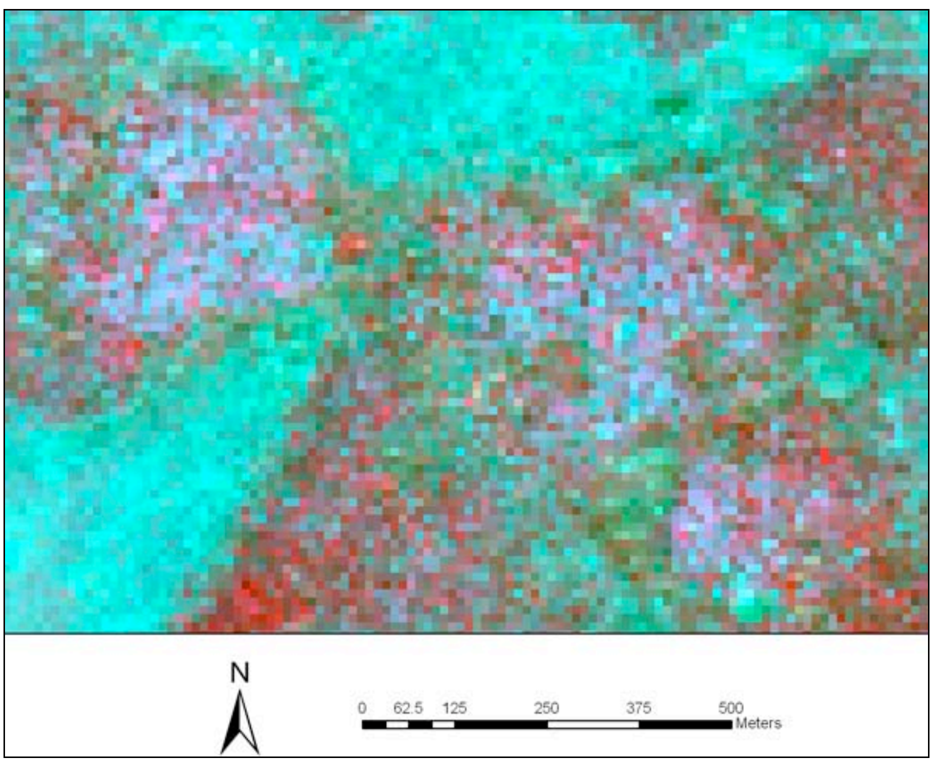


Figure 4.10. QuickBird multispectral image over the San Bartolo-Xultun intersite area.



a.



b.

Figure 4.11. a. QuickBird multispectral data at original resolution. b. QuickBird multispectral data after resample at 4:1 arithmetic average. Both images over Chaj K'ek' Cue.

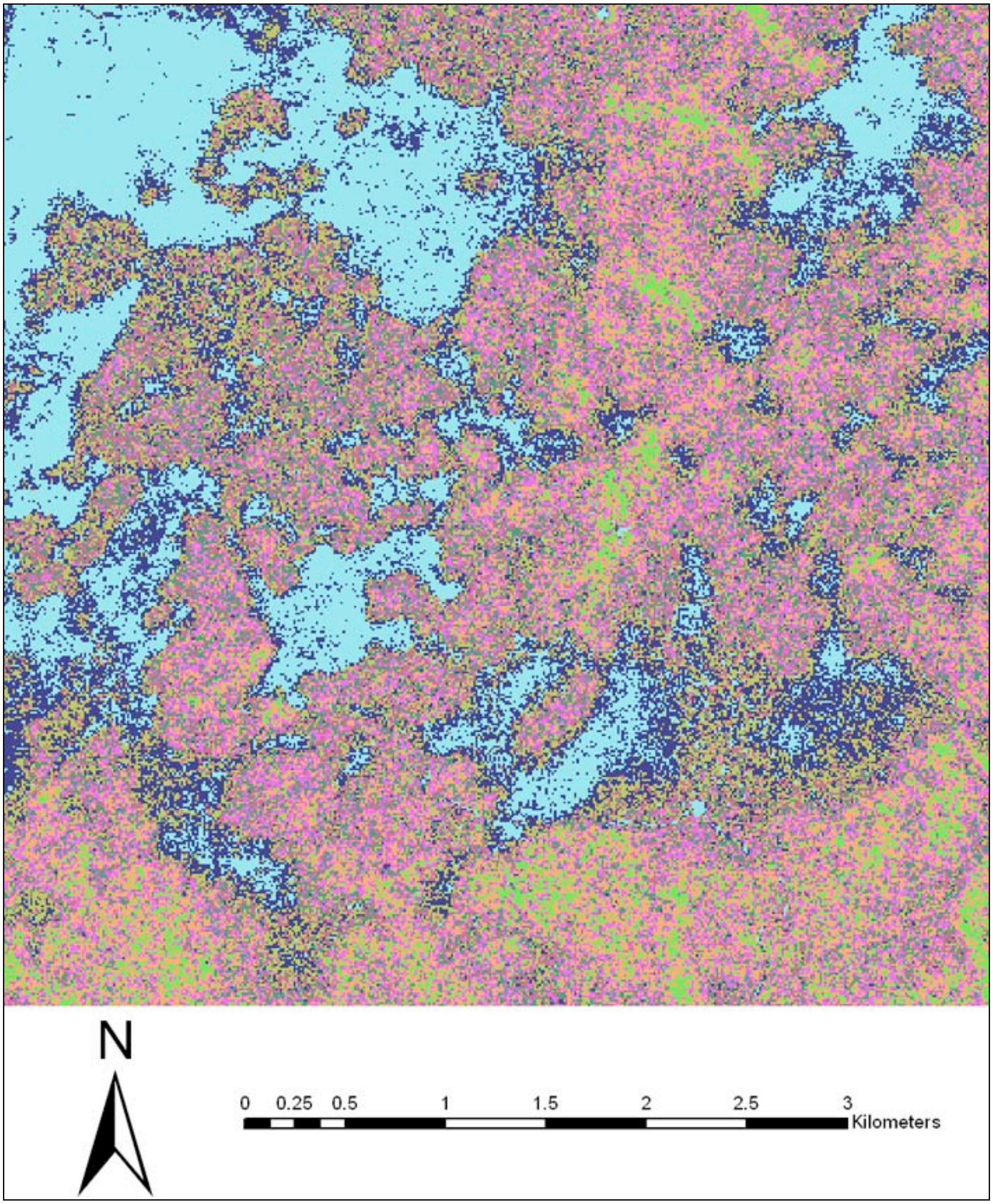


Figure 4.12. 8-class QuickBird classification before manual clustering

allowed a simple way to change pixel size without modifying the image's underlying transformation matrix or internal georeference information. The nearest-neighbor method was chosen as the best way to perform the resampling after bilinear and cubic convolution operations (Jensen 2005:243-244) created noise in the data set. This means that only the *x* and *y* dimensions of the pixel were modified, by instructing the affine routine to assign the resultant pixel value using a 4 x 4 neighborhood arithmetic mean (Burgess Howell, personal communication 2007). The nearest-neighbor resample generated a scene with a resolution of 11.2 m. This resampled scene was used to perform all subsequent analyses (Figure 4.11a, b).

A series of unsupervised classifications were performed on the data using the Iterative Self-Organizing Data Analysis Technique (ISODATA). An unsupervised classification was chosen because it required little initial input from the analyst as opposed to a supervised classification, which interprets a scene based on extensive input and training of the data by the analyst (Jensen 2005:338-392). The advantage of the unsupervised classification is that it provides an objective interpretation of the data to be compared against the data collected during ground-truthing and survey. The ISODATA method is a "comprehensive set of heuristic (rule of thumb) procedures that have been incorporated into and iterative classification algorithm (Jensen 2005:383)" (ERDAS 2003; Rees et al. 2003; Stow et al. 2003). ISODATA classifications were run seven times with 5, 6, 7, 8, 9, 10, and 11 output classes respectively. The 5-, 6-, 8-, and 11-class outputs showed the most promising results in that rough patterns could be seen prior to clustering.

In the end, the 8-class output reflected the best interpretation of the image with classes falling neatly into known vegetation patterns (Figure 4.12). The classification isolated four major vegetation types after clustering the results (Figure 4.13). One class each were assigned to scrub *bajos* (19.11% of total) and the littoral palm *bajos* (16.45%

of total) found at the edges of many scrub *bajos*. Three classes each were assigned to the *montaña* (36.20% of total) and upland palm *bajos* (28.24% of total). While the percentages of vegetation generated by the unsupervised classification are representative

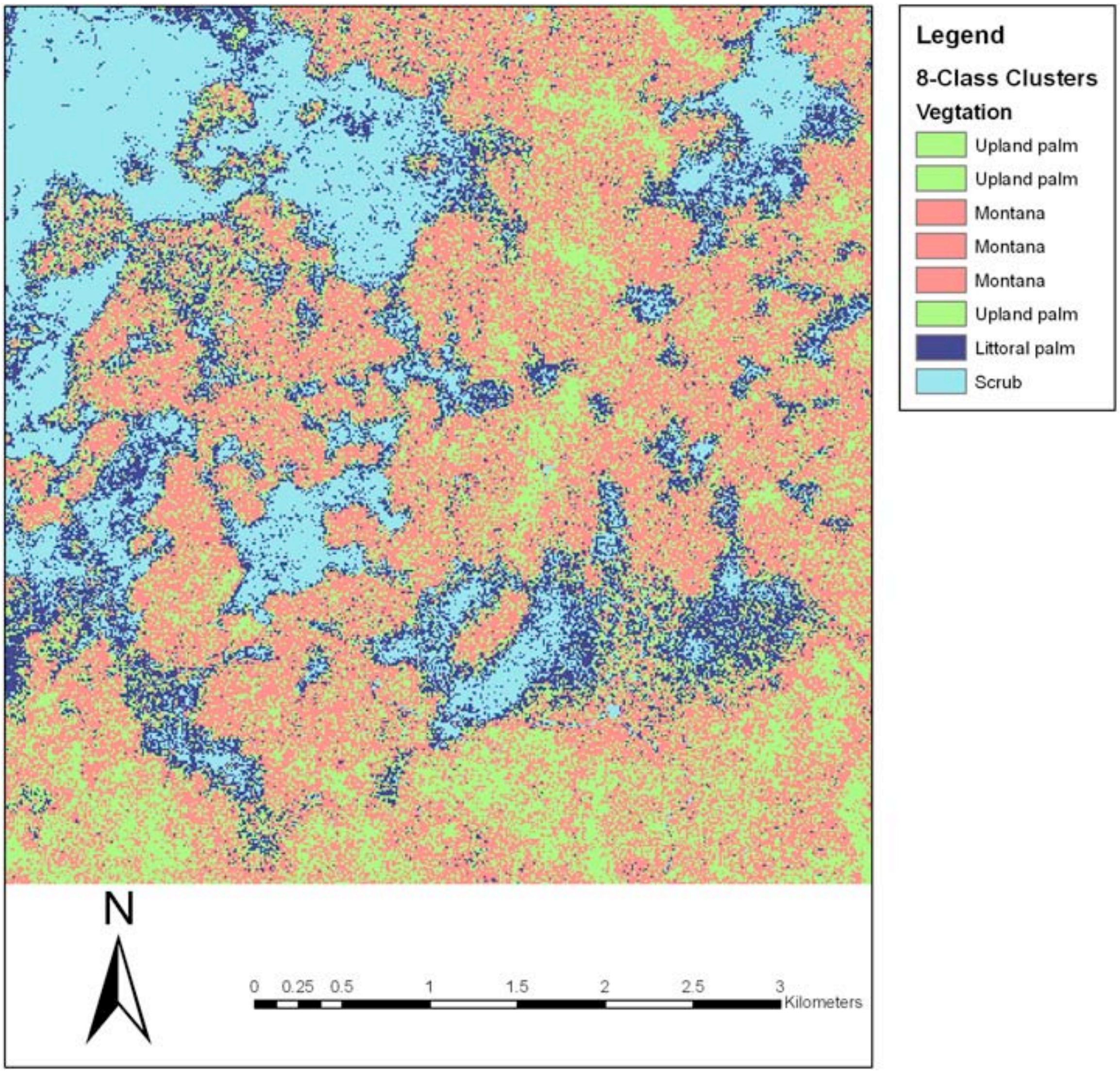


Figure 4.13. 8-class QuickBird classification after manual clustering.

of the total composition of the intersite area, the low resolution of the classification raster makes it difficult to make one to one comparisons between archaeological features and vegetation classes. A better way to look at the data is through a comparison of relative percentages.

According to the ISODATA classification (see Table 4.3), upland terrain, including *montaña* and upland *bajos* vegetation classes, represents 64.44% of the total intersite area. Leaving scrub *bajos* and their littoral palm *bajo* margins at 35.56% of the total area. During the intersite research, 31.31% of the area surveyed was scrub *bajo*, 39.19% was palm *bajo*, and 29.49% was *montaña*. The palm *bajo* could not be visually discerned as upland versus littoral during the initial classification of survey blocks, but the majority of palm *bajo* surveyed was on upland terrain. Table 4.3 shows a comparison of relative percentages of vegetation classes between the survey sample and the QuickBird classification, by combining the various upland and lowland classes. The survey sample and the ISODATA classification are within 5% of each other in terms of classifying upland versus lowland vegetation classes. These percentages would be even closer if the littoral and upland palm *bajos* could be distinguished for the settlement survey data.

Table 4.3. Comparison of relative percentages of vegetation between the survey sample and the QuickBird ISODATA classification of the intersite area.

Survey Vegetation	Survey Sample	QuickBird	QuickBird Vegetation
Uplands (*montaña* + palm *bajos*)	68.68%	64.44%	Uplands (*montaña* + upland palm *bajos*)
Lowlands (scrub *bajos*)	31.31%	35.56%	Lowlands (scrub *bajo* + littoral palm *bajos*)

Since the intersite survey design was based on predicted settlement predicated on the assumption that the settlement signature would work in intersite areas, the similarity in the survey results and the ISODATA classification may simply be by chance. However, the light blue and yellow pixels thought to represent less dense settlement are actually indicative of upland vegetation. In other words, all of the blocks classified as Partial Settlement (PS) during the survey design actually were classifying some portion of upland terrain and vegetation within the block. Similarly, No Settlement (NS) blocks represent lowland vegetation and Settlement (S) blocks are filled completely with upland vegetation. What follows is an examination of archaeological features encountered during the survey in relation to different vegetation classes.

Table 4.4 displays the breakdown of architectural and resource remains in relation to the major vegetation classes (*montaña*, palm *bajo*, scrub *bajo*) noted during survey. These results are further broken down into intersite and site periphery categories. Table 4.5 shows the relative percentage of architectural and resource remains found in each vegetation class. According to these tables, 77.93% of all features are found in *montaña* areas. If rock piles and terraces are removed from consideration, then 87.88% of all features are found in the *montaña*. Yet, when survey strategies are designed to only

Table 4.4. Architectural and resource remains in the intersite area and San Bartolo and Xultun peripheries in relation to vegetation classes.

Location	Area (m^2)	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
Montaña							
San Bartolo	71,004.57	9	2	20	1	1	12
Intersite	464,282.39	137	26	151	16	15	11
Xultun	202,048.24	58	7	17	13	5	25
Subtotal	737,335.2	204	35	188	30	21	48
Palm Bajo							
San Bartolo	48,879.24	5	0	10	0	0	0
Intersite	549,077.65	13	2	67	1	1	12
Xultun	382,019.24	14	0	11	3	1	5
Subtotal	979,976.13	32	2	88	4	2	17
Scrub Bajo							
San Bartolo	67,616.19	0	0	0	0	0	0
Intersite	674,139.96	0	0	0	0	0	0
Xultun	40,932.52	0	0	4	0	0	0
Subtotal	782,688.67	0	0	4	0	0	0
Total	**2,500,000**	**236**	**37**	**280**	**34**	**23**	**65**

Table 4.5. Relative percentages of architectural and resource remains found in each vegetation class.

	Montaña	Palm Bajo	Scrub Bajo	Total
Mounds	86.44%	13.56%	0.00%	100.00%
Platforms	94.59%	5.41%	0.00%	100.00%
Rock Piles	67.14%	31.43%	1.43%	100.00%
Quarries	88.24%	11.76%	0.00%	100.00%
Chultuns	91.30%	8.70%	0.00%	100.00%
Terraces	73.85%	26.15%	0.00%	100.00%

sample *montaña* microenvironments, the subsistence and economic components of Maya culture are underrepresented. Of particular importance are remains of ancient terraces. According to Table 4.5, 73.85% of all terraces are found in the *montaña*, versus 26.15% in the palm *bajos*. In this case the statistics are a little misleading. First, the terraces found in the *montaña* are invariably on slopes descending into *bajos*, so they are really located in transitional microenvironments that are difficult to isolate in remotely sensed data. Second, the terracing found in palm *bajos*, particularly on scrub *bajo* margins, is more complex, and the terraces are generally larger. Another important note regarding the distribution of features is that although only 11.76% of all quarries were found in the palm *bajos*, these four included the only two chert quarries found during survey. Since the highest quality chert in the area comes from these large quarries they represent a key component of the local economic system.

Scrub *bajos* should not be eliminated from survey strategies under the false assumption that they contain no cultural remains. While four rock piles represent the total cultural features located in scrub *bajos* in the San Bartolo-Xultun intersite area, one of these is quite large (see S-21-356) and was almost certainly related to ancient agricultural practices. Furthermore, reconnaissance throughout the San Bartolo-Xultun territory occasionally revealed remnant field systems and other rock pile features in scrub *bajo* contexts. The constant shrinking and swelling of *bajo* soils (Dunning, Jones, Chmilar, and Blevins 2006) during wet and dry season cycles is a very destructive environment for archaeological remains. Nevertheless, the fact that there are still some vestiges of ancient Maya scrub *bajo* activity demands more attention, particularly in the investigation of wetland subsistence strategies. The great number of settlements found on islands within scrub *bajos* (Kunen et al. 2000; Thomas Sever, personal communication 2007) also suggests that the scrub *bajos* were of significance to ancient populations.

The Maya settlement signature identified in IKONOS satellite imagery (Garrison et al. 2004; Saturno et al. 2006; Saturno et al. 2007) has the potential be a great aid to projects working in densely forested portions of the Maya lowlands. Having said that, at this time the signature does not work for all settlements. Capitals and minor centers are easily identifiable using satellite imagery. Smaller sites, composed of loosely arranged courtyard groups dispersed throughout the major intersite areas cannot securely be identified using remote sensing data. This is because the correlation between archaeological features and the light blue and yellow pixels found spread across the intersite area cannot be proven to be more than random and it is more likely that these pixels indicate upland terrain rather than the definite presence of a small site. Shallow topsoils and lack of limestone plaster at many of these small sites may be further confounding variables to a clear signature.

Survey with High-Resolution Remote Sensing Data: A Proposed Methodology

The San Bartolo-Xultun intersite survey was aimed at refining the application of IKONOS and QuickBird imagery in settlement survey. Based on the above results I here present a three phase research design for integrating remote sensing data into archaeological surveys. The settlement signature identified and refined by Saturno and colleagues (Garrison et al. 2004; Saturno et al. 2006; Saturno et al. 2007) will appear differently in other IKONOS and QuickBird scenes due to variations in atmospheric composition at the time of data acquisition that masks or highlights particular wavelength frequencies sensed by the instrument. Other variables such as sun angle, the off-nadir angle of the sensor, and variations in illumination caused by topography also affect the intensity of reflected energy as seen from the sensor (Burgess Howell, personal communication 2007; Lillesand et al. 2004). In the first phase all sites identified by the settlement signature are reconnoitered and ideally mapped. Not only would this confirm the way that the settlement signature manifests itself in the particular remote sensing data set being used, but it would also give the researcher a good overview of what the top levels of the settlement hierarchy look like in the region. The second phase would be to divide the research universe into manageable areas of investigation based on the location of different settlement types. The third phase would be to perform an unsupervised classification on a remote sensing data set to generate classes to sample during ground survey. Notes taken during reconnaissance activities during the first phase will help to assign classes in the data. The relative percentages of each class in the survey area should be calculated and a random block survey designed accordingly.

Population Estimates Using Remote Sensing Data

Maya archaeologists have been attempting to estimate ancient lowland populations since the Carnegie Institution of Washington projects beginning in the 1930s (Rice and Culbert 1990:7-9). Beginning with the publication of the Tikal map (Carr and

Hazard 1961) it was recognized that the density of ancient populations was much higher than previously suspected. Culbert and Rice (1990) edited a volume of data and methods related to Maya population estimates in order "to make explicit the procedures and problems of a historical demography of the Maya and to establish source consistency that allows cross-checking and comparative analysis (Rice and Culbert 1990:2)."

The data from the intersite area and the site peripheries has been combined to generate the population estimate for the survey universe. I decided to do this for two reasons. First, both site peripheries and intersite areas represent rural zones for the ancient Maya suggesting similar land usage. Second, the sample size, especially for the San Bartolo periphery (n=3) is statistically insignificant and combining the peripheral blocks with the intersite blocks provides a more meaningful sample.

According to the relative percentages presented in Table 4.3, the total uplands of the survey universe (25 km^2) ranges from 16.11 km^2 in the QuickBird ISODATA classification to 17.17 km^2 extrapolated from the intersite survey sample. Tables 4.6 and 4.7 present estimates of each feature class per square kilometer of uplands and lowlands based on a 10% total survey sample. Table 4.6 gives these estimates based on the QuickBird ISODATA, while Table 4.7 uses the survey sample data. Together these two data sets represent the probable range of total features in the intersite area. These tables show a range of 137-146 mounds/km^2 and a total of 2,360 mounds. Mounds represent structures in conventional estimates of population.

Table 4.6. Estimated features per square kilometer in the San Bartolo-Xultun intersite area based on the ISODATA classification of QuickBird imagery. Total feature counts are based on a 10% survey sample.

	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
Uplands	146/km^2	23/km^2	174/km^2	21/km^2	14/km^2	40/km^2
Lowlands	0/km^2	0/km^2	4/km^2	0/km^2	0/km^2	0/km^2
Total Count	**2,360**	**370**	**2,800**	**340**	**230**	**650**

Table 4.7. Estimated features per square kilometer in the San Bartolo-Xultun intersite area based on intersite survey sample. Total feature counts are based on a 10% survey sample.

	Mounds	Platforms	Rock Piles	Quarries	Chultuns	Terraces
Uplands	137/km^2	22/km^2	163/km^2	20/km^2	13/km^2	38/km^2
Lowlands	0/km^2	0/km^2	5/km^2	0/km^2	0/km^2	0/km^2
Total Count	**2,360**	**370**	**2,800**	**340**	**230**	**650**

Archaeologists often apply a series of modifications to their total structure counts based on such factors as hidden structures, nonresidential structures, contemporaneity of structures, and disuse of structures (Rice and Culbert 1990:14-17). There is also a variable multiplier applied to the resultant structure count to generate a proposed population estimate (Rice and Culbert 1990:17-18). In order to make the San Bartolo-Xultun population data compatible with comparative data from other portions of the Maya lowlands I follow Rice and Culbert's (1990:19) suggestion that the total structure count be reduced by 30% and that a multiplier of five people per structure be used to generate population estimates. For the intersite data this gives a total of 1,652 mounds with a density ranging from 96-103 structures/km^2. The total population, based on five people per structure, is estimated to have been 8,260, or 481-513 people/km^2.

The intersite survey sampled between San Bartolo and Xultun, however, may better be conceived of first the Late Preclassic San Bartolo periphery, followed by the Late Classic Xultun periphery. The population estimates calculated above are based on the predominantly Late Classic surface remains in the intersite area. Therefore the structure densities and population range presented here should be considered as rural Xultun. In comparison with data published by Rice and Culbert (1990:Table 1.1) the rural Xultun structure density of 96-103 structures/km^2 compares favorably with rural areas around the major sites of Copan (99 structures/km^2) and Tikal (98 structures/km^2).

This evidence supports the argument, developed in later chapters that Xultun was a major independent territorial capital.

Reconstructing populations from earlier time periods is even more problematic than those generated from surface remains. Only seven Early Classic sherds were recovered from the intersite excavations, representing 0.2% of all sherds recovered, and 0.4% of identified sherds. There is a significant ceramic sample from the Late Preclassic Period consisting of 572 sherds. The Late Preclassic, as a time period, is 2.33 times longer than the Late Classic. If the sherd totals are corrected to account for this difference then the Late Preclassic total should be corrected to 245 sherds. This number represents 23.2% of the identified Late Classic sherds (n = 1057). Applying the same relative percentages of ceramics to the intersite mound counts may give a rough estimate of at least the Late Preclassic population. Calculating 23.2% of the Late Classic modified mound count of 1,652 mounds, gives a total of 383 mounds. Table 4.8 presents the resultant structure and population densities for the Late Classic and the Late Preclassic based on these methods. The slight differences in percentages of upland and lowland

Table 4.8. Proposed structure densities and population estimates for the San Bartolo-Xultun intersite area for three major time periods.

Time Period	Structures/km^2	People/km^2	Population	% of Max.
Late Classic	96-103/km^2	481-513/km^2	8,260	100%
Late Preclassic	22-24/km^2	112-119/km^2	383	23.2%

terrain derived from survey data versus an unsupervised ISODATA classification of QuickBird imagery provide a reasonable range for calculating structure densities and population estimates in forested areas of the Maya lowlands.

Cultural and Ecological History of the San Bartolo-Xultun Intersite Area

This section integrates all of the data sets from the San Bartolo-Xultun intersite area as well as additional paleoenvironmental data collected by Dunning. The cultural and ecological history is followed by an analysis of the cultural sequence using concepts from landscape ecology (Fedick 1996). It is in that section that issues of process and change are addressed. This approach is in accordance with Gordon Willey's (1980) belief that cultural historical archaeology and processualism were not antithetical ways of looking at the past.

Archaic Period and Early Preclassic Period – 6000-1000 B.C.

There is no known evidence of cultural activity within the San Bartolo-Xultun territory prior to 1000 B.C. There is however, limited paleoenvironmental data that sheds some light on what the terrain may have looked like when the first settlers entered the northeast Peten. Organic material dated from a soil pit in the Bajo Itz'ul indicates a pre-Maya soil at 5240-4960 cal B.C. (2 sigma). Since this date is derived from a bulk analysis of organics collected, it is unclear at what time the soil was actually buried (Dunning, Jones, Chmilar, and Blevins 2006). Still, the presence of a buried Ab horizon indicates that this portion of the Bajo Itz'ul, in the southwestern portion of the intersite area was not a scrub *bajo* during the early Holocene. This means that if *bajos* even existed at this time they took different forms and were almost certainly smaller, with large portions actually being perennial wetlands. Environmental conditions and resource distribution were major deciding factors in the initial settlement of the Maya lowlands. This has been demonstrated through archaeological and paleoenvironmental research in the Petexbatun region (O'Mansky and Dunning 2004). The landscape encountered by the first Maya settlers was not the same as the one found today by archaeologists and other explorers of the Peten.

Middle Preclassic Period – 1000-400 B.C.

The first evidence of human activity in the San Bartolo-Xultun intersite area, and by extension the territory, comes from a paleosol recovered from the Bajo Majunche, located in the intersite area, 1.5 km southeast of Chaj K'ek' Cue. This buried Ab horizon has been radiocarbon dated to 920-800 cal B.C. (2 sigma), right at the beginning of the Middle Preclassic (Figure 4.14). The soil itself is a compressed organic clay that used to be a Histosol (organic muck) that probably formed within a perennial wetland (Dunning, Jones, Chmilar, and Blevins 2006). Ancient pollen preserved in the Ab horizon indicates a forested environment surrounding a wetland at the time the soil formed. The presence of water lilies (*Nymphea*) and cattail reeds (*Typha*) are particularly indicative of standing water and are species that are definitely not present in the area today. Minimal disturbance taxa (Asteraceae, Poaceae) suggest that there was limited forest clearing during this time, but the low number of charcoal fragments counted suggest that this clearing was not taking place too close to the location of the buried soil (Dunning, Jones, Chmilar, and Blevins 2006). This is because a relatively intact swamp forest environment was successfully filtering out the charcoal from the assemblage (Dunning, Jones, Chmilar, and Blevins 2006). The idea of a pristine landscape filled with standing water with cattail reeds and water lilies and abundant forest resources is reminiscent of the later concept of *pu*, or *Tollan*, as the "Place of Cattails" (Figure 4.15). In later times the "Place of Cattails" is associated with origin myths and the mythical foundations of

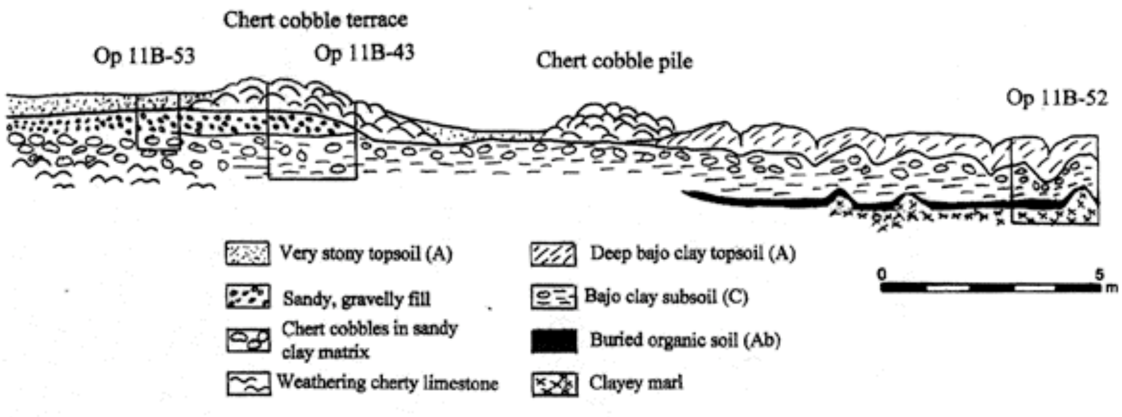


Figure 4.14. Profile of excavations at the palm *bajo* to scrub *bajo* transition showing a buried Ab horizon (drawing by Nicholas Dunning).

Figure 4.15. Maya glyph for *pu* (after Stuart 2000).

Figure 4.16. Coring the Tintal Aguada.

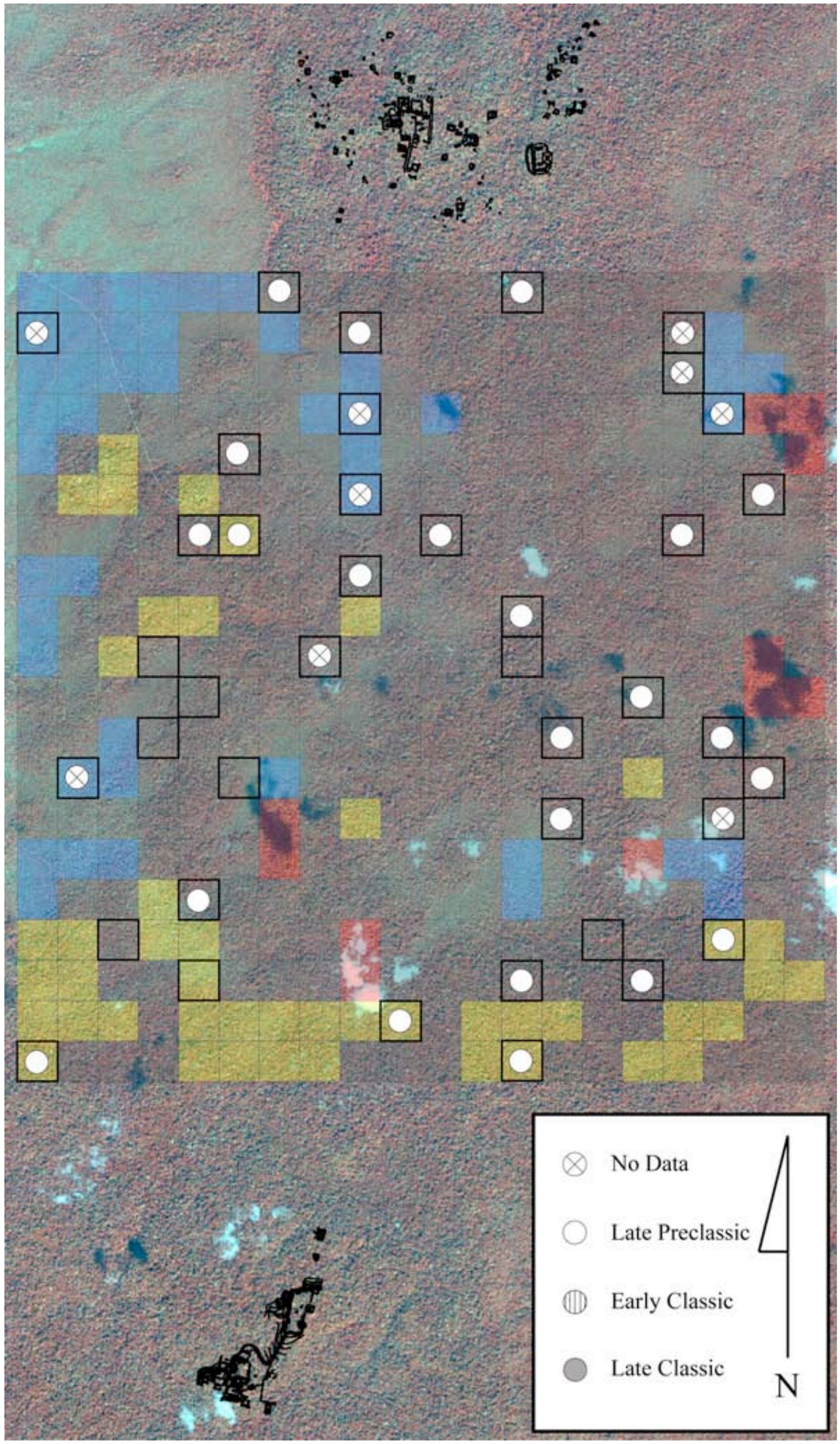


Figure 4.17. Map showing location of Late Preclassic contexts found during intersite excavations.

major Mesoamerican political powers from Central Mexico to Oaxaca to the Maya area (Stuart 2000:501-506).

There is no evidence of intersite settlement during the Middle Preclassic and it is likely that the relatively small population nucleated on the largest expanses of upland terrain. The early settlers were definitely farmers with evidence for Middle Preclassic agricultural activity coming from a core taken from the Tintal Aguada in the Ixcan Bend area (Figure 4.16). This core yielded a radiocarbon date of 780-410 cal B.C. (2 sigma), covering the latter portion of the Middle Preclassic Period. Pollen from this core indicates that maize, cotton, and manioc were all being cultivated in the area of the *aguada* (Dunning, Jones, Chmilar, and Blevins 2006) and probably represent territory-wide domesticates. Although, there were no economic species found in the Bajo Majunche pollen, so it is possible that the intersite area was not considered to be a good setting for early cultivation. Water lily pollen from the Tintal sample indicate that there was still a pattern of year-round moisture at this time. The early domesticates in the territory are contemporary with the earliest known settlements at San Bartolo.

Late Preclassic Period – 400 B.C.-A.D. 200

During the Late Preclassic, settlement expanded out of San Bartolo into the intersite area (Figure 4.17). Domestic ceramic types that span the entire Preclassic, such as those from the Achiotes Group (Culbert 1993), are found in numerous contexts suggesting that this population growth may have begun during the early portion of the period (though this has not be proven). The only identifiable ceramics from excavations near a chert quarry in block PS-116-152 date to the Late Preclassic, suggesting that these sources of raw lithic material were important during the early periods of settlement.

Based on the total contexts in which Late Preclassic ceramics were found (i.e. presence/absence), the Late Preclassic intersite area had 22-24 structures/km^2 and was home to over 1900 people. This increased rural population began to take a toll on the physical landscape leading to a serious subsistence crisis at the end of the Preclassic.

Late Preclassic to Early Classic Transition – A.D. 200-300

The Late Preclassic to Early Classic transition took place during the 3rd century A.D. and may have begun in the San Bartolo-Xultun territory as early as the mid-2nd century A.D (William Saturno, personal communication 2006). Many of the hallmarks of Classic Maya civilization (vaulted stone architecture, hieroglyphic writing, complex ceremonialism, class-structured society) have now been found to exist in Preclassic times (Adams and Culbert 1977; Hammond 1990). This raises the question of whether there even was a Preclassic to Classic transition or if instead archaeologists have created false divisions based on old data. While there are certainly strong continuities in Preclassic and Classic Maya civilization, paleoenvironmental, settlement pattern, architectural, and ceramic data all suggest serious changes took place as well, with a new order arising in the Early Classic and developing and expanding in the Late Classic.

Paleoenvironmental data are crucial to understanding the ancient Maya's relationship with their landscape. This in turn is a critical component of settlement archaeology, which also incorporates architectural data in settlement typologies as well as ceramic data for chronology. Paleoenvironmental data has been used in recent years to argue for a series of extended droughts that devastated the Maya area at various times throughout their culture history (Gill 2000; Hodell et al. 1995). The study of ancient soil processes and pollen has also been informative in reconstructing the management and mismanagement of the ancient landscape from Preclassic times onward (Beach et al. 2006; Dunning and Beach 1994; Dunning et al. 2003). A combination of environmental stress and cultural mismanagement of slope erosion were probably major contributors to the Late Preclassic to Early Classic transition.

Richard Hansen (1998) has written an extensive review of the continuities and disjunctions between Preclassic and Classic architecture, emphasizing the continuities more than the changes. Vernon Scarborough (1998) has discussed how Preclassic and Classic architecture changed based on different water management techniques, particularly a shift from Late Preclassic concave watershed management to Classic Period convex watersheds that utilized architecture to capture water. In terms of ceramics, the homogenous red, black, and cream wares of the Late Preclassic Chicanel sphere began to diversify with the development of Protoclassic types toward the end of the Late Preclassic. The Protoclassic was not a separate stage of cultural development for the Maya, but rather the creation of a new suite of ceramic types around the time of the Late Preclassic to Classic transition (Brady et al. 1998). The Early Classic Tzakol sphere represents localized diversification of types as contrasted against the prior monochromes of Chicanel (Sullivan and Sagebiel 2003), while at the same time continuities in ceramic iconography existed as pan-Maya traits. While the continuities in ceramics and architecture are easy to explain as the normal trajectory of a civilization developing into an ever more complex form, the drastic changes in these same data sets as well as in settlement patterns implies that Early Classic lowland Maya culture was a response to the devastation that occurred at the end of the Late Preclassic.

The most useful archaeological data set reflecting a Late Preclassic to Classic transition is that of settlement patterns. Many sites throughout the Maya area were either abandoned or saw significant population reductions at the end of the Late Preclassic. These abandonments led to a major restructuring of the political and economic landscape of the ancient Maya. Towards the end of the Late Preclassic the flourishing southern highland sites began to collapse (Sharer 1994). Most notable of these was the large commercial center of Kaminaljuyu located in present day Guatemala City. It is possible that the decline of the southern highland sites was in part a result of the disruption in the exchange network caused by the eruption of the Ilopango volcano in El Salvador (Sheets 1971, 1979). In the lowlands, many Late Preclassic sites either suffered population declines or were completely abandoned around the same time period.

The enormous site of El Mirador, and Nakbe (its political predecessor in the north-central Peten) were abandoned (Hansen 1992a). In the northeast Peten many smaller sites in the Ixcanrío Basin around the site of Río Azul seem to have also suffered setbacks toward the end of the Late Preclassic (Adams 1999). In the eastern Peten, the sites of Cival and T'ot in the Holmul Basin declined as Holmul emerged as the dominant Classic Period power in that region (Estrada-Belli 2002). The coastal site of Cerros in northern Belize was also abandoned at the end of the Late Preclassic perhaps in response to the decline of El Mirador (Reese-Taylor and Walker 2002). Many other sites experienced at least a brief interruption or disturbance in their occupational histories at the end of the Late Preclassic. So, while many of the traditional "markers of civilization" were already developed in the Maya area during the Preclassic, there still seems to have been a Preclassic to Classic transition with the face of the political and economic landscape changing drastically during this time period.

Hansen (1992a, 1993) has suggested that the collapse of El Mirador and the other north-central Peten centers was related to environmental degradation, which Reese-Taylor and Walker (2002) argue resulted in a decentralization of the distribution network throughout the lowlands. Adams (1999) notes a drastic decline in the Early Classic rural population around Río Azul and also discusses environmental degradation as a problem with which the Maya would have had to face. In the San Bartolo-Xultun intersite area there is a near total abandonment of the rural settlement as seen in the virtual absence of Early Classic ceramics. This abandonment was likely due to a shift from a stable to an aggrading landscape (Beach et al. 2006) brought on by poor slope management as increased agricultural and deforestation activities accelerated erosion processes, silting in the wetland environments (Dunning 1995). These processes led to the formation of the *bajos* that have dominated great portions of the Maya lowlands from the Classic Period to the present.

Early Classic Period – A.D. 300-600

Ceramics from the Early Classic Manik Complex (Culbert 1993, 2003) occur in three intersite excavation contexts and represent a total of seven identified sherds (Figure 4.18). This represents 0.4% of all identified ceramics and 0.2% of all analyzed ceramics from the intersite area. This reduction from Late Preclassic material is tantamount to a total absence of Early Classic ceramics and therefore a total abandonment of the intersite area. During the Early Classic the eroding slopes stabilized to a certain degree as reduced populations nucleated in the uplands. In this case the population was nucleating at

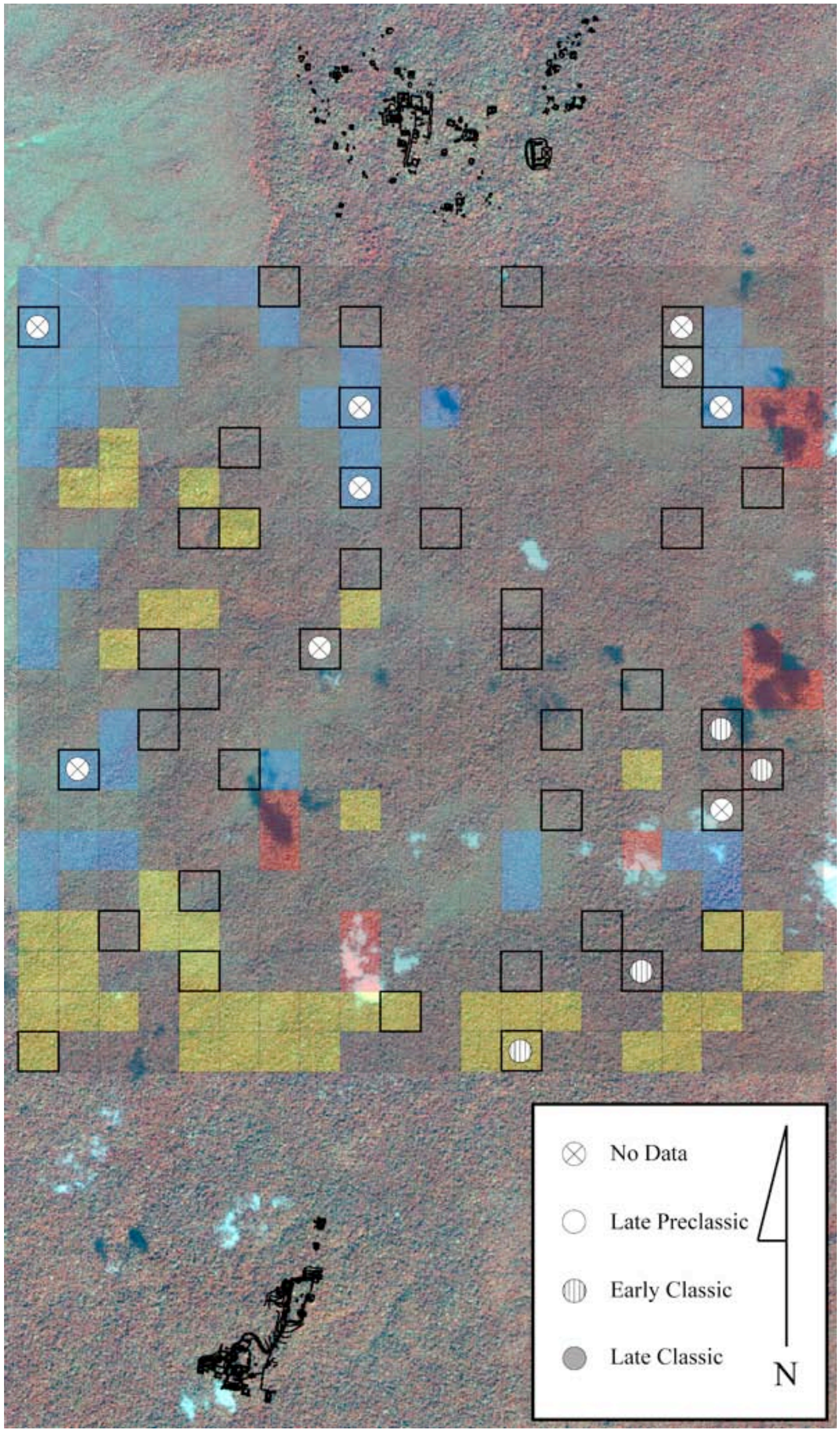


Figure 4.18. Map showing location of Early Classic contexts found during intersite excavations.

Xultun at the southern end of the intersite area where a local dynasty was beginning to gain power. The rich soil that had eroded down from the uplands accumulated at the bases of slopes, right at the transition to scrub *bajo* vegetation and terrain. This new ecological niche was exploited by the Maya as populations grew and slope management technologies, such as terracing, were further developed to prevent a recurrence of the disasters of the Late Preclassic to Early Classic transition (Dunning et al. 2002; Dunning et al. 2003).

Late Classic Period – A.D. 600-850

The Late Classic marks the peak of settlement in the San Bartolo-Xultun intersite area (Figure 4.19). The majority of the population, which may have been as high as 8,260 people, represented the supporting rural component of the Xultun site core. Extensive terracing along *bajo* margins allowed for intensive cultivation. There were a predicted 230 *chultuns* in the intersite area which were probably used to store portions of the agricultural surplus using technologies that may be lost to us today. The majority of the intersite occupation likely consisted of a series of extended family house groups dispersed across the landscape in single or multiple courtyard configurations. The minor center of Chaj K'ek' Cue, with its elite range structure, would have coordinated these families' activities so that the prescribed amount of tribute would be sent to the Xultun capital.

The picture that emerges of Late Classic hinterland populations is that of a large group of innovative farmers constantly monitoring and modifying the landscape. The Late Classic saw the widespread application of terracing as an agricultural technique and there were certainly other cultivation strategies that are not as clear to us in the

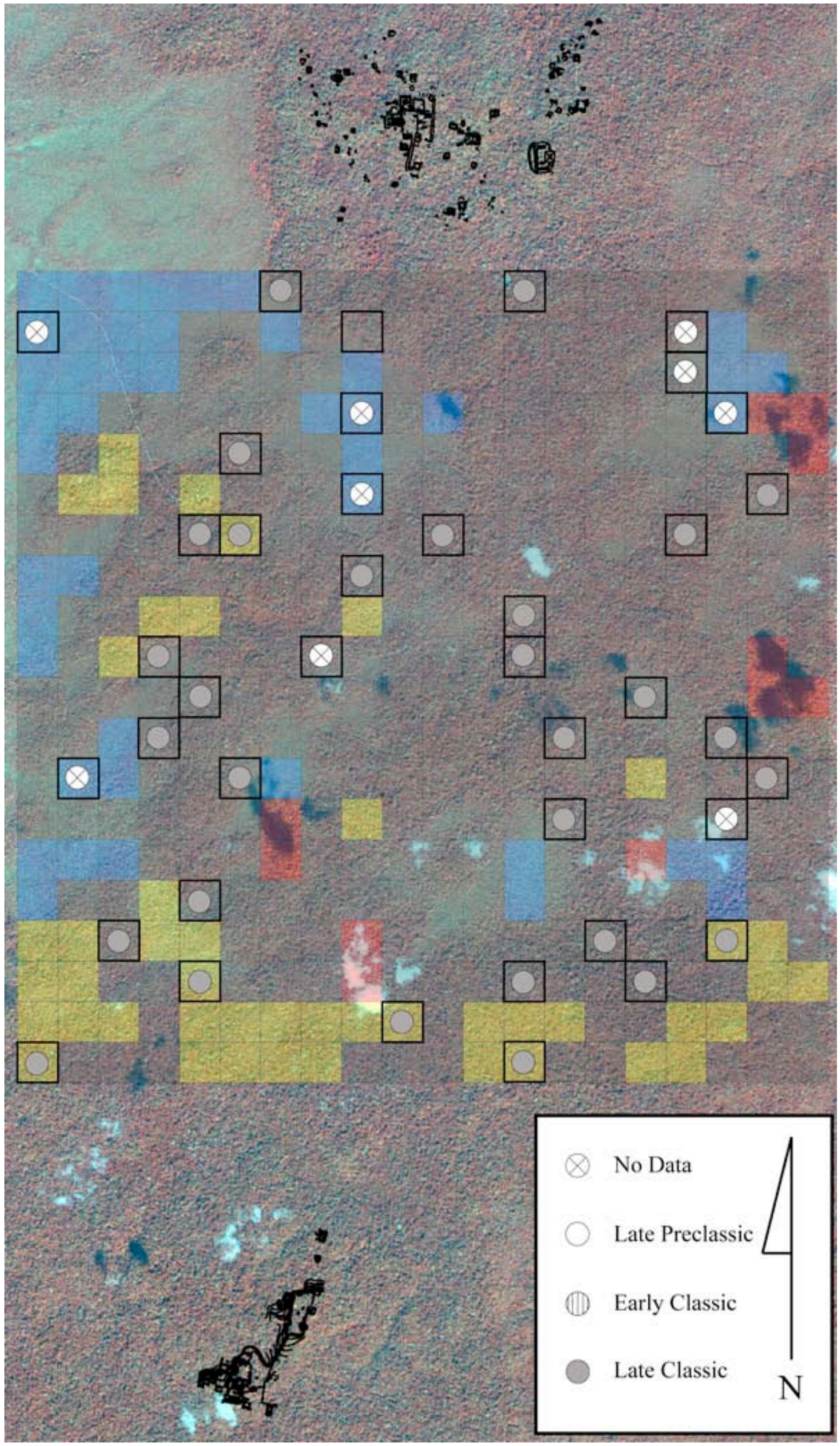


Figure 4.19. Map showing location of Late Classic contexts found during intersite excavations.

archaeological record. For example, long, linear features composed of chert cobbles may have served to prevent soil runoff or perhaps as walkways between gardens of special economic crops. The homogeneity of the archaeological assemblage throughout the intersite area suggests an atmosphere of cooperation in which the entire population shared the common goal of florescence through adaptation.

Terminal Classic Period – A.D. 850-1100

While populations may have persisted in the Xultun site core into the 11th century A.D., the intersite area seems to have been largely abandoned by the end of the Late Classic. Single Terminal Classic Eznab (Culbert 1993, 2003) sherds were found in the Xultun periphery (PS-273-348) and at Chaj K'ek' Cue (S-5-126). Be that as it may, it is difficult to put a precise date on the intersite abandonment since many of the domestic wares that compose the majority of the intersite ceramic assemblage span the Late and Terminal Classic Periods (see Appendix B). We do know that elite activity, in the form of stelae dedications, ceases in A.D. 889 at Xultun (Garrison and Stuart 2004; Houston 1986). It seems likely that no matter what the cause, the collapse of the elite would have provided the opportunity for remaining populations to move back to the uplands. One possible reason for such a movement would have been to nucleate around remaining water sources if there was a prolonged drought, as proposed by some scholars (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). More extensive excavations in the intersite area, particularly in areas with significant architecture may yield more evidence regarding the abandonment of the area.

Structure, Function, and Change in the San Bartolo-Xultun Intersite Area

The cultural and ecological history presented above provides a model that may be analyzed in terms of cultural processes. I use the landscape ecology concepts of structure, function, and change to examine these processes. Here this is done at the most local scale of the analytical hierarchy. However, in the following chapters a similar analysis is applied highlighting how cultural processes vary depending on scale and also how the importance of some processes in Maya culture history depends on the level of analysis.

Paleoenvironmental data inform on the structure of the landscape encountered by the first settlers around San Bartolo and Xultun in the Middle Preclassic. Although there is no intersite settlement dating to the Middle Preclassic, pollen evidence implies a landscape of perennial wetlands surrounded by stretches of upland terrain where the first villages formed. Since there were very few if any people living in the intersite area there is nothing we can presently say about the structure or any functions that would have taken place.

The intersite area was settled during the Late Preclassic. This change occurred as populations expanded out of the early nucleated villages, especially San Bartolo. Raw materials such as chert, and probably limestone, were harvested from the intersite area, and large stretches of terrain were likely cultivated by Late Preclassic farmers. The homogeneity of the ceramic types suggests that the extended family groups living in the intersite area were of the same socioeconomic status and probably interacted in their own heterarchical exchange network. This network was embedded into the emerging settlement hierarchy in the region with San Bartolo arising as a capital (see Chapters Five and Six). This means that in addition to interactions with one another, the Preclassic intersite farmers also would likely have supplied some of their surplus to the emergent elite class at San Bartolo. Unfortunately, these early farmers did not develop the necessary technologies to sustain long term agricultural production on upland terrains. Unchecked erosion, accelerated by deforestation to provide wood for lime plaster production (Hansen 2000; Saturno 2002), led to the silting in of wetland environments, transforming the landscape and causing a water crisis.

The cumulative effects of the environmental changes that took place during the Late Preclassic to Early Classic transition led to massive population reductions and settlement abandonments (Dunning 1995). During the Early Classic there were apparently very few people living in the intersite area to judge from the present sample. In terms of structure there are two possibilities. The first is that these isolated groups still living in the intersite area were independent families trying to survive on their own without any connection to higher political organizations. The second, more likely possibility is that small populations continued to harvest important resources in the intersite area and provide them to the nucleated populations living in the Xultun center. The functions between the intersite families and Xultun families were probably heterarchical immediately following the environmental crises. These functions would have become increasingly hierarchical as order was restored and populations began to grow again while a powerful dynasty and elite class emerged in the Xultun center.

Change occurred once again as Late Classic populations grew and began to repopulate the intersite area. The Late Classic was the peak of intersite settlement density as well as the height of total population across the Maya lowlands (Culbert and

Rice 1990). As the rural population grew new agricultural technologies allowed the Maya to feed a growing population for hundreds of years. The Late Classic structure of the intersite area was probably similar to that of the Late Preclassic in that a series of families looked out for one another sharing resources in embedded heterarchical networks. The emergence of Chaj K'ek' Cue suggests that intermediary elites helped process tribute to the Xultun capital. The high concentration of *chultuns* on the Chaj K'ek' Cue peninsula indicates that surplus could have been stored and counted there prior to being sent as tribute (with the local elites of course keeping a portion for themselves). Outside of Chaj K'ek' Cue, the homogeneity of the artifact assemblages found throughout the intersite area demonstrates a sense of equality among Late Classic rural populations.

The final change that occurred was probably environmental and social. An extended drought may have effected large portions of the Maya area (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). Even if this drought did not directly effect the northeast Peten, indirect effects on the sociopolitical hierarchy may have contributed to the disruptions at this time. The San Bartolo-Xultun intersite Maya continued in their agricultural way of life until the Terminal Classic. It is unclear whether the intersite area was abandoned suddenly or gradually and the dating of the abandonment is uncertain. Excavations (SB11B-26) in a plaza group in Chaj K'ek' Cue Group C (block S-5-126) uncovered a number of smashed vessel covering the steps of a low structure. This Late Classic deposit was a termination ritual suggesting a planned, but abrupt abandonment at the site. This is the only direct evidence for abandonment that was found during excavation. I believe that the intersite area was probably abandoned shortly after the cessation of elite activity at Xultun in A.D. 889 as remaining populations nucleated in the uplands. The functions between remnant groups would have been cooperative as people united in an effort to survive.

Conclusions

The main field research carried out for this dissertation informs on a very small area of the San Bartolo-Xultun territory that was occupied primarily by rural populations throughout its cultural history. New technologies aided in providing representative survey coverage and similarly aided in generating population estimates for the intersite area. The settlement remains and archaeological material inform us on aspects of rural life in the hinterland of a major Maya center. While the issues touched upon in this chapter are interesting in their own right, the question arises as to how the intersite populations integrated with the rest of Maya civilization. The theoretical framework presented in Chapter Three was used to contextualize the San Bartolo-Xultun intersite data in increasing scales of analysis. The following chapter will examine the San Bartolo-Xultun territory as a political entity. Chapter Seven will compare this entity to other territories that occupy the same adaptive region. Finally, Chapter Eight will examine some of the broader pan-lowland interactions in which the San Bartolo-Xultun territory was involved. Each scale of analysis highlights different aspects of structure, function, and change, demonstrating the value of a multi-scalar conjunctive approach to Maya archaeology.

Chapter 5: The San Bartolo-Xultun Territory

Introduction

One of the major goals of the intersite survey and excavation program was to try to unravel the complex relationship between San Bartolo and its larger neighbor to the south, Xultun. The theoretical framework outlined in Chapter One was designed to integrate the intersite data into a broader context. The San Bartolo-Xultun territory is comprised of 15 areas of which, the intersite area is one. A territory is an independent sociopolitical unit that was free to make or break alliances with other territories, either reaping the benefits or suffering the consequences depending on the outcome of the interaction. This chapter presents a cultural and ecological history of the San Bartolo-Xultun territory.

In order to contextualize the intersite data at the territorial level there needs to be a clear definition of the structure of the territory. A definition of each area is given, including what is known about the areas archaeologically. A detailed discussion of the archaeology of San Bartolo and Xultun follows using data from survey, excavation, paleoenvironmental studies, iconography and epigraphy to present the culture history of these two sites and their surrounding territory. Finally, following the theoretical framework of the dissertation, the Three Rivers adaptive region data is considered in terms of the landscape ecology terms of structure, function, and change.

The San Bartolo-Xultun Territory

The San Bartolo-Xultun territory is one of numerous territories found within the Three Rivers adaptive region. Other examples of territories from this adaptive region are

La Honradez, La Milpa, and Río Azul-Kinal which will be discussed in more depth in the following chapter. The San Bartolo-Xultun territory is in the southern portion of the Azucar Lowlands physiographic province of the Three Rivers adaptive region and near the ecotone with the Southern Plateau adaptive region. Within the Azucar Lowlands the territory occupies the southeast margin of the enormous Bajo de Azúcar. The landscape is dissected by *bajo* tributaries and isolated smaller bajos as the terrain gradually rises eastward. These *bajos* are of both palm and scrub varieties (Kunen et al. 2000).

The two largest sites in the territory by far are San Bartolo and Xultun, especially in terms of volume of architecture. Chapter Six presents a rank ordering of all sites within the San Bartolo-Xultun territory as part of the analysis of Three Rivers region settlement patterns. Here, it is sufficient to say that all named sites in the territory besides San Bartolo and Xultun are minor centers that were hierarchically subordinate to the two capitals during different time periods. Range structures of significant size were found at Las Minas, La Prueba, and K'ak' Quij Kwaribaal, while significant residential groups have been found at Oxtun, Chaj K'ek' Cue, El Noticiero, and La Pilita. Smaller settlements are found throughout the territory on almost every portion of extensive upland terrain, or *montaña*. There is evidence of terracing rising out of scrub *bajo* margins in many areas. Numerous *aguadas* are also located throughout the territory with the larger ones appearing to have been modified by the Maya themselves (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006). There are abundant chert resources in the territory including some large depositions that show evidence of ancient quarrying activities (Griffin et al. 2006).

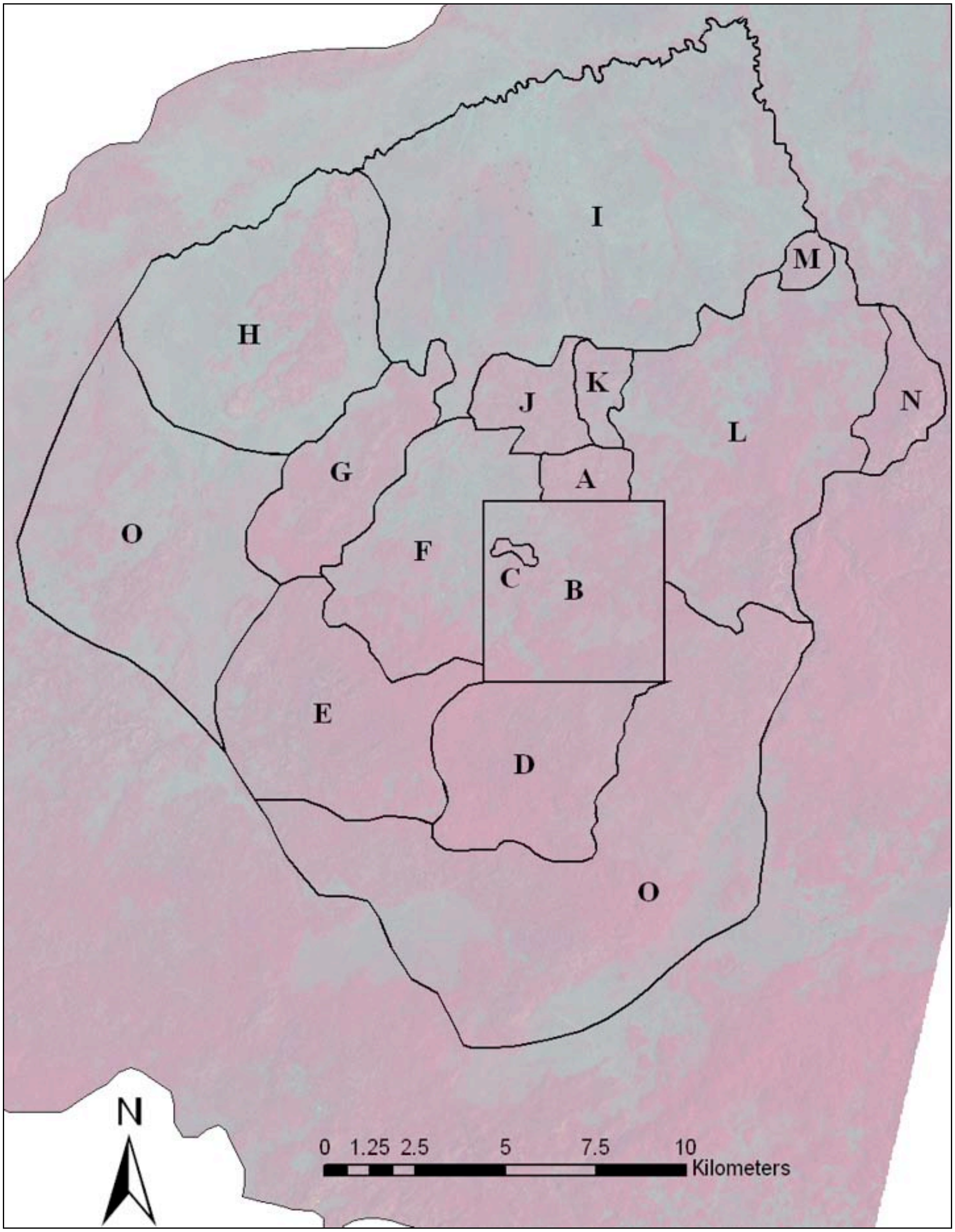


Figure 5.1. Areas of analysis in the San Bartolo-Xultun territory. A) San Bartolo area; B) San Bartolo-Xultun intersite area; C) Chaj K'ek' Cue area; D) Xultun area; E) Hormiguero area; F) Itz'ul Islands area; G) Las Minas area; H) Isla Oasis area; I) Azúcar Islands area; J) K'ak' Quij Kwaribaal area; K) El Noticiero area; L) Ixcan Bajos area; M) Oxtun area; N) Ixcan Bend area; and O) Unclassified area.

I have divided the San Bartolo-Xultun territory into 15 areas of analysis as defined in Chapter One (Figure 5.1). Most of the area divisions are based on minor physiographic changes, with the exception of the San Bartolo-Xultun Intersite area which was defined as a square survey universe for more detailed study. Reconnaissance and survey activities carried out in each area are briefly summarized in Chapter Four. What follows here are physical descriptions of each area based on field observations and satellite imagery analysis.

A. *San Bartolo Area*

San Bartolo is bordered on its western and southern edges by the Bajo Itz'ul, which is a tributary branch of the much larger Bajo de Azúcar. The Bajo de Azúcar drains into the Río Azul which flows to the northeast and merges with the Río Hondo, eventually flowing out to the Caribbean Sea. Numerous islands and peninsulas within the *bajo* were noted on satellite imagery. Evidence of settlement on islands in the Bajo La Justa (Kunen et al. 2000) prompted investigation of the islands around San Bartolo.

The archaeological site of San Bartolo is located on an approximately 4 km^2 patch of well-drained uplands, with the major architecture being at approximately 200 masl. The site has natural boundaries to all four cardinal directions in the form of areas of scrub *bajo*. The south of San Bartolo is bordered by intermittent small *bajos* as well as the Bajo Itz'ul. The Bajo Itz'ul also represents the western limit of the San Bartolo settlement. The north and east borders of San Bartolo are marked by intermittent bajos. The uplands upon which the major ruins of San Bartolo are located are drained by shallow arroyos, naturally lined with chert cobbles, that cut through the limestone bedrock and empty into the surrounding *bajos*. Within the uplands there are microenvironmental palm *bajo* depressions where no architectural remains have been located. Although, during survey in the surrounding areas some vestiges of ancient agricultural activity has been found within the palm bajos (see Chapter Four).

The site of San Bartolo consists of 240 known structures of varying size and function. The principal pyramidal groups at the site are Los Saraguates, Las Pinturas, Las Ventanas, and Jabalí (Figure 2.2). These structures are aligned in a general ESE to WNW direction. While the Los Saraguates architectural complex is the most massive structure at the site, the site center seems to be located at and around the Las Ventanas group. Las Ventanas looks over the Great Plaza to the south and the plaza is bounded on its west side by the large Tigrillo palace complex. The ball court is located in the northeast corner of the plaza and some very eroded stelae are located in the plaza center. A causeway runs southward out of the plaza apparently towards an area of intermittent *bajos*. The site received its water from at least one medium-sized *aguada* located just northwest of Las Ventanas.

B. San Bartolo-Xultun Intersite Area

The San Bartolo-Xultun intersite area was presented in detail in Chapter Four. Here I present the area as just one of numerous areas that make up the overall territory. This is done to balance the consideration of the intersite archaeology in the overall interpretation of the San Bartolo-Xultun territory.

The San Bartolo-Xultun intersite area represents 25 km^2 of intermittent *bajos* between the two major sites in the territory. Survey, reconnaissance and excavation operations have all contributed to the understanding of intersite settlement. Paleoenvironmental investigations have provided important temporal data concerning the nature of the ancient landscape (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006). There are scrub *bajo*, palm *bajo*, and *montaña* microenvironments present in the area. Evidence of ancient agriculture in the form of terracing was discovered in palm *bajo* and *montaña* contexts. A few large chert deposits were also located in the scrub *bajo* and these showed evidence of quarrying activities.

Settlement in the intersite area is generally light. Many of the mounds located during survey simply consisted of chert nodules and were probably not habitational at all. Other chert mounds seemed to be crudely oriented and careful excavation revealed the presence of burnt clay or *bajo* mud, which may have been part of a rudimentary floor surface. In the south central area a few medium-sized mounds were discovered during reconnaissance and were given the tentative site name of La Proxima. The settlement at La Proxima was not mapped as part of the stratified random block survey. Settlement in the extreme southern portion of the intersite area increased, representing a portion of the northern peripheral settlement of Xultun. The most significant settlement in the actual intersite area was the small site of Chaj K'ek' Cue. While this site is entirely within the intersite area, it has been given its own area designation in the territory and was mapped independently of the intersite survey program (see Chapter Three; Figure 3.8).

C. Chaj K'ek' Cue Area

The Chaj K'ek' Cue area is embedded in the intersite area and can be considered either as a separate analytical unit or as a part of the overall intersite settlement. The site is located on a peninsula jutting westward into the Bajo Itz'ul, approximately 2.5 km southwest of San Bartolo. Chaj K'ek' Cue consists of three architectural groups, the westernmost Group A being the largest. The groups are distributed over small patches of terrain, descending in elevation from east to west in an area of intermittent *bajos*. Groups A and B are separated by a patch of palm *bajo*; Groups B and C are divided by a very small area of scrub *bajo*. There are over 40 structures at the site, and 19 *chultuns* (cisterns excavated into bedrock) were discovered. The site also has a few limestone quarries and several amorphous piles of chert nodules. These rock piles represent an early step in the process of stone tool production where the quality of chert was evaluated (Kwoka and Griffin 2005). There is at least one small *aguada* at the site between Groups A and B. Griffin (personal communication 2004) reports evidence of terracing on the Group A peninsula.

D. Xultun Area

The archaeological site of Xultun has not been systematically surveyed, but it is clear from reconnaissance trips and satellite imagery that the site covers at least 16 km^2 of well-drained uplands at an elevation of approximately 280 masl. Settlement terminates 2 km north of the main ruins from which there is a steep descent into the intermittent scrub bajos that make up the Xultun and San Bartolo intersite area. This slope is characterized by large, natural outcroppings of chert cobbles which were used for stone tool production. To the west, there is a drop-off in settlement as the terrain descends into a large palm bajo, although on the other side of this feature there are more unmapped mounds, especially in the area of the Petipet Aguada (Von Euw 1978). The eastern boundary of the site is defined by a steep arroyo, approximately 2 km from Group A of the main ruins. The southern boundary is the most poorly defined, mainly due to lack of reconnaissance in that direction. Having said that, dense settlement extends for at least 2 km south to the Los Tambos Aguada. In addition to the large Los Tambos and

Petipet Aguadas, there is the El Delirio Aguada to the north, and at least two minor *aguadas* discovered during mapping at the site in the 1970s (Von Euw 1978). Nicholas Dunning cored the Los Tambos Aguada during the 2005 season and obtained limited paleoenvironmental data (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006).

The ruins of Xultun were discovered by a *chiclero* named Aurelio Aguayo in September of 1915 and has been known by archaeologists since Sylvanus Morley (1937-1938, vol. 1:383-422) first visited the site in May of 1920 as part of the Fourth Central America Expedition of the Carnegie Institution of Washington. The Fifth, Seventh and Eighth Central America Expeditions also visited Xultun in 1921, 1923 and 1924 respectively. At the time Stela 10's Long Count Date of 10.3.0.0.0 1 Ajaw 3 Yaxk'in (May 4, AD 889) was the latest inscribed date known in the lowlands, which is why the site was named Xul-tun, or "end-stone". Morley mapped the two main plazas at Xultun and noted that there were "scores of smaller courts surrounded by the ruins of stone buildings" (Morley 1937-1938, vol. 1:385).

In 1974 and 1975 Eric Von Euw of the Corpus of Maya Hieroglyphic Inscriptions project, visited Xultun to document the site's eroding stelae and map the major architectural groups. These were subsequently published in two volumes (Von Euw 1978; Von Euw and Graham 1984) and some of the stelae have since been looted from the site. Von Euw's stelae designations are the ones employed here as he noted that Morley's Stela 11 was actually the upper portion of Stela 13. While Von Euw produced a very good map of Xultun's principle architecture he noted that despite ten days of mapping, like Morley, he too, would not be able to complete a site map and instead focused on the principle architecture (Von Euw 1978:8).

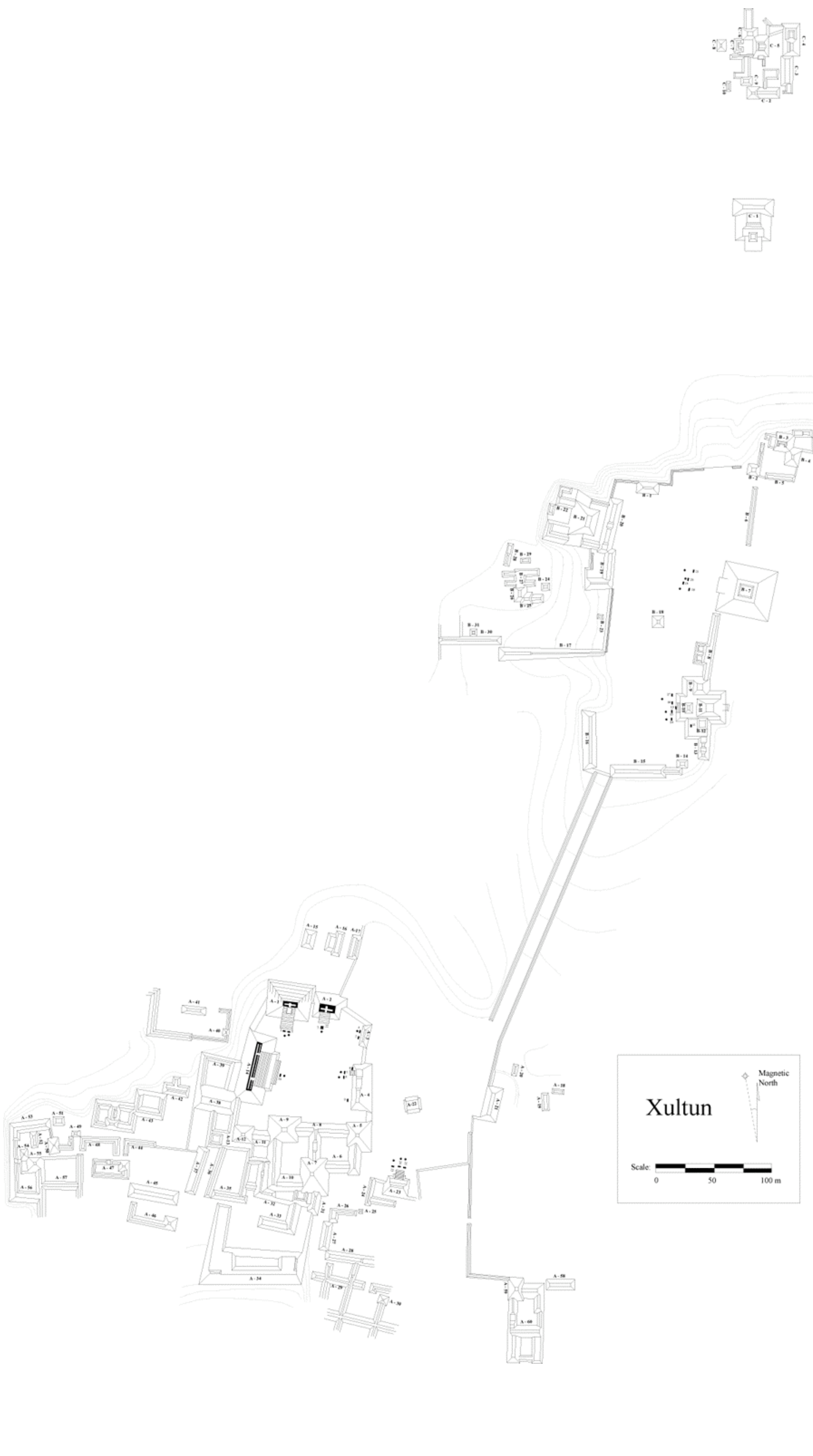
Little has been published about Xultun directly. Morley's (1937-1938, vol. 1:383-422) account remains the most extensive commentary on the site. Stephen Houston (1986) identified the site's Emblem Glyph (Figure 5.2a, b, c) and worked out the Long Count dates for the monuments following Morley's seminal work. David Stuart and I (Garrison and Stuart 2004) published a preliminary analysis of texts dealing with Xultun on monuments and looted ceramic vessels. Also, Xultun is often mentioned in passing in studies of Maya political interactions (Mathews 1985; Martin and Grube 2000). While epigraphers have long believed that Xultun was an important site in the northeast Peten, the San Bartolo Project is the first to have any sort of sustained presence in the Xultun area.

a. b. c.

Figure 5.2. Examples of the Xultun Emblem Glyph. a. Xultun Stela 19. b. K3743. c. K5357.

Visits to Xultun have confirmed that the published site map (Von Euw 1978:6-7) does not accurately represent the extent of settlement at the site. The current map of the site only incorporates the three principle architectural groups at Xultun (Figure 6.3). Though, large standing architecture has been found continuously within 2 km of the site center and it is quite possible that Xultun represents the largest site in the far northeastern Peten, eclipsing even Río Azul in size. The site is one of the most severely looted in the northeast Peten (Quintana and Wurster 2001), with much of this looting taking place

Figure 5.3. Site map of Xultun (after Von Euw 1978).


Xultun
Magnetic North
Scale:
0
50
100 m

during the turbulent 1970s (Von Euw 1978). IDAEH has delimited 16 km^2 to protect Xultun, although the large standing architecture visible on the northern delimitation transect suggests the site extends even further.

The principle groups at Xultun are oriented in a north-south direction, following the general template for Peten sites proposed by Ashmore (1991). Other elements of the template that are clearly present are a ball court at the transition between north and south groups and a causeway connecting the groups (Ashmore 1991:200). Group A to the south is dominated by two pyramids on its north side. Structure A-1 is the tallest structure at the site, measuring 35 m from plaza level to the top of the roofcomb. Structure A-2 immediately to the east has an intact room on top and the bottom of the roofcomb has a preserved image of what may either be a solar disc or an iconographic representation of butterfly wings (Figure 5.4). Whichever it is, the iconography seems to have strong Teotihuacan connections (Karl Taube, personal communication 2006).

Group B to the north is one of the largest open plaza spaces in the entire Maya area. The large B-7 pyramid on the western side of the plaza is the most massive structure at the site. Other important features of this plaza include a small acropolis to the northwest and a radial pyramid near the plaza center, similar to Structure 10L-4 at Copan. The northern edge of Group B is defined by a steep escarpment that would have been easily defendable. Group C to the north has not been investigated other than Von Euw's mapping.

E. Hormiguero Area

The Hormiguero area is immediately west of the Xultun area, separated only by a palm *bajo*. The Hormiguero *aguada* and *chiclero* camp give the area its name and was a

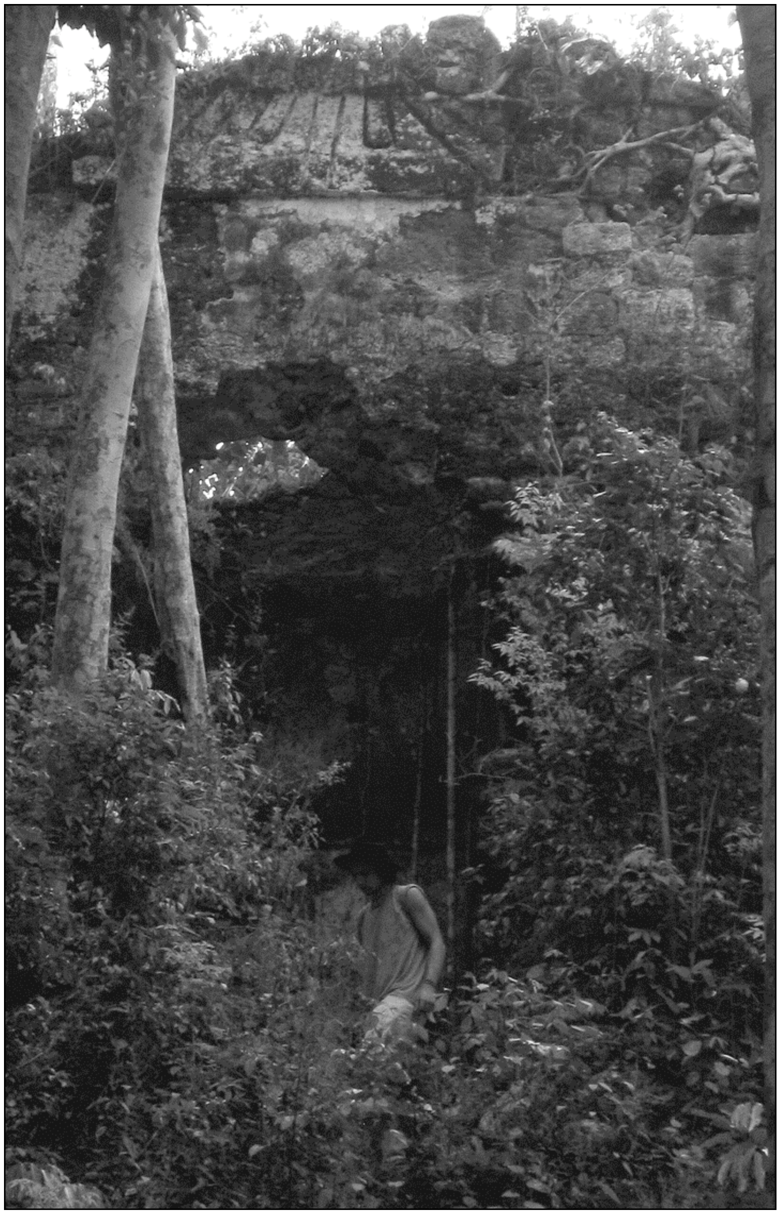


Figure 5.4. Roof comb of Xultun Structure A-2 with Teotihuacan iconography.

stopping point for Von Euw on his trips in the 1970s, as well as for Saturno during his initial trip to find San Bartolo. Von Euw (1978:5) notes numerous mounds in this area and this is confirmed by analysis of satellite imagery. Overall the terrain consists of intermittent patches of raised uplands and palm *bajos*, with settlement covering almost all of the raised areas. The western boundary of this area is formed by the Bajo de Azúcar, while the northern boundary is formed by the Bajo Itz'ul.

F. Itz'ul Islands Area

The Bajo Itz'ul is a large tributary scrub *bajo* off of the enormous Bajo de Azúcar. Many of the largest settlements in the San Bartolo-Xultun territory are situated around this *bajo*. There are a series of small islands within this *bajo* which have not been visited except for where they crossed into the intersite area. Satellite imagery indicates that there is settlement on most of these islands and recent investigations by Saturno and Sever suggest that there may be causeways criss-crossing the Bajo Itz'ul.

G. Las Minas Area

The Las Minas area is a large island strip of raised terrain running southwest to northeast and surrounded by scrub *bajo*. There is a palm *bajo* buffer between the scrub *bajo* and area of raised uplands. Settlement runs along the length of this strip. There are a couple of large range structures on the island, all of them severely looted. Some polychrome ceramics were found in association with looter trenches. A single, badly eroded, carved monument (possibly a stela fragment) was noted. It carried no inscriptions and the iconography was indiscernible. Settlement along the island is continuous except for in a few locations where there are descents into patches of upland palm *bajos*. The site here was named Las Minas for the high number of limestone quarries in relation to structures. This led us to hypothesize that this site may have exported limestone blocks to other areas where it was more difficult to harvest the bedrock, perhaps on the large island to the northwest.

H. Isla Oasis Area

The Isla Oasis area has been the subject of intense reconnaissance by the San Bartolo project in an effort to refine interpretations of various classes of remote sensing data. Isla Oasis is in the middle of the Bajo de Azúcar, with its northern tip bordering on the Río Tikal. The eastern boundary to this area is on the eastern side of a chain of *aguadas* found in the scrub *bajo* that seem to be associated with the island. The boundary to the southwest is delimited by the start of small islands at the end of the Bajo de Azúcar that represent part of the Unclassified area (see below). The island is covered by settlement on almost all raised areas and has been given the site name of La Prueba (changed from previous designations as Las Ruinas; see Chapter Three). Settlement on the island consists of modest plaza groups with only a few areas with large range structures on the highest points of the island. No pyramidal structures have been found on the island, nor were any monuments encountered during reconnaissance. A few polychrome vessels as well as two greenstone celts were found in association with looter trenches. Traces of painted walls were discovered by Kwoka in one structure. There are numerous *aguadas* in the scrub *bajo* along the eastern margin of the island. These are seen very clearly in IKONOS and QuickBird satellite imagery.

I. Azúcar Islands Area

The Azúcar Islands area forms the northern limit of the San Bartolo-Xultun territory. It is bounded to the north and east by the Río Tikal and the Ixcan Río, which confluence into the Río Azul in the northeast. The west is closed off by the Isla Oasis area, while the south is delimited by upland terrain. There are very few small islands in this area. Griffin and Kwoka visited two of these during the 2005 season, finding only a single *chultun* for settlement. The most notable cultural feature in this area is the hydrological modification of the Río Tikal and its tributary arroyos. Dunning (personal communication 2005) has noted straightened stretches of the normally meandering river that would never form regularly in nature. It is unclear exactly how this hydrological system functioned, but it was undoubtedly used either for agricultural production, pisciculture, water management or all of the above.

J. K'ak' Quij Kwaribaal Area

The K'ak' Quij Kwaribaal area is just to the northwest of the San Bartolo area. Its cumbersome name means "red rooms" in K'ekchi Maya. This is the name Joshua Kwoka gave to the main site in this area when he discovered it in 2004. The area has been reconnoitered, but not mapped. The terrain in the area is mostly palm *bajo* with a few sections of raised uplands that have settlement. Plaza groups have been found to be correlated with areas of settlement seen in IKONOS satellite imagery, however, the largest settlement in this area is by far the site of K'ak' Quij Kwaribaal itself. The site is dominated by a large platform with a standing vaulted structure on top. This structure overlooks a section of palm *bajo* and has numerous smaller plaza groups in its immediate vicinity. Kwoka noted crude stone masks on the side of the main structure during a return visit. There was also evidence of significant lithic production at the site with large piles of chert debitage found in one plaza. This site was severely looted and is comparable in size to Chaj K'ek' Cue.

K. El Noticiero Area

The El Noticiero area is to the north of San Bartolo and consists of a combination of palm *bajos* and uplands dissected by numerous arroyos as they drain into the Bajo de Azúcar. Settlement in this area is relatively light with the site of El Noticiero being the only noticeable concentration of mounds. Griffin, Irwin, Kwoka, and Sever found this small clustering of plaza groups during a reconnaissance trip in 2005. During this same trip the group found what might have been a cave entrance near where an arroyo emptied into the scrub *bajo*.

L. Ixcan Bajos Area

The Ixcan Bajos area is a large area running east-northeast from San Bartolo to the Ixcan Río. The area consists of numerous small scrub *bajos*, which drain into the larger Bajo de Azúcar to the northwest. There are patches of raised terrain amongst these *bajos*, many of them with light settlement. The small site of La Pilita is in this area and consists of two plaza groups, one of which has a large circular cistern cut into one side of it. There are two known *aguadas* in this area, the Chintiko and Tintal *aguadas*. The Chintiko Aguada was discovered late in the 2005 season and is within 2 km of the San Bartolo site center. The Tintal Aguada is in the northeastern portion of the area and was cored for paleoenvironmental data in 2005. The Tintal Aguada has a low berm around its margin suggesting ancient modification. Overall, the terrain and vegetation in this area are nearly identical to the intersite area and it is probable that a more detailed analysis would uncover comparable settlement data.

M. Oxtun Area

The Oxtun area is a small patch of raised terrain adjacent to where the Ixcan Río drains into the Bajo de Azúcar. This area could be considered a part of the Ixcan Bajos area in the same way that the Chaj K'ek' Cue area could be considered a part of the San Bartolo-Xultun Intersite area. The area is named for the small site that occupies it, which was discovered in 2003. Oxtun has three definite stelae, and a possible fourth, none of which show any sign of carving. The settlement consists of a few small plaza groups all of which have been extensively looted. A red painted stuccoed block was found near a looter trench in 2003. The site is less than 200 m from a portion of the Ixcan Río that holds a significant volume of water through the entire dry season. The site shows up clearly in satellite imagery. While Oxtun is closer to La Honradez than it is to Xultun, its location on the Xultun side of the Ixcan Río makes it more likely that it belongs in the San Bartolo-Xultun territory than it does in the La Honradez territory.

N. Ixcan Bend Area

The Ixcan Bend area consists of a patch of raised uplands in the area where the Ixcan Río bends around to the northwest to drain into the Bajo de Azúcar. This area has not been studied directly, but was passed through on a reconnaissance trip to Xixi in 2003. Field notes indicate the presence of light settlement as well as a small area of raised fields that was revisited and confirmed by Griffin later during the same season. Little else is known of this area.

O. Unclassified Area

There are two large unclassified areas in the territory. The large area to the south and east of Xultun has received no attention from the project so far other than some mounds noted to the east of the road running north to San Bartolo. The area is included within the territorial limits based on physiographic features in the landscape. The Ixcan Río defines the area to the east, while scrub *bajos* delimit the area to the southeast and southwest. It is possible that some of the settlement in the Unclassified area is just an extension of the Xultun settlement, but this would have to be confirmed with further reconnaissance and mapping. Given the size of this unclassified area, it would likely be divided into two or three smaller areas for future investigations. A second unclassified area consists of a number of *bajo* islands located northwest of the Hormiguero area and southwest of the Isla Oasis area. None of these islands have been visited by the project.

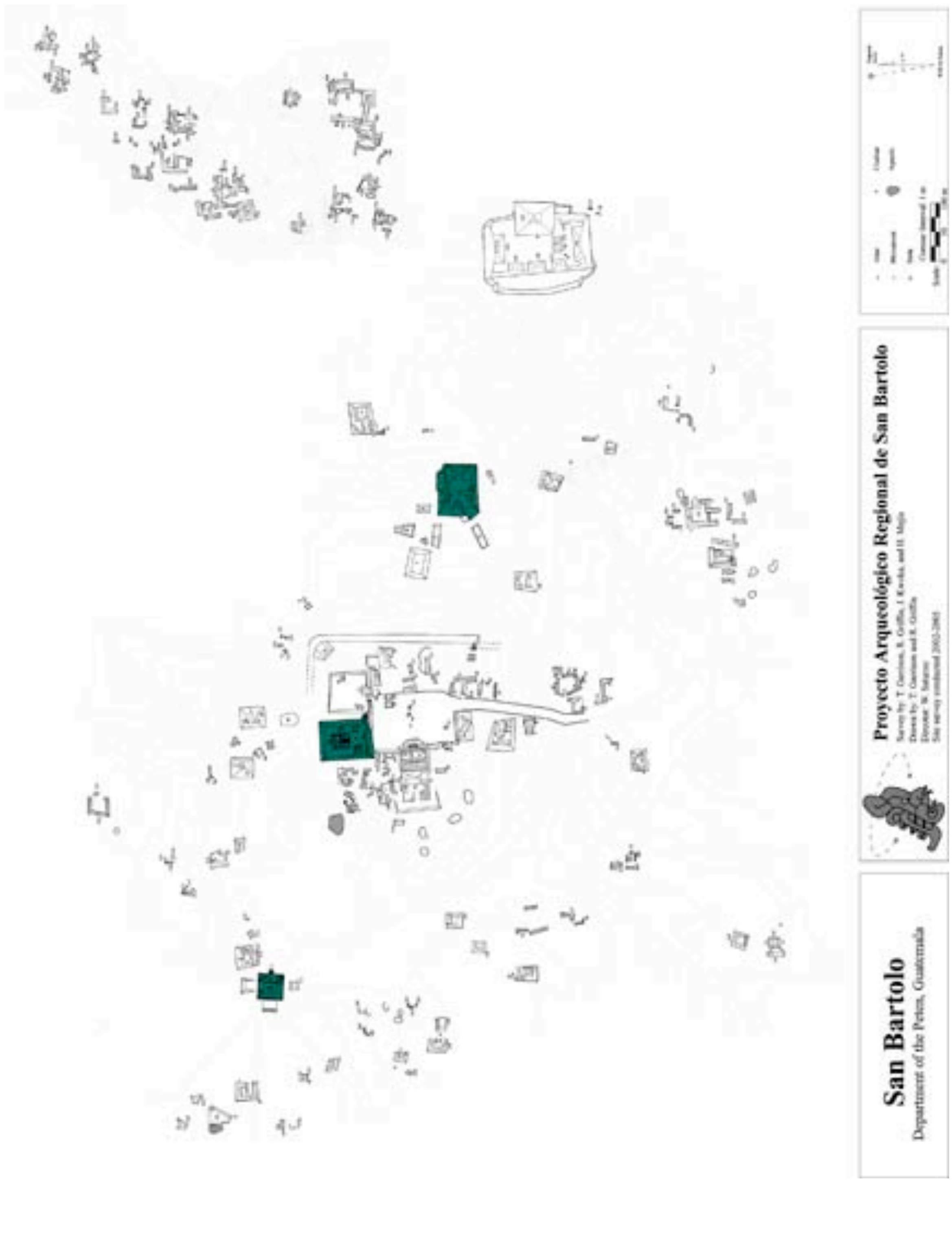
A Cultural and Ecological History of the San Bartolo-Xultun Territory

This section integrates the intersite settlement data presented in the previous chapter with other data sets from throughout the San Bartolo-Xultun territory to attempt a cohesive cultural and ecological history. The data sets used to support this history derive from archaeological survey and excavation, epigraphic and iconographic analyses, and paleoenvironmental studies. This draws on my own research at San Bartolo and in the intersite area, as well as the archaeological research of numerous other San Bartolo Project members. Interpretations derived from epigraphic and iconographic analyses build on my previous research with David Stuart (Garrison and Stuart 2004) and includes observations communicated to me by Karl Taube. Paleoenvironmental interpretations are based on the work of Nicholas Dunning and his colleagues (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006).

Middle Preclassic Period – 1000-400 B.C.

The environment encountered by the initial settlers of the northeast Peten was one of bountiful perennial wetlands and large tracts of raised terrain, recalling images of a mythical "place of reeds" (Stuart 2000). Amongst the wetlands early farmers established small villages on the largest stretches of upland terrain. At San Bartolo some public monumental architecture was constructed on a roughly east-west axis toward the end of the Middle Preclassic (Figure 5.5). Stone for this construction was quarried from what later became the site's main aguada (Dunning et al. 2005). The Ixkik substructure of

Figure 5.5. Site map of San Bartolo with highlighted structures indicating the presence of Middle Preclassic substructures.


San Bartolo
Department of the Peten, Guatemala
Proyecto Arqueológico Regional de San Bartolo

Pinturas and the Ixtab platform and Bak Na substructure of Ventanas were most likely contemporary public architectural features at the site. Excavations into the Ixtab platform found a spondylous shell dating to the Middle Preclassic (Urquizú 2003). This indicates widespread exchange networks were in place during this early period. Preliminary evidence also suggests that there may have been a Middle Preclassic occupation at substructures beneath the Jabalí Complex. The Bak Na substructure in particular, with its tiered architecture has a form more associated with a ritual function rather than any residential use. Although there is only direct archaeological evidence from San Bartolo it is probable that a similar, small Middle Preclassic community was founded at Xultun during this period as well. There is no evidence for Middle Preclassic occupation in the intersite area, but this may have been due to the presence of perennial wetlands.

Late Preclassic Period – 400 B.C.-A.D. 200

The Late Preclassic witnessed a population explosion in the San Bartolo-Xultun territory as well as in other parts of the Maya lowlands (Culbert and Rice 1990). San Bartolo grew as a capital with multiple construction phases evidenced in all of the major architecture at the site dating to this period. Between 300-200 B.C. there is evidence of fully developed hieroglyphic writing in the form of a painted stucco block (Saturno et al. 2006). The text from this block contains the glyph **AJAW** (*ajaw*, “lord, noble or ruler”) (Saturno et al. 2006:1282) demonstrating the antiquity of this term and suggesting that there was a central figure during this period who was commissioning the major architectural programs. Other stucco fragments found in a similar context depict an early image of the maize god.

During the latter part of the Late Preclassic the site plan of San Bartolo underwent an axis shift to a north-south orientation. The large main plaza and causeway to the south effectively changed the alignment of San Bartolo to adhere to emerging site canons established in the central Peten (Ashmore 1991; Ashmore and Sabloff 2002). The major murals for which San Bartolo is famous were also constructed around this time, between 100 B.C.-A.D. 0 (Saturno et al. 2005). While there is no direct evidence from Xultun or elsewhere, it would appear that San Bartolo emerged as the major center in the territory in the Late Preclassic. Late Preclassic architecture of the size found at San Bartolo would not have fit underneath the final phase Late Classic (and probably major Early Classic) architecture at Xultun (William Saturno, personal communication 2006). This suggests that San Bartolo had larger monumental construction than any contemporary settlement at Xultun. Since San Bartolo and Xultun are the only sites within a 10 km radius to contain ceremonial temple-pyramids, it is likely that San Bartolo was the territorial capital during this time period. This assumes that monumentality is one of a number of indicators of Maya political power (Guderjan 1991a).

During this period settlement began to appear in the San Bartolo-Xultun intersite area and also along the northern Xultun periphery. While no systematic excavations or surface collections have been made in other areas there are indications of Late Preclassic settlement throughout the territory. A few of the ceramics collected from the cleaning of four looter trenches at Chaj K'ek' Cue date to the Preclassic (Garrison 2003a). Observations during reconnaissance of looter trench backfill indicate a Late Preclassic presence in the Oxtun and Isla Oasis areas. Finally, the architectural profile left by a large looter trench at K'ak' Quij Kwaribaal suggests that there was a Late Preclassic phase at this site as well. Nevertheless, none of the evidence at the small settlements in these areas indicates that there was any sort of development comparable to what was at San Bartolo during this period. For this reason it is suggested that the San Bartolo-Xultun territory took its political form during the Late Preclassic, with San Bartolo emerging as the territorial capital.

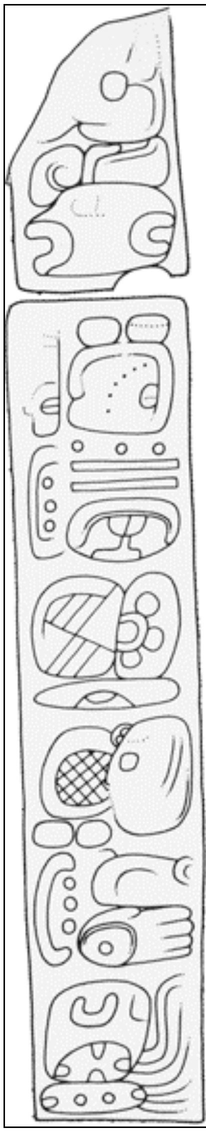
Late Preclassic to Early Classic Transition – A.D. 200-300

Paleoenvironmental, ceramic, and architectural data all support a major change in settlement patterns in the San Bartolo-Xultun territory during this transition. This evidence will be discussed briefly prior to presenting data related explicitly to the Early Classic in the territory. There are a number of lines of evidence that suggest turmoil and change in the San Bartolo-Xultun territory prior to the onset of the Early Classic. A severe drought before or around A.D. 250 (Brenner et al. 2002; Dunning et al. 2002; Hodell et al. 2001; Rosenmeier et al. 2002) may have been the final event in an increasingly stressful ecological context, that led to the abandonment of San Bartolo and the intersite area during this time period. A major drying event is observed in the Tintal Aguada and, while the dating is insecure, stratigraphy suggests that it may have occurred at the Late Preclassic to Early Classic transition (Nicholas Dunning, personal communication 2006). Further environmental stress is indicated by the decreasing thickness in plaster floors at San Bartolo, which would have resulted from less firewood availability for the production of lime plaster (Saturno 2002).

The consequence of the environmental stress and degradation described above was the abandonment of San Bartolo as well as the Late Preclassic settlement in the intersite area. This is indicated by the near nonexistence of Early Classic ceramics in these areas. Early Classic material represents less than 2% of the total ceramic assemblage at San Bartolo and what does exist comes mostly from a ritual context at Jabalí (Rivera Castillo 2005; Rivera Castillo and Sagebiel 2004). It has been argued that proposed Early Classic gaps in ceramic records do not reflect abandonments, but rather are a result of the fact that the Early Classic is a much shorter time period than the preceding Late Preclassic and that some Chicanel ceramics may have continued to be used into the Early Classic (Rice and Culbert 1990; Sullivan and Sagebiel 2003). Nevertheless, independent evidence from architectural analysis at San Bartolo confirms that the site was abandoned for an extended period of time. The final substructure in the Tigrillo Complex dates to the Late Preclassic, while the final phase represents a Late Classic remodeling. Weathering and damage to the stucco of the final substructure indicate that it was exposed without maintenance for several centuries confirming the general abandonment seen in ceramic analysis (Runggaldier 2006).

Early Classic Period – A.D. 300-600

Whatever calamity led to the abandonment of San Bartolo and the intersite area at the end of the Late Preclassic, Xultun seems to have maintained a population through the Early Classic. One reason for Xultun's survival may have been its more numerous, generally larger, and possibly better managed *aguadas*. It is likely that the surviving hinterland populations, including the residents of San Bartolo, nucleated around the center of Xultun. It is unclear what role the San Bartolo elites would have had in this situation, whether they simply moved their rule to Xultun or became subservient to an existing elite population at Xultun. Most of the Early Classic stelae at Xultun are from the northern Group B. On Stela 18, stylistically dated 6th century A.D., there is a



?	
AHK-NAL	Ahknal
?-WITZ-AJAW	Xultun Lord
U-OXLAJUN-WINIK	Thirty-third
TZ’AK-b’u-il	in the line of the founder
? ? ?	Xultun dynastic founder name and titles

Figure 5.6. Text from Xultun Stela 18 (modified from Von Euw 1978)

Figure 5.7. Tikal Emblem Glyph on Xultun Stela 6 (modified from Von Euw 1978)

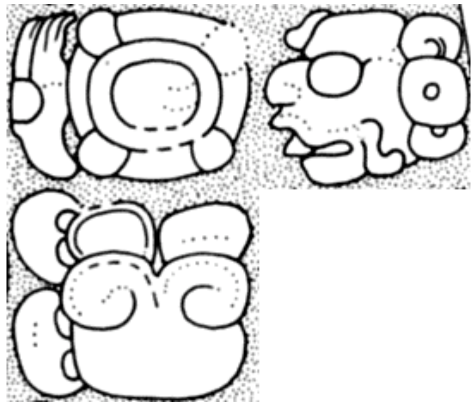


Figure 5.8. Xultun lord Upakal K'inich on Tikal Stela 17 (modified from Jones and Satterthwaite 1982). Text reads **U-PAKAL K"INICH ?-WITZ-AJAW.**

Figure 5.9. Lady Yohl Ch'e'n of Xultun on Caracol Stela 16 (modified from Beetz and Satterthwaite 1981). Text reads **IX-yo-la CH'E'N-na-? IX-? ?-WITZ-AJAW**.

reference to the 33rd ruler in the Xultun dynasty (Figure 5.6). This represents one of the longest such dynastic records in the Maya lowlands (Garrison and Stuart 2004), but it is unknown whether this references a dynasty that began at Xultun or if it is a continuation of a dynasty that originated at San Bartolo in the Late Preclassic.

Evidence of foreign relations with other sites also suggests a strong Early Classic Xultun territory. Here I will only present some general evidence and will go into more detail in later chapters as settlement is investigated at increasing scales of analysis. There is a mention of contact with Tikal on Xultun Stela 6 which dates to A.D. 501, although the Tikal event may not necessarily fall on this date (Figure 5.7). A Xultun lord, Upakal K'inich, is mentioned on Tikal Stela 17 (Figure 5.8). There is also evidence of contact with Caracol in the Vaca Plateau adaptive region. A retrospective text on Caracol Stela 16 makes reference to a Xultun woman named Yohl Ch'e'n, the wife of the Early Classic Caracol ruler K'ahk' Ujol K'inich I (Figure 5.9) (Garrison and Stuart 2004; Martin and Grube 2000: 87). Despite the eroded inscriptions at the site it is clear that in the Early Classic the Xultun elites were establishing bonds with other major centers throughout the lowlands.

There is virtually no evidence of Early Classic settlement at San Bartolo. The Early Classic ceramics that are present are found in ritual contexts. Monument 1 at San Bartolo, located in Structure 63 just south of the Tigrillo Complex, was the site of continuous ritual ceramic deposition during the Classic Period, possibly during pilgrimages to the site (Craig 2004). In a less understood context there is an apparent offering of Early Classic ceramics on the central axis of the Jabalí Complex (Pellecer Alecio et al. 2005: 285). These examples demonstrate that San Bartolo, even after its abandonment, retained a sacred significance for the territorial population. It should also be noted that the site of La Prueba in the Isla Oasis area may have also been a locus for Early Classic settlement. An Early Classic vessel was recovered from a looter's camp on the island and the great numbers of *aguadas* seen in satellite imagery in the adjacent scrub *bajo* may indicate that populations were sustainable (Figure 5.10).

Late Classic Period – A.D. 600-850

The Late Classic Period represents the height of Maya population throughout the lowlands (Culbert and Rice 1990). The contracted Early Classic population of Xultun exploded outward during the Late Classic. The majority of excavated material from the

Figure 5.10. IKONOS image of Isla Oasis showing concentration of *aguadas* on eastern margin.

intersite area was dated to the Late Classic. Terracing and other agricultural features are pervasive throughout the territory suggesting a thoroughly engineered landscape

(Scarborough et al. 2003). Surface and looter trench ceramics found during regional reconnaissance indicate a pervasive Late Classic presence. At Xultun itself there were major architectural programs as indicated by the examination of profiles in looter trenches. In particular, Group A was massively renovated to form the imposing ruins that can be found there today. The large temple-pyramid complexes found at Xultun are the only such architectural constructions dating to the Late Classic in the entire territory. Xultun further asserted its role as the territorial capital by suppressing ritual in the surrounding hinterland (see Chapter Six).

During the Late Classic San Bartolo was "reactivated" as a settlement. There is an ephemeral Late Classic presence throughout the site with renovations to major architecture at the Tigrillo (Runggaldier 2006) and Plumas (Ortiz Kreis and Mencos 2005) Complexes. There were no architectural renovations to any of the pyramidal structures at the site and it is even possible that some stones were robbed from Las Ventanas to construct nearby Late Classic residences (Pellecer Alecio 2003). Investigations of the San Bartolo Aguada indicate that it was dredged for reuse during this time period (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006).

There were continued ritual deposits on Monument 1 at Structure 63 (Craig 2004). The evidence for ritual at Structure 63 probably represents a station on a ritual pilgrimage circuit rather than a local ritual site (Craig 2004). These pilgrimages would have been participated in by members of all of the sites in the territory which has ethnographic precedence in modern ritual circuits around Zinacantan (Vogt 1976). If the ethnographic comparison is valid the pilgrimages would have begun at the territory center (i.e. Xultun) and proceeded around the territory eventually returning to the large plaza at Xultun

Group B. This point is made only to demonstrate that the hinterland populations would have been required to go to Xultun to participate in some rituals, even ones that took place throughout the territory.

There is further evidence of restrictions on ritual activity throughout the territory based on cursory examinations of ruins found during reconnaissance. Elite range structures have been located at the sites of La Prueba, Las Minas, K'ak' Quij Kwaribaal, and Chaj K'ek' Cue. There are no examples of pyramidal structures at any of these locations. These minor centers, while probably having heterarchical, interdependent relationships amongst themselves, were hierarchically subservient to the Xultun elites.

Towards the end of the Late Classic almost all of the major sites of the southern Maya lowlands were abandoned (Demarest et al. 2004; Culbert 1973). Reasons for these abandonments range from pandemic warfare (Demarest 2004) to environmental catastrophe in the form of a prolonged severe drought (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). Xultun elites continued erecting monuments into the Terminal Classic until A.D. 889. This date falls after the collapse of Tikal and other major sites of the Peten and the Three Rivers region. Just as Xultun weathered environmental calamity at the Late Preclassic to Early Classic transition, it was similarly successful in surviving the first wave of collapse toward the end of the Late Classic.

Terminal Classic Period – A.D. 850-1100

No monuments were erected in the Xultun territory following the A.D. 889 (10.3.0.0.0) dedication of Stela 10 (Figure 5.11). Still, there is other evidence that suggests that populations continued to reside at the site well into the Terminal Classic.

The major *aguada* of Los Tambos shows evidence of dredging dating to cal A.D. 980-1080 (2 sigma); (Figure 5.12); (Dunning et al. 2005). This suggests that residents at

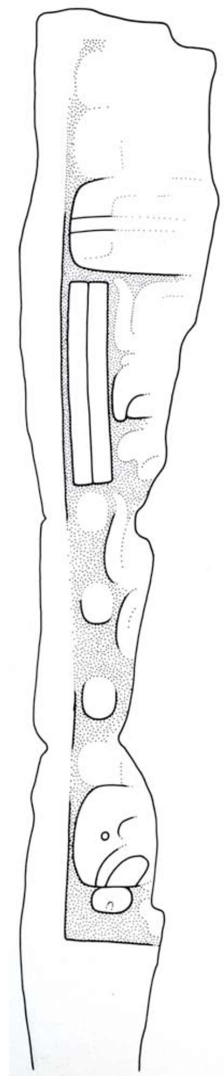


Figure 5.11. Xultun Stela 10 with 10.3.0.0.0 Long Count date (modified from Von Euw 1978).

Xultun were still trying to manage a viable water source even after most of the surrounding centers, as well as the Xultun elite political structure, had collapsed. However, by the end of the 11th century A.D. there is no further evidence of settlement or activity, suggesting a total regional abandonment.

Structure, Function, and Change in the San Bartolo-Xultun Territory

The preceding settlement summary was derived from a number of data sets in a conjunctive approach (Fash and Sharer 1991). The structure of the San Bartolo-Xultun territory changed numerous times during the 2100 years covered by the summary, as did

Figure 5.12. Los Tambos Aguada, Xultun (photo by Nicholas Dunning).

the nature of the functions that took place over the same time period. The changes that took place resulted in major reorganizations of the territory including a shift in the capital at the Late Preclassic to Early Classic transition. Some of the following discussion is necessarily speculative as excavation has not been conducted in many areas of the territory. Therefore both the settlement summary above and the evidence for structure, function, and change presented below should be considered the best models for the data currently available. This model can help to direct future research in the territory by providing a baseline against which later investigations may be compared.

The Middle Preclassic structure of the San Bartolo-Xultun territory was most likely a few nucleated settlements scattered on the high patches of terrain between the wetlands. Although there is only direct evidence for San Bartolo it is probable that there was a Middle Preclassic presence at Xultun, and possibly at La Prueba as well. These sites would have been of roughly equal size and one would speculate that during this early stage these settlements would have cooperated with one another in a true heterarchical network (Scarborough and Valdez 2003). Therefore the functions during this time period would generally have been ones of egalitarian exchange. Nonetheless a spondylous shell at San Bartolo dating to the late Middle Preclassic indicates long distance exchange which suggests emerging economic differences between the first communities.

The changes that led to the emergence of Late Preclassic Maya culture in the San Bartolo-Xultun territory are not as clear as the transitions between other periods. This is due to a lacuna in data pertaining to this time period compared to later periods. One possible explanation for the emergence of a territorial settlement hierarchy is that inequality was established through the differential access to elite ritual paraphernalia and the development of long distance exchange networks. Hieroglyphic writing and depictions of the Maize God near the start of the Late Preclassic (Saturno et al. 2006) indicate the presence of a literate elite as well as an emphasis on the supernatural world in artistic expression. The structure of the Late Preclassic San Bartolo-Xultun territory saw San Bartolo emerge as the territorial capital. San Bartolo had the largest architecture in the territory during this time period although there were likely sizable populations at Xultun and La Prueba. Ceramics also indicate the presence of populations at Oxtun, Chaj K'ek' Cue and K'ak' Quij Kwaribaal as well as at scattered locations in the intersite area. It is probable that similar small occupations were found at all of the named sites within the territory at this time, with some emerging as minor centers.

Late Preclassic functions in the San Bartolo-Xultun territory saw the continued heterarchical exchange network hypothesized amongst settlements in the San Bartolo hinterland. However, these networks were now embedded within an overall hierarchical framework. Chert tools, agricultural produce, domestic ceramics and surely other products of the forest would have been exchanged between settlements. This is indicated by the relatively homogenous assemblage of artifacts found in excavations outside of San Bartolo during this time period. These same materials, especially agricultural surplus, would have been exchanged in a hierarchical interaction between the hinterland population and the San Bartolo capital. San Bartolo would have reciprocated this tribute with ritual and possibly militaristic protection. Although, warfare and conquest do not seem to have been major themes of Maya iconography in the Late Preclassic.

The changes that took place during the Late Preclassic to Early Classic transition were discussed in detail above. The resultant structure in the San Bartolo-Xultun territory was a shift in the territorial capital to Xultun. The growing dispersed population of the Late Preclassic suddenly nucleated around Xultun and possibly La Prueba. Most areas of the territory were totally abandoned, including San Bartolo where Late Preclassic substructures at the Tigrillo complex indicate exposure to the elements for centuries (Runggaldier 2006). A powerful dynasty emerged at Early Classic Xultun that allied itself with Tikal and other prominent centers. Following a long, severe drought and protracted environmental degradation, water became the most valuable resource in the Early Classic (Scarborough 1998). The Xultun elite managed the water from at least five, and probably more *aguadas* within their territory. Elite control of water functioned to commission large scale building programs in the Early Classic as evidenced at other lowland sites (Scarborough 1998; Scarborough and Gallopin 1991) and Xultun became increasingly involved in the complex lowland Maya politics of the 6th century AD (Garrison and Stuart 2004; Martin and Grube 2000).

The Early Classic to Late Classic transition is seen most clearly in the explosion of settlement across the landscape throughout the Maya lowlands (Culbert and Rice 1990). New agricultural techniques were developed in the Early Classic to exploit fertile soils at the slopes of the *bajos*, an ecological niche created by the erosion processes of the Late Preclassic (Dunning et al. 2003). The benefit of this new intensive subsistence strategy was the ability to support larger populations, a result that was realized toward the beginning of the Late Classic. In the San Bartolo-Xultun territory, Xultun remained the capital of this burgeoning population and numerous minor centers (see Chapter One) were established, or reestablished in the hinterland, including: Chaj K'ek' Cue, K'ak' Quij Kwaribaal, La Prueba, Oxtun, and Las Minas.

It is unclear what relationships the minor center elites would have had to the dynastic and non-royal elites in the Xultun capital. It is possible that some of these small centers were established under charters by members of the Xultun royal family who were not going to succeed to the territorial throne (see Haviland 1981 for a similar argument at Tikal). This would have been a useful mechanism for preventing jealousy and unrest amongst a burgeoning elite class. The functions between these minor centers and the Xultun capital were clearly hierarchical. By the Late Classic warfare was common throughout the Maya lowlands and a hinterland population would have been very much dependent on protection from a capital. As with Late Preclassic San Bartolo, Xultun maintained control of major ritual in the territory during the Late Classic. No contemporaneous large pyramids have been found at any site within the territory and the enormous plaza at Xultun Group B may have been designed to host the entire territorial population (see Chapter Six).

Change at the Late Classic to Terminal Classic transition as well as during the Terminal Classic was highly regionalized in that different types of transformations took place depending on location (Demarest et al. 2004). In many lowland regions there was a cessation of elite culture as represented by the decline of monument dedications in the early 9th century A.D. Xultun did not follow this pattern with monument cessation not occurring until A.D. 889, one of the latest dedication dates in all the lowlands. The Maya had successfully adapted to their Classic Period environment over the course of six centuries. This landscape was highly engineered (Scarborough 2000) and significantly altered from the landscape adapted to by the Preclassic populations (Dunning et al. 2002). Towards the end of the Late Classic a severe drought effected significant portions of the Maya lowlands (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). Even if Xultun was not directly effected by this drought the elite population would have been severely compromised by the disruption of exchange networks that provided the ritual regalia necessary to maintain a theatre state (Demarest 1992). Either directly or indirectly drought probably brought an end to Late Classic elite culture in the San Bartolo-Xultun territory.

The Terminal Classic structure of the territory following the dedication of Xultun Stela 10 was totally compromised. The only direct evidence for any human presence is the continued dredging of the Los Tambos *aguada* possibly up until A.D. 1080 (Dunning, Jones, Chmilar, and Blevins 2006). The functions during this time period were minimal and probably saw a return to the heterarchical relationships that were common in the Middle Preclassic as a small population struggled to survive. In the end the San Bartolo-Xultun territory was completely abandoned by A.D. 1100 and at present there is absolutely no evidence of a Postclassic presence.

Conclusions

This chapter defined the San Bartolo-Xultun territory as a unit of analysis. The territory was physically defined by describing each of its constituent areas. A conjunctive approach was applied to the territory as a whole to generate a culture history supported by all current evidence. The development of this culture history was then explained in terms of the landscape ecology theoretical concepts of structure, function, and change.

The transitions between the different time periods of Maya civilization are marked by major changes that are often regionally specific. In the San Bartolo-Xultun territory environmental considerations prevailed as major influences in settlement structure. Following a devastating environmental catastrophe at the end of the Late Preclassic, the Early Classic Maya at Xultun entrenched themselves in the complex geopolitics of the emerging states of the central lowlands (see Chapter Seven). In the Late Classic the San Bartolo-Xultun territory continued its involvement in Maya politics, but not to the same extent as in the Early Classic. This was partly due to the decline of Xultun's close ally Tikal at the beginning of the Late Classic, but also because Xultun became more focused on localized ritual patterns, reflected in site planning, consistent with other sites in the Three Rivers adaptive region (see Chapter Six). Finally, the Terminal Classic saw a return to environmental concerns in the face of a devastating drought. The first casualties were the elites, followed by the small remaining Terminal Classic population with a total abandonment during the Postclassic.

The following chapters will explore these same patterns at broader scales of analysis. The San Bartolo-Xultun territory has much in common with other territories in the Three Rivers adaptive region. The development of this region will be traced in terms of structure, function, and change in Chapter Six. Chapter Seven applies the same conjunctive approach to the Maya lowlands from the perspective of the Tikal Alliance, placing the San Bartolo-Xultun territory into the broader context of Maya civilization.

Chapter 6: The Three Rivers Adaptive Region

Introduction

The Three Rivers region was identified archaeologically in the 1990s both in terms of settlement archaeology (Adams 1999) and prehispanic adaptive strategies (Dunning, Beach, Farrell, and Luzzadder-Beach 1998). A more detailed examination of the physiography of the region has been published recently (Dunning et al. 2003). In terms of the theoretical framework of this dissertation the San Bartolo-Xultun territory is one of numerous territories that comprise the Three Rivers adaptive region. This chapter presents a geographic definition of the Three Rivers region and its constituent physiographic provinces, followed by a brief history of archaeological research throughout the region. Next, the regional data from the San Bartolo project are combined with settlement analyses by Thomas Guderjan (1991a) and Richard E. W. Adams (1999) to present a hierarchical site typology for the Three Rivers region. Following the presentation of the rank order data each of the four major, and six possible minor territories are defined. Finally, a cultural historical synthesis is presented emphasizing relationships internal to the adaptive region and the role that the San Bartolo-Xultun territory played in regional dynamics.

The Three Rivers Adaptive Region

The Three Rivers region gets its name from the Río Azul, Río Bravo, and Booth's River, which represent the major tributaries of the Río Hondo that eventually empties into the Caribbean Sea. Dunning and colleagues (2003) state that these three rivers have notably distinct watersheds which influenced the ancient settlement patterns around them.

As a unifying feature the Three Rivers region is composed of a horst and graben landscape, descending in large steps west to east down from the karst plateau that is the central Peten. This combination of varied hydrological patterns with a transitional geological region makes for a number of distinct physiographic provinces (Figure 6.1). Dunning and colleagues (2003) defined eight of these provinces for the northeastern portion of the Three Rivers region. Here I extend their provinces to the southwest to incorporate the entire Three Rivers region, particularly the Guatemalan portion, as it was originally defined as an adaptive region (Dunning, Beach, Farrell, and Luzzadder-Beach 1998:93, Figure 1).

The Three Rivers region physiographic provinces have already been published (Dunning et al. 2003). The provinces are: the La Lucha Uplands, the Río Bravo Terrace Upland, the Río Bravo Terrace Lowland, the Río Bravo Embayment, the Booth's River Upland, the Booth's River Depression, the Azucar Lowlands, and the La Unión Karst. These provinces are easily distinguished in a shaded relief image of the Three Rivers region, which was used to draw them on the map. The Azucar Lowlands and La Lucha Uplands are the two physiographic provinces that extend furthest to the southwest into Guatemala.

The major rivers of the Three Rivers region would have been crucial for exchange networks both for import and export to and from the Peten heartland. The major archaeological sites of the Three Rivers region seem to be strategically located to exploit this economic network. Even some of the smaller settlements are located near seasonal tributaries and arroyos that may have been utilized during the rainy season. Due to the stepped geology of the region, each graben would have been its own natural corridor

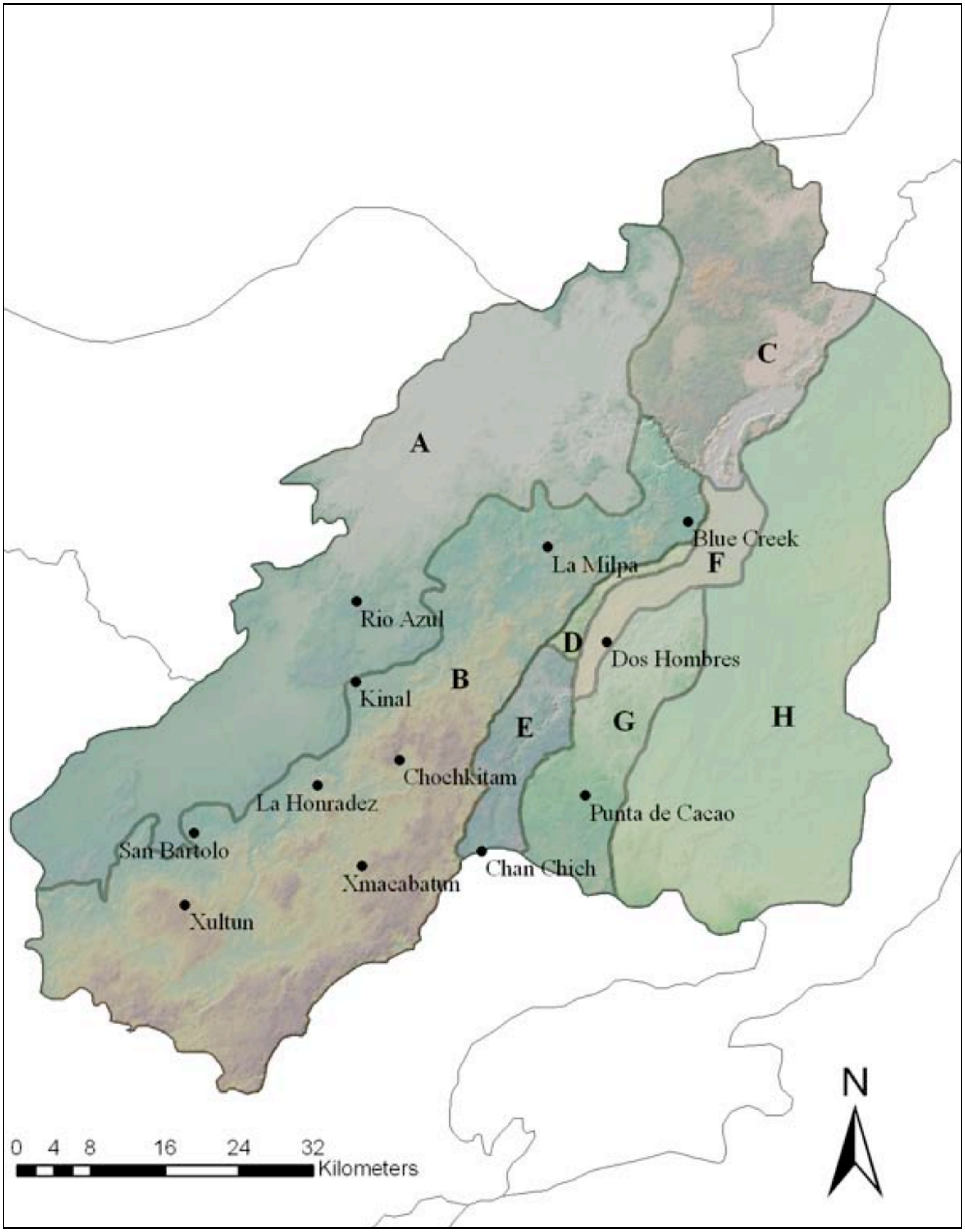


Figure 6.1. The Three Rivers adaptive region showing physiographic provinces. A) Azucar Lowlands; B) La Lucha Uplands; C) La Union Karst; D) Rio Bravo Terrace Upland; E) Rio Bravo Terrace Lowland; F) Rio Bravo Embayment; G) Booth's River Upland; H) Booth's River Depression.

lying between two horst cliffs, sometimes up to 100 m in elevation. The advantage of exploiting the Three Rivers drainage rather than the Belize River Valley is that the Río Hondo empties into the Caribbean much further to the north, which would mean less sea travel during trading expeditions up around the Yucatan Peninsula.

Archaeological Investigations in the Three Rivers Adaptive Region

Until the 1980s the Three Rivers region was only occasionally visited by archaeologists. Most of the early visits to the region sought to sketch maps of the settlements and register the monumental inscriptions found in the region. These investigations included visits by the Peabody Museum of Harvard University, the Carnegie Institution of Washington, and the Middle American Research Institute of Tulane University. Ian Graham made visits in the 1960s with the same goals as the earlier reconnaissance projects and further work by the Corpus of Maya Hieroglyphic Inscriptions Project of the Peabody Museum took place in the 1970s at Xultun and La Honradez.

Río Azul, La Milpa, and Blue Creek represent the most thoroughly investigated settlements in the region, in addition to San Bartolo. Significant research has also been carried out at Dos Hombres (Houk 1996, 2003), Chan Chich (Guderjan 1991b; Houk 2003), and Kinal (Adams 1991). I have identified the following territories within the Three Rivers region: San Bartolo-Xultun territory, La Honradez territory, Río Azul-Kinal territory, and La Milpa territory. Six other probable territories exist with capitals at Xmakabatun, Chochkitam, Chan Chich, Dos Hombres, Punta de Cacao, and Blue Creek. The most explicit emic way of identifying territories is through epigraphy and the identification of Emblem Glyphs (Berlin 1958), which means that illicit looting of monuments and polychrome vessels is particularly damaging to our understanding of indigenous political units. As an example, a local informant told members of the Río Bravo Archaeological Project that there used to be ten stelae at the site of Punta de Cacao (Guderjan et al. 1991). Now only one remains, begging the question of how much information has been lost if the report is true?

The Río Azul Project (1983-1987)

The site of Río Azul was first published in the 1960s following its discovery by workers of the Sun Oil Company (Adams and Gatling 1964). In the early 1980s, Ian Graham investigated reports of looting at the site and found a number of plundered tombs, many with paintings on their interior walls. In 1983, Richard E. W. Adams began a five year investigation of Río Azul and the nearby minor center of El Pedernal (BA-20) in order to salvage information from the tombs as well as investigate issues of subsistence and settlement at a large Classic center. Adams and his team learned that Río Azul had been a major Early Classic power and that there were significant connections to both Tikal and Teotihucacan (Adams 1990, 1995, 1999; Adams and Robichaux 1992).

Adams has consistently approached settlement patterns from the perspective of rank order analysis (Adams and Jones 1981). In an appendix to his book about Río Azul, Adams (1999:193-195) includes an analysis of settlement patterns in the Three Rivers region in which sites are ranked based on numbers of courtyards. The problem with this system is that it puts a heavy bias towards sites that have received long term investigation. Río Azul was originally assigned a 4 courtyard count (Adams and Jones 1981:305), but ended up with a 39 courtyard count (Adams 1999:193) following five field seasons of survey and excavation. There also does not seem to be a consistent methodology for counting courtyards. Xultun, for example, has been credited as having anywhere from 7 (Adams and Jones 1981:305) to 20 (Adams 1999:193) courtyards even though there has been no additional mapping at the site.

In the territory system used in this dissertation it is most crucial to identify the territorial capitals to successfully interpret settlement patterns at the adaptive region level. This is done through a combination of epigraphic analysis and a modified system of rank order analysis originally proposed for the region by Guderjan (1991a); (see below). The territories named above are defined by the presence either of an explicit Emblem Glyph (Xultun, Río Azul) or probable Emblem Glyphs in eroded inscriptions found at the sites (La Honradez, La Milpa). Coincidently, as will be shown later, these same sites are statistical outliers among the site scores for all Three Rivers region settlements. The remaining possible territorial capitals are defined statistically. The boundaries of the territories are determined based on geographic location in relation to physiography and other known territories following Maya conceptions of boundaries (see Chapter Three), as well as impressions published by archaeologists who have visited a number of sites in the region.

The Ixcanrío Regional Project and the Programme for Belize (1990-present)

These two projects were designed and directed by Adams, and later Fred Valdez, as regional investigations. A number of centers of different sizes have been mapped and excavated as well as a number of settlement transects and survey blocks in more rural areas. A major component of the PFB project has been environmental investigation, with Vernon Scarborough looking at watersheds and Nicholas Dunning, Timothy Beach, and

Sheryl Luzzadder-Beach studying geoarchaeology, soils, and hydrology. The rich data sets contributed by these scholars help to form a more complete picture of human-environmental interactions within a defined geographical region. A number of doctoral dissertations have come out of the PFB research, each approaching the region from a different perspective whether it be site planning (Houk 1996), *bajo* management (Kunen 2001), or settlement and community organization (Lohse 2001, Robichaux 1995).

Adams' (1999:190-207) settlement pattern outline is the only synthesis that attempts to include all the data from the Three Rivers Region as far south as Xultun. Scarborough, Valdez, and Dunning (eds., 2003) asked project members to try to address settlement issues in the Three Rivers region from the perspective of heterarchy as defined by Carole Crumley (1995). The great number of scholars working in the region have widely differing views on this subject, which I attribute to the presence of both heterarchical and hierarchical forms of organization acting in tandem in the Maya area. Heterarchical networks were embedded within a fundamentally hierarchical sociopolitical structure (see Chapter One). This means that studies examining rural settlement around a center (i.e. the hinterland population) tend to emphasize the heterarchical and local nature of Maya sociopolitical organization even while acknowledging some vertical relationships (Lohse 2001; Hageman and Lohse 2003), whereas projects focused on major sites reject a heterarchical model and instead highlight the hierarchical nature of the settlement system (Tourtellot et al. 2003). Another problem is that the term heterarchy has been applied to systems that also have hierarchical aspects. Following Crumley (1995), Scarborough, Valdez, and Dunning (2003:xiv) argue that heterarchy is "a more inclusive umbrella" that incorporates hierarchical models, but this does not appear to be the case in Scarborough and Valdez' (2003:7-8) discussion of interdependency, which seems to reject hierarchy.

The La Milpa Project (LaMAP) (1992-1998)

Following exploratory work by Guderjan (,ed. 1991) throughout northwestern Belize (see below), Norman Hammond and Gair Tourtellot began a long term project at the large center of La Milpa. The site was first visited by Sir J. Eric S. Thompson (1939) when he was looking for a medium sized settlement to excavate in the 1930s. He eventually chose San Jose (Hammond 1991a). The La Milpa project has combined transect and random block surveys as a part of the settlement pattern project and have also integrated their data into a GIS (Rose 2000; Tourtellot et al. 2002; Tourtellot et al. 2003). The project has concluded that La Milpa was a large, hierarchically organized settlement that replicated a Maya cosmogram in the form of a quincunx with satellite centers (Everson 2003; Tourtellot et al. 2002; Tourtellot et al. 2003).

The Río Bravo Archaeological Project and The Blue Creek Project (1988-present)

The Río Bravo Archaeological Project (RBAP) was directed by Thomas Guderjan (,ed. 1991) for two seasons in 1988 and 1990. The project reconnoitered or surveyed 32 sites, which Guderjan (1991a) then incorporated into a regional settlement analysis. While the RBAP study is necessarily preliminary, it provides a wealth of regional settlement data with detailed maps and geographic coordinates given for most sites. Guderjan (1991a) builds on Adams and Jones (1981) rank order system by placing weighted scores on features such as plazas, stelae, ball courts, and monumental architecture. Similar rankings based on perceived political complexity as reflected in architectural features have been employed by Guatemalan scholars (Laporte 1996;

Laporte and Morales 1994; Román 2006). Because Guderjan based his analysis on personal visits to most of the northwestern Belize sites, and they represent the bulk of the comparative settlement data, I have decided to incorporate the San Bartolo-Xultun data into Guderjan's system for consistency. Certain updates to Guderjan's scores have been made based on the continued research of the archaeological projects mentioned in this section. The most difficult data to incorporate into the system is the Río Azul data and other sites of the far northeastern Peten, since these sites were investigated with Adams' courtyard system in mind. Nevertheless, the detailed publication of the Río Azul reports (Adams 1984, 1986, 1987, 1989, 2000) has made some of the Río Azul data available for Guderjan's system.

The Blue Creek Project, directed by Thomas Guderjan, was an outgrowth of his earlier survey and reconnaissance work in the region (Guderjan, ed. 1991). Since 2001 the project has been directed by Jon Lohse. The project has defined Blue Creek as an independent polity located strategically at the southwestern most point where people could have canoed upstream on the Río Hondo from the Caribbean (Guderjan et al. 1994:1). While it is unclear whether Blue Creek was definitely a territory as defined in this dissertation, the project's data has been incorporated into the overall settlement summary presented later in this chapter.

Guderjan's Modified Rank Order Analysis

As mentioned earlier, Richard E. W. Adams has been the most consistent scholar using a rank order analysis of Maya settlement patterns (Adams 1981; Adams and Jones 1981; Adams 1999). Thomas Guderjan (1991a) modified Adams' system to include "known hallmarks of political power" into the overall site scores. Specifically, the inclusion of stelae and ball court counts into the ranking system present a greater range of scores that allow for clearer hierarchical divisions. Guderjan's system also factors monumentality into the site scores based on courtyard counts, weighted plaza counts, and weighted counts of structures over 10 m in height. While 10 m is an arbitrary unit of monumentality set by Guderjan it is used here for consistency's sake. Guderjan's (1991a:104) site score equation is as follows:

(# of plazas x 2) + (# of courtyards) + (# of ball courts) +
(# of stelae) + (# of large buildings x 0.5) = site score

In this equation plazas are defined as a courtyard that is "clearly designed for use by more people than its residents and has politico-religious functions (Guderjan 1991a:104)." Each plaza contributes two points to the overall score, while each courtyard, stelae, and ball court contribute one point. Finally, the total number of structures at a site that are over 10 m in height is divided in half, and that number is added to the total site score. This final factor is added to help account for monumentality at a site as an important indicator of political power. The major advantage of Guderjan's system is that it gives weight to some of the most commonly noted features during archaeological reconnaissance, thereby maximizing the utility of reconnaissance efforts while simultaneously conforming to current understanding of Maya expressions of political power.

I agree with Guderjan that his modified rank order system better accounts for political hierarchical ranking between sites, however, he does not explore his site score data statistically. Instead he proposes eight "site types" based on descriptions of sites resulting from the settlement data he collected. While it is true that probably not all meaningful hierarchical distinctions can be determined statistically using Guderjan's system, some important divisions are noticeable when all of the data from the Three Rivers region are ranked and normalized. Applying Guderjan's site scoring system to his own data, as well as data from the San Bartolo Project and other Three Rivers region projects has resulted in the following ranking of sites (Table 6.1). Single solid lines represent divisions in a possible site typology, while double breaks represent major divisions in the overall settlement hierarchy (see Chapter One).

Table 6.1. Site scores for the Three Rivers region using Guderjan's modified rank ordering system. (Ctyds = courtyards; BCs = ball courts; Archaeologists = scholar(s) whose work provided data; Z Prob. = probability based on z-score of date)

Name	Plazas	Ctyds	BCs	Stelae	10 m Strs.	Site Score	Archaeologists	Z Prob.
Xultun	2	20	1	24	8	53	Garrison/Adams	Outlier
Río Azul	3	39	1	4	6	53	Adams	Outlier
La Milpa	4	21	2	17	8	52	Guderjan/Grube	Outlier
San Bartolo	2	32	2	4	5	44.5	Garrison	Outlier
La Honradez	2	18	2	8	4	34	Garrison/Adams	Outlier
Kinal	4	16	1	0	4	27	Graham/Adams	Outlier
Dos Hombres	4	9	2	3	6	25	Houk	99.9%
Chan Chich	2	14	1	1	5	22.5	Houk	99.7%
Punta de Cacao	2	13	1	1	4	21	Guderjan	99.3%
Blue Creek	2	12	1	2	3	20.5	Guderjan	99.2%
Xmakabatun*	1	4	0	12	1	18.5	Garrison/Morley	98.0%
Chochkitam	1	7	1	6	2	17	Garrison/Morley	96.5%
Ma'ax Na	2	6	1	2	1	13.5	Adams/King/Shaw	89.2%
Quam Hill	3	3	1	0	5	12.5	Guderjan	85.9%
San Jose	2	3	1	1	6	12	Guderjan	83.9%
La Prueba**	1	8	0	0	4	12	Garrison	83.9%
Gran Cacao	1	10	0	0	0	12	Houk/Adams	83.9%
Gallon Jug	1	9	0	0	1	11.5	Guderjan	81.8%
Kakabish	1	2	1	2	3	8.5	Guderjan	66.1%
Xixi**	1	4	0	1	2	8	Garrison	63.1%
BA-22	0	8	0	0	0	8	Adams	63.1%
Chaj K'ek' Cue	0	7	0	0	0	7	Garrison	56.7%
Osh-Lüt	2	3	0	0	0	7	Guderjan	56.7%
Oxtun**	0	3	0	3	0	6	Garrison	50.2%
Laguna Seca	1	2	0	0	4	6	Guderjan	50.2%
Mula'an	1	3	0	0	2	6	Guderjan	50.2%
Say Ka	1	3	0	0	2	6	Guderjan	50.2%
Wari Camp	1	1	0	1	2	5	Guderjan	43.7%
Gongora Ruin	1	1	0	1	1	4.5	Guderjan	40.4%
Las Minas**	0	3	0	1	1	4.5	Garrison	40.4%
K'ak' Quij Kwaribaal**	0	4	0	0	1	4.5	Garrison	40.4%

(Table 6.1 continued)

E'kenha	1	0	0	1	2	4	Guderjan	37.3%
Laguna Verde	0	4	0	0	0	4	Guderjan	37.3%
Rosita	0	4	0	0	0	4	Guderjan	37.3%
X'noha (approx.)	1	1	0	0	2	4	Guderjan	37.3%
El Pedernal	0	4	0	0	0	4	Adams	37.3%
Mile 8 Ruin	1	1	0	0	1	3.5	Guderjan	34.2%
Tzi'kal	1	1	0	0	1	3.5	Guderjan	34.2%
El Infierno	1	0	0	0	2	3	Guderjan	31.3%
Las Abejas	0	3	0	0	0	3	Adams	31.3%
Thompson's Group	0	3	0	0	0	3	Adams	31.3%
28/195-3	0	2	0	0	0	2	Guderjan	25.7%
28/196-2	0	2	0	0	0	2	Guderjan	25.7%
29/196-1	0	2	0	0	0	2	Guderjan	25.7%
El Noticiero**	0	2	0	0	0	2	Garrison/Kwoka	25.7%
Great Savannah	1	0	0	0	0	2	Houk	25.7%
La Pilita**	0	2	0	0	0	2	Garrison	25.7%
Polvitz (approx.)	1	0	0	0	0	2	Guderjan	25.7%
Arroyo Negro	0	2	0	0	0	2	Adams	25.7%
BA-24	0	2	0	0	0	2	Adams	25.7%
BA-30	0	2	0	0	0	2	Adams	25.7%
BA-33	0	2	0	0	0	2	Adams	25.7%
BA-34	0	2	0	0	0	2	Adams	25.7%
RB-11	0	2	0	0	0	2	Adams	25.7%
Sierra de Agua***	1	0	0	0	0	2	Scarborough/Valdez	25.7%
Hunal	0	1	0	0	1	1.5	Guderjan	23.1%
28/195-2	0	1	0	0	0	1	Guderjan	20.7%
28/197-5	0	1	0	0	0	1	Guderjan	20.7%
29/197-10	0	1	0	0	0	1	Guderjan	20.7%
29/197-7	0	1	0	0	0	1	Guderjan	20.7%
La Proxima	0	1	0	0	0	1	Garrison	20.7%
Mile 5 Ruin	0	1	0	0	0	1	Guderjan	20.7%
Tzi'Kal Cab	0	1	0	0	0	1	Guderjan	20.7%
Nochi Ché	0	1	0	0	0	1	Guderjan	20.7%
28/195-4	0	0	0	0	0	0	Guderjan	16.3%

* – conservative courtyard count of 4 based on Morley’s impression that Xmakabatun is larger than Chochkitam

** – based on general impressions during reconnaissance; scores are conservative

*** – probably a much larger site, but only the main plaza is reported

Looking at the ‘Site Score’ column in Table 6.1, there is a range of 53 (Xultun, La Milpa) to 0 (28/195-4). The mean score of this range is 9.48, a number that not only seems high based on the number of sites, but also falls in a gap in the data where there are no sites. A test for statistical outliers was conducted using the equation of Q3 + 1.5 x IQR, where Q3 is the third quartile and IQR is the interquartile range (third quartile –

first quartile). This is a standard statistical method for identifying outliers (Moore and McCabe 2003:46) and was only applied to the top end of the data since the equation Q1 - 1.5 x IQR produces a negative number. The IQR for the Three Rivers site score data is 10 as derived from Q3 - Q1, or 12 - 2. The outlier equation calculates as 12 + 1.5 x 10 = 27. A bold dark line in the table reflects this division in the data. Noticeably, the six sites identified as territorial capitals based on previous research are delimited as outliers. Four of these sites (San Bartolo, Xultun, Río Azul, and Kinal) are paired capitals that held control over their territories during different time periods.

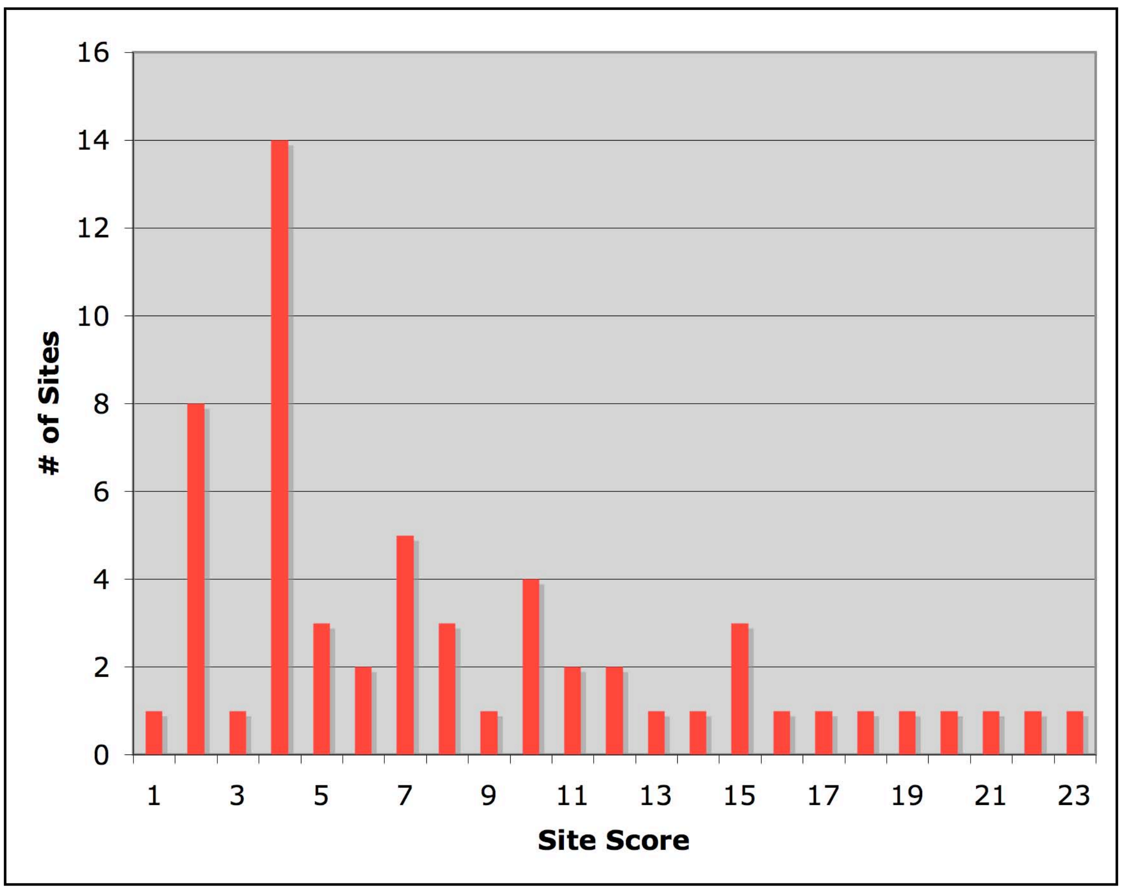


Figure 6.2. Distribution of site scores calculated for the Three Rivers region

Once the outliers are partitioned from the data set the distribution of the data becomes more clear. Figure 6.2 shows the distribution of sites based on the number of occurrences of each site score. The data are arranged left to right from lowest site score to highest. The distribution is skewed to the right with sites with lower scores being far more common. This is exactly the kind of distribution that would be expected in a generally hierarchical system.

Using the data in Table 6.1 without the outliers the new mean and standard deviation are calculated to be 5.97 and 6.08 respectively. The data were standardized using the formula

$$Z = \frac{X - \mu}{\sigma}$$

where the z-score is obtained by subtracting the mean (μ) from each site score (X) and dividing by the standard deviation (σ). The z-scores were converted to percentages using standard probability tables (Moore and McCabe 2003:table A). These percentages, rounded to the nearest tenth of a percent, are listed in the "Z Prob." column of Table 6.1 and indicate the percentage of total site scores in the region that are likely to be lower than the current site's score. The site of Gallon Jug for example, with a site score of 11.5, has a score that is likely to be greater than 81.8% of all sites in the region.

A number of divisions in the data can be determined from these statistics, particularly amongst sites with scores that are less frequent. The first division, already mentioned, is the one separating outliers from the rest of the data, which seems to also reflect the separation of the major (or perhaps simply the older) territorial capitals from the rest of the sites. This distinction would have been even greater if Emblem Glyphs had been given a weighted score in the system, but it is notable that the application of statistics to Guderjan's system sorted these settlements out on its own.

Further proposed divisions in the data were made whenever there was a difference of 7% or greater in the z-score probabilities. The first of these divisions falls between Chochkitam and Ma'ax Na. This division is marked as a double line in Table 6.1, reflecting the separation of capitals from minor centers. The two sites at the lower end of this division, Xmakabatun and Chochkitam, are probably much bigger sites, but have received little attention since Morley (1937-1938) described them in his reports on Peten monuments. A major statistical division falls between Gallon Jug and Kakabish with 15.7% separating their probability scores. The six sites falling above this division are tentatively classified as secondary centers, but in the overall settlement hierarchy they represent minor centers (see Chapter One). The site of Ma'ax Na (King and Shaw 2003) has been postulated as an important ritual center, which according to the model used in this dissertation would fall in the La Milpa territory. Perhaps Ma'ax Na, being located above several caves (King and Shaw 2003), provided some sort of ideological resource to the La Milpa capital, which seems to be ritually oriented in and of itself, the whole center representing a cosmogram (Everson 2003; Tourtellot et al. 2002; Tourtellot et al. 2003). In the San Bartolo-Xultun territory, the large, but poorly understood *bajo* island site of La Prueba seems to have been a significant settlement as well.

There are no further statistical divisions within the remaining data based on the criteria set above. Although, a few subjective divisions based on interpretations of the data contributing to the site scores do seem to be relevant. The first of these proposed divisions falls between the sites of E'kenha and Laguna Verde and is separated by a double line in Table 6.1. Above this line are sites that represent possible tertiary centers in the settlement typology, being less substantial than the major and minor capitals (considered a single group) and the secondary centers defined above. Due to possible biases stemming from disproportional reconnaissance and survey, the secondary and tertiary centers are considered together in the settlement hierarchy as minor centers. Below this division the sites are too small to have stelae or ball courts, but still have some monumental architecture, public plazas, or up to four courtyards. These sites may have been significant settlements of extended kin, but their influence does not seem to have been meaningful within the territories that controlled them.

These extended family, multiple courtyard sites are separated from extended family, single courtyard sites by the division between the sites of Hunal and 28/195-2. Guderjan (1991a:105) notes that the site of Hunal is poorly understood and its one very large structure is the only thing that separates it from other sites with just one courtyard. All sites below the line have a site score of one and probably housed a single, small extended family that derived the manpower to construct their residence from within the family. Nonetheless, both types of extended family sites are considered together in the settlement hierarchy as extended family, courtyard groups (see Chapter One).

A final division separates Nochi Ché from the 28/195-4 site. The latter of these sites has a score of zero, consisting of just a couple of mounds with no formal courtyard arrangements. It cannot even be determined if "sites" such as 28/195-4 actually represent permanent settlements or if instead they represent some sort of field house or temporary shelter. Therefore the following settlement typology is proposed for the Three Rivers region:

Table 6.2. Possible settlement typology for sites in the Three Rivers region

Site Type	# of sites
Major Capitals	6
Minor Capitals	6
Secondary Centers	6
Tertiary Centers	14
Extended family, multiple courtyard sites	24
Extended family, single courtyard sites	8
Field houses/temporary settlements	1

There is not enough data to determine whether this seven level typology is an accurate reflection of the ancient settlement hierarchy. Therefore, this typology has been condensed into the settlement hierarchy defined in Chapter One. There are a total of twelve capital for ten territories. San Bartolo and Xultun, as well as Río Azul and Kinal, are paired capitals that headed their territories during different time periods. There are currently 20 minor centers defined based on the current system. This number will likely increase both as further reconnaissance is made in the Three Rivers region and as more intensive investigation of some of the smaller sites increase their site scores. The San Bartolo-Xultun territory has the greatest number of minor centers probably due to its great size as well as its closer proximity to the Peten heartland and the great site of Tikal. The number of minor centers for Río Azul, here limited to one (BA-22), may be low because plaza, stela, ball court, and 10 m structure counts were not available from the Río Azul data. The minor centers for the La Milpa territory seems appropriate for its size whereas the La Honradez territory has not received enough exploration to know if Xixi is its only minor center.

Extended family, courtyard groups are the most common form of site in the Three Rivers region with a total of 32 recorded in Table 6.1. This corresponds well with what we know of the Maya archaeologically (Haviland 1966), ethnohistorically (Tozzer 1941), and ethnographically (Wisdom 1940; Vogt 1969). The average Maya sustain themselves through extended family agriculture similar to smallholding systems. While the ancient Maya undoubtedly practiced more intensive agricultural methods than the slash and burn *milpas* of today, the principle may have been the same throughout the duration of Maya civilization. Families supported themselves and exchanged their surpluses both heterachically for subsistence and economic goods and hierarchically in the form of tribute. Heterarchical and hierarchical exchange systems guaranteed support in times of economic need as well as ideological inclusion in state rituals and military protection in times of war.

Many other extended family, courtyard groups exist, such as those found in the intersite survey, that do not have site names. Heterarchical exchange networks between sites of equal size are embedded hierarchically beneath the heterarchical exchange networks that form between the elite classes at the level of the territorial capital. The territories of the Three Rivers region were equal to one another in the same way that two extended family, multiple courtyard groups were equal to each other. It is my position that all Maya territories were equal in the sense that they all could make independent political decisions for better or for worse. Nevertheless, when not engaged in broader alliances (see Chapter Seven) territories showed closer affiliations with other territories within their adaptive region. Local variation in the physiography and the environment fostered localized shared perceptions of the environment which provided certain unifying characteristics amongst the Three Rivers territories. This is most clear in the similarities in site plans of the Late Classic capitals of the Three Rivers region. This idea is expanded upon in the cultural and ecological history of the region presented later in the chapter. Prior to that discussion I here define the territories of the Three Rivers region that have so far been identified.

The Territories of the Three Rivers Adaptive Region

There are a total of ten territories identified for the Three Rivers Region at this time. The major and minor territorial capitals have been lumped together since their distinction seems to be one of size rather than function. The area covered by the territories identified thus far does not cover the entire Three Rivers region. The La Union Karst physiographic province is almost completely unknown archaeologically, but it is likely that there is a territorial capital, possibly a large one, within that province. Similarly, the area to the southwest of Xultun is poorly understood, though there may be a possible territorial capital at the site of Ramonalito, which has stelae and altars (Quintana and Wurster 2001). The southeastern portion of the Three Rivers region is also insufficiently covered by the current territories, but there are a number of poorly understood sites that may very well have been minor territorial capitals. These include sites such as Gran Savannah, Gran Cacao, Quam Hill, and Sierra de Agua, all of which have been indicated as important by archaeologists working in the Belize portion of the Three Rivers region (Guderjan, ed. 1991; Houk 1996, 2003; Scarborough and Valdez 2003). This section defines all ten identified territories based on our current understanding of the regional archaeology.

Based on modern Chorti Maya notions of boundaries (see Chapter One) and the identification of territorial capitals through rank order and statistical analysis I drew proposed territorial boundaries for the Three Rivers region using a shaded relief map and

Landsat imagery in a GIS (Figure 6.3). Once these were drawn, patterns were searched for in the settlement hierarchy of each territory. These are discussed in the description of each territory below. Still, there are some general trends relating to the size of territories and their corresponding capitals that will be presented briefly here.

A general pattern in territories is seen when correlation statistics are run comparing territory area and the site score generated for the territory's capital. Figure 6.4 shows the correlation of the ten proposed Classic Period territorial capitals in relation to the area of their territories as defined by natural physiographic boundaries. Xultun is used for the San Bartolo-Xultun territory while Río Azul is used for the Río Azul-Kinal territory. These two were chosen since they represent the largest capitals within their respective territories. The first trend to note in this diagram is that there is a strong positive correlation ($r = 0.87$) between site score and territory area in the Three Rivers region.

The R^2 value for this case represents the fraction of the variation in site scores of capitals that is explained by a regression analysis on territory area (Moore and McCabe 2003:144). Here, $R^2 = 0.76$, meaning that 76% of variation in major and minor territorial capital site scores in the Three Rivers region can be explained by the size of the physiographic area that they occupy. This is an intriguing statistic as it stands, however the lack of sufficient maps (the main data set used to generate site scores) may be hindering an even better statistical correlation.

The sites of Xmakabatun (site score = 18.5) and Chochkitam (17.0) are the only sites in the sample of territorial capitals that do not have a modern archaeological map.

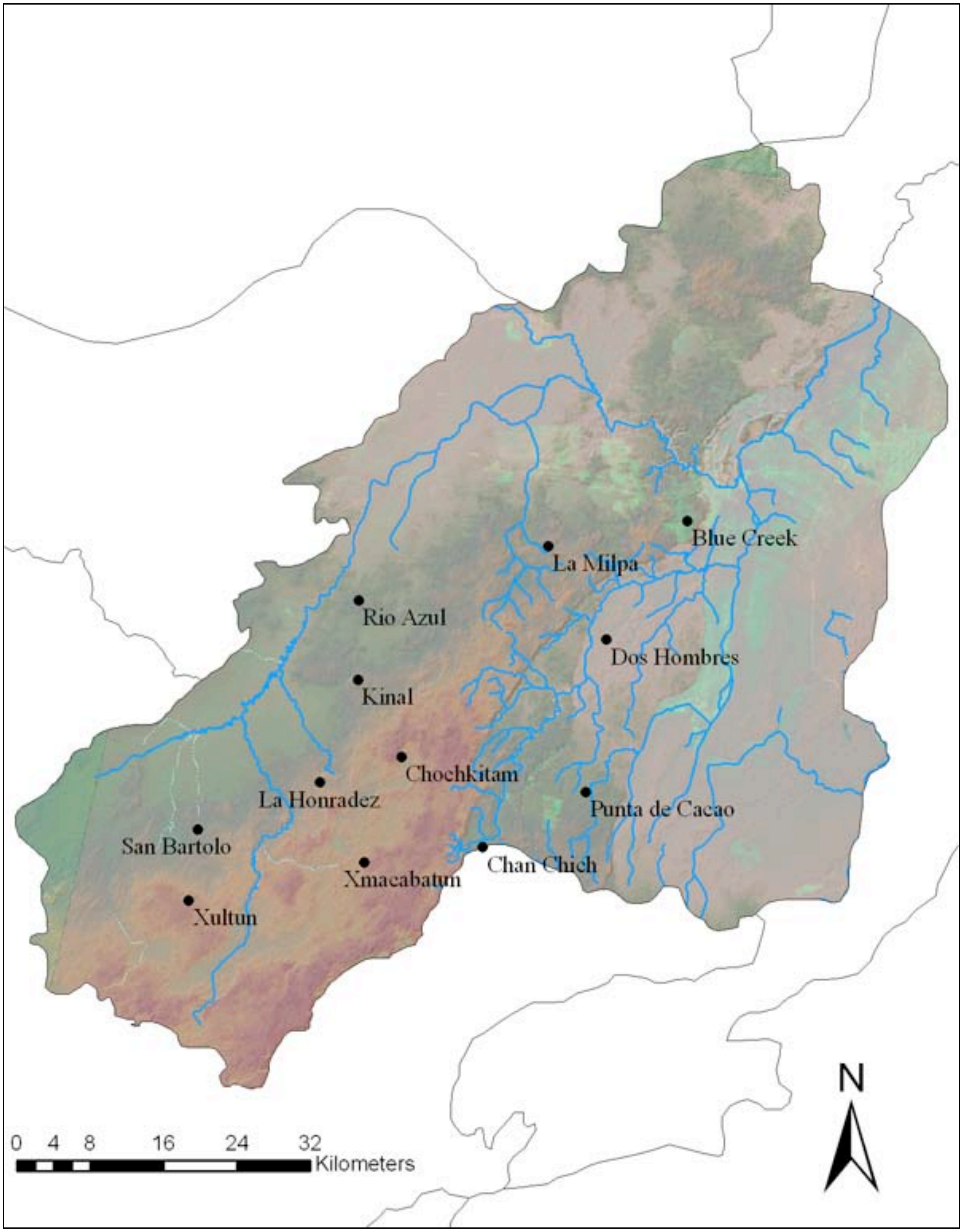


Figure 6.3. Shaded relief map of the Three Rivers region with 70% Landsat image overlaid. Major sites and drainages depicted.

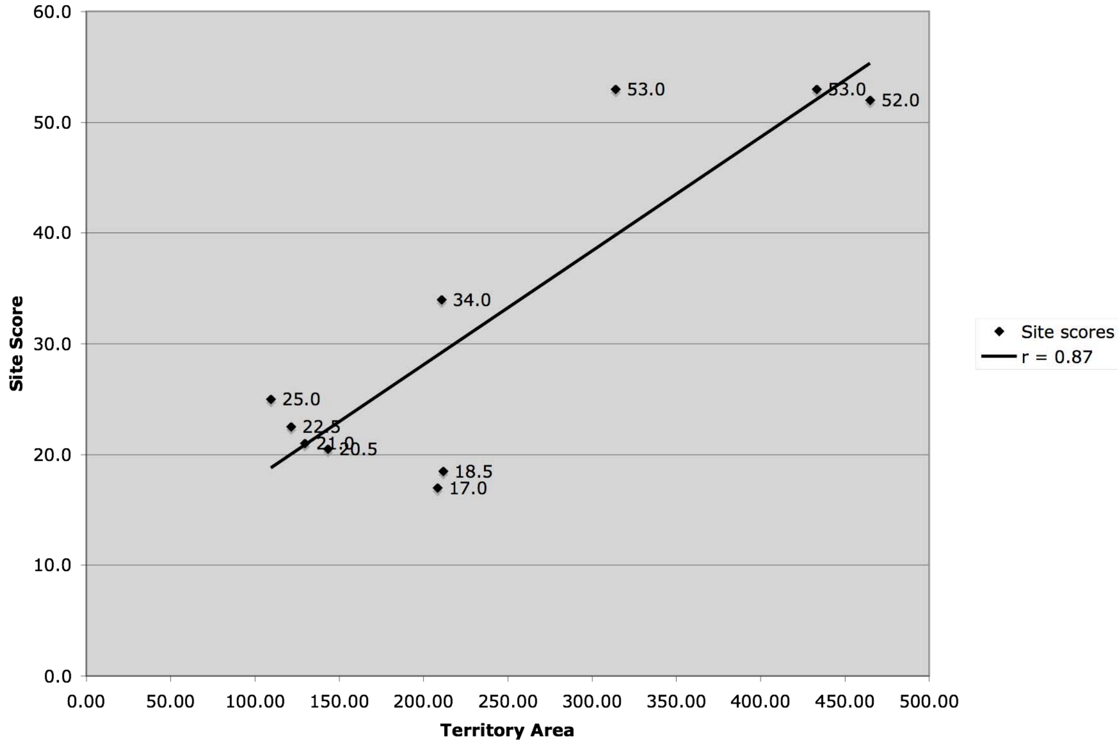


Figure 6.4. Correlation between territory area and site scores of capitals

Their site scores were generated using sketch maps of plazas containing stelae combined with Morley's (1937-1938) general impressions. These site scores will almost certainly increase with more detailed mapping, while their territory areas will remain the same since they are determined physiographically. This would move the Xmakabatun and Chochkitam points in Figure 6.4 up closer to the regression line, most likely in the area of La Honradez (34.0). This would create three distinct groupings of sites in Figure 6.4. The first group consists of Xultun (53.0), Río Azul (53.0), and La Milpa (52.0), representing the three most northwestern territories in the Three Rivers region. The second group of La Honradez (34.0), Xmakabatun (>18.5), and Chochkitam (>17.0) are intermediary territories. Finally, Dos Hombres (25.0), Chan Chich (22.5), Punta de Cacao (21.0), and Blue Creek (20.5) are the most southeastern territories in the Three Rivers region.

This creates a northwest to southeast trend in which territories and by correlation the site scores of their capitals become smaller. This trend follows the same pattern as the general physiography of the Three Rivers region, which becomes more fractious as the horst and graben steps descend from the Peten karst plateau (Dunning et al. 2003). This is further statistical support for the delimitation of territories using physiographic boundaries. What follows is a description of each territory identified in the Three Rivers region so far, in order from highest site score to lowest. Xmakabatun and Chochkitam are last because while it is probable that their site scores will increase with further mapping, it cannot be said with certainty.

The San Bartolo-Xultun Territory

The San Bartolo-Xultun territory was overseen by two capitals at San Bartolo and Xultun, with site scores of 44.5 and 53 respectively. The area covered by the territory is 433.24 km^2, although a large amount of this area is the scrub *bajo* comprising the Bajo de Azúcar and the Bajo Itz'ul (Figure 6.5). The western territorial boundary runs through the Bajo de Azúcar from the source of the Río Tikal to an area south-southwest where raised patches of terrain come out of the *bajo*. The southern border is defined by medium sized scrub *bajos*, one of which begins the drainage of the Ixcanrío. The Ixcanrío flows northward delimiting the eastern boundary of the territory, eventually flowing into the Río Tikal, which defines the northern limit of the territory. There are no archaeological sites close to the size of San Bartolo and Xultun within this territory, which suggests that these sites were the Late Preclassic and Classic Period capitals to the extensive hinterland population found dispersed across the nearby upland terrain.

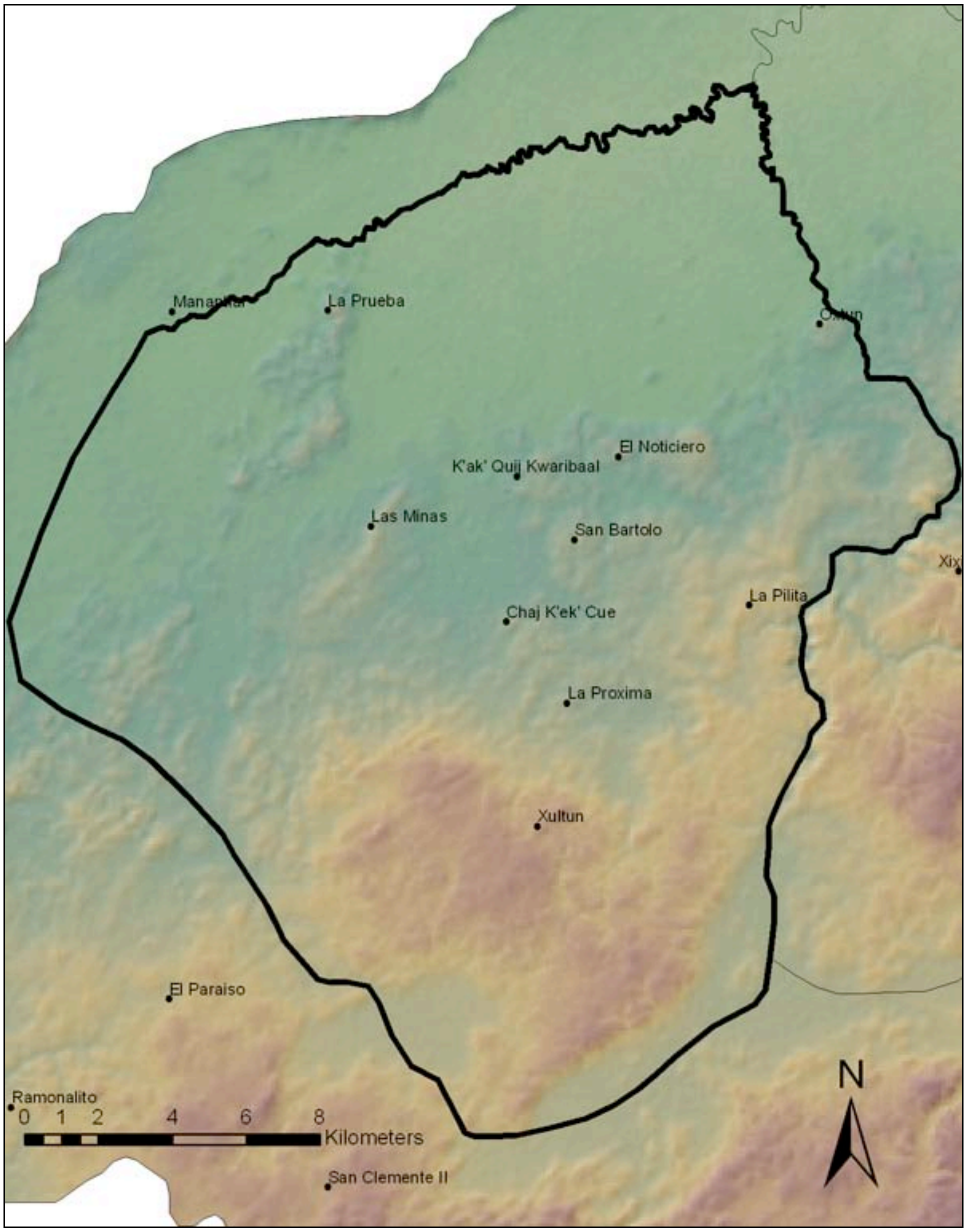


Figure 6.5. The San Bartolo-Xultun territory.

La Prueba (site score = 12), Chaj K’ek’ Cue (site score = 7), Oxtun (site score = 6), Las Minas (site score = 4.5), and K’ak’ Quij Kwaribaal (site score = 4.5) represent minor centers in the territory that would have had a certain number of extended family, courtyard groups under their control. La Prueba reached its size probably due to its isolation on a scrub *bajo* island. The three stelae that give Oxtun its high score, may have been boundary markers for the territory, displayed prominently at this site near the river.

El Noticiero (site score = 2) and La Pilita (site score = 2) are both examples of extended family, multiple courtyard groups in the San Bartolo-Xultun territory, while La Proxima (site score = 1) represents a single family courtyard site. There are numerous other unnamed extended family, single courtyard sites throughout the territory, particularly in the San Bartolo-Xultun intersite area. There are also significant, uninvestigated settlements to the west of Xultun, as identified in satellite imagery. While I am unable to say for certain, it is probable that these represent more minor centers.

The Río Azul-Kinal Territory

The Río Azul-Kinal territory dominates the northern portion of the Azucar Lowlands physiographic province (Figure 6.6). The most definitive evidence that the site of Río Azul was a territorial capital comes from its Emblem Glyph (Figure 6.7), most thoroughly studied by Houston (1986). The territory's boundary is defined to the west by the enormous Bajo de Azúcar. The northern boundary of the territory is formed by a *bajo* to the north that runs into Mexico following the course of the Río Azul. The eastern margin which borders both the La Milpa territory and the Chochkitam territory is defined by the transition between the Azúcar Lowlands and the La Lucha Uplands. A boundary with the La Honradez territory to the southwest is represented by the Río Azul itself.

The site of Río Azul (site score = 53) is one of the largest and most thoroughly investigated settlements in the Three Rivers adaptive region and played a major role in the region's cultural history (Adams 1990, 1999). The territory covers 313.92 km^2, but once again a large portion of this is the Bajo de Azúcar. The Río Azul territory's strategic location north of the confluence of the Río Tikal, Ixcanrío, and Río Azul proper would have made it a formidable player in the exchange corridor running out to the

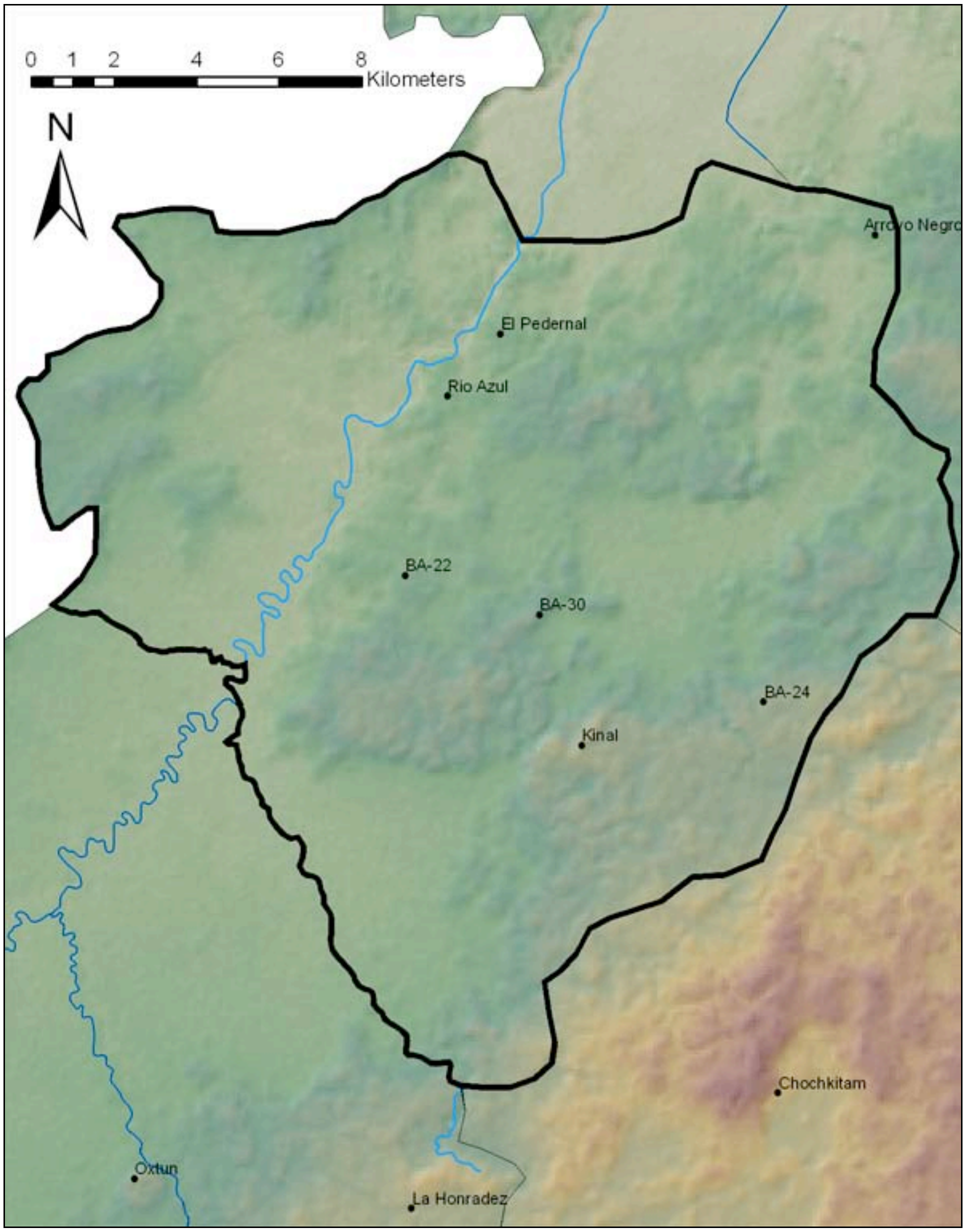


Figure 6.6. The Río Azul-Kinal territory.

Figure 6.7. Example of the Río Azul Emblem Glyph (after Houston 1986:Figure 7b).

Caribbean Sea. Perhaps this strategic positioning explains some of the more unique characteristics of the Río Azul-Kinal territory. For example, the site map of Río Azul does not seem to follow any site planning canons defined for either the Peten (Ashmore 1991) or the Three Rivers region (Houk 2003). Almost all of the terrain within the Río Azul-Kinal territory that is not scrub *bajo* is of very low elevation. For this reason there are very few known minor centers within the territory.

Site BA-22 (site score = 8) stands out as a minor center and it is possible that the site of Kinal (site score = 27) was a minor center during the time that Río Azul was the capital. As in the San Bartolo-Xultun territory there was a capital shift from Río Azul to Kinal, this time during the Late Classic. Kinal has not been as thoroughly investigated as Río Azul, but overall there is an excellent archaeological record for the territory. El Pedernal (site score = 4), Arroyo Negro (site score = 2), and sites BA-24 (site score = 2), BA-30 (site score = 2), BA-33 (site score = 2), and BA-34 (site score = 2) all represent extended family, multiple courtyard sites and there are approximately 20 other “BA sites” that may either be extended family, single courtyard groups or field houses/temporary settlements. Unfortunately there was not enough data relevant to these sites to incorporate them into the statistical analysis.

The La Milpa Territory

The La Milpa territory dominates the northern portion of the La Lucha Uplands physiographic province (Figure 6.8). An eroded possible Emblem Glyph appears on La Milpa Stela 12 (south side, final position) and another on Stela 7 (block D6), clearly identifies La Milpa as a territorial capital (Grube 1994:220) independent of statistical analyses. *Bajos* up to the Río Azul and the border of the La Unión Karst physiographic province form the northern boundary of the La Milpa territory. To the east the La Milpa

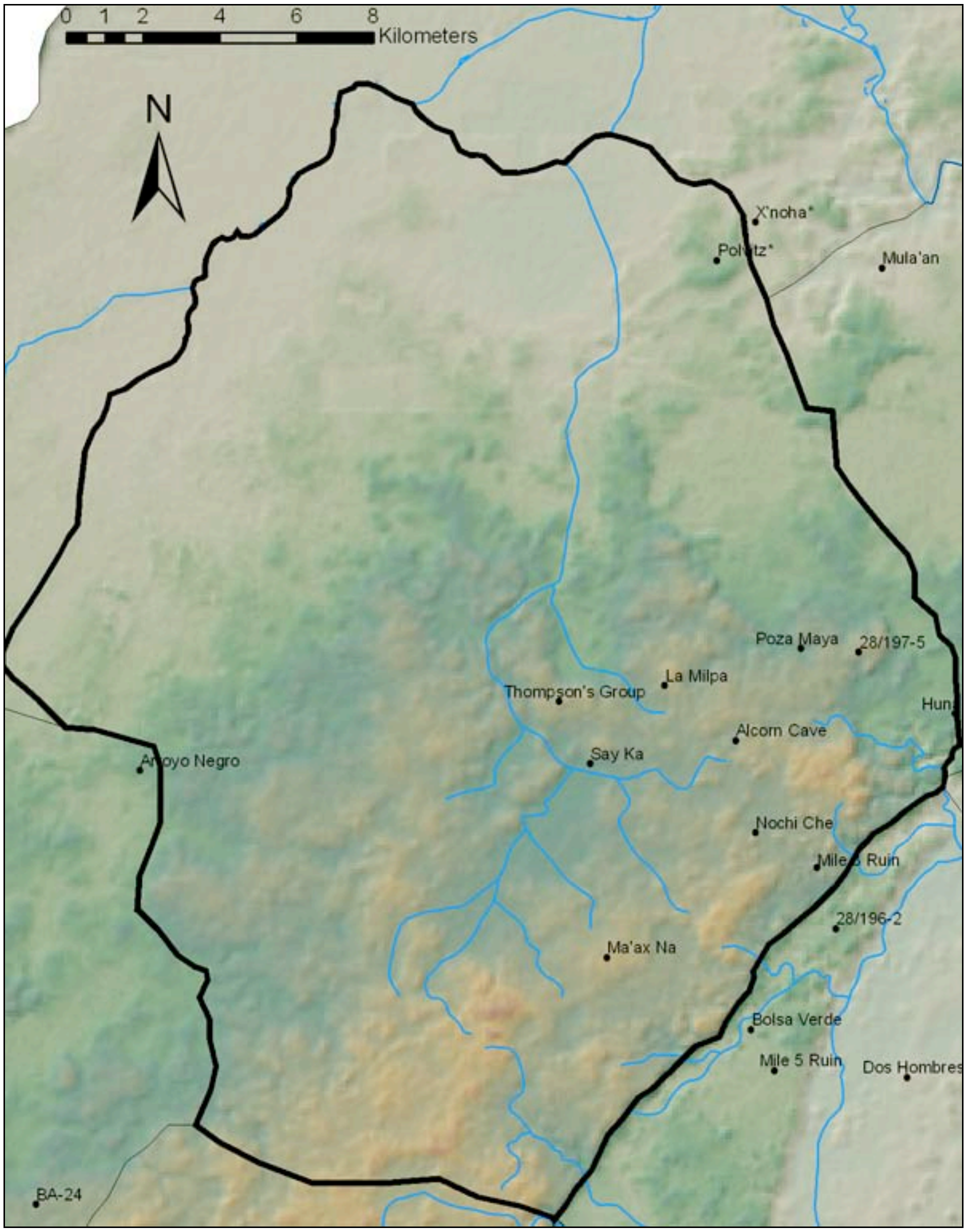


Figure 6.8. The La Milpa territory.

territory may include the site of Blue Creek, in which case the territorial boundary would be defined by the La Lucha escarpment. Although, if Blue Creek represents an independent territory then small patches of lowlands would represent the boundary between the two, with the La Lucha escarpment delimiting the southeastern edge of the territory. The western boundary with the Río Azul-Kinal territory is defined by the physiographic province boundary separating the La Lucha Uplands and the Azucar

Lowlands. The southern boundary is less clear and is dependent upon whether or not Chochkitam represents a territorial capital. The most likely boundary is a series of small *bajos* surrounding a minor drainage before the La Lucha Uplands continue to rise.

The La Milpa territory covers 464.98 km^2, making it the largest defined territory in the Three Rivers adaptive region. As with the San Bartolo-Xultun and Río Azul-Kinal territories a significant portion of this area is covered by scrub *bajo*. The territory is divided north to south by a minor seasonal drainage called Thompson's Creek, that flows northward to the Río Azul, with the La Milpa capital (site score = 52) laying on the eastern side of this system. A large minor center is reported at Ma'ax Na (site score = 13.5) to the south-southwest, also near a branch of Thompson's Creek (King and Shaw 2003). This site has been interpreted as being ritually significant based on a concentration of caves surrounding the site and may have been its own territorial capital (Eleanor King, personal communication 2007). Another minor center is located at the site of Say Ka (site score = 6). There are four identified extended family, multiple courtyard sites within the La Milpa territory. These are: Mile 8 Ruin (site score = 3.5), Las Abejas (site score = 3), Thompson's Group (site score = 3), and Polvitz (site score = 2). The poorly understood site of Hunal (site score = 1.5), with its one large structure is on the eastern border of the territory. Perhaps this large structure is part of an outpost site signifying the boundary with the Blue Creek territory. Site 28/197-5 (site score = 1) and Nochi Ché (site score = 1) are extended family, single courtyard sites within the La Milpa territory, while Alcorn Cave and Poza Maya represent sites of strategic interest to the La Milpa capital for ideological and subsistence reasons respectively.

More so than in some of the other Three Rivers territories, the La Milpa elite seemed to have seriously restricted the size of sites under their control. The exception being the significant settlement at Ma'ax Na, which approaches the size of a small territorial capital. The only other minor center, Say Ka, has no monumental ritual buildings, with two large elite range buildings representing the largest structures at the site. There are numerous settlements around the La Milpa capital itself that are of the extended family, single and multiple courtyard variety generally clustered on hilltops (Kunen and Hughbanks 2003; Tourtellot et al. 2003).

The La Honradez Territory

The La Honradez territory is postulated based on an eroded possible Emblem Glyph found on both Stela 1 (block Dp8b) and Stela 5 (block D9) at the site. Further support for La Honradez (site score = 34) as a territorial capital comes from its monumentality, the high number of carved stelae, and its strategic location near the source of the Río Azul. The site score for the capital would almost certainly be greater if there were a more complete map. The total size of the La Honradez territory would have been dependent on whether or not Chochkitam and Xmakabatun were in fact territorial capitals in and of themselves or not. Here it is assumed that this was the case and that the La Honradez territory was sandwiched between numerous other territories (Figure 6.9). At its smallest, the principle area of the La Honradez territory would have been a northeast to southwest running strip of upland terrain covering 210.87 km^2, with La Honradez situated at the northern end. The Ixcanrío would have formed the western boundary between the La Honradez and San Bartolo-Xultun territories. The territory probably also would have controlled a portion of the Bajo de Azúcar to the northwest

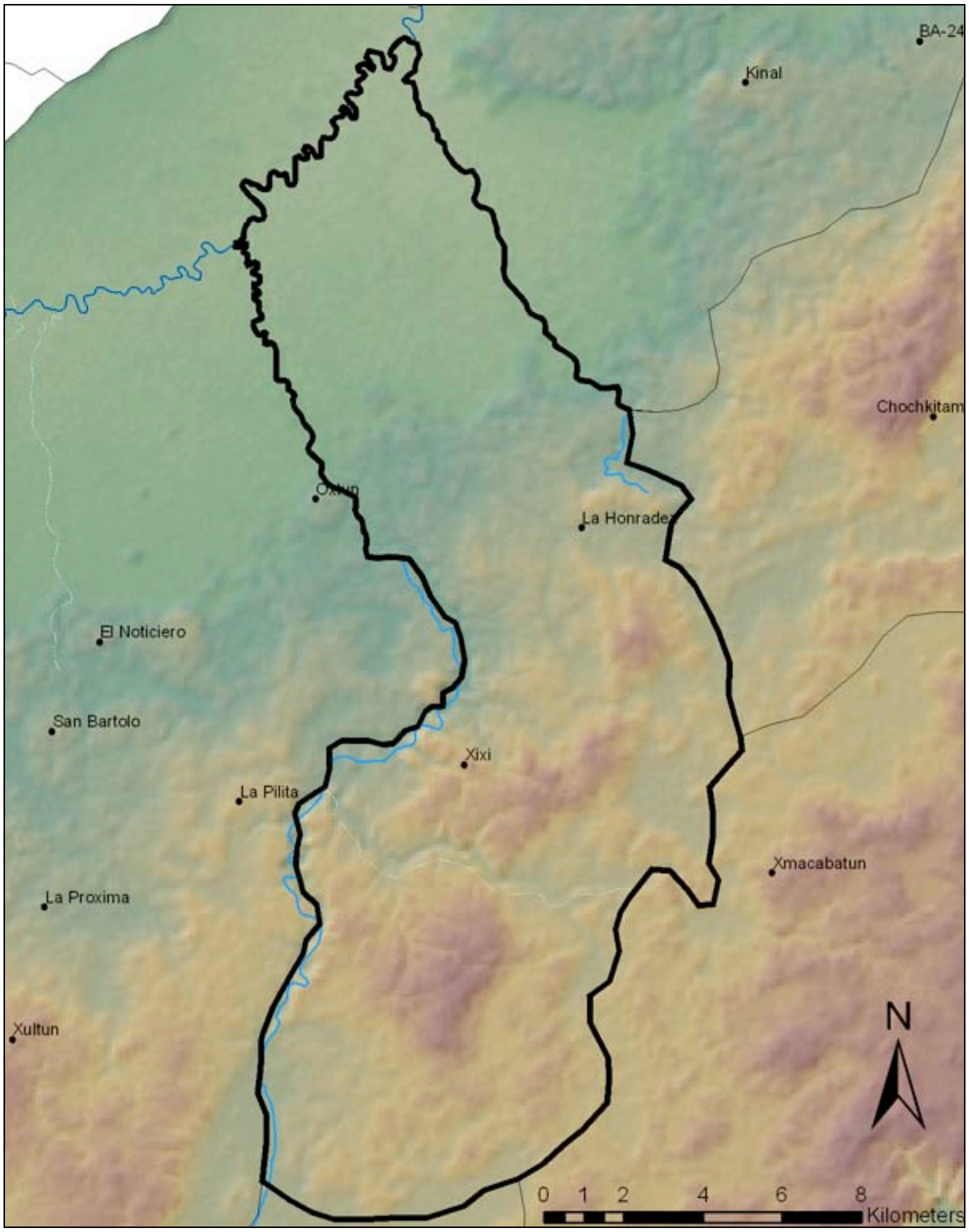


Figure 6.9. The La Honradez territory.

framed by the Ixcanrío and Río Azul. The southern and eastern margins of the territory would have been defined by large segments of intermittent scrub *bajos* that separate La Honradez from the uplands where both Xmakabatun and Chochkitam are located.

A second, though probably less likely possibility is that the La Honradez territory was much larger and incorporated both Xmakabatun and Chochkitam into its domain. This scenario at present seems unlikely for two reasons. First, physiographically the intermittent *bajos* to the east of La Honradez represent a major divide between the La Lucha Uplands and Azucar Lowlands physiographic provinces. While it is possible that a territory may have crossed multiple physiographic zones, major changes in elevation would have presented formidable natural boundaries for sites seeking to head their own territorial domain. Second, while La Honradez is indeed a large site it is apparently significantly smaller than Xultun. If monumentality is any indicator of political power over time, which many Mayanists assume (Guderjan 1991a), then we would expect the La Honradez territory to be smaller than that of San Bartolo and Xultun.

Members of the San Bartolo project visited La Honradez in 2006 confirming some of the observations made in Quintana and Wurster's (2001) publication on Maya sites in the northeast Peten (Román et al. 2006). Very little reconnaissance has been done in the area defined as the La Honradez territory. In 2003 I briefly explored a large site on the eastern side of the Ixcanrío. This site, labeled as Xultun on the IGN 1:50,000 maps of Guatemala, was named Xixi and has been severely looted (see Chapter Four). Xixi (site score = 8) ranks as a minor center, though its overall site score would undoubtedly increase with further reconnaissance and survey. There are certainly numerous other minor centers and extended family, courtyard groups along the stretch of uplands occupied by the La Honradez territory.

The Dos Hombres Territory

The Dos Hombres territory, as it is currently defined, covers an area of 109.34 km^2 (Figure 6.10). This may be an exaggerated size based on where the boundaries are presently drawn. As it stands the western boundary is defined by the La Lucha escarpment and the southern boundary is marked partially by a break in the Río Bravo

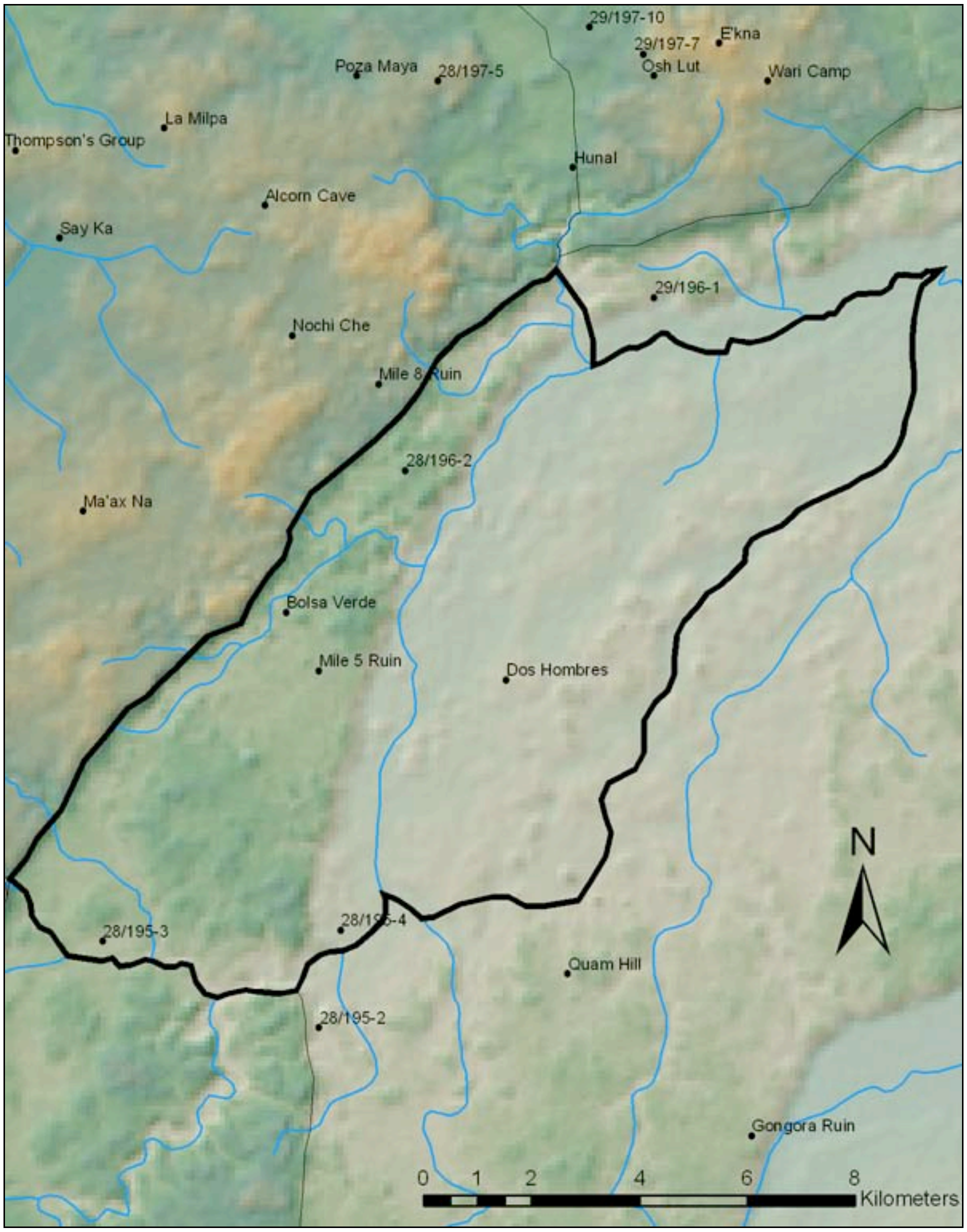


Figure 6.10. The Dos Hombres territory.

escarpment. To the east a series of patchy lowlands form a division with an undefined territory, possibly with a capital at Quam Hill. The northern territorial boundary is defined by a bend in the Río Bravo. As it currently stands the Río Bravo and the Río Bravo escarpment cut through the territory north to south. It is more likely that the area on top of the escarpment is either an extension of the Chan Chich territory to the south (but why wouldn't the capital be more centrally located?) or there is an extremely small independent territory inhabiting the Río Bravo Terrace Upland physiographic province (but where is the capital?). Until further exploration is conducted we are left with the unsatisfactory territorial boundaries currently shown.

The territorial capital at Dos Hombres (site score = 25) has been investigated extensively by Houk (1996, 2003). A number of small extended family sites (Barba Territory, Cerro Zaro, and Las Terrazas) are argued to be corporate groups within the Dos Hombres territory by Hageman and Lohse (2003). These sites were not included in the statistical analysis, but based on descriptions by Hageman and Lohse (2003) their site scores would have ranged from zero to two. These "sites" are similar to the scattered intersite settlement found between San Bartolo and Xultun. Site 28/195-4 (site score = 0), which may represent field houses or a temporary settlement is the only site identified in the territory below the Río Bravo escarpment. Above the escarpment sites 28/195-3 (site score = 2) and 28/196-2 (site score = 2) are extended family, multiple courtyard sites, while Mile 5 Ruin (site score = 1) is an extended family, single courtyard site. The Bolsa Verde site mentioned by King and Shaw (2003) falls within the Dos Hombres territory, above the Río Bravo escarpment, though its configuration is unclear. Given the small size of the Dos Hombres territory (smallest in the region) it is not surprising that there are no clear minor centers to the territorial capital. The main advantage for settlement at all at Dos Hombres is proximity to the Río Bravo flowing 1 km to the west.

The Chan Chich Territory

The Chan Chich territory covers most of the Río Bravo Terrace Lowland physiographic province, with the capital site of Chan Chich (site score = 22.5) being

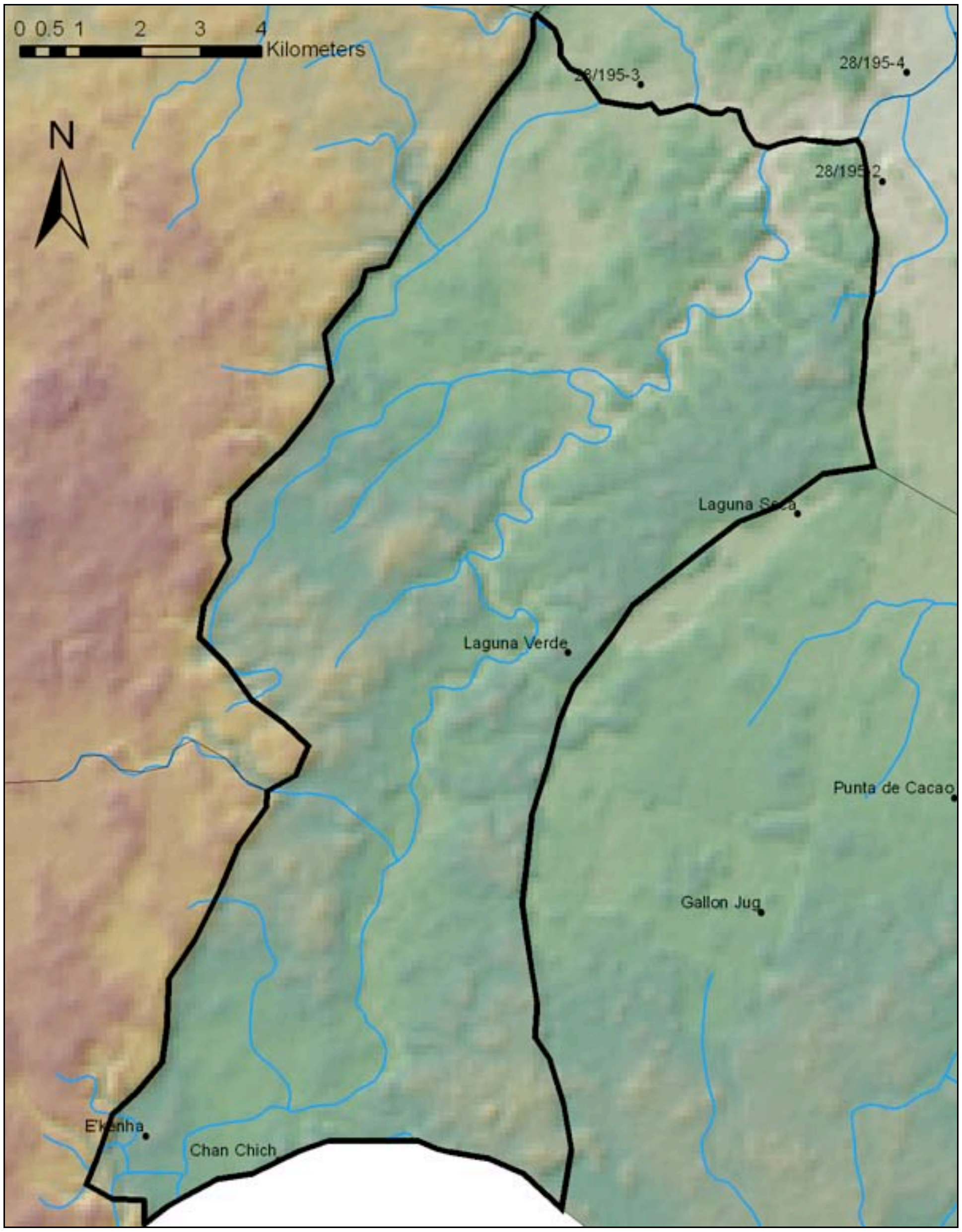


Figure 6.11. The Chan Chich territory.

located at the southern end of the territory (Figure 6.11). The territory covers 121.52 km^2 and is situated between the La Lucha escarpment to the west and the weathered end of the Río Bravo escarpment to the east. The southern boundary found almost exactly where the site of Chan Chich is located is defined by the transition between the Three Rivers adaptive region and the Southern Plateau adaptive region to the south. The northern territorial boundary begins where the Río Bravo crosses onto the terrace from the Río Bravo Embayment physiographic province and continues to the La Lucha escarpment.

The site of Chan Chich has been investigated by Guderjan (1991b) and Houk (2003). Houk (2003) notes the strong site plan similarities between Chan Chich and La Honradez to the west. There are not many other known sites within the territory most likely due to a lack of reconnaissance. The minor center of E'kenha (site score = 4) lies immediately to the west across the Río Bravo. This is the only site with a rank of 4 that is included amongst minor centers and this is only because of the single stela found at the site. Similar to the Oxtun stelae in the San Bartolo-Xultun territory, the stela at E'kenha may be marking the western boundary of the territory. The only other recorded site in the territory is Laguna Verde (site score = 4), an extended family, multiple courtyard site located about halfway up the Río Bravo Terrace Lowlands, just east of a bend in the Río Bravo. Presumably there are other sites along the river's course that would have been subsidiary to the Chan Chich capital.

The Punta de Cacao Territory

The Punta de Cacao territory is immediately east of the Chan Chich territory, occupying 129.51 km^2 of the southern portion of the Booth's River Upland physiographic province (Figure 6.12). The western and eastern territorial boundaries are defined by the Río Bravo escarpment and Booth's River escarpment respectively. The northern boundary is defined by a slight drop in elevation just south of where an intermittent stream bends to the east to flow into the Booth's River. The southern territorial boundary is formed by the boundary between the Three Rivers adaptive region and the Southern Plateau adaptive region.

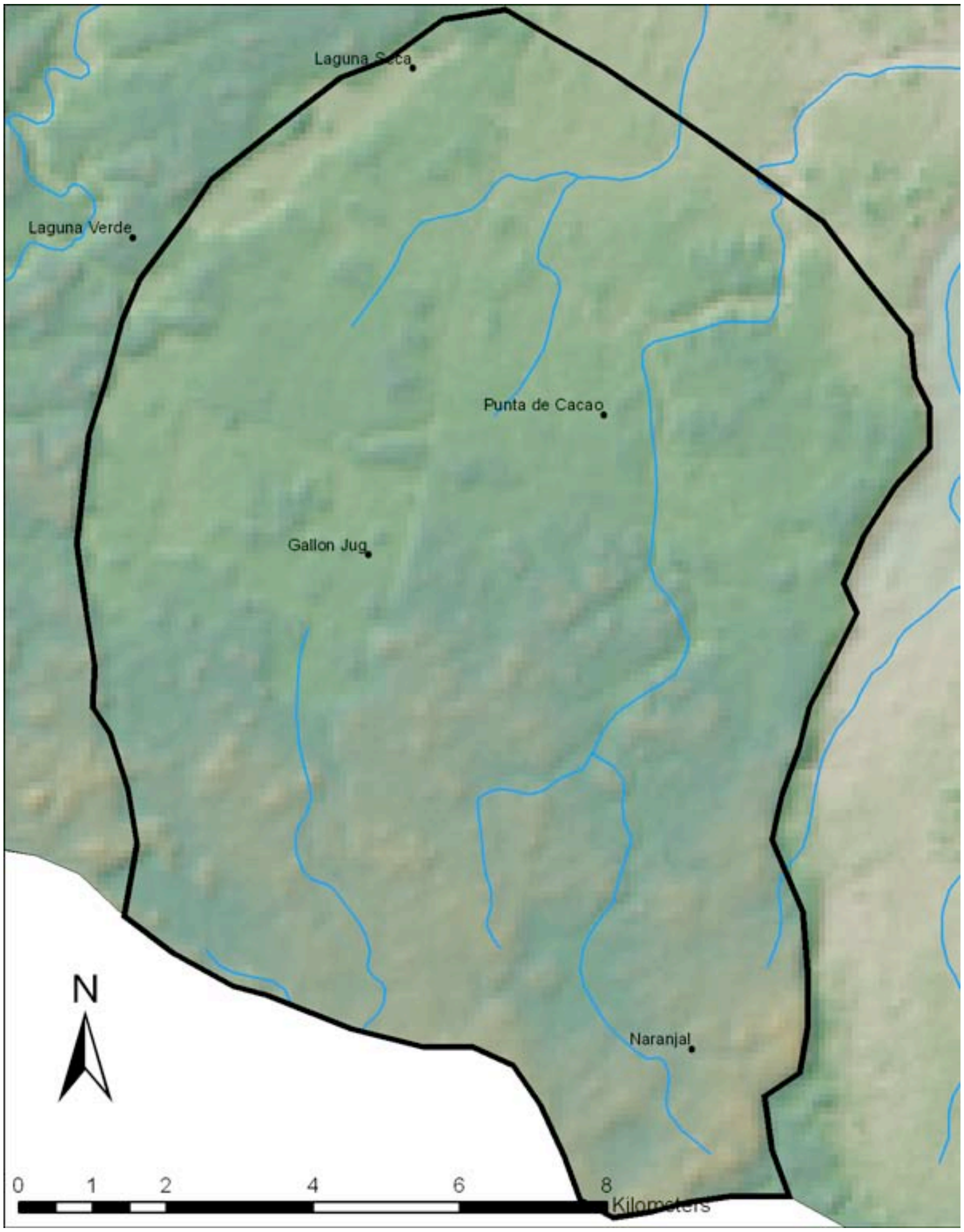


Figure 6.12. The Punta de Cacao territory.

The site of Punta de Cacao (site score = 21) has been mapped by members of the Río Bravo Archaeological Project (Guderjan et al. 1991) and has a significant acropolis. The site is spread across an intermittent stream with the major portion of the site being on the western side (Guderjan et al. 1991:61). A minor center is found at Gallon Jug (site score = 11.5) to the southwest. Gallon Jug has the lowest site score of all secondary centers and its score may be relatively inflated due to the intensity of the site survey following clearing of the terrain for agribusiness (Yaeger 1991). If comparatively intense research were conducted at all sites in the Three Rivers region there would be an upwards shift in site scores. This was one of the main reasons for combining secondary and tertiary centers as minor centers. Another minor center is found at Laguna Seca (site score = 6), which boasts at least four monumental structures and has a scenic view of the lagoon (Guderjan et al. 1991:68). Other than that the only other known site is that of Naranjal in the southeast corner of the territory. Naranjal is described by Thompson (1939:278), but was not revisited by Guderjan's project (Guderjan et al. 1991:61). Based on Thompson's vague description Naranjal is probably an extended family, multiple courtyard site. There are probably numerous other settlements in the Punta de Cacao territory that await discovery with increased reconnaissance.

The Blue Creek Territory

The Blue Creek territory is located immediately to the east of the La Milpa territory occupying the northeastern tip of the La Lucha Uplands physiographic province, an area of 143.19 km^2 (Figure 6.13). The southern and eastern boundaries are formed by the La Lucha escarpment. The Río Azul delimits the northern boundary, while a section of medium sized scrub *bajos* separates the Blue Creek territory from the La Milpa territory to the west. While it is possible that Blue Creek is part of an even larger La Milpa territory, Guderjan and colleagues (2003) have convincingly argued that Blue Creek was an independent territory, although my boundaries are more conservative, particularly on the eastern side.

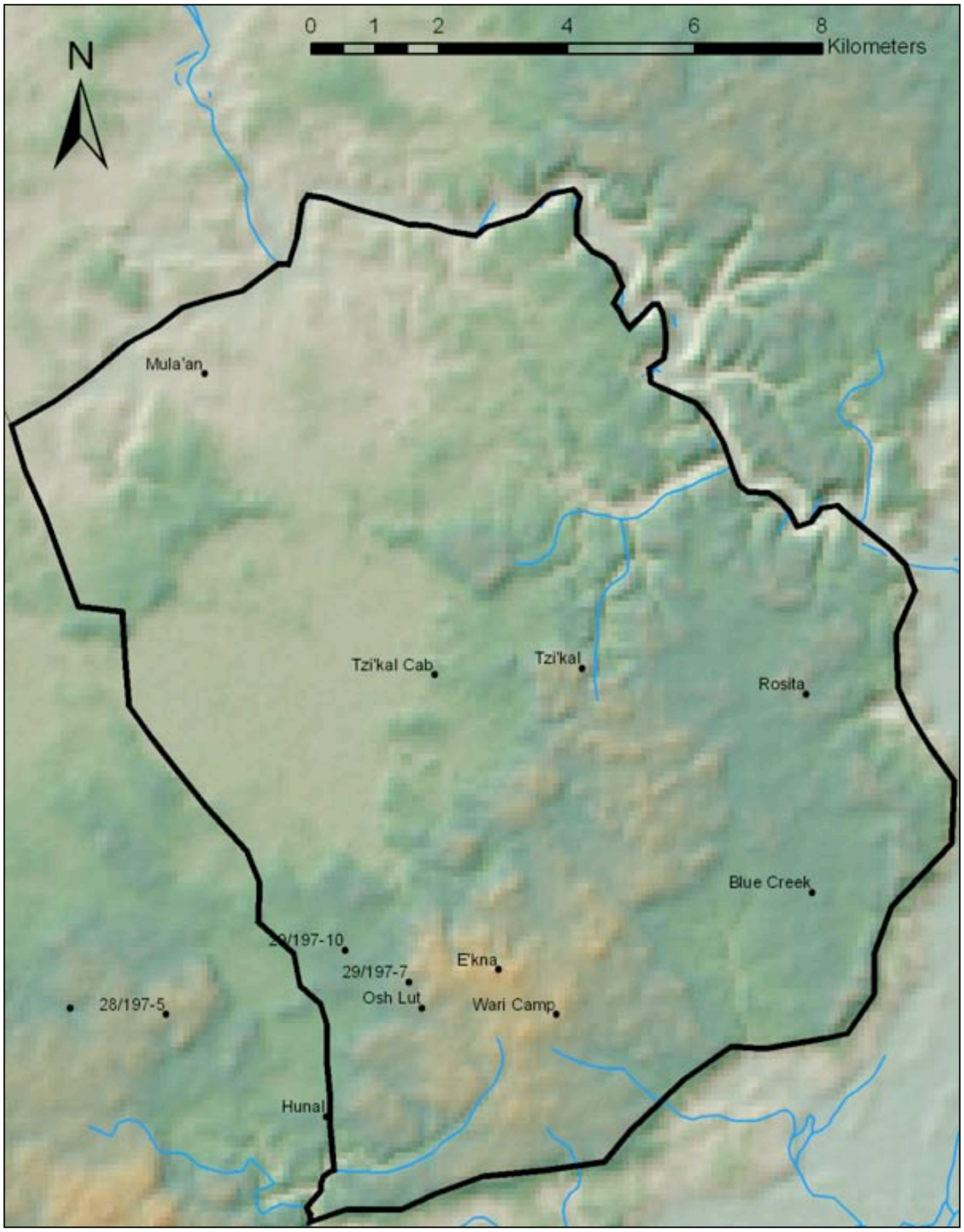
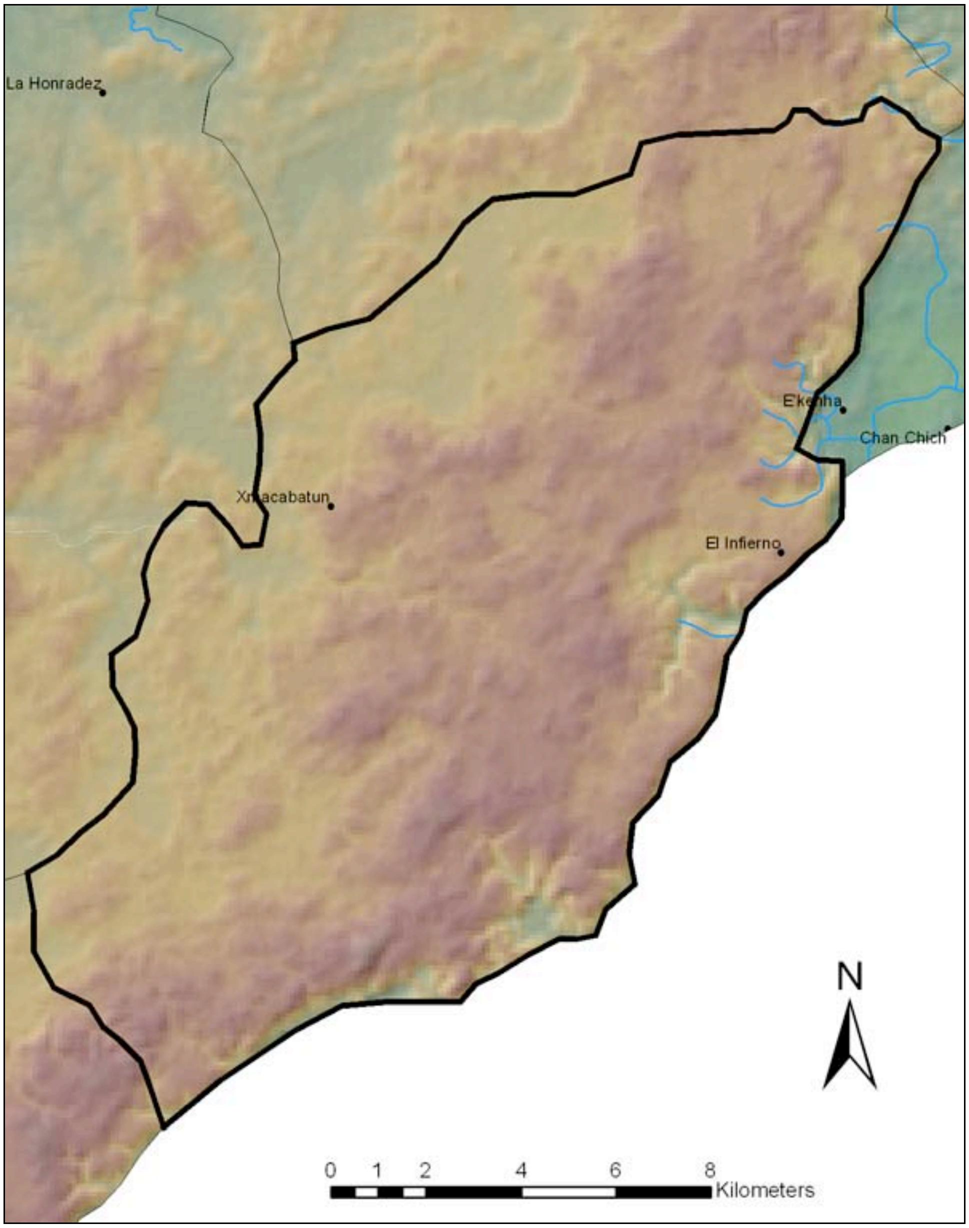


Figure 6.13. The Blue Creek territory.

As a territory, Blue Creek is one of the more thoroughly investigated both in terms of reconnaissance (Guderjan et al. 1991) and excavation (Guderjan et al. 1996; Guderjan et al. 2003). The territorial capital at Blue Creek (site score = 20.5) has been under investigation since 1990 and the site core is situated immediately adjacent to a large *rejollada* (sinkhole) that may have been a royal garden (Guderjan et al. 2003), possibly for the cultivation of cacao. There are three minor centers in the Blue Creek territory at the sites of Osh Lüt (site score = 7), Mula'an (site score = 6), and Wari Camp (site score = 5). Mula'an, in the extreme northwestern portion of the territory, may not be subsidiary to Blue Creek since the territorial boundary was particularly difficult to determine in this area. Rosita (site score = 4) and Tzi'kal (site score = 3.5) are extended family, multiple courtyard sites, while sites 29/197-10 (site score = 1), 29/197-7 (site score = 1), and Tzi'kal Cab (site score = 1) are all extended family, single courtyard sites. The site of E'kna on the map is a rockshelter where Guderjan and colleagues (1991:87) found a looted burial. Despite the small size of the Blue Creek territory and its capital site there seems to have been a well formed territorial hierarchy with a strong embedded heterarchy at the level of minor centers. Guderjan (1996:7) argues that Blue Creek is the easternmost of the Peten style sites, while Houk (2003) feels that Blue Creek is one of a number of eastern Three Rivers region sites that may have been culturally distinct for a period of time based on his interpretation of the site plan. I am inclined to agree with Guderjan in the case of Blue Creek which would isolate Houk's (2003:fig. 5.1) "Northern Belize Style Site Plan" to sites in the Booth's River Upland and Booth's River Depression physiographic provinces.

The Xmakabatun Territory

The Xmakabatun territory is located to the east of the La Honradez territory and south of the Chochkitam territory (Figure 6.14). It covers an area of 211.81 km^2 and occupies a significant part of the southern portion of the La Lucha uplands. The eastern territorial boundary is defined by the La Lucha escarpment as well as the boundary between the Three Rivers adaptive region and the Southern Plateau adaptive region. The northern boundary begins in the east where a minor drainage cuts through the uplands



6.14. The Xmakabatun territory.

and then continues west and south through medium sized *bajos*, creating a divide with the La Honradez territory. Another minor drainage forms a short boundary to the southwest.

The capital at Xmakabatun (site score = 18.5) was reported on by Morley (1937-1938:422-431) and a map of the Main Plaza was published with the site description. A conservative courtyard count of four was assigned to Xmakabatun based on Morley's description that settlement extended in all directions from the Main Plaza in the form of "mounds and pyramids surrounding subsidiary courts (Morley 1937-1938:423)." No other sites are currently known in the region, but based on the area of the elevated terrain there are certainly a number of sites in this region awaiting discovery (although most are likely already looted).

The Chochkitam Territory

The Chochkitam territory is located north of the Xmakabatun territory, east of the La Honradez territory, southeast of the Río Azul-Kinal territory, southwest of the La Milpa territory, and west of the Chan Chich territory (Figure 6.15). The territory occupies the central portion of the La Lucha Upland physiographic province and covers an area of 208.37 km^2. The eastern boundary is the most clearly defined, being represented by the La Lucha escarpment. A minor drainage cutting into the uplands in the southeast begins the boundary with the Xmakabatun territory. Similarly, a somewhat larger drainage forms the divide with the La Milpa territory. The western boundary separating Chochkitam from both the Río Azul-Kinal and La Honradez territories is marked by the physiographic transition between the La Lucha Upland and Azucar Lowlands physiographic provinces.

The territorial capital at Chochkitam (site score = 17) was discovered by Alfred Tozzer during work for the Peabody Museum at Harvard University and was subsequently visited by Frans Blom of Tulane University and later by J. Eric S. Thompson, then working for the Field Museum in Chicago. Morley (1937-1938:459-465) provides the most complete report of Chochkitam and indicates that it is almost certainly larger than reported. The only other known site in the territory is El Infierno

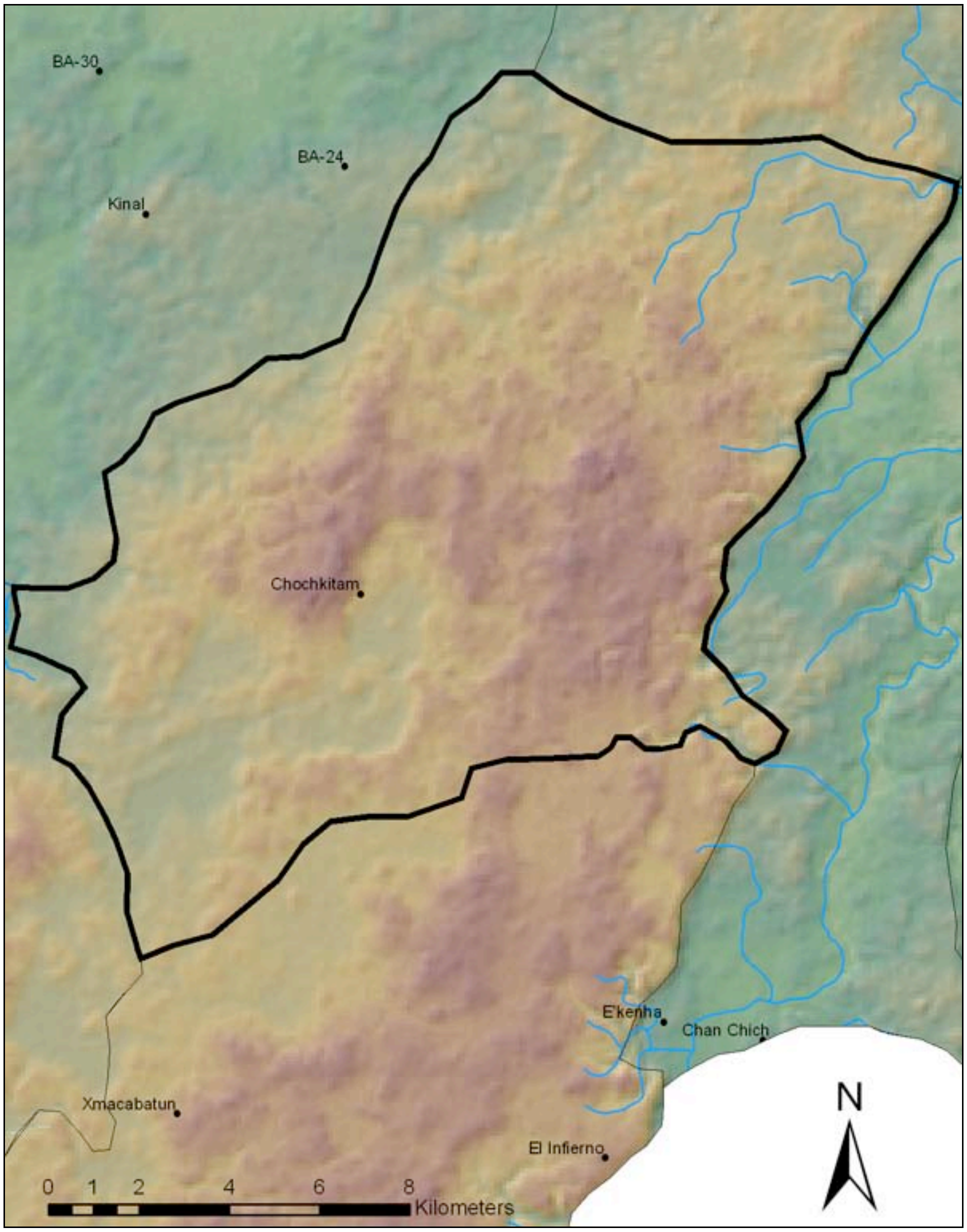


Figure 6.15. The Chochkitam territory.

(site score = 3). Its low site score is generated based on vague descriptions of the site on file with the Belize Department of Archaeology, but work by the Río Bravo Project (Guderjan et al.1991:61) suggests that it may be a large site. My guess is that with further investigation El Infierno would be a minor center within the territory. Like Xmakabatun the rest of the Chochkitam territory is unexplored archaeologically, particularly on the Guatemalan side of the border.

A Cultural and Ecological History of the Three Rivers Adaptive Region

All of the above indicate how much remains to be done in terms of survey, whether by ground or air. What follows should be considered a first attempt at synthesis, recognizing that with time we will be in a better position to make revisions to the current model. This section integrates data from all of the projects in the Three Rivers region in an effort to produce a comprehensive settlement pattern synthesis for an archaeological region. The only existing synthesis of settlement in the entire Three Rivers adaptive region as it is geographically defined in this study is Adams' (1999:190-207) outline appendix to his study of Río Azul with a summary and commentary (although some of Adams' BA sites are actually outside of the Three Rivers region). Guderjan (1991a) synthesizes the reconnaissance data from the Río Bravo Archaeological Project, while Houk (1996:110-126) synthesizes all available data for the eastern Three Rivers region (i.e. Belize) and Río Azul. Adams and colleagues (2004) present an updated version of Houk's summary, but exclude all sites south of La Honradez.

The fundamental difference between the summary presented here compared to previous summaries is the use of the territory concept. Guderjan's (1991a) synthesis relies on La Milpa being the highest ranked site in the region, with all other sites being considered in relation to it. Adams has consistently applied the rank order analysis he developed (Adams and Jones 1981) for Maya settlement pattern analysis. Adams places heavy emphasis on his courtyard counts in arguing for hierarchical relationships, including the use of logarithmic transformations to show scales of dependencies. For the Three Rivers region this means comparing how all other sites relate to Río Azul, which has the highest courtyard count of 39.

The territory concept combined with the notion of embedded heterarchies takes some of the emphasis off of a site's specific score and how it relates to other scores. In my system a site's type in the settlement hierarchy (Table 1.1) is its most defining characteristic and all sites within a given type are considered to be politically equal and maintain heterarchical relations. Each site, especially the capitals, maintains hierarchical control over a network of settlements of smaller types. At each typological level there is an embedded heterarchy. For example, all of the minor centers within the San Bartolo-Xultun territory (La Prueba, Chaj K'ek' Cue, Oxtun, K'ak' Quij Kwaribaal, Las Minas) would have maintained heterarchical relationships as part of a resource generalization subsistence strategy (Dunning et al. 2003). However, as an embedded heterarchy within the San Bartolo-Xultun territory these sites would not have had regular heterarchical relations with minor centers of other territories.

Chapter Five presented the settlement history of a single territory, discussing sites of all settlement types. The primary focus of the summary that follows is to present a settlement history of the Three Rivers region as a whole. Therefore, the emphasis will be on territories and their capitals rather than all of the sites in the settlement typology. Minor centers may be mentioned where appropriate, but most of the focus will be on the capitals and their elite class. Due to a lack of archaeological research there is little to say about the Xmakabatun, Chochkitam, La Honradez, and Punta de Cacao territories, however speculations based on comparative data are made when deemed appropriate.

Middle Preclassic Period – 1000-400 B.C.

While there is evidence of Archaic peoples in northern and eastern Belize (Lohse 2001:59), the first evidence of human occupation in the Three Rivers region comes from the Middle Preclassic Period (though see Beach et al. 2006:171 for possible early evidence near Blue Creek). Adams (1995) indicates that the first settlers came to the Río Azul territory around 900 B.C. Similarly, a radiocarbon date from a paleosol containing disturbance taxa in the San Bartolo-Xultun territory dates from 920-800 B.C. (2 sigma). At this time, many if not all of the scrub *bajos* that cover about 40% (Dunning, Jones, Chmilar, and Blevins 2006) of the Three Rivers region were perennial wetlands. There is direct evidence for such wetlands in the San Bartolo-Xultun territory (Dunning et al. 2005; Dunning, Jones, Chmilar, and Blevins 2006) and the La Milpa territory (Dunning et al. 2002; Dunning et al. 2003). *Bajo* sediment histories need to be considered on a case by case basis as there is great variability in the human impact on individual *bajos* (Beach et al. 2006; Dunning, Beach, and Luzzadder-Beach 2006).

Towards the end of the Middle Preclassic there is broader evidence of occupation throughout the Three Rivers region as indicated by the presence of Mamom sphere ceramics. Guderjan (1996:8) argues that the site of Blue Creek was a nucleated village that was practicing communal rituals. Houk (1996) and others (Adams et al. 2004; Sullivan and Sagebiel 2003) indicate significant Middle Preclassic ceramic deposits at Dos Hombres and Chan Chich. There are limited Mamom deposits at La Milpa as well, although there is not a complete ceramic complex (Sullivan and Sagebiel 2003:25-27).

The only clear architectural data for this period comes from the western portion of the Three Rivers region. There is a monumental platform dating to the Middle Preclassic at Río Azul (Str. G-103-sub 2)(Adams 1995; Valdez 1995). There are multiple public architectural constructions dating to the Middle Preclassic at San Bartolo and further evidence of Mamom ceramics at other locales at the site. Significantly, a marine shell from the Pacific Ocean also dates to the Middle Preclassic at San Bartolo indicating broad trade networks.

The general settlement pattern of the Middle Preclassic in the Three Rivers region is one of dispersed nucleated villages. These villages were agricultural with maize, manioc, and cotton being proven domesticates from this time period. Relationships between these communities were almost certainly heterarchical in nature as early settlers struggled to adapt to a pristine high forest/wetland environment. Towards the end of this period there are signs of increased community participation both in the form of rituals (Blue Creek), and in the construction of major public architecture (San Bartolo, Río Azul). There is no evidence for a settlement hierarchy in any of the territories at this time as all existing settlement seems to be concentrated at sites that would later become capitals.

Late Preclassic Period – 400 B.C.-A.D. 200

Chicanel ceramics indicate that during the Late Preclassic there was considerable population growth throughout the Three Rivers region (Sullivan and Sagebiel 2003:27) as new settlements were founded around the initial sites established by early settlers. In some territories explicit settlement hierarchies developed, while in others elites at nearby sites may have been vying for control. The Late Preclassic Maya continued to coat all of their buildings and plazas in lime plaster. This process required the cutting down of more and more trees to maintain fires at the 800°C (1472°F) necessary to process the calcium carbonate in limestone into quicklime (Hansen 2000:61). The Maya of the Three Rivers region were beginning to anthropogenically alter their landscape through deforestation and resultant erosion processes.

In the San Bartolo-Xultun territory a clear leader emerged to orchestrate the architectural programs at San Bartolo. The *ajaw* title meaning "lord, ruler" was found on a glyph block dating to 300-200 B.C. (Saturno et al. 2006) and was replicated multiple times on the west wall of the later San Bartolo murals. The presence of Late Preclassic ceramics in looter trenches throughout the territory suggest that a significant hinterland population was forming under San Bartolo's control. Clear hierarchical divisions had developed both within the capital and within the territory.

The Río Azul-Kinal territory was a different story. Adams (1995:38) argues that during the Late Preclassic there was no centralized control in the territory. Sites like Río Azul and Arroyo Negro may have been competing to become a dominant center or sites may have continued to interact in the same heterarchical manner of the Middle Preclassic. Presumably if the *bajos* were perennial wetlands at this time then the Río Azul itself was also perennial (although there is no direct data for this). If there were constant water sources available to numerous sites then site hierarchies may not have formed as quickly as in territories where anthropogenic effects on the landscape were causing some of the wetlands to silt in through erosion processes, leading to a need for better organization of resource control. Even though there is not a clear settlement hierarchy in the Río Azul-Kinal territory at this time, there is an emerging elite class present at numerous sites, each with its own supporting rural population (Adams 1995:38).

Similarly, there is no conclusive evidence for a settlement hierarchy in the La Milpa territory during the Late Preclassic. At the site of La Milpa itself there are plaster floors and ceramics dating to the Late Preclassic in almost every excavation down to bedrock (Hammond and Tourtellot 2004:292). Public architecture is present at the

Structure 1 locale (Tourtellot et al. 1994:121), as well as a Late Preclassic stepped platform built on the highest point of a bedrock ridge under Structure 9 (Hammond et al. 1996:89). Another possible Late Preclassic public structure is under Structure 21 (Tourtellot et al. 1994:121). In the La Milpa territory paleoenvironmental investigations indicate that the Far West Bajo was perennialy wet until at least AD 100 (Dunning et al. 2003). Nearby Thompson's Creek may have been a stable water resource for the nucleated Preclassic La Milpa village with no need for hierarchies beyond those internal to the community. Evidence of Preclassic activity at the small site of La Milpa South (Tourtellot et al. 2002) suggests a possible settlement hierarchy in the territory, but further excavations would be needed to confirm this.

At the Blue Creek territory to the east there were some monumental constructions (8 m in height) at the site of Blue Creek itself in the Late Preclassic (Guderjan 1996:8). In terms of a settlement hierarchy, there is a Late Preclassic presence at the small site of Rosita to the north of Blue Creek (Guderjan et al. 1991:85) but there does not seem to be architecture of similar size to the contemporary community at Blue Creek (Guderjan et al. 2003:86). Guderjan and colleagues (2003:86) suggest that Rosita played an integrative role in the Blue Creek territory, representing the first large construction encountered when crossing the Río Azul from the north. Though, until further investigation is conducted at some of the smaller sites in the territory it will be unclear whether or not Blue Creek was a territorial capital as early as the Late Preclassic.

There is no data from the intermediary sized territories of La Honradez, Xmakabatun, and Chochkitam due to a lack of formal investigations at these sites. There is similarly very little data from the Punta de Cacao territory although Guderjan and colleagues (1991:65) believe that there are undoubtedly earlier construction phases under some of the larger structures at Punta de Cacao. The two remaining territories of Dos Hombres and Chan Chich have architecture dating to the Late Preclassic at the capitals (Houk 1996, 2003), but it is unclear whether these structures are public or residential. It is likely that these two sites represent small nucleated villages with some possible internal social hierarchies, but that there were almost certainly no settlement hierarchies or formal territories surrounding Dos Hombres or Chan Chich at this time.

The Late Preclassic saw general population increase throughout the Three Rivers adaptive region (Adams et al. 2004) and the Maya lowlands as a whole (Culbert and Rice 1990). Although, only in the San Bartolo-Xultun territory did a clear settlement hierarchy emerge, with San Bartolo as its capital. Blue Creek may have been a territorial capital at this time, but in general the eventual Classic Period capitals remained nucleated settlements probably in heterarchical relationships with other nearby sites. Access to water may have been a crucial variable in shaping social relationships in the Late Preclassic. As growing populations began changing their environment at an increasing rate social hierarchies may have developed to counteract potentially disastrous circumstances. These events varied in the Three Rivers region across both time and space as indicated by the Late Preclassic to Early Classic transition.

Late Preclassic to Early Classic Transition – A.D. 200-300

Some of the crucial issues surrounding the timing, spatial distribution, and reality of the Late Preclassic to Early Classic transition were addressed in Chapter Five. In the Three Rivers region there was a general (though not universal) population decline accompanied by nucleation around certain centers. The reasons for the transformations that took place at this crucial juncture in Maya development seem to be a combination of a changing environment and the social responses to these changes (Dunning 1995).

The San Bartolo-Xultun territory was the most developed territory in the Three Rivers region during the Late Preclassic. In fact, with the possible exception of Blue Creek, it is the only territory with an identifiable capital and settlement hierarchy during the Preclassic. Perhaps this is why the earliest and the most severe transformations took place at San Bartolo. By the end of the Late Preclassic, settlement had spread in the San Bartolo-Xultun territory not only into minor centers, but also into the more rural intersite areas as well. The San Bartolo-Xultun intersite area, which is composed of numerous scrub and palm *bajos* occasionally interrupted by patches of uplands, was perennially wet in many places during the Middle Preclassic. Sometime during the Late Preclassic there was a shift from a stable environment to what Beach and colleagues (2006) call an aggrading environment. Erosion processes resulting from higher populations and increased deforestation for the production of lime plaster caused the wetlands to silt in with aggraded sediment. This wetland transformation combined with a possible drought (Gill 2000; Hodell et al. 2001) seems to have strained the nascent San Bartolo capital contributing to its abandonment. Surviving populations in the San Bartolo-Xultun territory nucleated around Xultun and possibly the site of La Prueba on a large *bajo* island northwest of San Bartolo. This set the stage for a major territorial capital shift in the Early Classic.

In the Río Azul-Kinal territory a similar process of nucleation took place. Adams (1995:40) argues that a prolonged drought hit the already competitive political situation between Río Azul and Arroyo Negro, leading to a series of crop disasters. Under this scenario it is unclear whether nucleation was voluntary or forced, but populations did increase at Río Azul, while sites like Arroyo Negro and other Late Preclassic villages were abandoned. Part of this transition may have also been effected by the aggrading environment argued for the San Bartolo-Xultun territory to the southwest. As the Bajo de Azúcar, which feeds the Río Azul, became seasonal rather than perennial, it seems likely that the Río Azul made a similar shift from a perennial river to a seasonal drainage. This undoubtedly would have interrupted the continuous Preclassic settlement along the river course as water would only pond permanently in certain areas.

In the La Milpa territory the Far West Bajo was perennially wet until at least A.D. 100 (Dunning et al. 2003:18), which probably effected the annual flow of Thompson's Creek. That being said, this *bajo* also made the shift to an aggrading environment leading to the near total abandonment of the La Milpa periphery during the Late Preclassic to Early Classic transition. Consequently there was a nucleation of a greatly reduced population in the La Milpa center at this time (Hammond and Tourtellot 2004:Figure 13.3). While the exact timing is unclear it seems that these processes may have taken place later than in sites to the southwest based on the late date (A.D. 100) of wetland species in the Far West Bajo pollen profiles.

In the Blue Creek territory, Guderjan (1996:8) argues that Blue Creek was the capital of a territory at the end of the Late Preclassic. Unlike the previous territory discussions, Guderjan (1996; Guderjan et al. 2003:83-85) does not mention a population decline at Blue Creek during the Late Preclassic to Early Classic transition. Data from Blue Creek suggest that the environment made the same shift from stable to aggrading as in other portions of the Three Rivers region (Beach et al. 2006:170), but according to

Guderjan and colleagues (2003:83) there is an acceleration in monumental construction at this time. Perhaps Blue Creek's proximity to the perennial portion of the Río Azul spared it from disaster. It seems that Blue Creek established itself as a territorial capital during the Late Preclassic to Early Classic transition, possibly facilitated by the weakened state of some of its neighbors.

Once again there is no data for La Honradez, Xmakabatun, Chochkitam, or Punta de Cacao. The population of Dos Hombres center declined during the Late Preclassic to Early Classic transition, but rural populations seem to have increased (Houk 1996:116; Robichaux 1995:244-246). There is no hinterland data for the Chan Chich territory at this time, but Guderjan (1991b) does indicate an Early Classic presence at the Chan Chich capital. Whether or not there is nucleation throughout the territory is unclear.

The Late Preclassic to Early Classic transition took place over the course of 100 to 150 years during the 2nd and 3rd centuries A.D. The processes involved in this transition generally occurred in a southwest to northeast direction beginning with the San Bartolo-Xultun territory. This northeasterly trend also corresponds with the degree of social complexity reached in the Late Preclassic. San Bartolo-Xultun was a clearly defined territory with a settlement hierarchy and a defined capital at San Bartolo. The Río Azul-Kinal territory had a number of significant settlements with internal social hierarchies, but no clear settlement hierarchy. La Milpa was a small site with a dispersed rural population, but no clear settlement hierarchy. Blue Creek is a possible exception with its strategic location near the confluence of the Río Azul and Booth's River influencing settlement patterns. The other sites that would eventually become minor territorial capitals (Dos Hombres, Chan Chich, and Punta de Cacao) do not seem to be particularly significant during the Late Preclassic.

The level of social complexity in each of the territories is also related to total population. There is evidence of Late Preclassic occupation not only at all sites in the San Bartolo-Xultun territory, but also in portions of the San Bartolo-Xultun intersite area. The greater population and larger settlements caused more stress on the environment and led to aggrading sooner than in other territories to the northeast. Over the next century and a half environmental transformations effected the other territories as well. The result was a drastic decline in rural populations throughout the Three Rivers region.

The rural population decline and contemporary nucleations at select centers drastically changed the settlement dynamic internal to territories. In cases where heterarchical hinterland networks had existed, populations were now concentrated at single centers. Resources during this time would have been under the control of elite lineages cementing social hierarchies. The Late Preclassic to Early Classic nucleations initiated a gestation period during which the Classic Period territorial capitals were established and many new ruling dynasties were founded. The Early Classic represents the time when these newly formed Three Rivers region territories began serious geopolitical interactions across the Maya lowlands, moving beyond the realm of purely economic exchange.

Early Classic Period – A.D. 300-600

The Classic Period is characterized environmentally by a period of relative stability throughout the Maya lowlands. While there are indications of possible droughts during the so-called “Hiatus” (Rosenmeier et al. 2002:188) there is nowhere near as great a disturbance as those indicated both during the Late Preclassic to Early Classic transition and the Terminal Classic (Hodell et al. 2001). The more likely scenario is that there was no pan-Maya "hiatus" (Willey 1974) but rather disturbances at certain major sites due to geopolitical conflicts (Martin and Grube 2000).

The initial portion of the Early Classic Period in the Three Rivers region as a whole is a time of recovery following the disasters of the Late Preclassic to Early Classic transition. New agricultural methods, especially terracing, became widespread in order to exploit a new ecological niche created during the transitional period. This niche was the *bajo* footslope where the rich eroded sediments accumulated at the margins of the scrub *bajos* (Dunning et al. 2002; Dunning et al. 2003). There is evidence for terracing throughout the Three Rivers region, and while it is difficult to date terraces, they seem to postdate the Preclassic burial of paleosols in almost all areas (Beach et al. 2006).

The elite class that took control of the nucleated populations in many territories established royal lineages where previously none existed. While there is evidence at San Bartolo for the *ajaw* title in the Late Preclassic, it is unclear whether this marks the beginning of a royal line of succession or whether the title was instead an achieved status awarded to powerful shamans at this early time (Freidel and Schele 1988). Either way the concept of dynastic kingship was not widespread in the Three Rivers region until the Early Classic. The *ajaw* institution was associated with the supernatural during the Preclassic, as evidenced in the San Bartolo murals, but during the Early Classic the *ajaw* himself becomes a semi-divine entity, thereby integrating the institution of dynastic rulership with cosmological forces, including the agricultural cycle. These are the crucial steps that took place in order to set the stage for the Classic Period order.

In the San Bartolo-Xultun territory, Xultun emerges as the territorial capital. Three stelae at the site are securely dated to the Early Classic based on calendrical information with an additional three being stylistically dated to the period as well. The earliest securely dated monument at the site is Stela 20 which celebrates the 9th Baktun Period Ending in A.D. 435. While it is possible that Stela 12 predates Stela 20, based on their stylistic similarities they are probably both early 5th century A.D. monuments. If the abandonment of San Bartolo took place as early as A.D. 150, then it may have taken more than 250 years for the capital to shift to Xultun and for an elite dynasty to emerge.

On Stela 18, an important monument dated stylistically to the 6th century A.D. (David Stuart, personal communication 2003), a ruler, Ahk Nal, is named as the 33rd in the line of the founder of the Xultun dynasty (Figure 5.6). If this statement is true than the Xultun dynasty certainly predates the 5th century monuments. In terms of Xultun's relation with the Preclassic capital at San Bartolo there are two possibilities for what the statement on Stela 18 implies. The first possibility is that when the territorial capital shifted from San Bartolo to Xultun the elites moved from the former site to the latter. The second possibility is that Xultun's elite class, which would have been subordinate to San Bartolo in the Preclassic, were asserting the antiquity of their own heritage in order to erase the memory of the San Bartolo rulers. This question will only be answered with further excavation and epigraphic analysis.

Finally, Xultun exhibits important ties to Tikal in the Early Classic. The details of this relationship go beyond the Three Rivers region scale of analysis and will be discussed in the following chapter discussing Maya geopolitics and the Tikal Alliance. Suffice it to say that Tikal seems to have temporarily united with the major Three Rivers region territories during the Early Classic. I believe that this was in an effort to control an exchange corridor to the Caribbean Sea via the Río Hondo.

Coming out of the Late Preclassic to Early Classic transition Río Azul emerged as a strong territorial capital. Adams (1995:41) places the rise of Río Azul at ca. A.D. 385 and believes that Tikal conquered Río Azul at this time to make them an ally. Although, there is no explicit epigraphic evidence for a violent interaction. Adams (1995:41, fig. 31) interprets stuccoed altars at Río Azul as depicting bound captives representing the conquered Río Azul elite, although there is no glyphic evidence to confirm this claim. On Río Azul Stela 1, dating to A.D. 392, the Río Azul ruler Sak B'ahlam is depicted together with Sihyaj K'ahk' (Adams 1995:41), a general from Teotihuacan who entered the Maya area, and specifically Tikal in January of A.D. 378 (Martin and Grube 2000; Stuart 2000). While it is likely that Sihyaj K'ahk' installed Sak B'ahlam at Río Azul there does not seem to be any direct evidence for this being a violent act. Instead, Sihyaj K'ahk' may have been installing loyal elites at strategically located sites in order to establish allies for the new dynasty he placed at Tikal beginning with Yax Nuun Ayiin I (Martin 2003; Martin and Grube 2000).

Río Azul's dynasty flourished during the Early Classic, with 95% of the city being constructed during that time (Adams 1995:42). As a territory Río Azul benefited by being positioned to the northeast of the confluence of the Río Tikal, Ixcanrío, and the Río Azul, which means that all canoe trade coming from around the Bajo de Azúcar during the wet season would have had to have passed by Río Azul. Furthermore, the river provided a naturally defensible boundary to the capital to both the north and the west, while the generally low lying terrain surrounding Río Azul would have presented a challenge for invaders coming from the south or east. The divine rulers and high elites of Early Classic Río Azul were buried in elaborate painted tombs, many depicting iconographic connections with both Tikal and central Mexico (Adams and Robichaux 1992). During the early 6th century the Río Azul capital appears to have been sacked and burned by invaders. Adams (1995:44) places the timing of this event at A.D. 530, accompanied by a near total abandonment of Río Azul.

The La Milpa territory was also established during the Early Classic Period. Numerous stelae date to this time period indicating a dynastic presence. This is further confirmed by an Early Classic royal tomb dating to A.D. 450 ± 40 (Hammond et al. 1996:90). There is monumental construction at the La Milpa capital towards the end of the period at Structure 5 (A.D. 450-600)(Hammond et al. 1996:88). There are also two large *aguadas* near La Milpa Center as well as two artificial reservoirs built to supply the community (Scarborough 1994). The Early Classic rural population gradually expanded, with a presence detected in 50-60% of Robichaux's (1995:273-276) peripheral test pits. An Early Classic presence is found at the substantial minor center of Ma'ax Na, most notably in the construction of a ball court (King and Shaw 2003:68), as well as at the minor center of Say Ka (Adams 1999:Appendix 2, Table 2). There is also a significant Early Classic presence at numerous extended family, multiple courtyard group sites, including: Las Abejas (Houk 1996:116), Thompson's Group (Kunen 2006:108), and La Milpa East (Tourtellot et al. 2002:634). This indicates that La Milpa was an established territorial capital with a clear settlement hierarchy in place during the Early Classic. While there is no direct evidence for contact with Tikal, La Milpa was probably allied with the great center in the Early Classic given the evidence from adjacent territories.

The Blue Creek territory, which may have been established in the Late Preclassic, thrived and expanded during the Early Classic (Guderjan 1996). Large stucco masks were built on Structure 9, with iconography marking it as a “flower house” (Grube et al. 1995). This type of structure has been interpreted as a place for dancing and counsel (Fash et al. 1992; Freidel et al. 1993:257-263) as well as a building for royal accessions (Guderjan 1996:10). The population of the territory increased with evidence of an Early Classic presence at many of the small sites around Blue Creek (Guderjan et al. 2003). At the beginning of the 6th century A.D. there was a large ritual deposit made in the Main Plaza at the Blue Creek capital indicating a major change at the site. Guderjan (1996:15-16) interprets this event as the end of the royal bloodline at Blue Creek. I believe this event may have been related to broader geopolitics occurring in the Maya lowlands at the end of the Early Classic (see Chapter Seven).

Once again the data for Xmakabatun and Chochkitam is nonexistent due to lack of research. Inspection of looter trenches at La Honradez by Quintana and Wurster (2001) and by a team from the San Bartolo Project (Román et al. 2006) found stucco masks similar to the ones at Blue Creek that may date to the Early Classic. In the smaller territories to the east there is very little Early Classic data. Houk (1996:118-119) believes that the Dos Hombres capital was smaller during the Early Classic than in the preceding period. At Chan Chich there may have been some architectural expansion (Houk 1996:118, 2003:59), but the evidence is unclear at this point. There is no data for Punta de Cacao in the Early Classic.

Overall the Early Classic saw the birth of the major territories with capitals at Xultun, Río Azul, La Milpa, Blue Creek, and probably La Honradez. These sites, while functionally independent were almost certainly part of a larger alliance of territories associated with the great site of Tikal to the southwest. The implications of this association involve analysis at a scale larger than the Three Rivers region and are treated in the following chapter. The most important developments from a regional perspective were the population rebound following the events of the Late Preclassic to Early Classic transition, and the establishment of local dynasties that each controlled a territorial settlement hierarchy.

Late Classic Period – A.D. 600-850

The Late Classic Period saw a population explosion throughout the lowlands and the florescence of the ancient Maya civilization (Culbert and Rice 1990). In the Three Rivers adaptive region there is no clear evidence of monumental construction during the first century of the Late Classic (Tepeu I, A.D. 600-700)(Sullivan and Sagebiel 2003), although there were stelae dedications at Xultun and future excavations may indicate monumental construction as well. This cessation of activities has been attributed to the withdrawal of Tikal from the Three Rivers region at the end of the Early Classic (Adams 1995; Sullivan and Sagebiel 2003:27), a proposal which will be discussed in detail in the following chapter.

The Late Classic Three Rivers region territories seem to have adopted a regional culture expressed through similarities in site planning. Houk lists the following site plan elements for the Three Rivers region:

> 1. a large, rectangular plaza; 2. a quadrangle group that is attached to and elevated above the main plaza; 3. an acropolis-like group that is typically juxtaposed with the main plaza; 4. a ballcourt that usually mediates between the two main groups of architecture; 5. at least one stela; 6. internal causeways connecting otherwise separated sections of the site

> core; 7. large causeways that radiate out from the site core to distant architectural groups or features; and 8. a north-south alignment of the major architectural groups [Houk 2003:54].

Of these, the ball court (4), the causeways (6, 7), and the north-south alignment (8) are all characteristics of a broader Peten site planning template defined by Wendy Ashmore (1991). Although, it should be noted that some causeways in the Three Rivers region are not typical, raised causeways (*sacbe*), but rather are open spaces flanked by low, parallel architectural features (Houk 2003:58-60). These sunken causeways appear to be a rare, regional architectural form (Houk 2003:60).

Also of interest, although not emphasized by Houk, is that ball courts in the Three Rivers region sometimes appear within, or directly attached to the main plaza at many sites. Examples include San Bartolo (Garrison and Mejía 2002), La Milpa, Plaza A (Tourtellot et al. 2003:Figure 4.4), La Honradez, Group A (Houk 2003:Figure 5.3), Chan Chich, Group A (Houk 2003:Figure 5.4), Ma'ax Na, Plaza A (King and Shaw 2003:Figure 6.2), and possibly Blue Creek, Plaza A (Guderjan et al. 2003:Figure 7.7). The placement of the Chan Chich ball court in the southeast corner of Group A suggests that it may have served as a mediator between north and south architectural groups while at the same time being more directly affiliated with Group A. This style of ball court placement has precedence in the northeast Peten at Uaxactun where the court is located in the southeast corner of Group B (Graham 1984).

Many of the patterns of the Three Rivers template were established in the Late Preclassic at San Bartolo (large main plaza, plaza ball court, stelae, and a sunken causeway), but their widespread adoption throughout the region was not realized until the Late Classic. Perhaps the most significant regional characteristic of the Three Rivers site plans is the enormous plazas found at most major sites. Table 6.3 shows the areas of the plaza spaces at some of the major sites in the Three Rivers adaptive region, following work originally done by Brett Houk (1996). Clearly San Bartolo and Xultun belong in

Table 6.3. Area of select plaza spaces in the Three Rivers adaptive region

Site	**Plaza Area**	**Source**
Xultun - Plaza B	22,610 m^2	Garrison
La Milpa - Plaza A	18,730 m^2	Houk 1996:Table 5.2
Chan Chich - Plaza A-1	13,080 m^2	Houk 1996:Table 5.2
Dos Hombres - Plaza A-1	12,910 m^2	Houk 1996:Table 5.2
San Bartolo	11,950 m^2	Garrison
Kinal - North Plaza	10,700 m^2	Houk 1996:Table 5.2
Great Savannah	10,000 m^2	Houk 1996:Table 5.2
Gran Cacao - Plaza B-2	9,000 m^2	Houk 1996:Table 5.2
La Milpa - Plaza B	8,170 m^2	Houk 1996:Table 5.2
Punts de Cacao - Plaza A	7,540 m^2	Houk 1996:Table 5.2
La Honradez	6,650 m^2	Von Euw and Graham 1984*
Chochkitam	6,000 m^2	Morley 1937-1938**

* No computer calculation used, area estimated from map
** No computer calculation used, area estimated from Morley's notes

the same group as the other Three Rivers region sites, lending further support for their inclusion in that region. Xultun Plaza B is second only to the Great Plaza at Copan (Fash and Long 1983:map 12) in terms of area, with the Copan plaza measuring between 25,000 and 34,750 m^2 depending on how much space is included in the calculation.

Houk (1996:140-141) summarizes previous interpretations of why there are large plaza spaces in the region. The most common suggestions are that they were places of ritual, places of refuge and defense, or complex microwatersheds for water management. Scarborough and Valdez (2003:8-9) argue that plaza size in the Three Rivers region may be correlated with the size of hinterland populations. Assuming this is true they go on to suggest that there were interdependent heterarchical relationships between sites of all sizes. The statistical correlation between known plaza areas and the suggested territory areas yields an r-value of 0.73 as shown in Figure 6.16, with an R^2 value of 53%. One possible confounding variable in the above correlation is that *bajos*, which were important resource areas, but not habitation areas, are not subtracted from the overall territory area. As it stands this correlation has very little explanatory power and is significantly weaker than the relationship between site score and territory area presented earlier (Figure 6.4), which has an R^2 value of 76%.

I believe that rather than emphasizing heterarchical relationships, the large plazas of the Three Rivers region are explicit statements of hierarchical control over their hinterland populations during the Late Classic Period. With the exception of Ma'ax Na in the La Milpa territory, no other territorial capital in the Three Rivers region appears to have allowed minor centers to construct monumental temples approaching the size of those at the capital. Ma'ax Na may be an exception due to its ritual importance and association with caves (King and Shaw 2003). In the San Bartolo-Xultun territory there are literally no known pyramids outside of the two capitals.

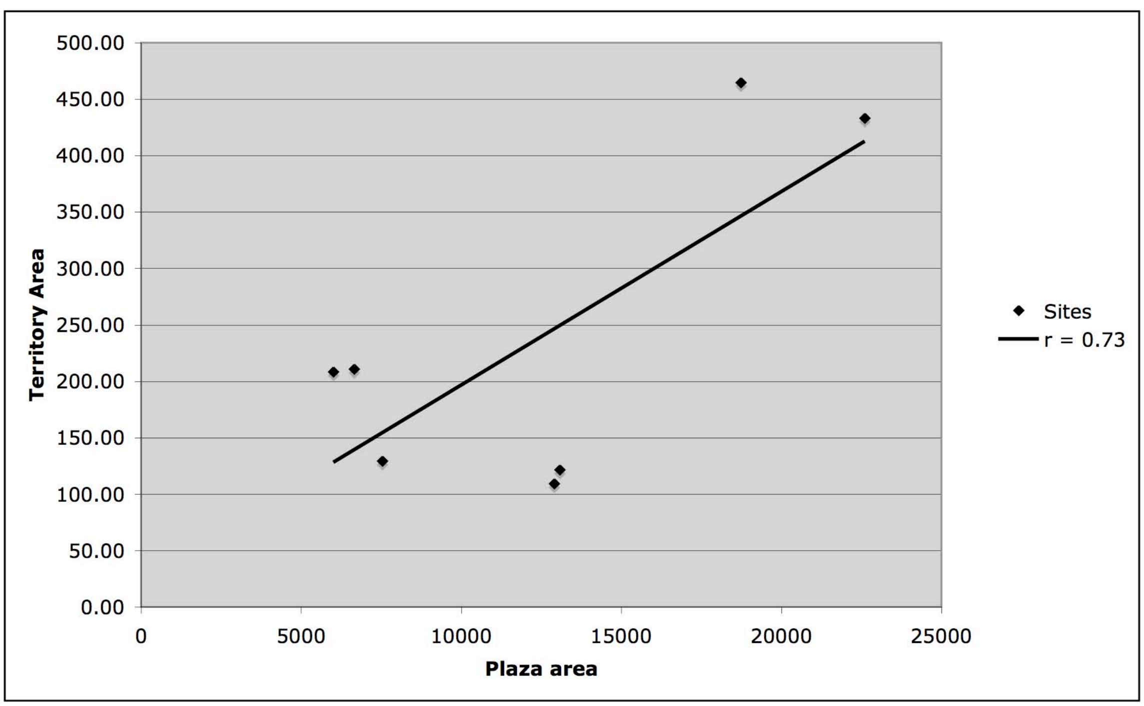


Figure 6.16. Correlation of Three Rivers plaza areas with territory areas.

I agree with Scarborough and Valdez (2003) that the plazas were locales for the gathering of the entire hinterland population, but I believe that such events occurred to celebrate important public rituals which were not permitted outside of the capital. There is an ethnographic parallel from the modern *municipio* of Zinacantan in Chiapas, Mexico. There all of the churches are in the ceremonial center while the outlying hamlets only have small chapels. Furthermore, the hinterland population of Zinacantan, living in numerous hamlets, congregates at the municipal capital for major rituals such as the New Year's ceremony (Vogt 1976). By requiring the regular assemblage of the total population a Late Classic territorial ruler would constantly be informed of how many people were under his control as well as the geographic extent of his authority. This may have been particularly important to maintaining control following the withdrawal of Tikal from the region.

Another aspect of this proposed Three Rivers style of management is the political economy. Times of ritual gathering would also have been used to exact tribute. The major territories of the Three Rivers region were located strategically along a major riverine trade corridor. The elite could have managed the distribution of important traded goods to the hinterland further exerting their power over the general population. During public rituals, which probably involved pilgrimages throughout the territory (Craig 2004), the capital elites would provide the representatives of the subsidiary centers and extended household groups with ideological nourishment. These rituals would involve worldmaking, worldcentering, and worldrenewing ceremonies that were essential to the continual function of the cosmos in Mesoamerican religion (Carrasco 1990:19-23). These rituals would have taken on a regional character based on shared perceptions of the local environment as it is defined for the adaptive region. It is even possible that some physiographic provinces further influenced local perceptions of the environment, which would explain the division between Houk's (2003) Northern Belize Style Site Plans versus Peten Style Site Plans.

The Three Rivers region once again became involved with Tikal in the Late Classic, but during the intervening century many of the sites developed a shared sociopolitical system involving the management of hinterland populations. Although, there were significant changes at some of the individual territories as well. The most important change was in the Río Azul-Kinal territory, where the capital shifted to the fortress-like site of Kinal in the mid-8th century, marking the early onset of the Terminal Classic in this territory (Adams 1999). Other important changes occurred in the southeastern portion of the Three Rivers region where sites like Dos Hombres, Chan Chich, and Punta de Cacao firmly established themselves as territorial capitals. Houk (2003:61-63) believes that Late Classic Dos Hombres and Chan Chich were communities that "hive[d] off" of La Milpa and La Honradez respectively. He goes on to argue that La Milpa and Dos Hombres, for example, would have maintained horizontal connections, possibly even heterarchical. I agree that there were horizontal relationships between all of the Three Rivers territorial capitals, but I do not believe that we can say clearly that one site was specifically descendant from another without an explicit textual statement. I am more inclined to agree with Ashmore and Sabloff (2002:206-207) who argue that younger centers replicated older ones, but make no claim of descent between these sites.

The most likely scenario for the emergence of smaller territories in the Late Classic is that following the withdrawal of Tikal from the region there was a brief power vacuum in which numerous small, geographically isolated centers were able to build up a certain degree of independence. Further support for this comes from a possible Emblem Glyph for Dos Hombres on a polychrome sherd found at that site (Adams et al. 2004:324). The Three Rivers territories seem to have become more and more affiliated with a rejuvenated Tikal during the latter part of the Late Classic (Tepeu 2) (see Chapter Seven), before entering into another period of transition.

Terminal Classic Period – A.D. 850-1100

Like the period from A.D. 200-300, the Terminal Classic is a period of transition throughout the Maya lowlands. It has been assigned a period designation because the Tepeu 3 ceramic tradition can be isolated to this time period. The Terminal Classic played out differently in the various adaptive regions of the Maya area and a recent edited volume (Demarest et al. 2004) has admirably summarized our current understanding of this period. Similarly, the Terminal Classic differentially effected the territories of the Three Rivers region. As with the Late Preclassic to Early Classic transition the timing is not uniform for the Terminal Classic.

The Terminal Classic saw the gradual abandonment of the Three Rivers region. Extended droughts have been the most recently cited cause of these abandonments (Gill 2000; Hodell et al. 1995; Hodell et al. 2001), but the degree to which these effected the Three Rivers territories directly is unclear. If droughts effected the major trading partners of the Three Rivers territories that may explain the cessation in elite activity while small populations continued to live in the region until the end of the Terminal Classic. At the smaller territories in the southeastern portion of the region there are ritual ceramic deposits in the plazas and some of the structures of the territorial capitals suggesting the cessation of elite activity at these sites (Adams et al. 2004:337-339). Such deposits have been found at Dos Hombres (Adams et al. 2004:337-338), Chan Chich (Adams et al. 2004:338), Blue Creek (Guderjan 1996:17-18), and possibly Punta de Cacao (Guderjan et al. 1991). All of these have been dated to ca. A.D. 850. At La Milpa there appears to have been a sudden abandonment of the territory sometime between A.D. 830 and 850. There is no concrete evidence for what led to this collapse, but it has been interpreted as a short event that presents more questions than it answers (Hammond and Tourtellot 2004).

In the Río Azul-Kinal territory Adams (1999:186) argues that there was a Yucatec, possibly Puuc, invasion at Río Azul around A.D. 850, but that this was short lived and the site was abandoned within a decade. At the Kinal fortress a small group survived, but with no supporting population this site was also abandoned by A.D. 1000. Xultun appears to be the last holdout in the Three Rivers region with elite activity coming to an end in A.D. 889 and the final abandonment coming no later than A.D. 1080. A possible precursor to the end at Xultun comes from Chaj K'ek' Cue in the San Bartolo-Xultun intersite area where a ceramic deposit in the form of smashed *ollas* dating to the Late Classic was found on the steps of a structure in a courtyard group probably representing a termination ritual. As at Kinal it is possible that the surviving hinterland population nucleated in the capital until the territory was finally abandoned. After the Terminal Classic the next visits to the Three Rivers territories were not until centuries later when Lacandon and other Maya hunters and pilgrims came to Río Azul and La Milpa (Adams 1999:186; Hammond and Bobo 1994).

Structure, Function, and Change in the Three Rivers Adaptive Region

The above settlement pattern summary was derived from an enormous amount of data collected over many decades by numerous archaeologists and projects. Many of the interpretations I presented are different from, or variations of those proposed by the scholars that collected the original data. One of the major factors that led to my divergent interpretations was the extension of the Three Rivers region to the southwest to include San Bartolo and Xultun. This is how the region has previously been defined in terms of adaptive strategies (Dunning, Beach, Farrell, and Luzzader-Beach 1998), but not archaeologically. The Three Rivers region seems to have been defined archaeologically by drawing an arbitrary east-west line immediately south of either Chan Chich or La Honradez. San Bartolo and Xultun belong in the same group as the other major Three Rivers region based on analysis of site plans (Ashmore 1991; Houk 2003), as well as physiography (Dunning, Beach, Farrell, Luzzadder-Beach 1998). By incorporating the San Bartolo-Xultun data with that generated from the other Three Rivers region projects we get a much richer picture of culture history for an entire physiographically defined adaptive region. At this scale of analysis structure function and change are considered at the level of the region as a whole, emphasizing the capitals, rather than at the territorial level presented in Chapter Five.

The structure of the Three Rivers region during the Middle Preclassic is a series of nucleated villages located on raised uplands. These first settlements were located in proximity to either rivers or perennial wetlands. This primordial environment may have been harkened back to in later times as embodied in the "Place of Reeds" concept known as *tollan* or *pu* in Nahuatl and Maya respectively (Stuart 2000). During the first portion of this period the existing settlements built relationships that were probably heterarchical in nature. Towards the end of the Middle Preclassic public architecture is built at some sites reinforcing concepts of community and shared beliefs. There is also evidence of long distance exchange in limited contexts, which indicates that differential access to wealth was in place at some sites during this early period.

The changes that occurred that led to the Late Preclassic regional structure are not clear due to the paucity of material collected dating to the Middle Preclassic. Population increase and the growth and development of exchange networks were almost certainly factors. During the Late Preclassic a strong sense of social differentiation emerged at all major sites. A few sites achieved dominance over surrounding settlements that had sprung up during population growth, forming the first formal territories in the Three Rivers region. These territories were led by an *ajaw* who orchestrated architectural programs within the capital. In other areas, particularly along river flows, sites continued to compete for territorial dominance. There is no evidence that the established capitals at San Bartolo and possibly Blue Creek exerted any hierarchical influence over sites outside of their territorial boundaries. In this sense this may be an isolated period where heterarchical interactions may have taken place between sites of different size and complexity (Scarborough and Valdez 2003). Functions can generally be considered as horizontal during the Late Preclassic with vertical hierarchical functions being the exception.

The major change that took place at the Late Preclassic to Early Classic transition was a shift from a stable environment to an aggrading one (Beach et al. 2006). While there was likely a combination of human and natural causes for this shift (Dunning 1995), it seriously altered the regional structure. In some ways the region returned to its initial Middle Preclassic structure in that populations nucleated at long standing settlements while many sites that had been occupied in the Late Preclassic were abandoned. Nevertheless, the social hierarchies that had emerged within sites during the Late Preclassic effected how individuals interacted in the Early Classic nucleated communities.

Resources were scarce in the Three Rivers region following the Late Preclassic to Early Classic transition, and new agricultural technologies had to be invented to exploit the changed environment. Elites that had emerged during the Late Preclassic seized control of resources. This is most evident in the construction of water management features at this time (Scarborough 1994). As the environment stabilized divine royal lineages emerged as controlling forces in the Three Rivers region territories and long distance exchanges were resumed, particularly with Tikal. In terms of function the Three Rivers territorial capitals interacted with one another horizontally, but there were very few hinterland communities in the territories throughout the Early Classic.

Two major changes occurred in the Three Rivers region at the onset of the Late Classic that altered the regional structure. First, Tikal withdrew from the region creating a power vacuum, particularly in the physiographically fragmented southeastern portion of the Three Rivers region. Secondly, starting with Tepeu 2, there was a population explosion throughout the region. The resultant structure, as reflected in settlement patterns, was a series of complex territorial hierarchies. Each of these had a capital center and a supporting hinterland population organized into embedded heterarchies. Evidence for horizontal functions within the embedded heterarchies comes from their generally uniform material culture, while horizontal ties between the territorial capitals are reflected in their shared site plans. Most prominent are the large plaza spaces that were used by the Three Rivers region elites to assemble their entire hinterland populations for public rituals that were not permitted outside of the capital. Late Classic functions involved the hierarchical interactions between territorial elites and their subordinates in which sustaining ritual was exchanged for material tribute most likely in the form of agricultural surplus. The need for these rituals was fostered by a shared perception of the local environment.

Toward the end of the Late Classic and beginning of the Terminal Classic there was a major change in the Three Rivers region, with the cessation of elite activity occurring at all territories between A.D. 830 and 889. There is no direct evidence from the Three Rivers region for the lengthy drought that is proposed to have occurred around this time. Though, most of the evidence for the drought in the lowlands shows up best in lake cores and there are very few lakes in the Three Rivers region, so drought cannot be ruled out. If drought did not directly effect the Three Rivers elites, it may have had an indirect effect by crippling the complex exchange network developed with sites in other adaptive regions. If important trade partners succumbed to drought than the Three Rivers elites may have lost access to the ritual paraphernalia necessary to maintain their theatre states (Demarest 1992). Regardless of what happened, the resultant Terminal Classic structure seems to have involved small, nucleated squatter populations living amongst the ruins of the former territorial capitals, exploiting the remaining water sources, until finally abandoning the region by A.D. 1100 at the latest. There is no direct evidence for what sorts of functions may have taken place during the Terminal Classic if there were any at all between Three Rivers region sites.

Conclusions

This chapter reviewed the archaeological data that has been collected for one adaptive region: the Three Rivers region. A rank ordering system was used to identify territorial capitals and other types of sites in the settlement hierarchy, and the territories that make up the Three Rivers region were defined. The San Bartolo-Xultun territory data presented in Chapter Five was integrated with constructed culture histories from the other territories that make up the Three Rivers region emphasizing the interactions between the territorial capitals through time. The regional culture history was summarized in terms of structure, function, and change.

The territory is a critical concept for looking at interactions between sites in the Maya area. While it is an admittedly constructed concept, the idea of the territory is supported by hieroglyphic evidence, statistical analysis of regional settlement patterns, ethnohistoric data, and ethnographic analogies with modern Maya groups (see Chapter One). The territories of the Three Rivers adaptive region were united in the sense that they occupied the same trade routes that converged on the Río Hondo. The capitals of these territories had strong affiliations with Tikal, as will be presented in the next chapter, but they also demonstrate strong affiliations internal to the region, particularly during the Late Classic. The territories were further united by a shared hierarchical structure with their hinterland populations in which the most important rituals required the full gathering of the people of the territory within the capital’s main plaza. These rituals, in addition to protection, land, and some goods, are what the dynastic elites provided to their subjects in return for tribute in a hierarchical dynamic.

Some important aspects of the regional archaeological analysis are the trends seen during periods of change. Almost every dynamic in the Three Rivers region expresses a temporal and spatial trend. For example, the collapse of Late Preclassic settlements begins in the southwest and progresses to the northeast along the course of the Río Azul. Also, the emergence of established territories with clear capitals begins with the large territories in the northwest and proceeds through time to the southeast with many small territories emerging in physiographically fractious zones during the Late Classic. Demarest, Rice, and Rice (2004) highlight the spatial and temporal differences in Terminal Classic processes throughout the Maya lowlands. Analysis of Three Rivers region settlement patterns and culture history suggests that some of these processes may be unfolding at even smaller scales of time and space than previously thought.

The adaptive regional scale of analysis presented above serves to highlight the relationships between adjacent sites that are physiographically linked within a single adaptive region. Similarities in site plans and material culture reflect shared principles held amongst the elites of the major sites. In the following chapter the Three Rivers adaptive region data is integrated with settlement data from the broader Maya lowlands, particularly emphasizing the role of Tikal geopolitics on settlement patterns in the Three Rivers region.

Chapter 7: The Tikal Alliance

Introduction

The final scale of analysis in this dissertation is to contextualize the Three Rivers region settlement pattern data into a broader Maya lowlands framework. Numerous edited volumes have attempted to synthesize pan-Maya data related to settlement patterns (Ashmore, ed. 1981), population dynamics (Culbert and Rice 1990), subsistence strategies (Harrison and Turner 1978), and political interactions (Culbert 1991). The complexity of Maya civilization, particularly during the Classic Period makes a pan-Maya synthesis using a conjunctive approach a nearly impossible task, particularly within the scope of this dissertation. Instead, I choose to contextualize the Three Rivers region data into broader lowland patterns by focusing on that region's close relationship with the site of Tikal, which has been argued as a putative superstate (Culbert 1991; Martin and Grube 1995, 2000).

The Three Rivers region's settlement history was intimately linked to the geopolitical fortunes of Tikal. During times when the Tikal ruling dynasty was a major power the territories of the Three Rivers region, and other adaptive regions as well, united with the Tikal ruling dynasty in what has been called the Tikal Regional State (Adams 1995, 1999) or the Tikal superstate (Martin and Grube 1995, 2000). Here I choose to call these periods of expansion and unity the Tikal Alliance. The definition of alliances, as they are used in this study are presented in Chapter One. Suffice it to say here that alliances were temporary moments of broader unity that interrupted the otherwise stable geopolitical situation of independent territories. What follows is a lowland Maya culture history focused on, but not limited to the Tikal Alliance. The model that is presented is then explained in terms of the landscape ecology terms of structure, function, and change.

Maya Lowland Geopolitics and the Tikal Alliance

Middle Preclassic Period – 1000-400 B.C.

The Middle Preclassic saw the first settlers of the interior Maya lowlands in many areas. The Peten Karst Plateau, consisting of the Mirador Basin and Northern Plateau adaptive region and the Southern Plateau adaptive region, was covered in pristine high forest interspersed with large areas of perennial wetlands. The most significant lowland settlement during this time period was by far the site of Nakbe in the north-central Peten (Hansen 1992b). At Nakbe, Hansen (1992b) argues that an economic inequality related to the agricultural base emerged and that the resultant elite population began to dictate public projects at the site. Major architectural constructions included hydraulic systems, buildings, and possibly even causeways (Hansen 1992b, 1998). Nakbe was also involved in extensive long distance trade with marine shells found relatively frequently and obsidian being traded from the San Martín Jilotepeque source in the Guatemalan highlands (Hansen 1993). Similar evidence, both in the form of long-distance exchange and public architecture was present in isolated areas of the Three Rivers region at this time as well (see Chapter Six). Although, there is no clear indication of what relationship if any, the Three Rivers region sites had with the populations at Nakbe.

At Tikal, in the Southern Plateau adaptive region, the earliest Middle Preclassic populations settled between 800-600 B.C. (Harrison 1999:48-51). Unlike to the north and northeast, the pioneers at Tikal did not seem to have constructed any form of monumental architecture at this early time. Nevertheless, as at contemporary sites in the Maya lowlands, there is evidence of long distance exchange at the early Tikal villages in the form of imported obsidian and quartzite (Harrison 1999:49). Towards the end of the Middle Preclassic the dispersed villages at Tikal increased their production of homogenous Tzec Phase ceramics, suggesting that the dispersed settlements were becoming more unified at this time (Culbert 2003; Harrison 1999).

Late Preclassic Period – 400 B.C.-A.D. 200

The Mirador Basin and Northern Plateau adaptive region saw what was probably the first example of Maya political expansion. The Mirador Alliance has been argued as extending as far away as Cerros on the Belizean coast (Reese-Taylor and Walker 2002). The monumentality of architectural construction at El Mirador is unrivaled throughout the course of Maya prehistory. Distinctive architectural traits such as triadic pyramid groups achieved enormous dimensions at El Mirador (Hansen 1998). While it is difficult to determine the extent of El Mirador's Late Preclassic political influence, it is clear that significant independent territorial powers emerged contemporaneously in scattered regions of the lowlands.

In the Three Rivers region, San Bartolo emerged as a territorial capital during the Late Preclassic. The San Bartolo elites commissioned hieratic art that so far has no known rival for that time period. In other portions of the Three Rivers region no clear territorial power emerged. Were these territories part of broader hegemonies based at El Mirador or San Bartolo? This question is impossible to answer based on current data. While San Bartolo is nowhere near the size of El Mirador, either in extent or monumentality, it is a significant settlement with some very large constructions. The

Late Preclassic Saraguates Complex at San Bartolo reached a mass of over 275,000 m^3, although much of this structure was built on a large, natural hill that probably represented a local sacred mountain to the community. If San Bartolo was participating in El Mirador's exchange network at this time, it sill maintained a certain degree of independence from the largest Late Preclassic center. This is proven by the clear statement of a local *ajaw* on the San Bartolo murals (Saturno et al. 2006). Notably no extensive hieroglyphic texts or hieratic art have been uncovered at El Mirador, and there is no direct evidence for the *ajaw* political rank.

In the Southern Plateau adaptive region Tikal also grew into a sizeable independent center, roughly the same size as (though perhaps smaller than) San Bartolo, during the Late Preclassic (Coe 1990). The Lost World Complex and the North Acropolis were the two major foci of monumental architecture at Tikal during this period (Harrison 1999). While there are no known texts from the site dating to the Preclassic, there are numerous sumptuous burials from the Late Preclassic that indicate elite and probably royal individuals were living at Tikal at this time. Once again the relationship between Tikal and the putative Mirador Alliance is unclear, but Tikal, like San Bartolo, definitely had some degree of independent control over its surrounding territory during the Late Preclassic. Based on estimates derived from counts of kings and average reign lengths during the Classic Period it is estimated that the Tikal dynasty may have been founded by Yax Ehb' Xook during the late 1st century A.D. (Martin and Grube 2000:26).

Late Preclassic to Early Classic Transition – A.D. 200-300

The catastrophes of the Late Preclassic to Early Classic transition have been discussed in previous chapters. More than any other region, the Mirador Basin suffered dramatically during this time period. Control of the region had shifted from Nakbe to El Mirador during the Late Preclassic, but as population grew and the environment shifted from stable to aggrading, all sites in the Basin became stressed. Hansen and colleagues (2002) argue that deforestation from lime production caused the sedimentation of the *bajos*, thereby leading to catastrophic collapse throughout the region. The dissolution of the Mirador Alliance represents the first failure of a major political power to expand beyond its territory. Reese-Walker and Taylor (2002) argue that the collapse of El Mirador led to a destabilization of lowland trade networks, resulting in the collapse of distant sites such as Cerros. It is unclear exactly to where the surviving population of the Mirador Basin emigrated, but one likely candidate seems to be the Kaan territory to the north (Martin and Grube 2000:102). Codex-style dynastic vases, produced during the Late Classic around Nakbe, refer to early Kaan rulers whose origins may have been at El Mirador (Martin 1997). Recent evidence suggests that the early Kaan capital may have been at Dzibanche (Martin 2005b), but there was also a significant population at Calakmul at this time.

In the Three Rivers region, San Bartolo and many other centers were abandoned during this time. The rural populations that had begun to expand during the last centuries of the Late Preclassic once again contracted into nucleated settlements in select resource-strategic areas. This period of nucleation served as a gestation period for the cementing of local social hierarchies and the emergence of powerful territorial dynasties. What resulted was that the sites of Xultun, Río Azul, La Milpa, and Blue Creek grew into large independent capitals with control over their own destinies.

In the Southern Plateau adaptive region, Tikal seems to have largely avoided the catastrophic effects of the Late Preclassic to Early Classic transition. The Tikal dynasty, which likely had its origins in the Late Preclassic continued unbroken into the Early Classic Period. How was Tikal able to survive an early demise? There were probably three factors contributing to Tikal's perseverance. First, even when the Peten is in the midst of a significant drying trend, climate is extremely localized. As an example, during the 2004 field season at San Bartolo our camp flooded due to almost daily rain storms while the Bajo de Juventud at Uaxactun, just 30 km to the southwest, remained dry through most of April. While there is no direct evidence, Tikal could have been spared the worst of any long term climatic drying at the end of the Late Preclassic. Second, Tikal may have improved their chances of survival by developing complex water management strategies at an early stage of development. The large and numerous reservoirs at Tikal (Scarborough and Gallopin 1991) may have been constructed during the Late Preclassic. The ability to manage water would have been crucial to survival and also would have played a role in the development of socioeconomic hierarchies through the control of this precious resource. Finally, Tikal's own slow development during the Middle and Late Preclassic, in comparison to the Mirador Basin, may have delayed the shift from a stable to an aggrading environment in time for the population to develop the necessary strategies to stabilize eroding slopes through terracing. Through some combination of these factors Tikal successfully emerged as the dominant power of the Maya lowlands during the Early Classic.

Early Classic Period – A.D. 300-600

The Early Classic rulers of Tikal were descendant from Yax Ehb' Xook, the dynastic founder who took the throne possibly at the end of the 1st century A.D. (Martin 2003:5; Martin and Grube 2000:26). As other sites began to collapse to the north and east, Tikal continued to grow at the onset of the Early Classic and may have been receiving refugee populations from some of the sites that succumbed at the end of the Late Preclassic. This is evidenced by the increased number of perishable, "hidden" structures dating to this period that were excavated by Bennet Bronson in 1966 (Puleston 1973:165-168). With political power firmly established in the form of a royal dynasty as well as a strong supporting population, Tikal was quick to begin its political expansion.

Tikal's first step was to unify its territory. As early as A.D. 307 Tikal rulers were erecting portrait stelae at minor centers nearby. This is the date of a stela found at the small site of El Encanto, located some 10 km to the northeast of Tikal that was probably dedicated by Tikal's 11th ruler Sihyaj Chan K'awiil I (Martin and Grube 2000:27). Further territorial consolidation took place under the 14th Tikal ruler, Chak Tok Ich'aak I. Chak Tok Ich'aak I honored his father K'inich Muwaan Jol's death with a stela dedicated at the minor center of Corozal, 5 km to the east. It is also possible that a stela found at the site of El Temblor, even further east, refers to Chak Tok Ich'aak I's accession to the Tikal throne (Stuart 2000:471). Toward the end of the 4th century A.D. Tikal had secured control over its own territory and had established contact, if not exchange networks (see Iglesias 2003 for argument against strong economic ties) as far as Central Mexico and Teotihuacan (Martin and Grube 2000:28). This set the stage for an event that would change the dynamic of lowland geopolitics and lead to the formation of the Tikal Alliance.

The role Teotihuacan played in the invasion of Maya sites has been recently revisited (Braswell 2003). Based on the evidence for the first 14 rulers of the Tikal dynasty it seems clear that Tikal consolidated its authority over surrounding centers in a standard Maya way of organizing territory. Having said that, Teotihuacan elites may be responsible for introducing the idea of hegemonic expansion to Tikal and the Maya lowlands in general. This process began with what has been labeled the *Entrada* of A.D. 378 (Martin and Grube 2000:29).

David Stuart (2000) has published the most thorough treatment of the “arrival of strangers” in A.D. 378. Two important figures are associated with this event. Sihyaj K’ahk’ appears to have been a Teotihuacan general who led the *entrada*, while Spearthrower Owl may have been the ruler of Teotihuacan during this time (Stuart 2000). Their arrival at Tikal is preceded by an event recording their arrival three days earlier at the site of El Peru/Waka’ to the west (Freidel et al. 2007). Importantly, Tikal Stela 31 records the death of Chak Tok Ich’aak I on the very same day that Sihyaj K’ahk’ arrives, almost certainly indicating a hostile exchange (Stuart 2000:478). The result of this interaction was that Spearthrower Owl’s son, Yax Nuun Ayiin I, took the Tikal throne over a year after the initial *entrada*. Prior to and during his reign Tikal began an aggressive campaign of expansion, with Sihyaj K’ahk’ playing a prominent role.

First, Uaxactun was absorbed into Tikal’s territory, after centuries of being a political equal. The sites of Sufricaya and Holmul seem to have also been incorporated early on by Sihyaj K’ahk’ (Alexandre Tokovinine, personal communication 2007). Yax Nuun Ayiin further expanded his influence beyond the Southern Plateau adaptive region by establishing the Tikal Alliance. It is probably during his reign that the Three Rivers region exchange corridor to the Caribbean Sea was brought under Tikal's influence. This is particularly evident by the presence of Sihyaj K'ahk' at Río Azul in A.D. 393 (Adams 1995) and the association between Teotihuacan and the Early Classic Río Azul tombs' material culture (Adams and Robichaux 1992). Adams (1995, 1999) argues that this intervention was a violent event at Río Azul, although other explanations are possible (see Chapter Six).

During the subsequent reign of Sihyaj Chan K'awiil II (A.D. 411-456), Tikal continued to expand. Ucanal, to the southeast, was brought into the Tikal Alliance during this time, as evidenced on a carved vessel from that site (Martin and Grube 2000:35). Other sites, such as Palenque, Copan, and Quirigua, founded dynasties during Sihyaj Chan K'awiil II's reign, and all of them have either textual or iconographic connections to Tikal or Teotihuacan. The dynastic founding of Copan especially seems to be directly connected to the Tikal dynasty, with K'inich Yax K'uk' Mo' almost certainly coming from the Peten, and probably Tikal (Sharer 2003). Likewise, the Quirigua founder, Tok Casper's accession was overseen by K'inich Yax K'uk' Mo' shortly after his own accession (Martin and Grube 2000:216). This is particularly important since the natural lowland system of territories did not ever emerge in the Copan Valley. Instead, a Teotihuacan derived system of political hegemony was put in place from the very beginning of Copan and Quirigua's dynastic histories, replacing a poorly understood, local Preclassic system of rule.

The next Tikal ruler, K'an Chitam, was in power from A.D. 458 to around A.D. 486. It is possible that he was married to a daughter of the Early Classic Naranjo king, Tsik'in Bahlam (Tokovinine and Fialko in press). This marriage would have been arranged by Sihyaj Chan K'awiil II as part of his own political expansion program. During K'an Chitam's reign another marriage alliance took place between Caracol and Xultun. The retrospective text from Caracol Stela 16 is unclear, but it seems to name Ix Yohl Ch'e'n of Xultun as the wife of the early Caracol ruler K'ahk' Ujol K'inich I (Figure 5.9) (Garrison and Stuart 2004). At this point there is no direct evidence that Xultun had been brought into the Tikal Alliance so early, but Xultun's location between Río Azul and Tikal makes it a likely supposition. In that case, Tikal may have overseen this marriage in order to bring Caracol into the Tikal Alliance. By the end of K'an Chitam's reign Tikal would have had access to the Río Azul, Belize River, and Río Motagua trade routes through connections with Río Azul, Naranjo, and Quirigua respectively. Caracol, located on the Vaca Plateau would have provided access to resources coming out of the Maya Mountains, while Copan represented the southern gateway to trade with the peripheral cultures of southern Mesoamerica. In this manner the members of the Tikal Alliance had secured access to the resources needed to perform the rituals necessary to maintain the theatre state (Demarest 1992). Sites like Holmul and Xultun were also linked to this network as intermediary territories in the Tikal Alliance.

Towards the end of K'an Chitam's reign or possibly at the beginning of Chak Tok Ich'aak II's reign (~A.D. 486-508), there is direct evidence that the expansion of the Tikal Alliance became violent. In August of A.D. 486 Tikal attacked the city known hieroglyphically as Maasal (or Masul), a probable reference to the archaeological site of Naachtun (Reese-Taylor et al. 2005). Chak Tok Ich'aak II also maintained (or possibly established) ties with the Three Rivers region. Stela 6 at Xultun has a date of A.D. 501 and mentions that someone from Tikal was present. Grube and Martin (1998:123) suggest that there is a Distance Number of 15 years on this monument, which means that the event may have taken place in A.D. 486 or A.D. 516, but there does not appear to be any clear evidence other than the A.D. 501 Long Count (9.3.7.0.0 13 Ajaw 3 Kank'in) proposed by Houston (1986). While the exact event glyph is eroded beyond recognition, the iconography on Stela 6's front side shows a ruler seated in a jaguar throne. This suggests that a Tikal lord was overseeing or witnessing a Xultun royal accession ceremony. Events such as this would have cemented relationships within the Tikal Alliance.

Chak Tok Ichaak II's death is recorded on a monument at distant Tonina in A.D. 508 and 13 days later a prominent Tikal elite was captured by Yaxchilan (Martin 2003:17; Martin and Grube 2000:37; Tate 1992:169-170). It is unclear whether or not Chak Tok Ich'aak II was killed in battle, but the Tikal Alliance began to show its first signs of weakness in the early 6th century. The records for the Calakmul territory at this time are murky (Martin 2005b), but the archaeology suggests that there was a strong Early Classic presence. Tikal's A.D. 486 attack on Maasal may have irritated the ruler of Calakmul, a site which, physiographically, is closely connected with Naachtun. For the next 21 years following the death of Chak Tok Ich'aak II there was an interruption in Tikal's normal male line of succession. The Lady of Tikal, who was probably Chak Tok Ich'aak II's daughter seems to have co-ruled with prominent men (Kaloomte' Bahlam and possibly Bird Claw) who were not direct descendants in the royal lineage (Martin and Grube 2000:38-39).

The next major ruler at Tikal was Wak Chan K'awiil, the 21st in the line of the founder, and the son of Chak Tok Ich'aak II. Wak Chan K'awiil was born just months before the demise of his father and it seems that the baby prince may have been spirited away to the court of another Tikal Alliance member, possibly for protection. Tikal Stela 17 proclaims the "arrival" of the 21 year old ruler at Tikal possibly in A.D. 537 (Martin 2005:7,n.14), just months before his accession during the same year. The damaged state of Stela 17 does not permit a reading of from where the young lord arrived, although there are two likely candidates. The mention of a prominent Xultun lord, Upakal K'inich, in the Stela 17 text (Figure 5.8) may point to where Wak Chan K'awiil was raised (Martin 2001:11). Alternatively, an unprovenienced vessel (K8763) names Wak Chan K'awiil with an obscure form of the Naranjo Emblem Glyph (Martin 2005:7). Both Xultun and Naranjo claim to have extremely long lines of royal accession (Garrison and Stuart 2004) and there is no evidence that either was incorporated into the Tikal Alliance through violent means. Therefore both sites are likely candidates for the rearing of the young Wak Chan K'awiil prior to his return to the Tikal throne.

During Wak Chan K'awiil's reign, the Tikal Alliance apparently began to come apart. A crucial blow came as Naranjo's powerful ruler Aj Wosaaj allied himself with Calakmul during an accession ceremony in A.D. 546 (Martin and Grube 2000:72). The destruction of Río Azul in the first half of the 6th century A.D. (Adams 1995:44), probably at the hands of a member of a new Calakmul Alliance, caused a disruption in the northeastern exchange network. In order to guard this frontier Calakmul brought the site of Los Alacranes into its alliance by installing a ruler there in A.D. 561. Despite these setbacks, Wak Chan K'awiil attempted to maintain connections with Caracol, further to the southeast, and oversaw the accession of Yajaw Te' K'inich II in A.D. 553 (Martin 2005). However, things soon went sour as Tikal "axed" a Caracol lord just three years later (Houston 1991:40). This event seems to have led the Caracol ruler to link himself with a growing Calakmul Alliance. The culmination of all of these events was the defeat of Tikal, most likely at the hands of Calakmul (Martin and Grube 2000:90) in A.D. 562. These events led to the dissolution of the Tikal Alliance, while a new Calakmul Alliance rose to prominence from the end of the Early Classic through the beginning of the Late Classic.

Late Classic Period – A.D. 600-800

The former members of the Tikal Alliance returned to their independent territory status following Tikal's defeat in A.D. 562. Some sites, such as El Peru and Caracol chose to join the Calakmul Alliance. Río Azul had been effectively destroyed. Naranjo, following the death of Aj Wosaaj, tried to become independent and engaged in a series of wars with members of the Calakmul Alliance, particularly Caracol (Martin and Grube 2000:72-73). In other places, like the Pasión adaptive region, new territories like Dos Pilas were founded following the dissolution of the Tikal Alliance. In the Three Rivers region, sites like Xultun and La Milpa appear to have become independent and interacted in adaptive regional exchange networks. Xultun erected stelae in A.D. 642 and A.D. 672, with the latter of these two (Stela 5) depicting an unnamed bound captive (Figure 7.1). This suggests that Xultun elite were engaging in independent warfare, presumably for their own benefit. At Blue Creek there was a major termination ritual in one of the site's main plazas dating to this time (Guderjan 1996). Guderjan (1996) interprets this as the

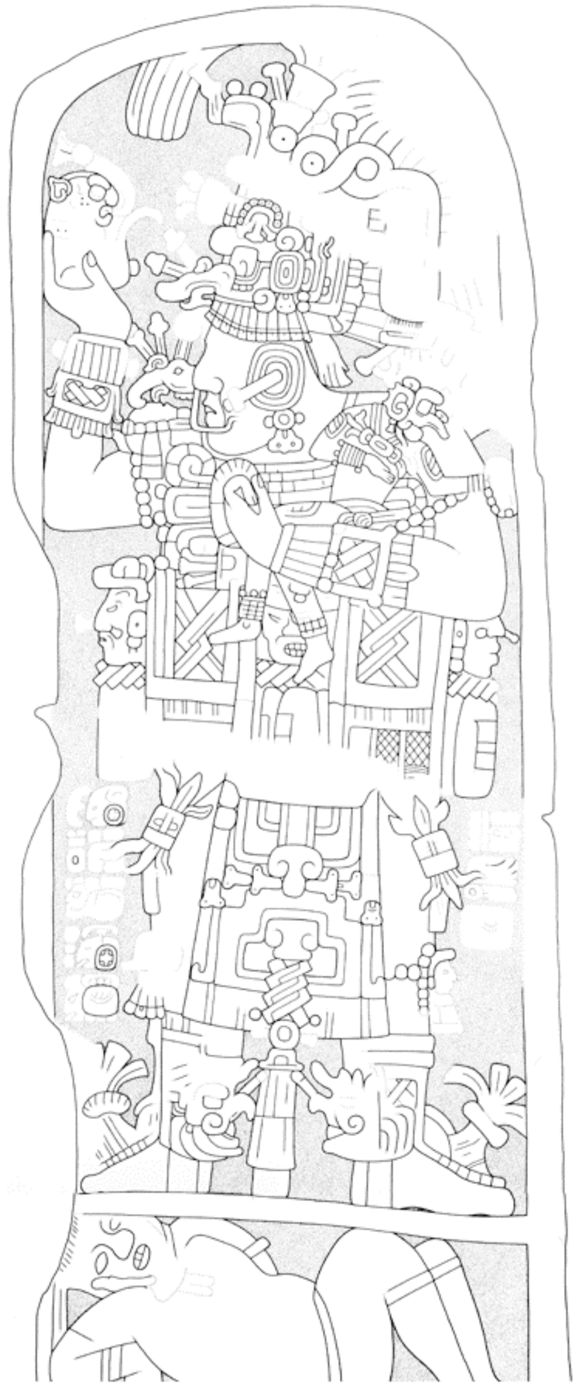


Figure 7.1. Xultun Stela 5 (after Von Euw 1978).

end of the local dynasty at Blue Creek, but I believe it instead represents the dissolution of the Tikal Alliance.

During the 130 years following Tikal's first defeat by Calakmul, the Tikal dynasty struggled to survive. There were internal conflicts over the royal line of succession with a splinter group led by B'alaj Chan K'awiil leaving to found Dos Pilas around A.D. 648 (Houston 1993; Martin and Grube 2000:56). This was followed by a series of back and forth wars between Tikal and members of the Calakmul Alliance, especially Dos Pilas. It seems at one point the exiled 25th ruler of Tikal, Nuun Ujol Chaak, may have sought assistance from the great K'inich Janaab' Pakal at Palenque (Martin and Grube 2000:42). These violent and complex times in the western lowlands may have provided sites in the Three Rivers region the breathing room they needed to go on with their regular activities. This included the establishment of numerous new territories as local populations expanded.

Everything changed when the 26th ruler of Tikal, Jasaw Chan K'awiil, was finally able to decisively defeat the Calakmul Alliance in A.D. 695 (coinciding roughly with the division between the Tepeu 1 and Tepeu 2 ceramic spheres). Jasaw Chan K'awiil sought to reunite the Tikal Alliance with Motul de San José to the southwest and Naachtun to the northwest showing clear connections (Martin and Grube 2000:45-46). Other former Tikal Alliance sites like El Peru (allied with Calakmul) and Naranjo (independent) resisted inclusion in the new Tikal expansion. While these defiances seem to restrict the extent of Tikal's new network, mentions of Copan and Palenque on bones found in Jasaw Chan K'awiil's tomb suggest renewed or continuing ties with these distant territories (Martin and Grube 2000:47).

Just as with the first incarnation of the Tikal Alliance, Jasaw Chan K'awiil called on the symbolism of Teotihuacan to bring together allegiances, even though the great Central Mexican city had collapsed decades earlier. This renewal of Teotihuacan affiliation spread out of Tikal as other members of the new Tikal Alliance began to also construct monuments with strong Mexican influence. At Xultun, the crumbling roofcomb of the A-2 pyramid bears iconography associated with Teotihuacan star signs, or possibly butterfly wings (Figure 5.4) (Karl Taube, personal communication 2006). Similarly during the mid-8th century at Copan, the 15th ruler, K'ahk' Yipyaj Chan K'awiil, completed the Hieroglyphic Stairway and portrayed ancestral Copan lords in Teotihuacan costume (Fash 2002). Some of these foreign constructions were probably built during the reign of Yik'in Chan K'awiil (A.D. 734-746>) at Tikal, or one of his two sons, Ruler 28 (A.D. >766-768) and Yax Nuun Ayiin II (A.D. 768-794)(Martin and Grube 2000:48).

Yik'in Chan K'awiil was the last great ruler of the Tikal Alliance. His military victories against Calakmul, Naranjo, and the Yaxa' site (near El Peru) strengthened the newly reunited Tikal Alliance (Martin and Grube 2000:49). The result was the reopening of the exchange corridors with the coast and members of the Tikal Alliance once again had access to the ritual paraphernalia they needed to perpetuate the legitimacy of the dynastic line. This is evidenced in the architectural programs executed by Yik'in Chan K'awiil's sons. Ruler 28 built Temple 6, while Yax Nuun Ayiin II built the famous twin pyramid complexes (Groups Q and R) celebrating k'atun ending rituals. Nevertheless, during Yax Nuun Ayiin's reign there are signs that the Tikal Alliance was once again losing its grip on the lowlands with renewed monumental activities at many of Tikal's rival sites.

Terminal Classic – A.D. 800-900

I place the shift to the Terminal Classic for the Tikal Alliance at the start of the 9th century A.D., following Martin and Grube (2000) who note the end of clear dynastic succession from Yax Ehb' Xook at this time. This differs from the date of A.D. 850 used in previous chapters because transitional periods were not uniform across space and time (see Chapter Eight). Despite the resurgence of Caracol, Naranjo, and El Peru at the end of the 8th century, members of the Tikal Alliance were still scoring some military victories. Xultun Stela 21, dedicated on the half-k'atun ending in A.D. 800, depicts a captive from B'uuk (Figure 7.2) (Garrison and Stuart 2004), a site known to be Los Alacranes where Sky Witness of Calakmul had installed a ruler in A.D. 561 (Grube and Martin 1998:49-50). Los Alacranes is located on the northwestern margin of the Bajo de Azúcar, across from Río Azul. Holding the B'uuk lords at bay would have been crucial to maintaining the exchange corridor to the Caribbean along the Río Azul and Río Hondo.

In the subsequent decades most of the major lowland dynasties collapsed, although there does not seem to be a single unifying explanation for what took place (Culbert 1973; Demarest et al. 2004). In the Pasion adaptive region (or Petexbatun) Arthur Demarest (1997, 2004) has convincingly argued that warfare brought down the dynasties in place of any ecological explanation. Elsewhere, there is convincing environmental data pointing to a long-term drought that would have effected important sites (Gill 2000; Hodell et al. 1995; Hodell et al. 2001). Although, these data must be used discriminately as Dunning, Beach, and Luzzadder-Beach (2006) have recently examined the sharp differences in *bajo* soil histories around different sites. In the southeast, population pressure at Copan, which included the settlement of the most fertile agricultural lands, led to that city's rapid demise (Fash 2001).

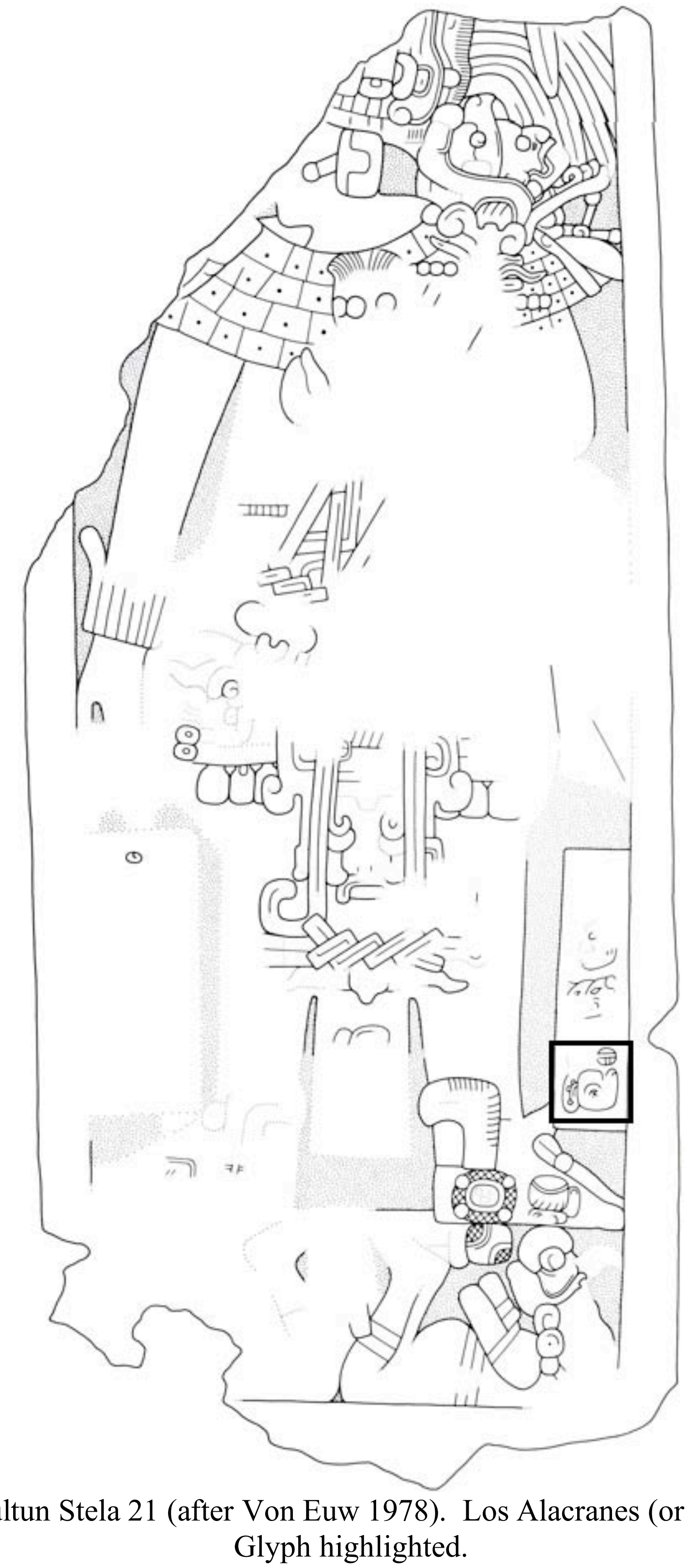


Figure 7.2. Xultun Stela 21 (after Von Euw 1978). Los Alacranes (or *B'uuk*) Emblem Glyph highlighted.

At Tikal, the royal dynasty lost most of it power by about A.D. 850, and secondary centers like Jimbal began using the full Tikal Emblem Glyph for their own purposes (Martin 2003:34). Other former members of the Tikal Alliance continued to perform acts of royal pageantry until the end of the 9th century. The A.D. 889 Period Ending was celebrated at Xultun, a site whose conservative iconographic program may also be a reflection of that site's stability (Garrison and Stuart 2004). Still, this A.D. 889 date represents the end of all royal activity for the twice great Tikal Alliance as there is a total cessation of monument dedication at all former member sites (activity at Seibal at this time is probably related to an independent political movement). Despite the end of royal elite activity there was a continued presence of squatter populations at many sites. At Tikal this occupation is indicated by the Eznab phase ceramics found on the surface of many of Tikal's palace complexes (Culbert 2003). At Xultun, environmental data from the Los Tambos *aguada* indicates that there were people still maintaining this water source between A.D. 980-1080 (Dunning et al. 2005). Nevertheless, the vast majority of the lowlands were certainly abandoned by the end of the 11th century A.D.

Structure, Function, and Change in the Tikal Alliance

In this broadest level of settlement analysis many of the most frequently discussed facets of Maya civilization (kingship, warfare, foreign relations, exchange) take on a prominent role. However, beneath this macro-level there were complex interrelationships and hierarchies that were extremely important at more localized scales of activity. While I hope that previous chapters have adequately demonstrated this argument, here I present how Maya settlement can be examined beyond the level of the adaptive region.

During the Middle Preclassic and the beginning of the Late Preclassic, Tikal was similar to many other early settlements in the Maya lowlands. The pioneer populations settled on the *bajo*/wetland margins as well as on the nearby high terrain. Most exchanges were interdependent with some degree of socioeconomic differentiation beginning to emerge in the early Late Preclassic. A similar pattern was definitely occurring at San Bartolo and almost certainly among other early members of the future Tikal Alliance.

This was in stark contrast to the developments occurring contemporaneously in the Mirador Basin to the north. Nakbe was a major Middle Preclassic settlement, with El Mirador succeeding as the greatest Preclassic power in the lowlands. El Mirador developed broad exchange networks throughout the Maya lowlands and highlands and beyond. Karl Taube (2003) has noted that lowland Chicanel sphere ceramics have been found in both the Merchant's Barrio (Rattray 1987) and the Pyramid of the Sun (Smith 1987) excavations at Teotihuacan. El Mirador seems to be the most likely exchange partner to provide these early ceramics to Central Mexican populations.

In other areas of the lowlands the institution of Maya kingship, encompassed by the word *ajaw*, emerged during the Late Preclassic, as evidenced at San Bartolo (Saturno et al. 2006). Formal settlement hierarchies developed in some areas to create the first territories. Sites like Tikal, San Bartolo, and probably Naranjo and Caracol were capitals of these territories. At an interregional level these capitals would have been involved in heterarchical exchange networks independent of the activities of the Mirador Basin, although there is no direct evidence to support or refute this aspect of the model. The structure of the Maya lowlands on the eve of the Late Preclassic to Early Classic transition was one of two different political situations, which involved separate types of functions. On the one hand there was the vast Late Preclassic metropolis of El Mirador and its broad pan-Mesoamerican exchange network to the north, while on the other hand there were the small independent territories involved in interregional exchanges to the south.

The Late Preclassic to Early Classic transition witnessed a total reconfiguration of Maya lowland settlement and therefore, political and exchange networks. Environmental degradation as well as possible climatic disturbances had catastrophic effects on the burgeoning Late Preclassic populations. In the immense territory occupied by El Mirador and its satellite centers the stress was too much to overcome and the entire settlement network was abandoned, with the surviving population probably seeking refuge at the already well established Kaan territory to the north. In the independent territories to the south some areas reacted by shifting the capital to a nearby locale as with the San Bartolo to Xultun shift (see Chapter Five), and the consolidation of the settlement network at Holmul (Estrada-Belli 2002). At other sites like Tikal and Blue Creek, the Late Preclassic to Early Classic transition was smooth and involved continuous growth. With the lowland populations nucleated at select centers the stage was set for one of the greatest changes in the history of the Maya lowlands.

The A.D. 378 *entrada* of Sihyaj K'ahk', Spearthrower Owl and a contingent of Teotihuacanos cemented the shift in power in the lowlands to Tikal. I argue that the overarching goal of this *entrada* was to consolidate the lowland exchange networks in order to provide a reliable source of royal and ritual paraphernalia to the Teotihuacan court. Taube (2003:313) notes that the Teotihuacan elites had "a deep interest and understanding of the accouterments and symbolism of Maya kingship" and that they "were aware of the symbolism and rituals of Maya royal ancestor veneration." The dissolution of the Mirador Basin exchange network would have caused a crisis at Teotihuacan, which used elite trade goods from the Maya lowlands in their own rituals. Sihyaj K'ahk' may have been sent to the Maya area to re-establish relations with the most strategically located settlement and to consolidate trade networks around this site.

For the Maya, the *entrada* represented the introduction of a new form of political organization superimposed on their preexisting system of territorial divine kingship. Sihyaj K'ahk' installed new *ajawob* in some territories himself, while many other dynasties were formally established in the decades following the *entrada*. Many of these dynastic founders either came from or were endorsed by Tikal. In this sense Tikal formed a far-reaching alliance with numerous centers located strategically either near resource concentrations or on critical junctures of exchange corridors, especially riverine systems. While numerous sites were members of the Early Classic Tikal Alliance, it seems that there was some degree of mutual respect and interdependence among the allies, arguing against a demonstrably hierarchical system of macro-political organization. Maya alliances were temporary moments of broader unity that interrupted the otherwise stable geopolitical situation of independent territories.

The structure of the lowlands during the Early Classic was a total reversal of the Late Preclassic structure. Following the Teotihuacan *entrada* there was a broad alliance of sites connected to Tikal with a general interest in the economic distribution of the trappings of Maya royal costume and ritual associated with a theatre state (Demarest 1992). Cowgill (1992:96) speculates that commercial success, particularly in obsidian working, was an important factor in the formation of Teotihuacan during its Patlachique Phase (150-1 B.C.). He also argues that during the subsequent Tzacualli Phase (A.D. 1-150) the Teotihuacan elites consolidated the Basin of Mexico through a combination of military threat, ideological promotion, and economic rewards (Cowgill 1992:97). It was this strategy of consolidation that Sihyaj K'ahk' introduced into the lowland Maya political economy, but only as a means to create a reliable provider of elite material culture to the Teotihuacan capital.

The concept of the Tikal Alliance is loosely based on the Aztec Triple Alliance (López and López 2000), especially after Sihyaj K'ahk''s initial *entrada*. Although Sihyaj K'ahk' did overthrow Chak Tok Ich'aak I and was instrumental in installing numerous other rulers, generally the local political system was allowed to remain intact. For the Maya, this meant that existing territories maintained their form when they joined the Tikal Alliance, a characteristic similar to the Triple Alliance (López and López 2000:52). Similarly, local expressions of culture were permitted, with members of the Tikal Alliance exhibiting their own stelae programs depicting local rulers engaged in local rituals. This and other similarities to the Aztec Triple Alliance are what led me to choose the term 'alliance' for broader expressions of political unity in the Maya lowlands.

To the north of the Tikal Alliance, the Calakmul (Kaan) elites, with their connection to the formerly powerful El Mirador, nurtured their own territorial control. Calakmul lay in wait, devising a strategy to break up the emerging exchange networks. The motivation for this revenge strategy was certainly pluralistic. First, Calakmul was left out of the new pan-Mesoamerican exchange system set up by Sihyaj K'ahk' as indicated by the total lack of Teotihuacan material culture at Calakmul (Marcus 2003:353). This would have been detrimental to the political economy of the Calakmul elites. Second, there was probably some degree of jealousy on the part of the Calakmul elites for having been replaced as the major trading partner with Central Mexico (assuming the El Mirador-Calakmul connections are valid). Finally, there may have been some degree of ethnic prejudice emerging between the pure blood Maya royalty of Calakmul and the mixed Teotihuacan-Maya royalty of the Tikal Alliance. This is reflected in the differences in the iconographic symbolism of Calakmul versus Tikal, with the latter showing strong Teotihuacan influences. The linking of ethnicity with sociopolitical organization was also a characteristic of the Aztec Triple Alliance (López and López 2000).

The result of Calakmul's dissatisfaction was to develop a military strategy that mimicked the Tikal Alliance's strategy of unifying independent territories toward a single cause. The difference in the Calakmul Alliance was that the major goal was the disruption of the Tikal Alliance, and specifically the Tikal dynasty, rather than gaining access to any complex long distance exchange network. Calakmul did not attempt to establish ties with Teotihuacan, following the defeat of Tikal. In fact, Teotihuacan itself seems to have gone into a period of major turmoil and decline just decades after Tikal's defeat by Calakmul. The members of the Calakmul Alliance that fought against Tikal retained their own territorial independence with some sites, such as Naranjo, breaking free from Calakmul following Tikal's defeat.

The first half of the Late Classic saw a return to small independent territory status for most of the former members of the Early Classic Tikal Alliance. While sites engaged in intense intersite warfare, and possibly civil war in the Pasión region to the southwest, sites in the Three Rivers region concentrated on interaction with more local territories. At these sites there was still continuous royal ritual as evidenced by stelae dedications at Xultun, but in general the territories of the Three Rivers region distanced themselves from the broader geopolitical conflicts occurring in the west. The interactions that took place amongst these sites resulted in a unified strategy to cope with the political fallout of the dissolution of the Tikal Alliance. The Three Rivers region capitals constructed large plazas where they could assemble the entire hinterland population of their territories while at the same time prohibiting the performance of many major rituals outside the capital. While only the Three Rivers region has been examined in this study, it seems likely that other regionally defined political strategies also would have emerged during this time (see Laporte 2004 for an example from the Dolores region).

During the 8th and 9th century A.D. Tikal was restored to power under the leadership of a succession of charismatic leaders who were also impressive military strategists. Tikal's recovery and the subsequent reunification of a similar, but different Tikal Alliance, coincided with a population explosion throughout the lowlands. Many new sites grew into formidable centers in and of themselves. Examples from the Three Rivers region include Chan Chich and Dos Hombres, the latter of which may have had its own Emblem Glyph. Iconographically, there was a renaissance of Teotihuacan related imagery although this may have been as much a reference to the Early Classic Tikal Alliance as it was to the great Central Mexican metropolis. The Late Classic represents the apogee of the theatre state rituals practiced by Maya elites. The new Tikal Alliance facilitated the distribution of the necessary accoutrements amongst allies, rather than trying to export to Central Mexico.

Nevertheless, even this resurgence of Tikal and its allies came to an end. It is possible that population pressure eventually surpassed the carrying capacity of the land in some areas, a situation that may have been compounded by localized regions of extended drought. As some of the royal courts of the Tikal Alliance began to succumb in the Terminal Classic it created a snowball effect which culminated in the total cessation of elite activity in the southern central lowlands. While opportunistic lineages tried to pick up the pieces in some minor centers, these attempts were short-lived, leaving only a series of squatter populations that clung on until the 11^{th} century A.D. when the lowlands were almost completely abandoned.

Conclusions

The analysis presented in this chapter relies greatly on epigraphic data as well as economic data derived from the preservation of elite material culture. The story of the Tikal Alliance presents a complex model involving changing alliances, brilliant military strategies, and long distance exchange interests. Still, while fascinating as much because of the names and dates we can assign to historical events as it is due to the complexity of the interactions, this level of analysis does not give any indication of how an everyday Maya farmer was effected by these events. The answer seems to be that he was effected very little in terms of his day to day life, which probably holds a clue as to how the Maya have persisted both physically and culturally to this day.

The Maya culture at its most base level is an adaptive one in which individuals support one another to perpetuate the survival of all. Nancy Farriss (1984) has called this a collective or corporate enterprise of survival. The Maya theatre state, whose exchange network was at the very core of the geopolitical interactions outlined above, was only the most ornate manifestation of a "hard nucleus" of shared beliefs that permeated all socioeconomic levels of Mesoamerican civilizations as part of a unified cosmovision (López Austin 2001). The collapse of the Classic Period dynasties and the dismantlement of Postclassic elite culture by the Spanish were both devastating events to Maya civilization when viewed as a whole. Despite this, the core belief system that was performed by these highest levels of Maya society was perpetuated in the more humble rituals of the average Maya farmer and persists to this day, whether in a transculturated church ritual involving feeding Catholic saints or in the four quartered partitioning of a new *milpa*.

The issue of scale of analysis is crucial in archaeology and anthropology in general. The archaeology of the San Bartolo-Xultun intersite area has very little bearing on the events that shaped the history of Tikal Alliance, and vice versa. Yet, both of these cultural entities were part of the broader Maya civilization. The questions we seek to address archaeologically are scale dependent, but this does not mean that we must limit are analyses to a single scale.

Chapter 8: Conclusions

Introduction

The embedded heterarchy model presented in Chapter One combines the use of an analytical hierarchy with a heterarchically-based landscape ecology approach. I directly collected data at the areal and territorial scales of the hierarchy while participating in the San Bartolo Project. These data were integrated with information from other projects at both the adaptive regional and alliance scales of analysis. This chapter first addresses some of the methodological issues encountered during field work, before moving on to explore the effectiveness of the embedded heterarchy model. This is followed by a brief discussion of future research possibilities based on the research carried out for this dissertation. While the San Bartolo-Xultun intersite area comprised the primary field component of this study, it is hoped that the interpretive framework in which it has been placed has addressed broader issues that will be useful in future studies of the ancient Maya.

Methodological Conclusions

New technologies can require the development of new field methods in order to maximize not only the use of the new technology, but also the interpretive power of the resultant data. The field work for this dissertation involved the integration of remote sensing data and high-resolution GPS units with more conventional survey methods to maximize the representativeness of the intersite survey sample. The development of these methods led to a reconsideration of how the concept of the intersite area needs to be changed in Maya archaeology. In particular, the use of transects to interpret intersite areas needs to be abandoned in favor of random block surveys. Further improvements were developed for the use of remote sensing data in survey design following the laboratory processing of QuickBird data.

The San Bartolo Project has benefited from close collaboration with the Marshall Space and Flight Center, NASA since 2002. Due to this collaboration we had access to a variety of remote sensing data, including IKONOS and QuickBird satellite imagery, and AIRSAR radar imagery, that would normally have cost the project thousands of dollars. The prices of these technologies have already begun to drop, which will allow them to be incorporated into an increasing number of Maya archaeological projects. The intersite research, as well as the broader reconnaissance work of the San Bartolo Project will help to facilitate the integration of new remote sensing data into future projects.

The San Bartolo-Xultun intersite survey sought to systematically sample settlement in relation to microenvironmental variations seen in IKONOS satellite imagery as well as to verify and refine a settlement signature identified by Saturno in remote sensing data sets in 2003. A 1:5000 IKONOS scene was broken into 400 survey blocks and visually classified based on the expected amount of settlement in each block. A sample of each classification category was randomly selected for survey and excavation resulting in 40 survey blocks and 56 test pits. Results from survey and excavation were compared against an unsupervised ISODATA classification of a QuickBird scene covering the survey universe. This confirmed relationships between microenvironments and certain settlement features, such as terracing with palm *bajos* and zones of lowland to upland transition. However, outside of areas of dense settlement concentration, such as the minor center of Chaj K'ek' Cue, the settlement signature was difficult to isolate in the intersite area.

One scene each of IKONOS and QuickBird imagery were used in the intersite survey and analysis. Variables such as sun angle, the off-nadir angle of the sensor, illumination caused by topography, as well as the time of year a scene is acquired can cause significant variation even when data is collected using the same sensor. Each remote sensing data set needs to be treated on a case by case basis, due to these variations as well as local geological, pedological, and hydrological conditions. One of the possible reasons the San Bartolo settlement signature appears so clearly in the IKONOS and QuickBird scenes is that there are relatively shallow topsoils surrounding San Bartolo. The average depth to bedrock in the intersite excavations that were not placed into plaza floor sequences or scrub *bajos*, was 68 cm, with the average depth of the A horizon being around 11 cm. This includes excavations placed on the sides of small rock piles and mounds, which are marginally inflating the average.

There are two consequences of the shallow soils around San Bartolo. First, shallow soils mean an increased amount of stress on vegetation. Lillesand and colleagues note the following concerning vegetation in remote sensing data:

> If a plant is subject to some form of stress that interrupts its normal growth and productivity, it may decrease or cease chlorophyll production. The result is less chlorophyll absorption in the blue and red bands. Often, the red reflectance increases to the point that we see the plant turn yellow (combination of green and red) [Lillesand et al. 2004:18].

The combination of stucco covered architecture and shallow soils increases the stress on vegetation growing on significant settlements. However, in the intersite area, where settlement is more dispersed, it is difficult to distinguish between stressed vegetation growing on architecture and vegetation that is stressed due to the shallow topsoil. Another consequence of the shallow soils is that the types of mounds convincingly argued by Kevin Johnston (2002) to be hidden by processes of bioturbation are unlikely to occur in the areas around San Bartolo. This means that, while not presuming to have surveyed 100% of all archaeological remains during the intersite survey, I am reasonably certain that we did not miss a significant amount of subsurface features. This is corroborated by a few test pits that were excavated in areas with no surface remains, which did not uncover any "hidden" architecture.

Caution should be exercised when employing remote sensing data to a new study area. Extensive ground-truthing needs to be conducted in order to verify potential signatures, whether they be archaeological or simply vegetation. Basic archaeological reconnaissance should be done to become familiar with the general settlement trends in the survey universe. Following ground-truthing and reconnaissance efforts the most appropriate survey strategy can be designed to maximize representative coverage. In the San Bartolo-Xultun intersite area this meant that the entire concept of an intersite survey had to be rethought.

An intersite area is a large tract of land made up of diverse terrain and vegetation types, which correlate with different forms of ancient settlement remains. The most appropriate methodology to sample an intersite area is through the use of a stratified random block survey based on the classification of remote sensing data. Transects are unlikely to provide representative coverage of an intersite area, from a microenvironmental standpoint. This is crucial since cultural features, such as agricultural terracing, have been found to be associated with specific microenvironmental niches. Such features could either be overrepresented or missed altogether if representative sampling strategies are not used. With the development of new technologies, especially high-resolution remote sensing data and GPS units, stratified random block surveys present the best strategy for surveying in the forested lowland Maya area.

The results of the San Bartolo-Xultun intersite survey suggest that new surveys can incorporate high-resolution remote sensing data into a multi-phase project design. First, the capitals and minor centers within the project's concession can be identified through the use of the settlement signature, assuming the survey universe is forested. Once these sites are reconnoitered or mapped the region can be divided into manageable research areas. The multispectral data can then be resampled to a resolution that permits unsupervised classification. Based on the relative percentages of each output class, a random block survey can be designed to generate a representative sample of each designated research area. This proposed methodology is designed based on the successes and failures of the application of remote sensing data to the San Bartolo-Xultun intersite survey design.

The Embedded Heterarchy Model

The embedded heterarchy model consists of an analytical hierarchy designed based on the theoretical work of David L. Clarke (1972, 1977, 1979). The explanatory power of the model comes from the integration of the landscape ecology concepts of structure, function, and change (Fedick 1996), all of which were developed to study heterogeneous landscapes. The analytical hierarchy generally reflects the hierarchical nature of Maya sociopolitical organization, while the landscape ecology theory is representative of the embedded heterarchies within the hierarchical system. Instead of Clarke's (1972) nested hierarchies this model consists of 'hierarchically nested heterarchies', which I have termed embedded heterarchies.

At the most local scale, extended family groups interact with one another in an embedded heterarchical exchange network in order to provide mutual support as a community survival strategy (Farriss 1984). Extended family groups are tied to minor centers. The minor centers within a territory are similarly equal trading partners. The archaeological evidence for heterarchical exchange networks among both extended family groups and minor centers comes from a comparison of artifact assemblages. The homogeneity of assemblages suggests a resource generalization strategy in which extended family groups, as well as minor center populations form heterarchical support systems as a survival strategy (Dunning et al. 2003). Extended family groups, minor centers, and territorial capitals are studied at the areal scale of analysis. Chapter Four presented a case study of this scale of analysis with the examination of the San Bartolo-Xultun intersite area. The San Bartolo-Xultun territory was presented as a case study for how the members of a territory interact with one another in Chapter Five.

The territory, is a variation of the city-state/peer polity model of Maya society (Mathews 1991; Freidel 1986; Sabloff 1986), and is supported by ethnohistoric linguistic data as well as ethnographic analogy with the Chorti Maya. The territory is also represented hieroglyphically as *chan-kab'-ch'e'n*, meaning "sky-earth-cave", which refers to both cosmological as well as physical aspects of Maya territorial organization and is supported by modern Q'anjob'al linguistics. Territories are made up of a territorial capital and hinterland population, which are arrange in a hierarchical organization. The local heterarchies described for the areal scale of analysis are embedded within this territorial hierarchy. Territories interacted in heterachical exchange networks within adaptive regions. These exchanges involved the physical trading of elite ritual paraphernalia necessary to perpetuate the theatre state (Demarest 1992), as well as the exchange of ideas based on shared perceptions of the local environment, shaped by the physiography of the adaptive region. Archaeological evidence for these territorial heterarchies comes from the analysis of site plans. In the Three Rivers adaptive region case study, presented in Chapter Six, an analysis of site plans showed how territorial capitals within the Three Rivers region (Houk 1996, 2003) had site plans that varied from those defined as part of the Peten template (Ashmore 1991, 1992; Ashmore and Sabloff 2002). The territorial heterarchies embedded within adaptive regions were the most stable exchange networks for the ancient Maya.

Alliance is the term that I use to refer to broader forms of Maya political organization that have previously been called large regional states (Adams 1995, 1999; Marcus 1993), superstates (Martin and Grube 1995), pulsating galactic polities (Demarest 1992), and hegemonies (Martin and Grube 2000). Alliances were loose affiliations between sites, focused on an organizing center, and united toward a common goal. Alliances were a form of Maya sociopolitical organization that transcended local adaptive and survival strategies. While the formation of an alliance was normally initiated by a powerful ruler, once territories were brought into an alliance the original ruler became a “first among equals” rather than a de facto overlord. The inherent instability of such alliances is what argues against any system of overkingship (Martin and Grube 2000) being in place. This system was introduced at Tikal by the Teotihuacan lord Sihyaj K'ahk' in A.D. 378 with the goal of centralizing the exchange of Maya ritual paraphernalia so that it could easily be sent to Teotihuacan. This argument was presented as a case study of the alliance system in Chapter Seven, using the Tikal Alliance as the principle example. Participation in an alliance seems to have been more dependent on human agency, in that in most cases rulers chose to make allies. This contrasts with the adaptive regions discussed above in which shared perceptions of the environment were held by territorial populations and not just the ruling class. In the adaptive region the environment dictated, to a certain extent, the subsistence strategies available to the Maya, which would have generated some level of inherent association. Having said that, whether territorial affiliations were formed naturally in adaptive regions, or were formed by choice in alliances, the participant territories interacted in embedded heterarchies within the larger scales of analysis.

The Case Studies

Four case studies were presented in this dissertation to examine each scale of analysis in the embedded heterarchy model. Tables 8.1 through 8.4 summarize the results of each scale of analysis. Each table highlights changes that took place at each major transition in ancient Maya culture history. Depending on the scale of analysis these changes varied in terms of the intensity of their effect.

There were four major transitional periods for the ancient Maya within the time frame covered by this dissertation (1000 B.C.-A.D. 1100): the Middle Preclassic to Late Preclassic transition, the Late Preclassic to Early Classic transition, the Early Classic to

Late Classic transition, and the Late Classic to Terminal Classic transition. Of the major transitional periods, the Middle Preclassic to Late Preclassic transition is the least understood at this time. Generally there seems to have been population growth and localized deforestation as heterarchical networks developed and some of the first sociopolitical hierarchies began to emerge.

Table 8.1. Summary of culture history an change in the San Bartolo-Xultun intersite area from the Middle Preclassic to the Terminal Classic.

Period	**Settlement Structure**	**Environmental Structure**	**Functions**
Middle Preclassic	None	Perennial wetlands with small portions of raised uplands	None
CHANGE	Population growth	None	Local networks develop
Late Preclassic	Extended family groups living on drained land	Perennial wetlands with small portions of raised uplands	Embedded heterarchical exchange amongst families to support resource generalization
CHANGE	Abandonment	Sediment aggrades into wetlands through processes or erosion accelerated by deforestation	Dissolution of local embedded heterarchy
Early Classic	Small, isolated extended family groups	*Bajo* environment with interspersed uplands	Possibly some small groups exploiting intersite resources for nucleated village population
CHANGE	Population growth	Land reclamation through terracing and development of intensive agricultural technologies	Local networks re-develop
Late Classic	Extended family groups distributed around minor centers	Managed *bajo* environment through landscape engineering	Embedded heterarchy among families that maintained hierarchical relationships with minor centers
CHANGE	Abandonment	Destabilization of anthropogenic management systems; possible extended drought	Dissolution of local embedded heterarchy
Terminal Classic	Possibly small, isolated extended family groups	*Bajo* environment with interspersed uplands	Possibly some small groups exploiting intersite resources for nucleated village population
CHANGE	Total abandonment	*Bajo* environment with interspersed uplands; upland forest regeneration	None

Table 8.2. Summary of culture history and change in the San Bartolo-Xultun territory from the Middle Preclassic to the Terminal Classic.

Period	**Settlement Structure**	**Environmental Structure**	**Functions**
Middle Preclassic	Early settlers establish nucleated villages; public architecture at San Bartolo	Perennial wetlands with large tracts of raised uplands; *aguada* established at San Bartolo	Social hierarchy develops at San Bartolo; heterarchical exchanges with local villages; long distance exchange with foreign elites
CHANGE	Population growth	Moderate deforestation	Local hierarchical networks develop; regional elite heterarchical networks established
Late Preclassic	Capital established at San Bartolo; other nucleated settlements become minor centers in the site hierarchy	Perennial wetlands with small portions of raised uplands; forest cleared around capital and other nucleated villages	Embedded heterarchical exchange amongst minor centers and family groups; minor centers give tribute in hierarchical exchange with San Bartolo; San Bartolo elites engage in heterarchical exchange with other elites throughout the region
CHANGE	Local abandonments; populations nucleate near *aguadas*, particularly at Xultun	Sediment aggrades into wetlands through processes or erosion accelerated by deforestation; possible drought	Dissolution of local embedded heterarchy; San Bartolo elite either collapse or move to Xultun
Early Classic	New capital established at Xultun under royal dynasty	*Bajo* environment surrounding uplands containing nucleated settlements in some areas	Xultun elites build strong ties with other lowland sites through heterarchical exchange
CHANGE	Population growth	Land reclamation through terracing and development of intensive agricultural technologies	Local networks re-develop; elite heterarchical networks contract to some degree
Late Classic	Full range of settlement hierarchy develops throughout the territory	Managed *bajo* environment through landscape engineering	Xultun elites manage local hierarchy while interacting at regional and interregional level with other territorial elites
CHANGE	Population nucleation at Xultun to exploit *aguadas*	Destabilization of anthropogenic management systems; possible extended drought	Dissolution of local hierarchy; local embedded heterarchy established at Xultun
Terminal Classic	Small nucleated village at Xultun	*Bajo* environment with interspersed uplands	Villagers interact in local embedded heterarchy with communal goal of survival
CHANGE	Total abandonment	*Bajo* environment with interspersed uplands; upland forest regeneration	None

Table 8.3. Summary of culture history and change in the Three Rivers adaptive region from the Middle Preclassic to the Terminal Classic.

Period	**Settlement Structure**	**Environmental Structure**	**Functions**
Middle Preclassic	Early settlers establish nucleated villages; evidence of communal rituals at a few of these settlements	Perennial wetlands dominate the northwest, while uplands descend into river floodplains to the southeast	Nucleated villages distributed across upland terrain engaging in heterarchical exchange; Social hierarchy develops at San Bartolo
CHANGE	Population growth	Localized deforestation in southwest where significant ritual structures are being coated in lime plaster	Local hierarchical networks develop in some territories; regional elite heterarchical networks intensify
Late Preclassic	San Bartolo becomes capital of a clear territory; other nucleated villages compete for territorial control	Perennial wetlands and rivers with most settlement located strategically in relation to water resources	Heterarchical exchanges amongst elites foster a shared ideological perception of the local environment
CHANGE	Local abandonments with populations nucleating at oldest settlements; Blue Creek uninterrupted	Environmental shift from stable to aggrading with clear spatiotemporal trends	Dissolution of exchange networks as nucleated populations turn inward
Early Classic	Dynasties based on divine kingship established at emerging capitals	Large seasonal *bajos* in the northwest; perennial rivers in the southeast	Elite heterarchical exchange networks expand beyond the adaptive region
CHANGE	Population growth; new territorial capitals established in the southeast	Land reclamation through terracing and development of intensive agricultural technologies	Three Rivers territories withdraw from geopolitics and continue regional heterarchical exchange
Late Classic	Regional site planning canons established at capitals; population maximum as all levels of settlement hierarchy develop and grow	All aspects of the environment are managed by the Maya through local engineering programs	Elite heterarchical exchange continues at the level of the adaptive region; return to geopolitical interactions toward the end of the period
CHANGE	Widespread abandonment of regional settlement	Destabilization of anthropogenic management systems; possible extended drought	Dissolution of all local and regional exchange networks
Terminal Classic	Small nucleated villages living in the ruins of former capitals	*Bajo* environment with interspersed uplands	Villagers interact in local embedded heterarchies with communal goal of survival
CHANGE	Total abandonment	*Bajo* environment with interspersed uplands; upland forest regeneration	None

Table 8.4. Summary of culture history and change in the Tikal Alliance from the Middle Preclassic to the Terminal Classic.

Period	**Settlement Structure**	**Environmental Structure**	**Functions**
Middle Preclassic	Nakbe is major power in the north; nucleated villages emerge in the south	Generally wetter environment and climate throughout the lowlands	Settlement hierarchy emerges around Nakbe; heterarchical interactions amongst nuclear villages
CHANGE	Shift to El Mirador in the north; general lowland population growth	Localized deforestation to coat significant ritual structures in lime plaster; more intense around El Mirador	Strong settlement hierarchy in Mirador basin; continued heterarchical interaction in the south
Late Preclassic	Mirador Alliance emerges in north; strong independent territories emerge in the south	Perennial wetlands and rivers with most settlement located strategically in relation to water resources	Mirador Alliance involved in pan-Mesoamerican exchange; southern territories focus on local exchange networks
CHANGE	Collapse of Mirador Alliance; nucleation at oldest settlements in the south; Tikal uninterrupted	Environmental shift from stable to aggrading catchments; Tikal adapts through combination of water and slope management	Dissolution of most exchange networks; local population concentrations strengthen support for emergent dynasties
Early Classic	Strong territories arise; *entrada* of A.D. 378 introduces alliance structure to Maya politics; first Tikal Alliance unites	Generally stable environment throughout lowlands	Tikal Alliance organizes and distributes resources necessary for the ritual perpetuation of the theatre state both for its members and for Teotihuacan
CHANGE	Dissolution of Tikal Alliance at hands of Calakmul Alliance; return to independent territories	Land reclamation through terracing and development of intensive agricultural technologies	Geopolitical interactions continue in the east, while the west and south return to local networks
Late Classic	Calakmul Alliance unseated in A.D. 695; second Tikal Alliance emerges with new members	All aspects of the environment are managed by the Maya through local engineering programs	New Tikal Alliance focused on redistribution of theatre state paraphernalia to alliance members; warfare in defense of alliance networks
CHANGE	Dissolution of second Tikal Alliance; partial collapse of elite class; localized abandonments	Prolonged drought effects numerous major capitals, with destabilizing results	Collapse of exchange networks
Terminal Classic	Small nucleated villages living in the ruins of former capitals	*Bajo* environment with interspersed uplands	Villagers interact in local embedded heterarchies with communal goal of survival
CHANGE	Total abandonment in central lowlands except around lakes	*Bajo* environment with interspersed uplands; upland forest regeneration	None

The Late Preclassic to Early Classic transition was caused by a combination of climate change and anthropogenic effects on the natural environment (Dunning 1995). The result was a complete reorganization of lowland Maya settlement patterns at nucleated centers. This period of nucleation provided the context for the development of divine kingship, the establishment of territorial boundaries, and the invention of new agricultural and water management technologies. These developments effected all levels of the Maya sociopolitical order and led to the rise of Classic Period civilization. At the broadest level of analysis the collapse of the Mirador Alliance during this transition created a political vacuum that allowed Tikal to grow into a powerful Early Classic center.

As culture history unfolded throughout the Maya lowlands during the Classic Period, there were broad alliances that waxed and waned effecting the fortunes of the ruling elite classes of each territory. The most spectacular of these changes came at the end of the 6th century A.D. when the Tikal Alliance, which had formed under Teotihuacan influences, was broken up by a newly formed Calakmul Alliance. This shift in lowland macropolitical influence marks the Early Classic to Late Classic transition. While devastating to the ruling elite class, the effects of this transition were not as strong at more localized scales of analysis. This is to say that the average Tikal farmer still cultivated his family's plot of land the year after Calakmul overran the Tikal elite. The effects of conquest do not seem to have been pervasive. Former members of the Tikal Alliance either reverted to preexisting adaptive region heterarchical exchange networks, as was the case with Xultun, or they became totally independent and tried to forge their own existence, as with Naranjo.

The final of the major transitional periods took place between the Late and Terminal Classic Periods. A combination of circumstances led to major changes at almost all lowland centers. Warfare, drought, and collapse of exchange networks were all important factors in different regions and at different times. The elite class was generally the first to succumb to the effects of this transitional period, but eventually most southern lowland sites were completely abandoned by A.D. 1100.

Scales and Transitions in Maya Archaeology

The use of scales of analysis facilitates the interpretation of cultural phenomena within their spatiotemporal context, without denying the interrelatedness of all scales to ancient Maya civilization as a whole. Transitional periods such as the Late Preclassic to Early Classic transition or the Late Classic to Terminal Classic transition were particularly transcendental events that effected all scales. The territory, of all of the scales of analysis, was the building block of Maya sociopolitical organization from the Late Preclassic onward. There were brief periods of broad political alliances that have led some to argue that Maya politics were inherently unstable (Demarest 1992), but this is just a matter of perspective. This section examines how scales and transitions are studied archaeologically and some of the relationships between these two issues.

Scales of analysis in archaeological interpretation allow certain cultural phenomena to be contained within their appropriate level of influence. For example, a military defeat for a site did not demonstrably effect the day to day agricultural activities of the Maya farmer, but it was devastating to the ruling elite residing in the capital. Should the complex histories and political interactions recorded in the epigraphic record really matter when examining the humble remains of intersite archaeology? Similarly, while subsistence strategies are obviously important to the population as a whole, the Maya elite were mostly concerned with the performance of ritual to perpetuate their theatre states (Demarest 1992). If the archaeologist is addressing issues of dynastic legitimacy and hierarchical social organization, then preference needs to be given to analysis of the political economy and exchange networks. Identifying appropriate scales of analysis facilitates a holistic approach to the study of ancient Maya culture, which consisted of numerous classes that were part of the same cultural tradition (Willey 1956b). However, despite the shared worldview of these classes, the everyday interests and challenges for members of each social class surely differed. Ideally the archaeologist will use a scalar system of analysis, similar to the one used here, so that he or she may study multiple aspects of Maya civilization without overemphasizing any single cultural phenomena.

Geographic Information Systems (GIS) present the archaeologist with an appropriate tool for examining different scales of analysis. Similarly, remote sensing data, collected at different scales and resolutions, can also facilitate this type of analysis. GIS is not a theory for archaeologists to use, in the same way that settlement patterns analysis was not a new theory when it was first introduced (Willey 1968). GIS is the context in which the embedded heterarchy model is best studied. The model is based on theories from both archaeology (Clarke 1972, 1977, 1979) and landscape ecology (Fedick 1996). GIS is the best tool, currently available, to examine the spatial aspects of the model presented in this dissertation.

Transitional periods are the key moments when the archaeologist may study processes that effect numerous scales of analysis. Processes of change occurred during transitional periods that led to the reorganization of the sociopolitical order. Unfortunately, GIS is not as efficient in examining temporal trends as it is in the analysis of spatial patterns. Ancient temporal trends are best studied through laboratory analysis of data collected by field scientists whether they be archaeologists, geographers, or other environmental scientists. Once major patterns of change are identified they may then be integrated with identified spatial trends to build a model that best reflects the available date.

In the Maya area transitional processes did not occur uniformly across time and space, a fact demonstrated by a recent broad look at the Late Classic to Terminal Classic transition (Demarest et al. 2004). I found similar variations during transitional periods except these variations were at both large and small spatial scales. For example, in the case studies used in this dissertation the effects of the Late Classic to Terminal Classic transition varied according to time and space. During this transition, the San Bartolo-Xultun intersite area was abandoned, but elite culture continued to thrive at Xultun until A.D. 889. In contrast, other sites of the Three Rivers adaptive region seem to have been abandoned by A.D. 850, while the power of the second Tikal Alliance was waning as early as A.D. 800. This variation covers nearly a century of time and thousands of square kilometers of space.

A second example of strong spatiotemporal trends is the Late Preclassic to Early Classic transition in the Three Rivers adaptive region. Territories in the southwest nucleated prior to those in the northeast. Similarly, during the Early Classic to Late

Classic transition, the political reorganization that took place following the withdrawal of Tikal from the Three Rivers region led to the rise of minor territories in the physiographically fractal southeast, while older territories remained stable. The archaeology of transitions is crucial to understanding the processes that effected all aspects of Maya civilization during the course of culture history.

Looking at different spatial scales and temporal trends is one of the ways in which Maya archaeologists can reconcile culture history with cultural process. Gordon Willey (1980) believed that culture history and processualism were not antithetical approaches to archaeology, a view that is shared here. This is particularly relevant to the Maya where some of the ideas of the "new archaeology" were difficult to apply to complex societies (Sabloff 1983). Much of the nature of Maya civilization is best explained through culture history, while the analysis of cultural transitions is best facilitated by a processual approach. Stated another way, the processes that take place at transitional periods are what drive the cultural history of ancient Maya civilization. The embedded heterarchy model presented in this study is the model that I argue best explains cultural process while remaining faithful to what we know to have been historical events. Following Clarke's (1972) lead, I have taken this model to its explanatory limits based on available data and it is now ready to be compared to future models as more data is uncovered.

Future Research

This dissertation has looked at four scales of settlement analysis with the overarching goal of contextualizing the San Bartolo-Xultun intersite survey data. Using the embedded heterarchy model a number of intriguing themes have emerged that will require further research, both methodologically and interpretively. This section examines these future research possibilities organizing them by the appropriate scale of analysis.

One of the most important issues in the coming decade of Maya archaeology will be the refinement of the application of remote sensing technologies to field methods. Already a wide number of projects have access to high-resolution satellite imagery as well as AIRSAR elevation data. It is critical that researchers employing these technologies understand the biases of each remote sensing data set and are explicit in how imagery is manipulated to serve the interests of the project. This dissertation attempted to make correlations between different forms of Maya settlement remains and microenvironmental vegetation signatures seen in IKONOS and QuickBird satellite imagery. This goal was met with mixed results and deserves more research attention. In particular, the relationship between the remains of ancient agricultural activities and certain transitional environments may hold clues to Maya subsistence strategies in the face of burgeoning populations.

At the level of territories there are a number of issues that can be addressed. What were the relationships between territorial capitals and minor centers? I argue that sites of the same type interacted in heterarchies embedded within a hierarchical framework. While some work has been done on minor centers around Copan (Canuto 2002; Saturno 2000), further excavation of smaller settlement types is necessary to prove or disprove this argument. Transitional periods are also critical to explaining processes underlying the culture history of territories. In this dissertation a model was presented for the San Bartolo-Xultun territory with particular emphasis being placed on the Late Preclassic to Early Classic transition and the shift in capitals between these two sites. However, there are lingering questions about this process. How much population loss was there during the time of nucleation? Did the San Bartolo elites move to Xultun, or were there existing Xultun elites that took advantage of San Bartolo's dire Late Preclassic situation by assuming the seat of power in the territory? These questions would best be addressed not only by continued research at San Bartolo, but also by a long term project at the ceremonial core of Xultun before looters destroy the entire site.

In terms of Maya lowland archaeology as a whole, we need a better understanding of the macropolitical interactions that took place among, what I have called, alliances. Particularly crucial is the role of Teotihuacan in deciding political allegiances throughout the lowlands. Is it possible that ethnic prejudice played a part in Classic Period Maya warfare? Did the disruption of the Tikal Alliance exchange network of ritual materials effect the Teotihuacan elites? These questions will best be addressed through epigraphic and iconographic analyses, as well as the study of elite material culture distribution.

Conclusions

The San Bartolo-Xultun intersite survey covered a minute portion of the Maya lowlands. However, when this data is contextualized at increasing scales of analysis it has implications for a number of broader issues. I believe that Maya civilization is best explained using a combination of cultural historical and processual theories, combined in a conjunctive approach and articulated through model building. The embedded heterarchy model incorporates hierarchical and heterarchical aspects of Maya sociopolitical organization and also integrates culture history and process by using scales of analysis and highlighting transitions. This dissertation research has examined a very specific geographic area, but has raised issues that need to be addressed at all levels of Maya archaeology.

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Appendix A – Survey and Excavation Data from the San Bartolo-Xultun Intersite Area

Introduction

This appendix presents the raw survey and excavation data from the San Bartolo-Xultun intersite area. The intersite area was investigated by the San Bartolo Project for three seasons. In 2003, Robert Griffin (Pennsylvania State University) and I cut and surveyed a 7 km long transect from the southwest corner of the San Bartolo site delimitation to the center of Xultun (Garrison 2003). The small site of Chaj K'ek' Cue was discovered and mapped during that season as well. In 2004, I began to survey a sample of the 25 km^2 intersite area using a stratified random block method. Each survey block measured 250 m on a side or 62,500 m^2. During the 2004 season ten of the 40 selected blocks were mapped. In 2005, mapping of the blocks continued and a test pitting program was initiated with the goal of dating parts of the intersite zone occupation. This work was carried out with the help and support of numerous people. Damaris Menéndez excavated numerous test pits and, together with Patricia Rivera, conducted the ceramic analysis. Nicholas Dunning of the University of Cincinnati excavated test pits to study the soil history of the region and with the help of John Jones reconstructed the paleoenvironment from the Middle Preclassic onward. Julio Cotom, a Guatemalan student, excavated numerous test pits as part of his requirements for his program of study at the Universidad de San Carlos. Jose Garrido, another Universidad de San Carlos student, assisted in survey in 2004 and excavation in 2005. Joshua Kwoka (SUNY Buffalo) excavated a chert quarry and analyzed the obsidian that was excavated. Finally, field school students from the University of New Hampshire assisted in survey and excavation throughout the 2005 season.

Excavation Objectives by Sub-Operation

SB11A

The goal of Operation SB11A was to clean some of the looter trenches encountered during survey. There were relatively few looted structures in the intersite area with the majority of those found being in the Xultun periphery. In total eleven trenches were cleaned in two different blocks. The descriptions of these cleanings are included below in the descriptions of the survey blocks.

SB11B

Operation SB11B represents the test pitting program carried out in all parts of the intersite area. This operation included soil pits excavated for paleoenvironmental studies as well. There were 56 test pits excavated during the 2005 season (22 by Thomas Garrison, 13 by Damaris Menéndez, 9 by Julio Cotom, 4 by Nicholas Dunning, 4 by Aaron Carter, 3 by Trevor Emond and Keith Ferguson, and 1 by Joshua Kwoka). The stratigraphic data from these excavations are presented below in the descriptions of the survey blocks. Brief descriptions of occupation sequences are presented in the block summaries however, detailed analysis of the materials recovered is presented in Appendices B and C. Due to the low quantity of ceramic material recovered per excavation unit, the presence or absence of a given ceramic type is taken to indicate a human presence during that corresponding time period. While many ceramicists would no doubt criticize this approach, based on the data available this was the most comprehensive analysis possible. Since excavations were designed to date entire settlement blocks the chronology is believed to be accurate especially since the humble farmers living in the intersite area were unlikely to transport large quantities of material to build their homes. Settlement maps showing the occupation sequence for the intersite area can be found in Chapter Five (Figures 5.17-5.19).

Survey of the San Bartolo-Xultun Intersite Area

The intersite area survey was completed during the 2005 season. The survey consisted of 29 Partial Settlement (PS) blocks, 5 No Settlement (NS) blocks, and 6 Settlement (S) blocks. Below is a description of each survey square in the intersite zone, including the ten squares surveyed in 2004, and their associated excavations. Map conventions are as follows:

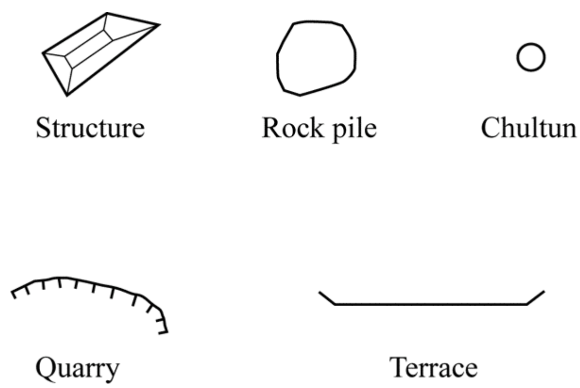

Figure A.1. Map conventions for the San Bartolo-Xultun intersite survey maps.

All survey block maps are overlaid on unsharpened QuickBird multispectral data (Fals Composition RGB/4, 2, 1). The drawing conventions for the stratigraphic profiles are found on the following page (Figure A.2). I drew all maps and profiles based on my own field sketches as well as those of others unless otherwise indicated. In the survey block descriptions, the excavator(s) of each unit is indicated. All units were excavated to bedrock unless indicated by the words “Sterile Level” or “Sascab” below the final strata.

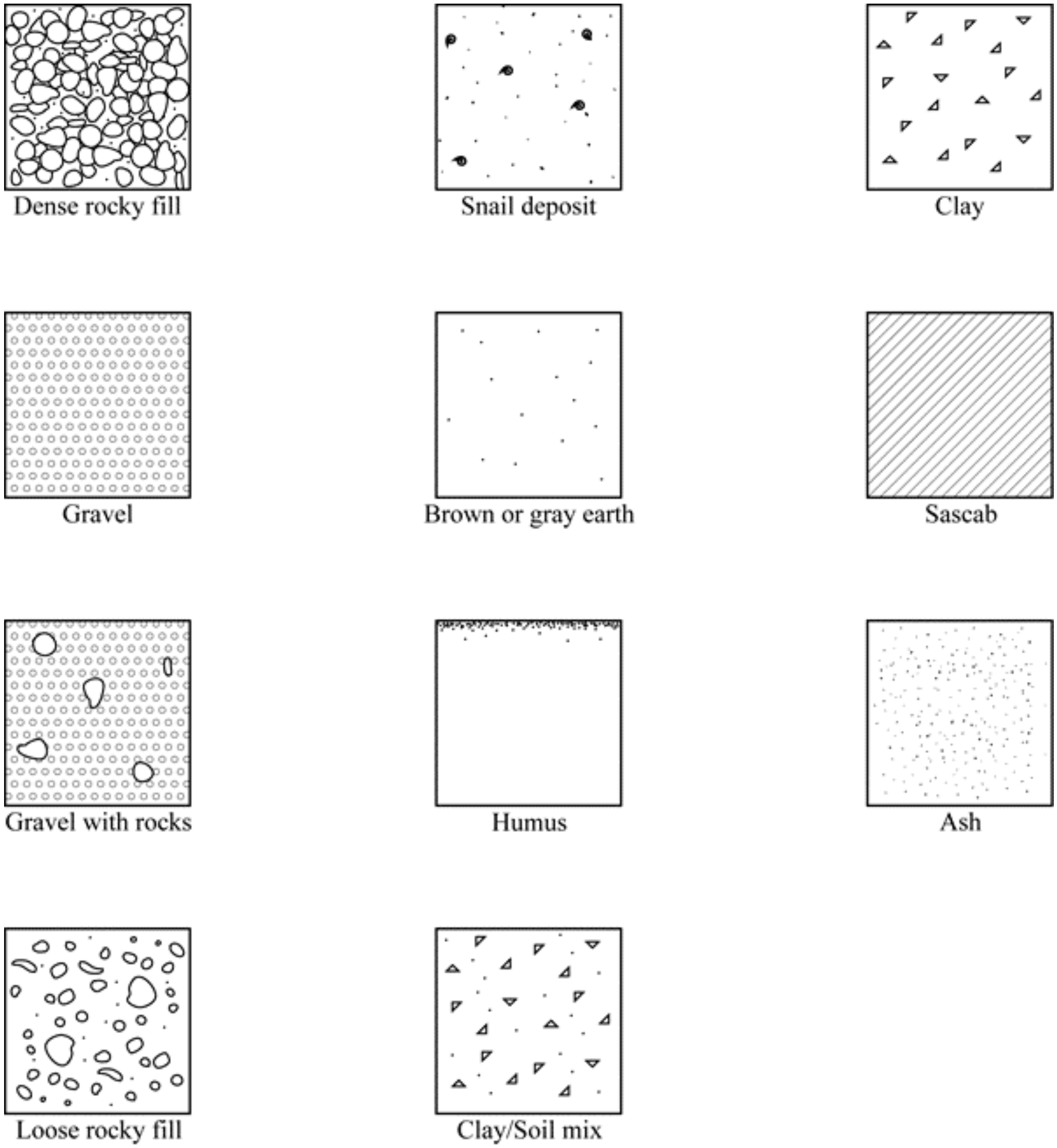

Figure A.2. Drawing conventions for stratigraphic profiles from the intersite excavations (unless otherwise indicated).

PS-1-7

This block (Figure A.3) was surveyed during the 2004 season (Garrison 2004:99). The majority of the block consists of scrub *bajo* (*tintal* and *huechal* varieties) and is part of the Bajo Itz'ul, which represents a branch of the large Bajo de Azúcar that runs to the northeast up to Río Azul. The center of this block is located at 243625 E, 1940875 N in the UTM (Zone 16 North) coordinate system based in the WGS 84 datum. All other UTM coordinates in this report are from the same datum. This block includes the southwest corner of the San Bartolo site delimitation where the transect to Xultun begins (Garrison 2003). There is a small mound in the northeast corner and a quarry which may have been converted into an *aguada*. There is a *chultun* to the north, just outside of the square. Damaris Menéndez excavated two test pits in this square (SB11B-11 and SB11B-13).

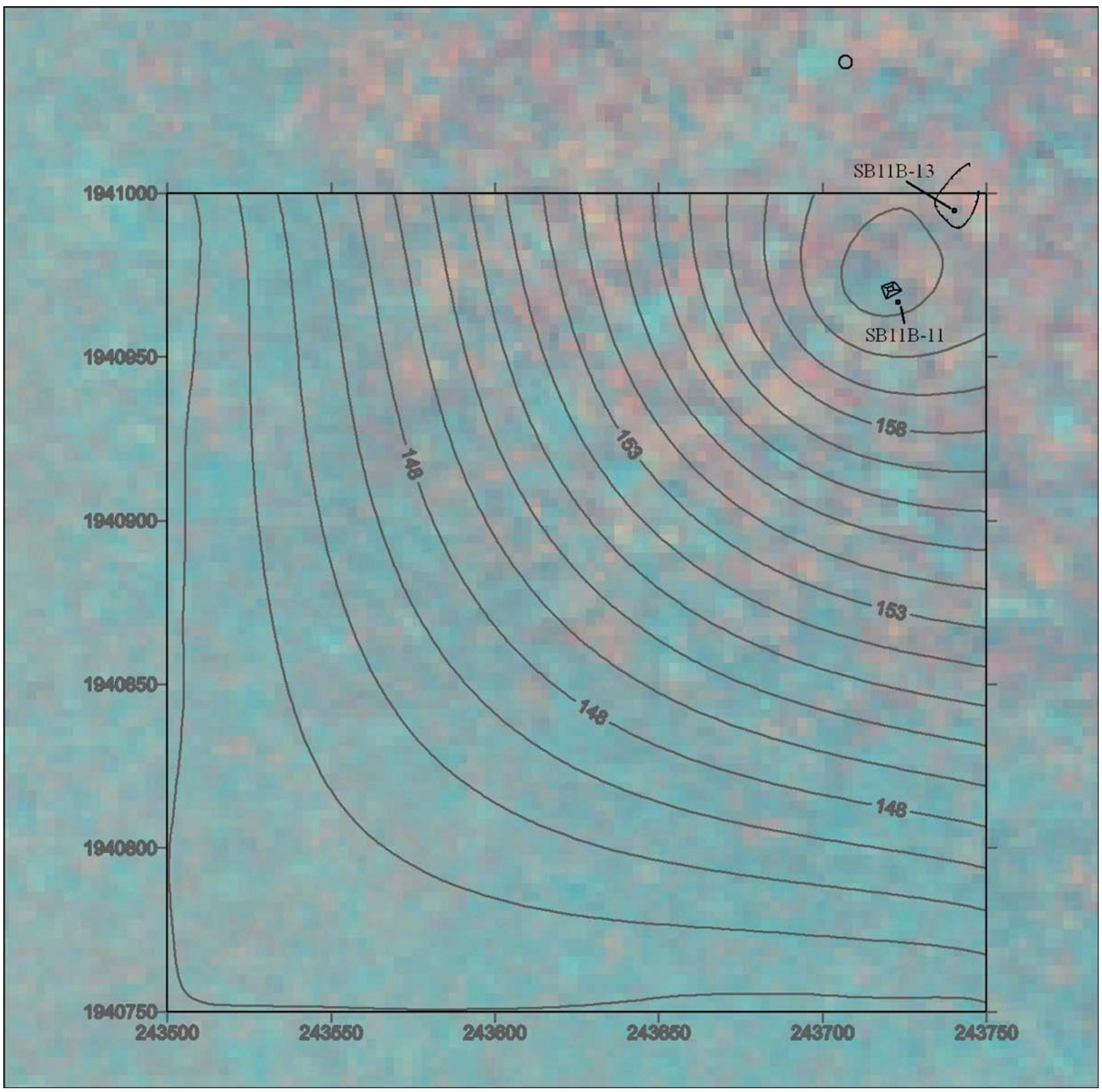

Figure A.3. PS-1-7.

SB11B-11

This 1 x 1 m was located to the southeast of the small mound in the survey block. Three levels were excavated and limestone bedrock was encountered at an average of 58 cm (Figure A.4).

- Level 1 (0-25 cm) – Humus layer with small and medium sized roots, seeds, small rocks, and some large rocks (2.5 YR 3/6 Dark Red). 8 sherds.
- Level 2 (25-50 cm) – Earth fill layer, with gravel, medium rocks, some large rocks, and chert debitage. This stratum was almost identical to the previous one. The fill was very loose (7.5 YR 4/6 Strong Brown). 36 sherds, 2 chert fragments.
- Level 3 (50-58 cm) – The soil was a lighter color. There was gravel on top of the limestone bedrock. The soil had a fine texture (10 YR 5/6 Yellowish Brown). There was no material.

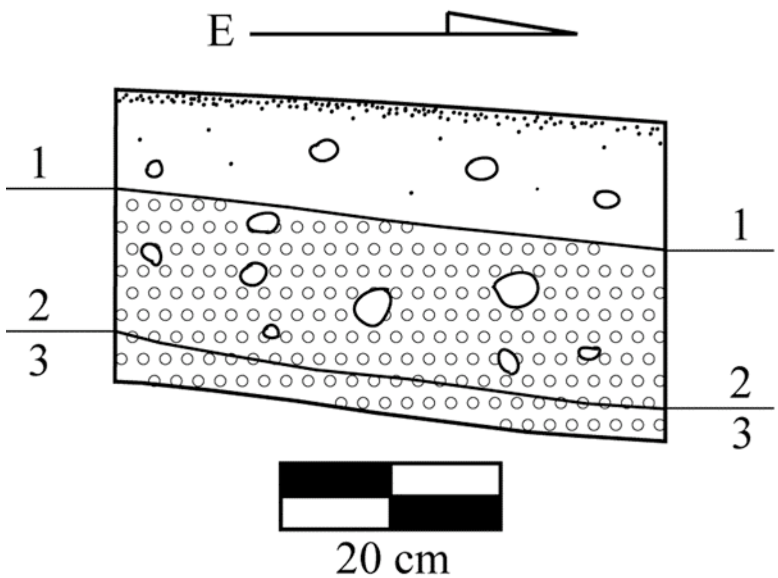

Figure A.4. SB11B-11.

SB11B-13

This 1 x 1 m test pit was located in a limestone quarry. The goal of this unit was to collect more sherds to date the settlement. Two levels were excavated to approximately 59 cm (Figure A.5).

- Level 1 (0-25 cm) – Humus layer with small roots, seeds, and small rocks. There was some ash in the level. This stratum was a little thick due to a small dip in the quarry. The soil was hard with some clay content (7.5 YR 5/8 Strong Brown). 4 sherds, 1 sample of ash or gray clay.

- Level 2 (25-59 cm) – The soil was the same as the previous level, but there were small and medium sized rocks, including a few medium sized chert nodules. There were also small roots. This layer had a stronger clay content and was more humid and therefore had a harder texture. Once the clay was reached there were only five medium sized rocks. In general the soil was hard and compact with a strong clay content (7.5 YR 4/6 Strong Brown). 32 sherds, 2 chert fragments, 1 sample of ash or gray clay.

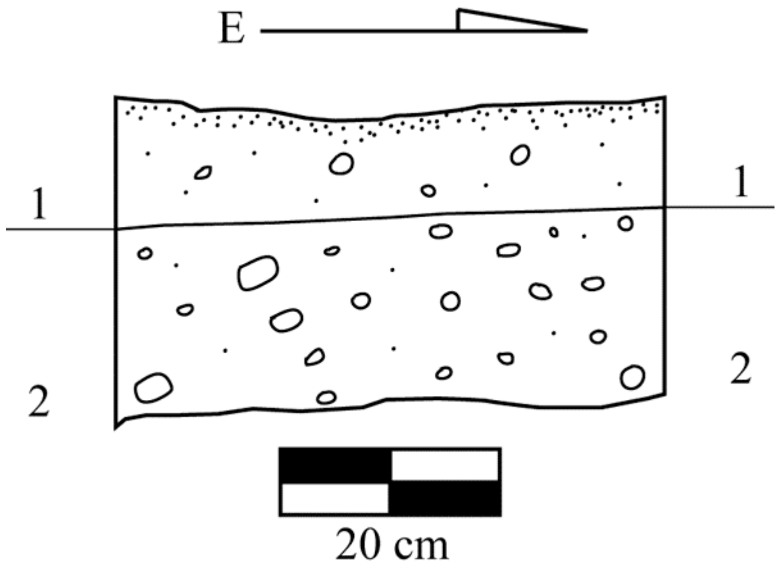

Figure A.5. SB11B-13.

<u>Summary of PS-1-7</u>

This square is part of the San Bartolo site periphery. The presence of small quarries is common in all parts of San Bartolo. According to IKONOS satellite imagery there should be settlement along the entire eastern bank of the Bajo Itz'ul beginning at PS-1-7 and continuing 2km to the north. Material from these excavations consisted of Late Preclassic domestic and diagnostic types as well as Late Classic material from the Tinaja group.

PS-7-13

This block (Figure A.6) was surveyed during the 2004 season (Garrison 2004:99-100). The center of the block is located at 245125 E, 1940875 N. The northwestern quadrant of the block contained a portion of the San Bartolo archaeological camp. A segment of the arroyo that runs through the block was mapped in to correspond with satellite imagery. There is a low platform and a mound in the southeastern quadrant. Also in the southeastern quadrant, along the transition from *bajo escobal* to *montaña*, there was a line of large chert boulders, possibly delimiting a terrace. In the southwestern quadrant there were three low structures. Damaris Menéndez excavated two test pits in the square (SB11B-3 and SB11B-4).

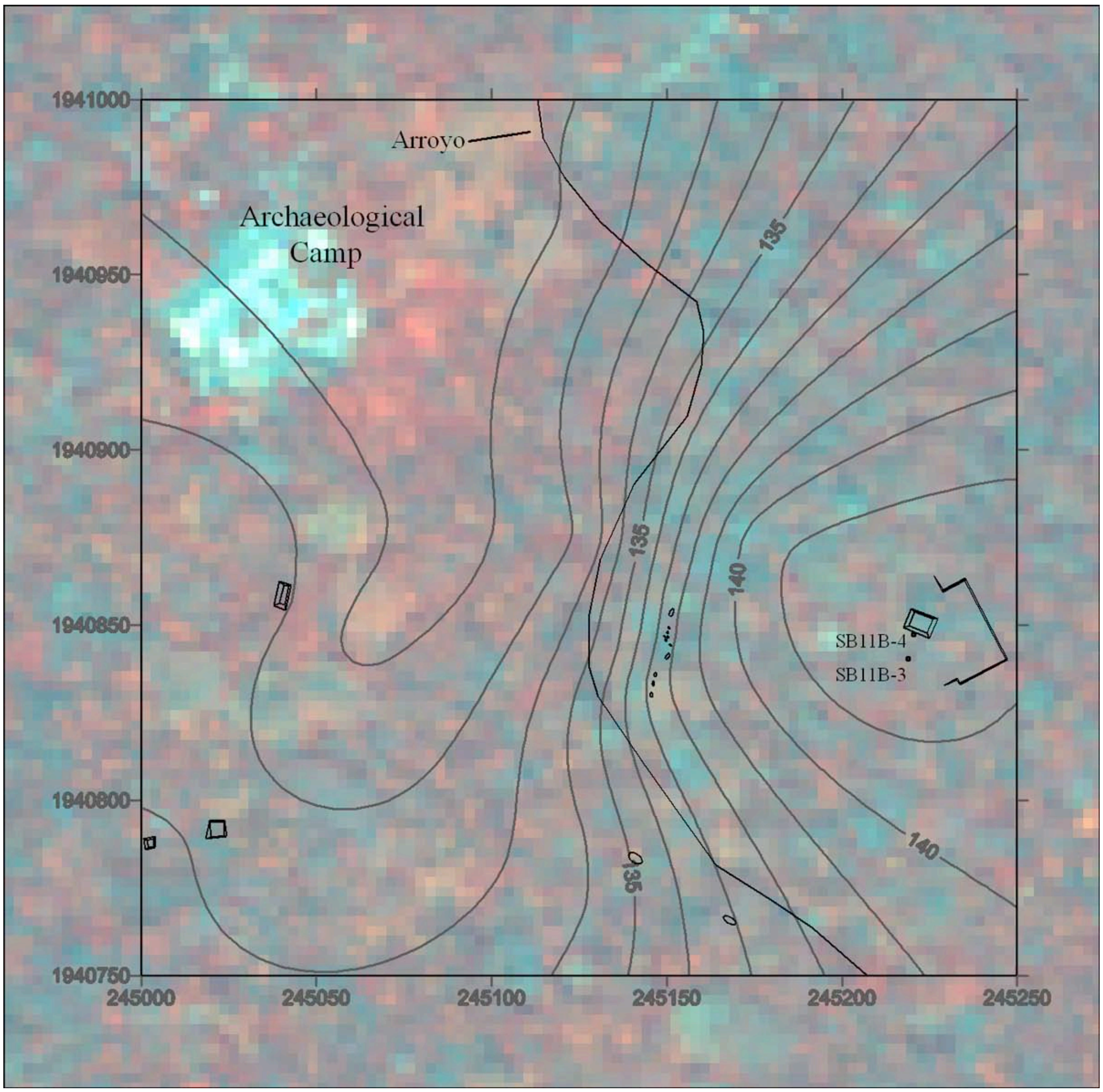

Figure A.6. PS-7-13.

SB11B-3

This 1 x 1 m test pit was located over an apparent small platform to the south of a small mound. The goal of this unit was to date the settlement. Two levels were excavated and bedrock was encountered at an average depth of 49 cm (Figure A.7).

- Level 1 (0-30 cm) – Humus layer with small roots. The soil had a slightly firm texture (10 YR 2/2 Very Dark Brown). 1 sherd, 1 chert fragment.
- Level 2 (30-49 cm) – This level contained fill of medium sized rocks mixed with gravel, with some large rocks. This fill was on top of bedrock. There was very little material, possibly due to the proximity of the bedrock. The soil was soft (10 YR 6/8 Brownish Yellow). 12 sherds.

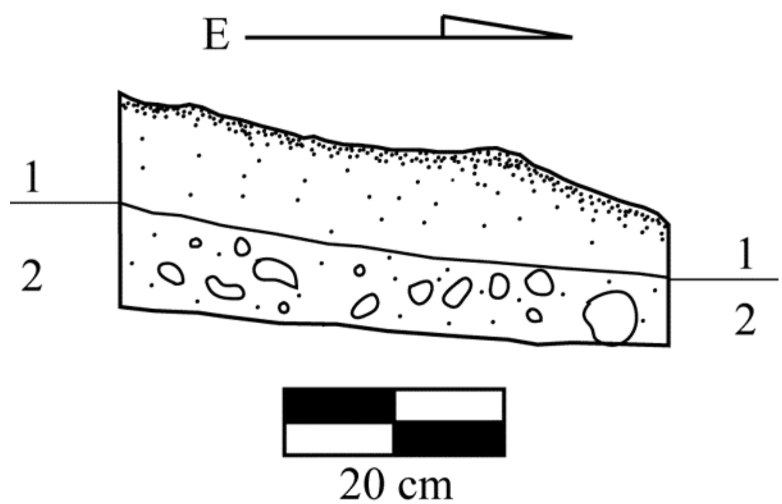

Figure A.7. SB11B-3.

SB11B-4

This 1 x 1 m test pit was located on the edge of the small mound on top of the platform that was tested by SB11B-3. The goal of this excavation was to collect more ceramic material to date the settlement. Two levels were excavated and bedrock was reached at an average depth of 51 cm (Figure A.8).

- Level 1 (0-23 cm) – Humus layer with small and medium sized roots, three large roots, and some gravel. The soil was soft (7.5 YR 3/4 Dark Brown). 5 sherds, 2 chert fragments.
- Level 2 (23-51 cm) – Dense gravel fill with medium sized rocks and some large rocks. Small roots continue. Bedrock was reached and little material was found. The soil was fine (5 YR 6/8 Reddish Yellow). 3 sherds.

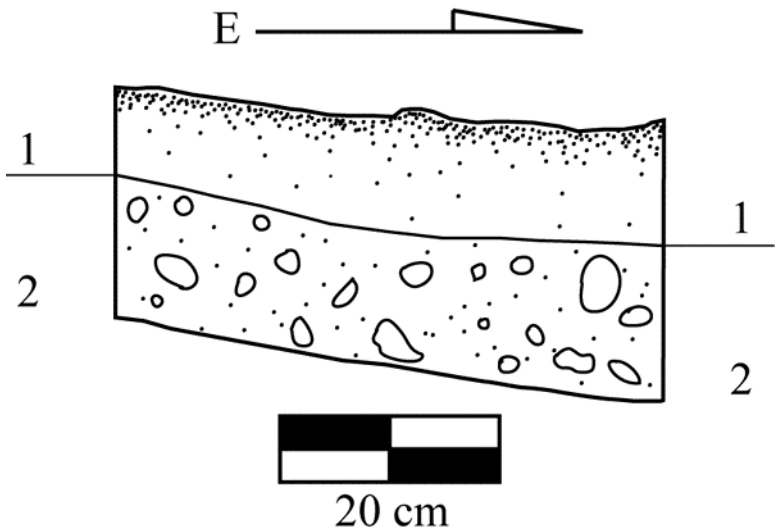

Figure A.8. SB11B-4.

Summary of PS-7-13

This block is part of the San Bartolo periphery. The project camp was placed in this zone due to the light amount of settlement found in 2001. It is possible that the banks of the *escobal bajo* in this zone were used for agriculture, as indicated by vestiges of terraces found during survey. The mounds were very humble and it is possible that some were platforms for perishable houses whereas others were simply rock piles created in the early stages of lithic tool production. All of the identified ceramics from these excavations are Late Preclassic Paso Caballo Waxy wares, although the unidentified material is believed to date to the Late Classic based on paste.

PS-17-24

This block (Figure A.9) was surveyed during the 2004 season (Garrison 2004:100). The center of the block is located at 246125 E, 1940625 N. In this block there is evidence of ancient Maya agriculture. Between two small rivulets that joined into a larger *arroyo* there is a raised patch of terrain. On this raised terrain there are a number of linear features that were most likely associated with ancient agriculture. The mounds were made up of fractured chert nodules and they may have demarcated field boundaries. Another possibility is that the mounds were used to retain soil and nutrients that would normally be lost as a result of runoff, thereby prolonging the life of the soil. Damaris Menéndez excavated two test pits to search for ceramic material associated with the agricultural features (SB11B-15 and SB11B-21). Nicholas Dunning and I excavated two trenches on the sides of the *arroyo* to look at the fluvial geomorphology of the zone (SB11B-55 and SB11B-56).

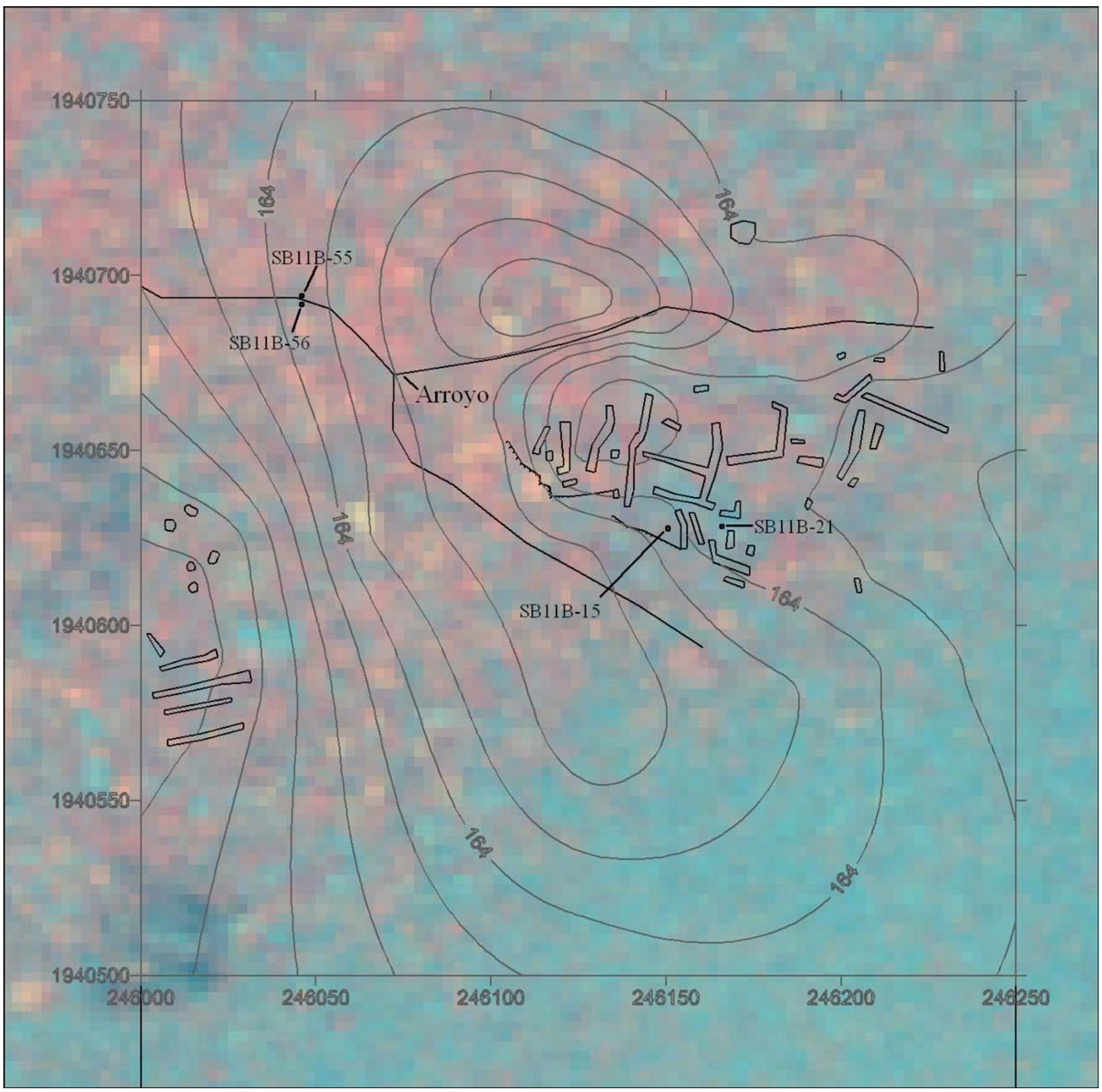

Figure A.9. PS-17-24.

SB11B-15

This 1 x 1 m test pit was located on the edge of one of the agricultural features. Three levels were excavated and limestone bedrock was found at approximately 68 cm (Figure A.10).

- Level 1 (0-27 cm) – Humus layer with small rocks and some roots. The soil was hard and compact (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (27-55 cm) – Fill layer with medium rocks and gravel with some roots. Lots of chert nodules. The soil was hard and compact with some clay content (5 YR 3/3 Dark Reddish Brown). 2 chert fragments.
- Level 3 (55-68 cm) – This level was all gravel, which had been laid on top of the bedrock. The bedrock was severely eroded. The soil had a heavy clay content (5 YR 3/3 Dark Reddish Brown). There was no material.

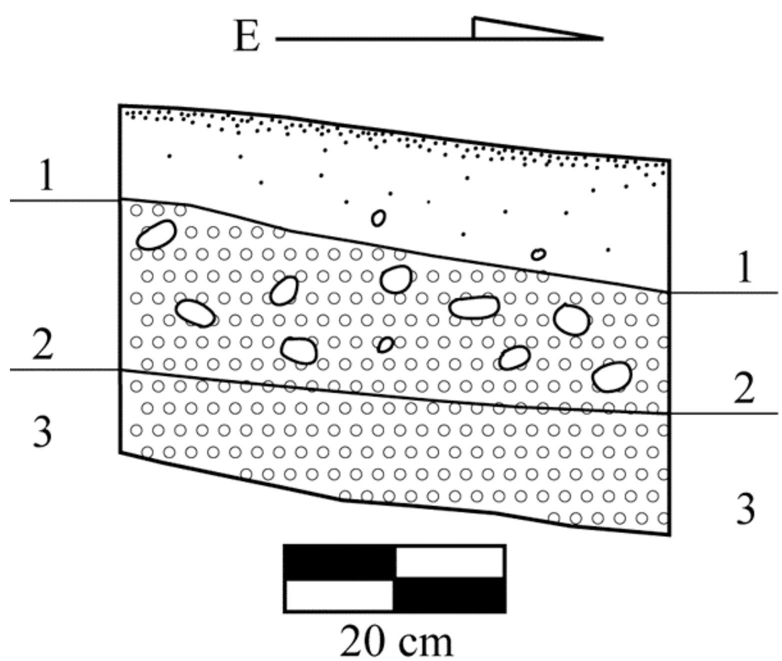

Figure A.10. SB11B-15.

SB11B-21

This 1 x 1 m test pit was located between two agricultural features in order to look for ceramic material. Two levels were excavated to approximately 55 cm, but no material was recovered (Figure A.11).

- Level 1 (0-20 cm) – Humus layer on top of gravel fill. Some large roots. The soil was soft (7.5 YR 3/2 Dark Brown). There was no material.

- Level 2 (20-55 cm) – This level consisted of small rocky fill. There were some medium and large rocks. There were some roots and two snails. There was some carbon found in the fill layer. The soil was hard and compact with some clay content (7.5 YR 4/4 Brown).

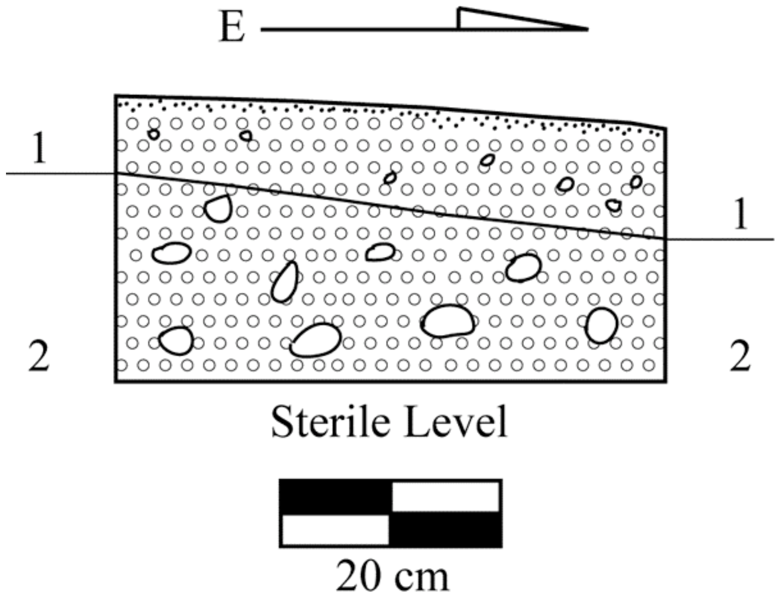

Figure A.11. SB11B-21.

<u>SB11B-55</u>

This 2 x 1 m trench was located on the northeast bank of the *arroyo* that runs east to west through the square. The goal of this unit was to understand the fluvial geomorphology of the *arroyo*. The unit was excavated in one large level and bedrock was encountered at 40 cm (Figure A.12).

- Level 1 (0-40 cm) – This level had five soil strata from which Dunning took four soil samples. In the deepest strata there were three extremely eroded sherds. This strata consisted of hard clay (7.5 YR 3/1 Very Dark Gray). 3 sherds, 4 soil samples.

<u>SB11B-56</u>

This 3 x 1 m trench was located on the southwest bank of the *arroyo* that runs east to west through the block. The goal of this unit was to understand the fluvial geomorphology of the *arroyo*. The unit was excavated in one large level and bedrock was encountered at 63 cm (Figure A.12).

- Level 1 (0-63 cm) – This level was very similar to SB11B-55-1. Dunning recorded the soil strata and drew the profile.

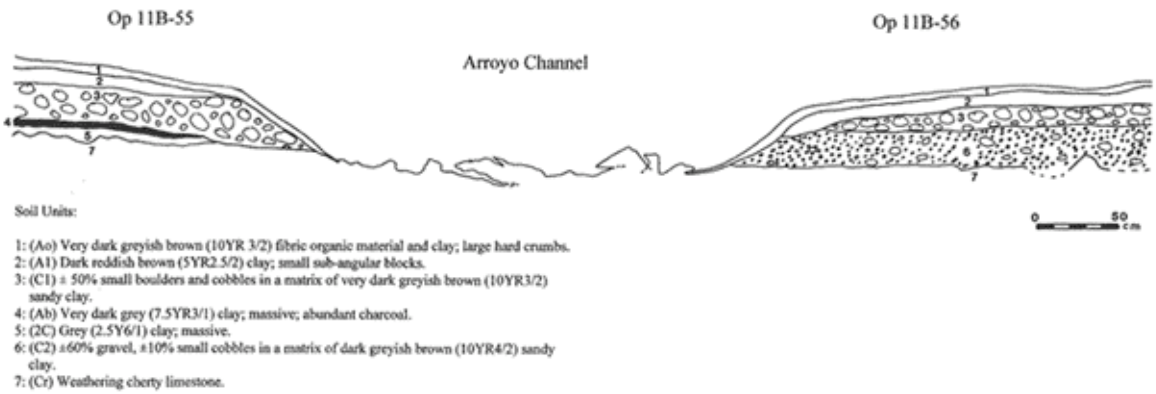

Figure A.12. SB11B-55 and SB11B-56. Drawing by Nicholas Dunning.

<u>Summary of PS-17-24</u>

This block is in the northeast of the intersite zone and it is possible that it pertains to the San Bartolo settlement, but without any chronological data it will be impossible to say for sure. The agricultural features could have had numerous functions. They could have been walkways between gardens or maybe they were used to retain soil nutrients on top of the small hill where they are located. Agricultural features are some of the most difficult remains to interpret in the Maya area. No ceramic material was recovered from these excavations.

PS-25-32

This block (Figure A.13) was surveyed during the 2004 season (Garrison 2004:100). The center of the block is located at 244125 E, 1940625 N. More evidence of ancient Maya agricultural features was found here. In the northeast quadrant there was a series of terraces stepping out of the scrub *bajo* from west to east. The majority of cultural features were found in the northern half of the survey block, with the southern portion being mostly *tintal* scrub *bajo*. There was also a transitional band of *escobal* palm *bajo* in some areas. Logging activity caused serious damaging to the terraces during the three days we spent mapping the block. Damaris Menéndez excavated two test pits in this survey block in order to date the settlement (SB11B-5 y SB11B-7).

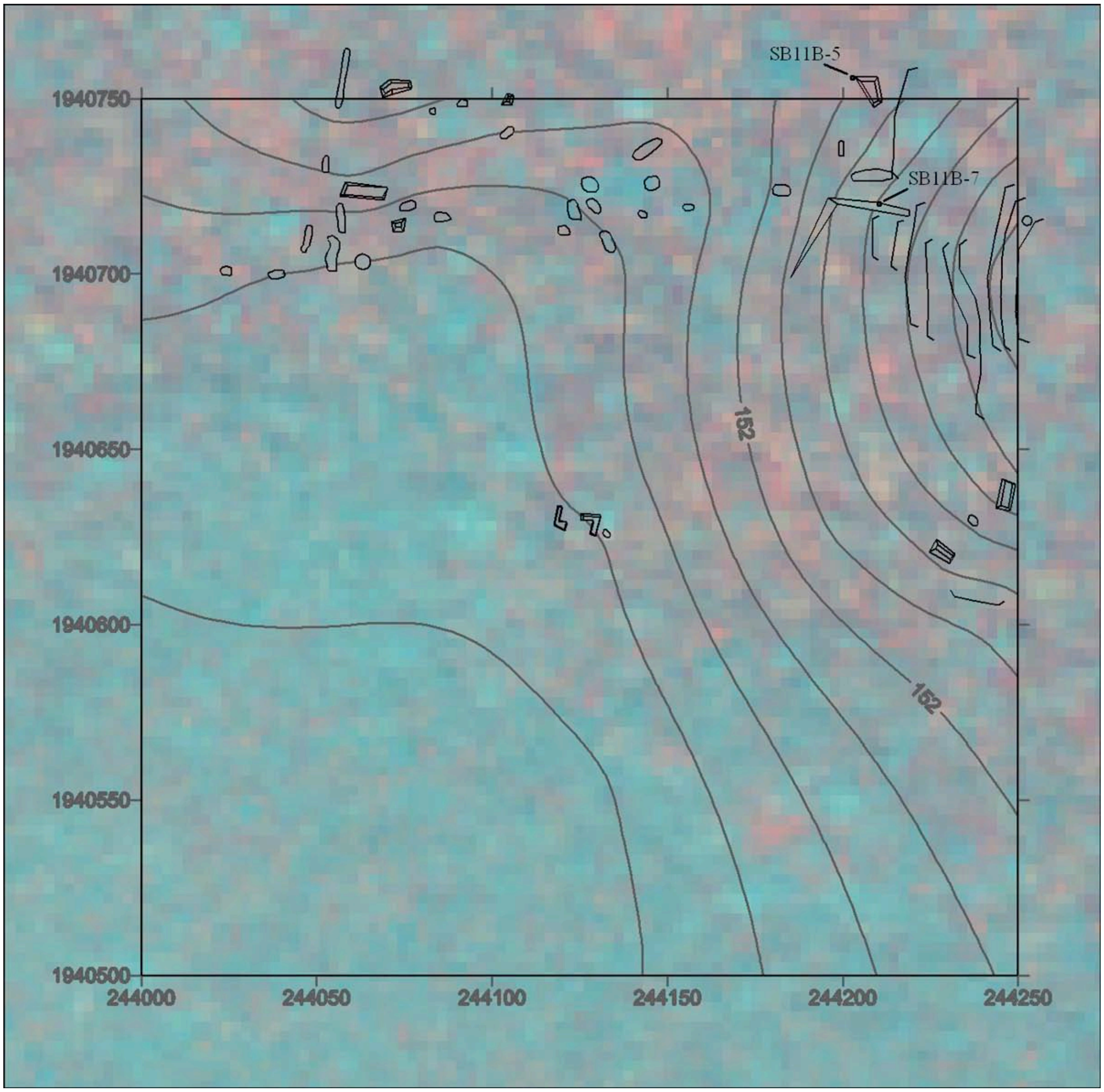

Figure A.13. PS-25-32.

<u>SB11B-5</u>

This 1 x 1 m test pit was located on the side of a mound that lay half way outside of the northern border of the survey block. The goal of the test pit was to date the mound. The unit was excavated in two levels and was abandoned at about 54 cm due to the paucity of material recovered. It was determined that this mound was a rock pile and not a housemound (Figure A.14).

- Level 1 (0-38 cm) – Humus level with small and large roots, small stones, and some chert cobbles. There was denser chert toward the bottom of the level. The soil was hard and compact (10 YR 3/6 Dark Yellowish Brown). 6 chert fragments.
- Level 2 (38-54 cm) – The soil was basically the same as in the previous level, but here there were many chert cobbles of all sizes. Deeper in the level the soil had a more clay-like texture. There were only a few sherd fragments from a single vessel. There was no fill , nor inclusion of cultural material after the chert level began. Many of the chert pieces had been tested for quality. The soil was hard and compact (10 YR 3/6 Dark Yellowish Brown). 15 chert fragments (sample).

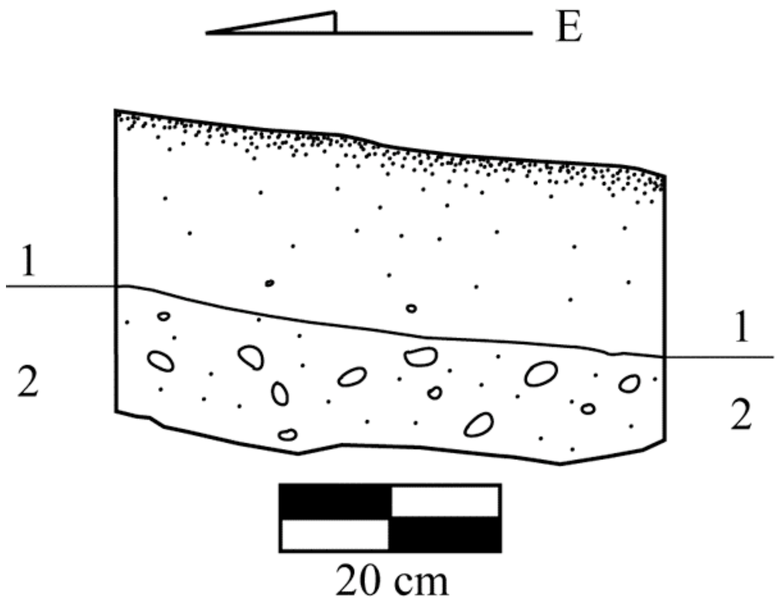

Figure A.14. SB11B-5.

<u>SB11B-7</u>

This 1 x 1 was located on the edge of a leveling platform at the base of the terraces. the goal of the excavation was to find more ceramics. Four levels were excavated and bedrock was reached at approximately 54 cm (Figure A.15).

- Level 1 (0-6 cm) – Humus layer with many roots and small stones. This strata was very thin on top of the fill. The soil was hard and compact (10 YR 3/6 Dark Yellowish Brown). 2 chert fragments.

- Level 2 (6-22 cm) – This level consisted of very hard fill made up mostly of medium sized rocks with some large ones and some gravel. Many small roots were included in this level. The soil was hard and compact (10 YR 3/6 Dark Yellowish Brown). There was no material.
- Level 3 (22-42 cm) – This level was the same as the one before except with a lot more gravel. The level terminated upon reaching a strata of soft limeston (10 YR 5/8 Yellowish Brown). 1 sherd, 2 chert fragments.
- Level 4 (42-54 cm) – This level of soft limestone included a lot of gravel and very few larger stones. After this thin *sascab* strata bedrock was reached (10 YR 7/8 Yellow). 20 sherds.

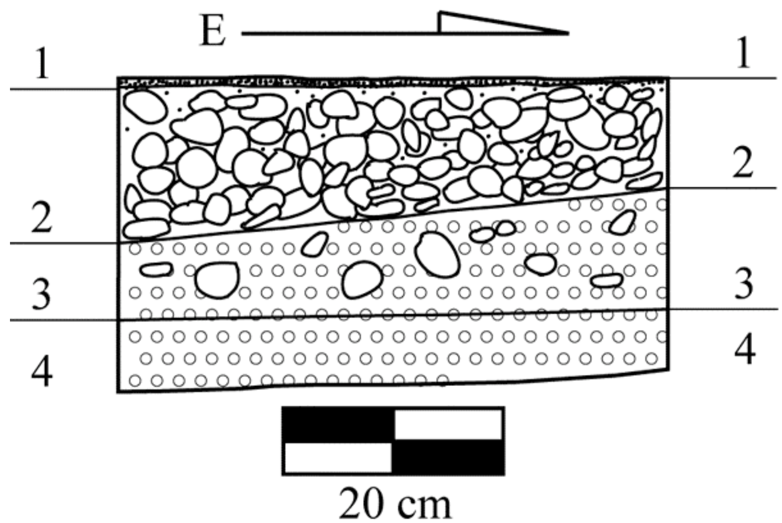

Figure A.15. SB11B-7.

Summary of PS-25-32

Few sherds came out of the excavations. The rock piles found throughout the block were made during the early stages of stone tool production. Alternatively they may have been formed during the process of removing rocks from the soil contained by the terraces, but this seems less likely. Most likely the Maya carried nutritive soil from the scrub *bajo* margin and laid it behind the terraces. Loggers from Arbol Verde damaged this block during the 2004 season. All of the ceramic material recovered dates to the Late Preclassic period, consisting entirely of Paso Caballo Waxy wares.

NS-12-40

This block (Figure A.16) was surveyed during the 2004 season (Garrison 2004:100). The center of the block is at 242125 E, 1940625 N. It is located 2.98 km from camp and 1.53 km into the Bajo Itz'ul from the southwest corner of the San Bartolo site delimitation. There was absolutely no evidence of Maya cultural material or activity in this block. There was no settlement, evidence of agriculture, or resource remains. I excavated a test pit here to confirm that there was no cultural material (SB11B-10).

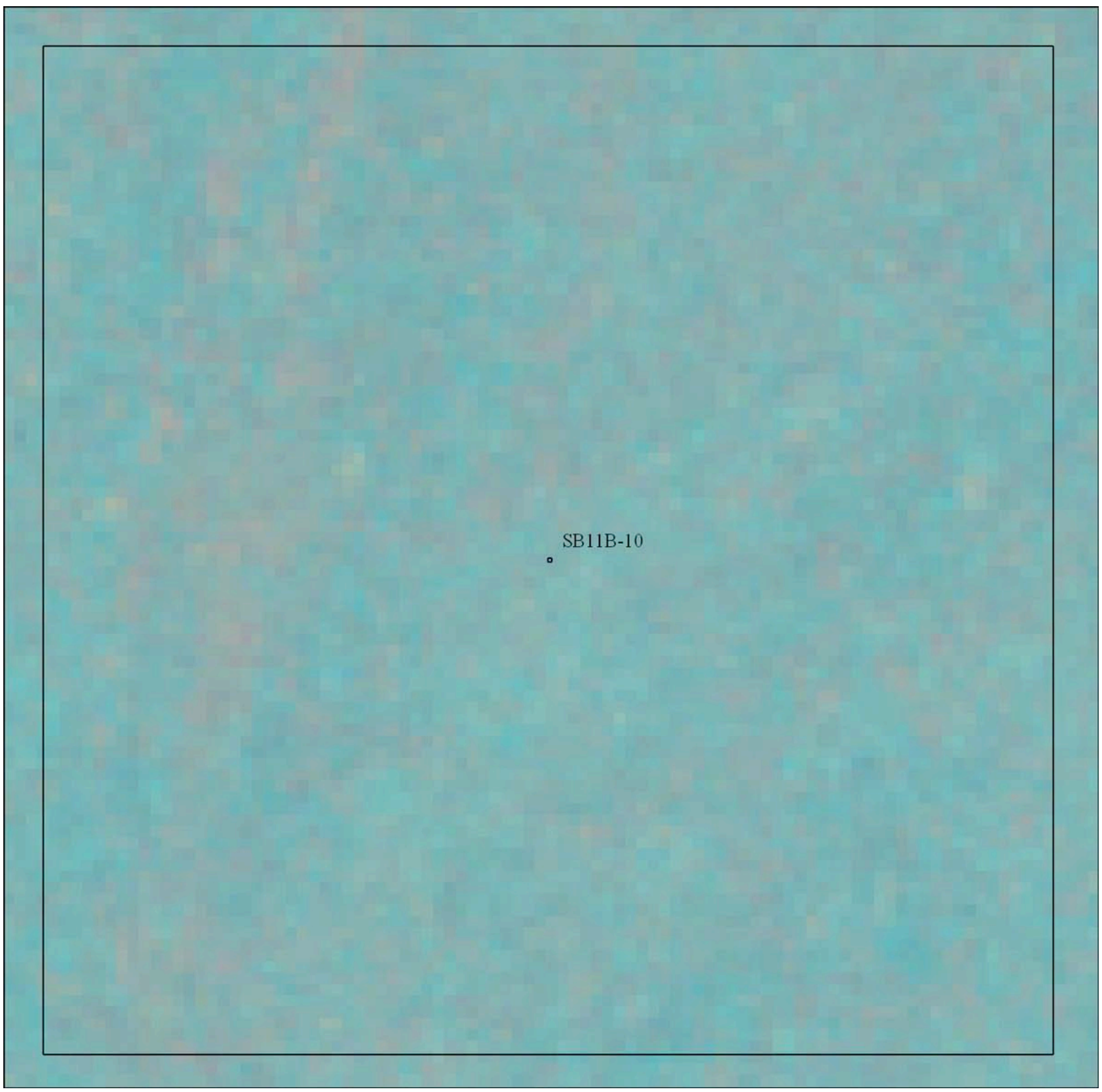

Figure A.16. NS-12-40.

<u>SB11B-10</u>

This unit was located near the center of the block. One level was excavated until the hard clay layer of the scrub *bajo* was reached (Figure A.17).

- Level 1 (0-30 cm) – The surface of this level was very uneven due to the gilgai formed by the seasonal drainage of water. Almost no rocks came out of the unit. The soil contained a lot of clay and was dense and compact (10 YR 3/1 Very Dark Gray). There was no material.

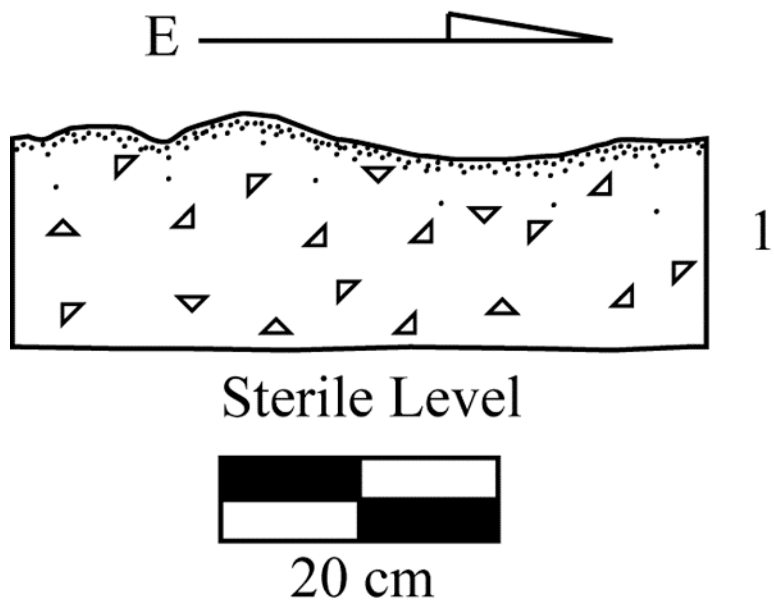

Figure A.17. SB11B-10.

<u>Summary of NS-12-40</u>

Although it is possible that the Maya settled in the scrub *bajo* for part of the year there is no evidence to support such a claim. The Maya most likely used these *bajos* as founts of resources, especially potable water and nutritive soil. No material was recovered.

PS-40-57

This block (Figure A.18) was surveyed during the 2004 season (Garrison 2004:100). The center of the block was located at 246125 E, 1940375 N, directly south of block PS-17-24. There was relatively dense settlement in the southern portion of the block. There was a small courtyard group in the southwest quadrant that represents the largest settlement in the block. The *bajo* was transitional, with vegetation typical of scrub *bajo* on terrain more common in upland palm *bajos*. There was no settlement in the northern half of the block. There were numerous rock piles, many of them in long, linear shapes. Damaris Menéndez excavated three units in this block to date the settlement, especially the courtyard group (SB11B-18, SB11B-19, y SB11B-20).

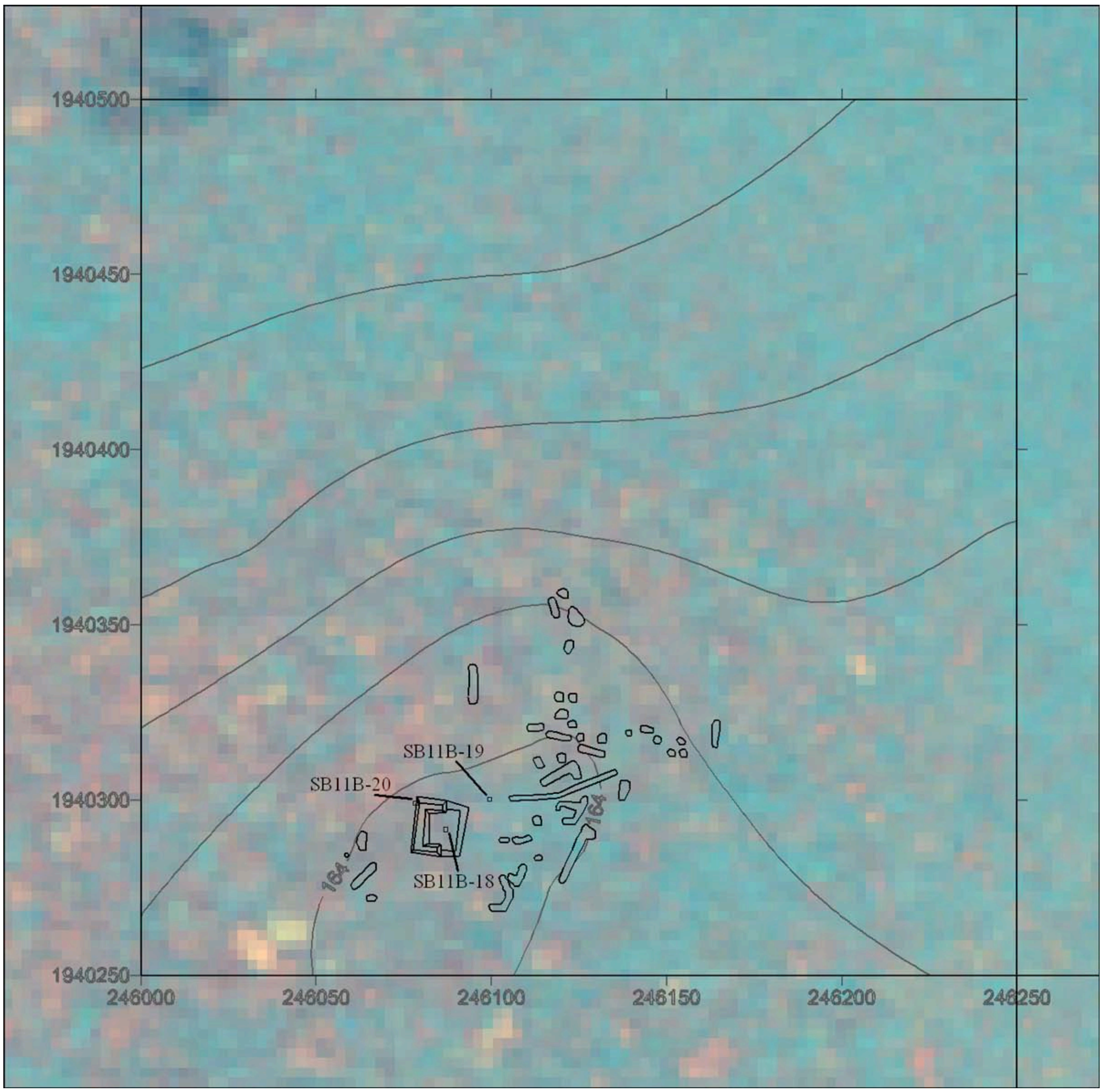

Figure A.18. PS-40-57.

<u>SB11B-18</u>

This unit was in the center of the courtyard plaza. One 40 cm level of pure fill was excavated before the unit was abandoned due to lack of material (Figure A.19).

- Level 1 (0-40 cm) – This level had a 2 cm strata of humus that consisted mostly of small roots. This was followed by a level of dense fill of medium rocks, gravel, and four very large rocks. The excavation was abandoned due to the density of the chert fill. The soil was hard and compact (5 YR 3/3 Dark Reddish Brown). There was no material.

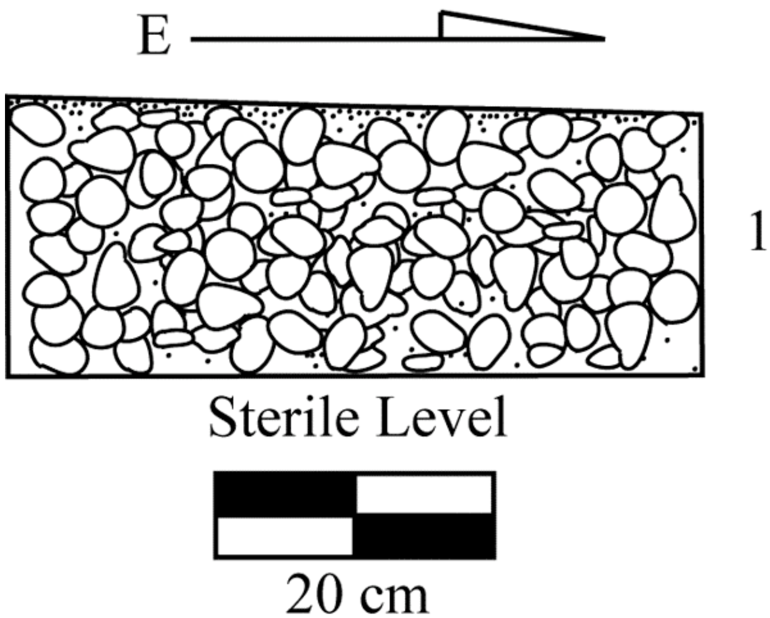

Figure A.19. SB11B-18.

<u>SB11B-19</u>

This unit was located outside of the courtyard group, to the northeast. One 43 cm level of pure fill was excavated before the unit was abadanoned due to a lack of material (Figure A.20).

- Level 1 (0-43 cm) – The fill started after 10 cm of humus with small roots, stones and seeds. The fill was composed of dense chert cobbles of medium size. The soil was hard and compact (7.5 YR 3/2 Strong Brown). There was no material.

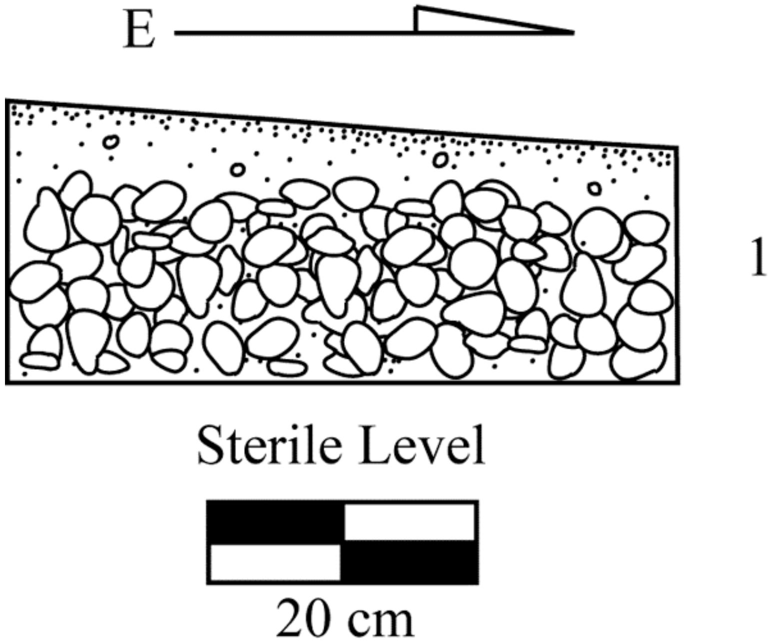

Figure A.20. SB11B-19.

SB11B-20

This unit was located on the northeast exterior corner of the courtyard group. Two levels were excavated and bedrock was encountered at approximately 76 cm (Figure A.21).

- Level 1 (0-64 cm) – There was almost no humus before the rocky fill began. There were some small roots. The stone fill was low quality, eroded chert, probably from the arroyo beds nearby. The unit was pure fill with no other cultural material. The soil was hard and compact (7.5 YR 3/2 Dark Brown). 3 chert cobbles (sample).
- Level 2 (64-76 cm) – The chert cobbles continued but they were a smaller size and were mixed in with gravel. This was followed by the bedrock, which was exteremely eroded and had a depression in the northeast corner. The soil was hard and compact (7.5 YR 4/4 Brown). There was no material.

Summary of PS-40-57

Excavations in this block did not uncover a single sherd for dating purposes. The formof the courtyard group, as well as the *chultun*, indicate that there was ancient activity

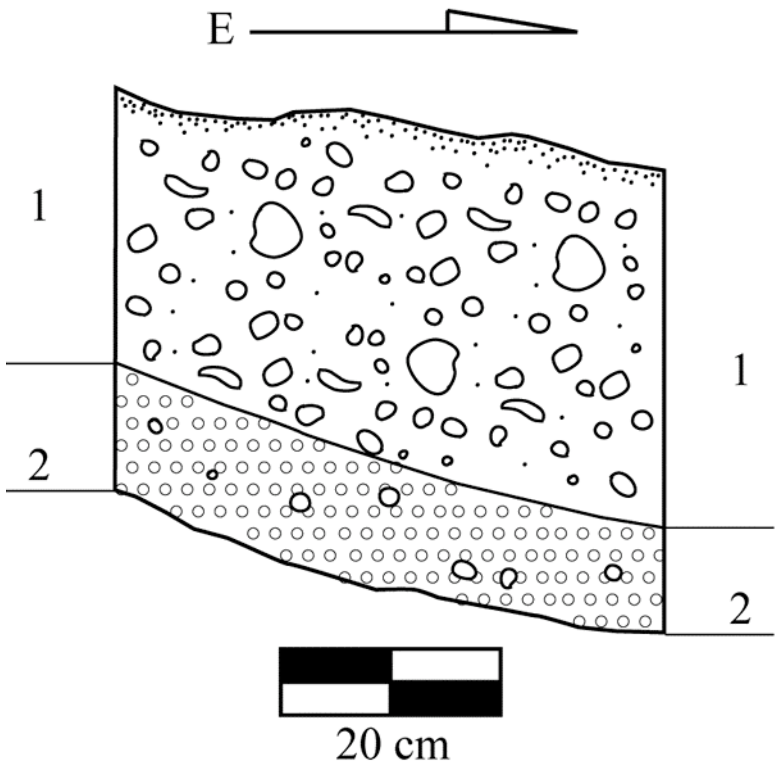

Figure A.21. SB11B-20.

in the block. The chert cobbles in the excavations were so dense that they had to be fill, rather than simple rock piles. Its possible that this fill was covered by a layer of compacted mud or clay that has long since eroded, leaving no archaeological vestige. The absence of ceramic material may indicate that the courtyard group was a field house only used during planting and harvest. The group is located only 250 m south of the agricultural features in PS-17-24. It is difficult to interpret to which site or to which time period the remains in this portion of the intersite zone pertain, since no datable material was recovered.

NS-20-63

This block (Figure A.22) was surveyed during the 2004 season (Garrison 2004:100). The center of the block is located at 246375 E, 1940125 N, to the southeast of PS-40-57. The block is in the center of the Bajo de Nato, which is entirely *tintal* scrub *bajo*. There was no evidence of settlement. I excavated one test pit to confirm the absence of material (SB11B-27).

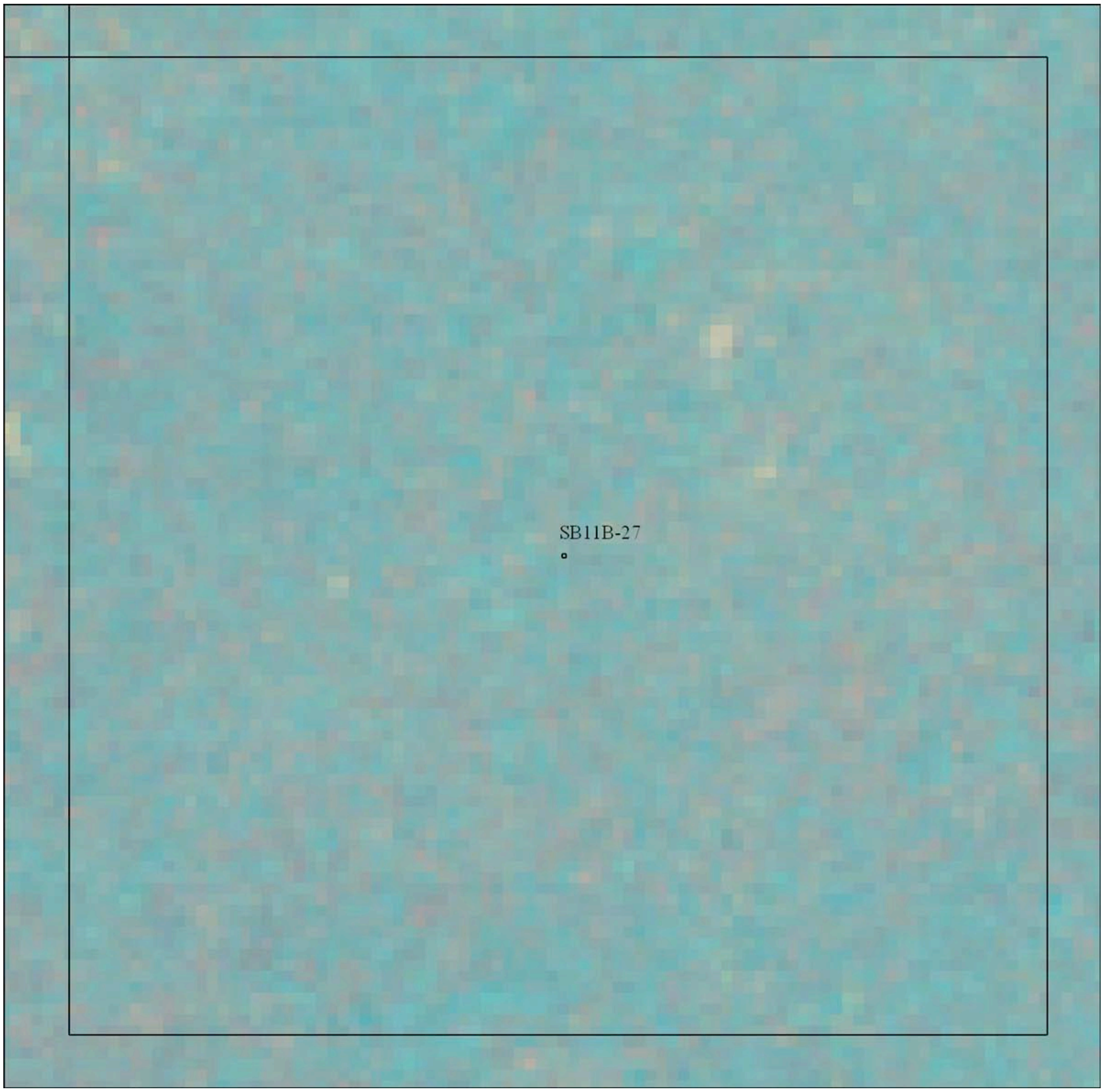

Figure A.22. NS-20-63.

<u>SB11B-27</u>

This unit was located in the center of the square. Three levels were excavated until the gray clay strata was reached at 30 cm (Figure A.23).

- Level 1 (0-10 cm) – This level had a very uneven surface due to the gilgai formed by the seasonal drainage of water. There were almost no rocks in this level. The soil had a high clay content and was hard and compact (10 YR 3/2 Very Dark Grayish Brown). There was no material.

- Level 2 (10-20 cm) – This level was mostly clay (10 YR 6/2 Light Brownish Gray). There was no material.
- Level 3 (20-30 cm) – This level was sterile gray clay, and the unit was abandoned (10 YR 6/2 Light Brownish Gray). There was no material.

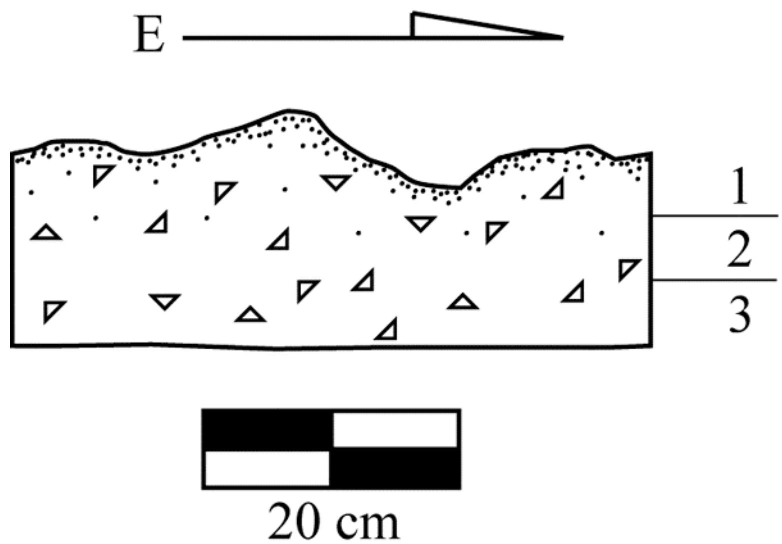

Figure A.23. SB11B-27.

<u>Summary of NS-20-63</u>

In this block of scrub *bajo* there were neither superficial nor excavated remains to indicate the presnec of ancient Maya activities. However, the presence of settlement on *bajo* margins does indicate that they were an important resource. No material was recovered.

NS-22-72

This (Figure A.24) block was surveyed during the 2004 season (Garrison 2004:101). The center of the block is at 244125 E, 1940125 N, 500 m south of PS-25-32. It is in a part of the Bajo Itz'ul composed entirely of *tintal* and *navajuelal*. Julio Cotom and I excavated a test pit to confirm the absence of material (SB11B-24).

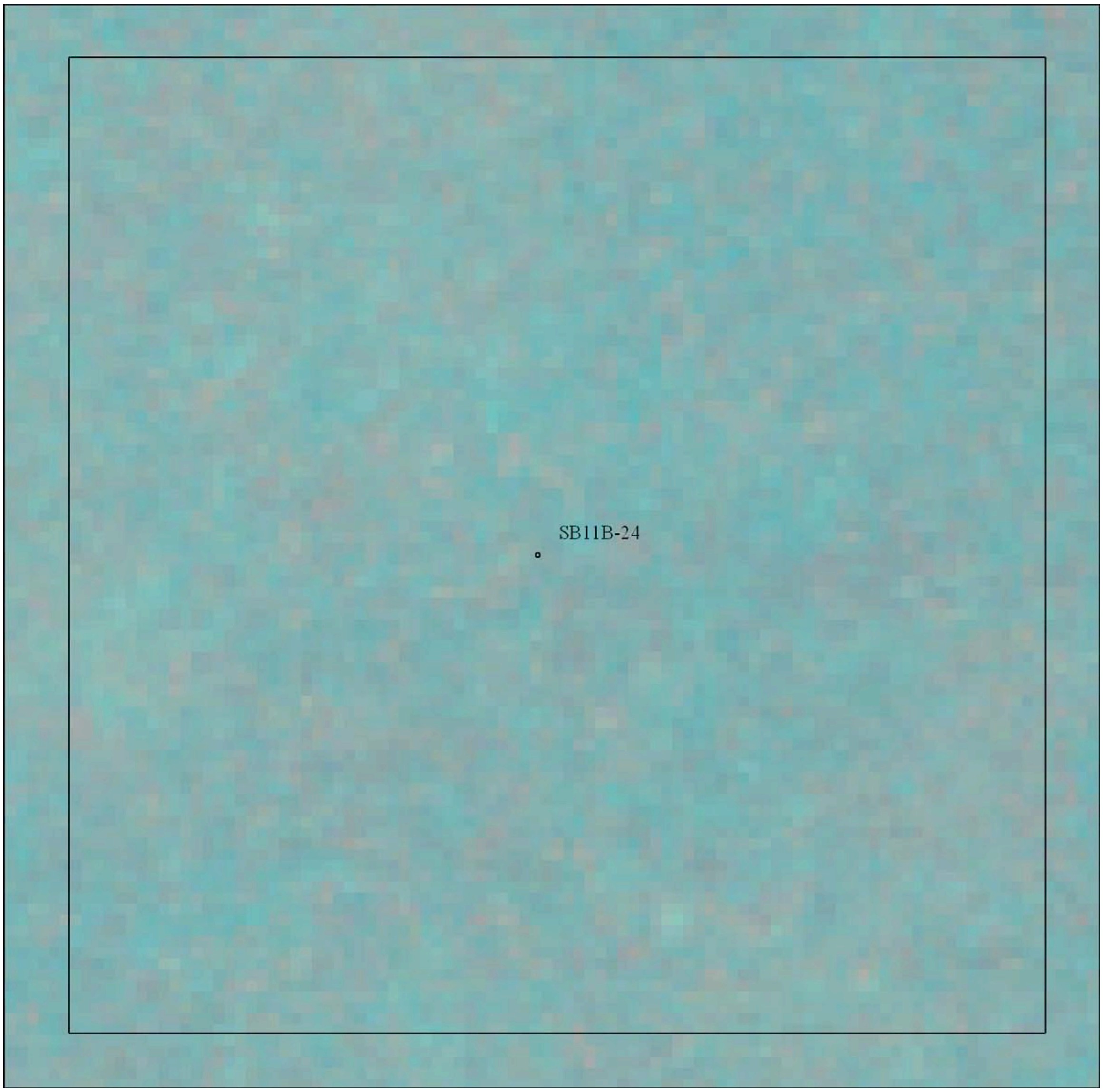

Figure A.24. NS-22-72.

SB11B-24

This unit was located near the centere of the block. Three levels were excavated until the level of brown clay at 30 cm (Figure A.25).

- Level 1 (0-10 cm) – This level had a very uneven surface due to the gilgai formed by the seasonal drainage of water. There were almost no rocks in this level. The soil had a high clay content and was hard and compact (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (10-20 cm) – This level was mostly compact clay with some brown sand and some roots (10 YR 6/2 Light Brownish Gray). There was no material.

- Level 3 (20-30 cm) – Light brown clay strata with very few roots. Like the previous level there was some sand as well. The clay was hard and compact (10 YR 6/2 Light Brownish Gray). There was no material.

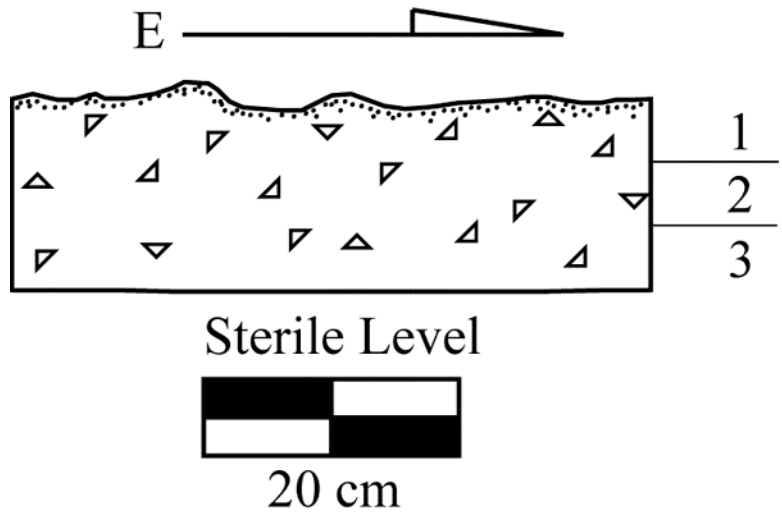

Figure A.25. SB11B-24.

<u>Summary of NS-22-72</u>

Like the other No Settelement blocks (NS), there was no evidence of ancient activity. No material was recovered.

PS-57-86

This block (Figure A.26) was surveyed during the 2004 season (Garrison 2004:101). The center of the block is at 243375 E, 1939875 N. It is near, and possibly part of the site of Chaj K'ek' Cue. The majority of features were found in the southeast quadrant of the block. It is the only block to contain all types of architectural and resource remains. Settlement extends to the southeast, outside of the block. A medium sized structure with a *chultun* was found near some ancient terraces. The scrub *bajo* margin is lined with chert cobbles, although this may be a natural formation. Large limestone boulders with quartzite inclusions were found just south of the center. These were very fragile and would not have served either for architecture or monument carving.

Damaris Menéndez and Jose Garrido excavated a unit in the platform of the structure associated with the *chultun* (SB11B-23).

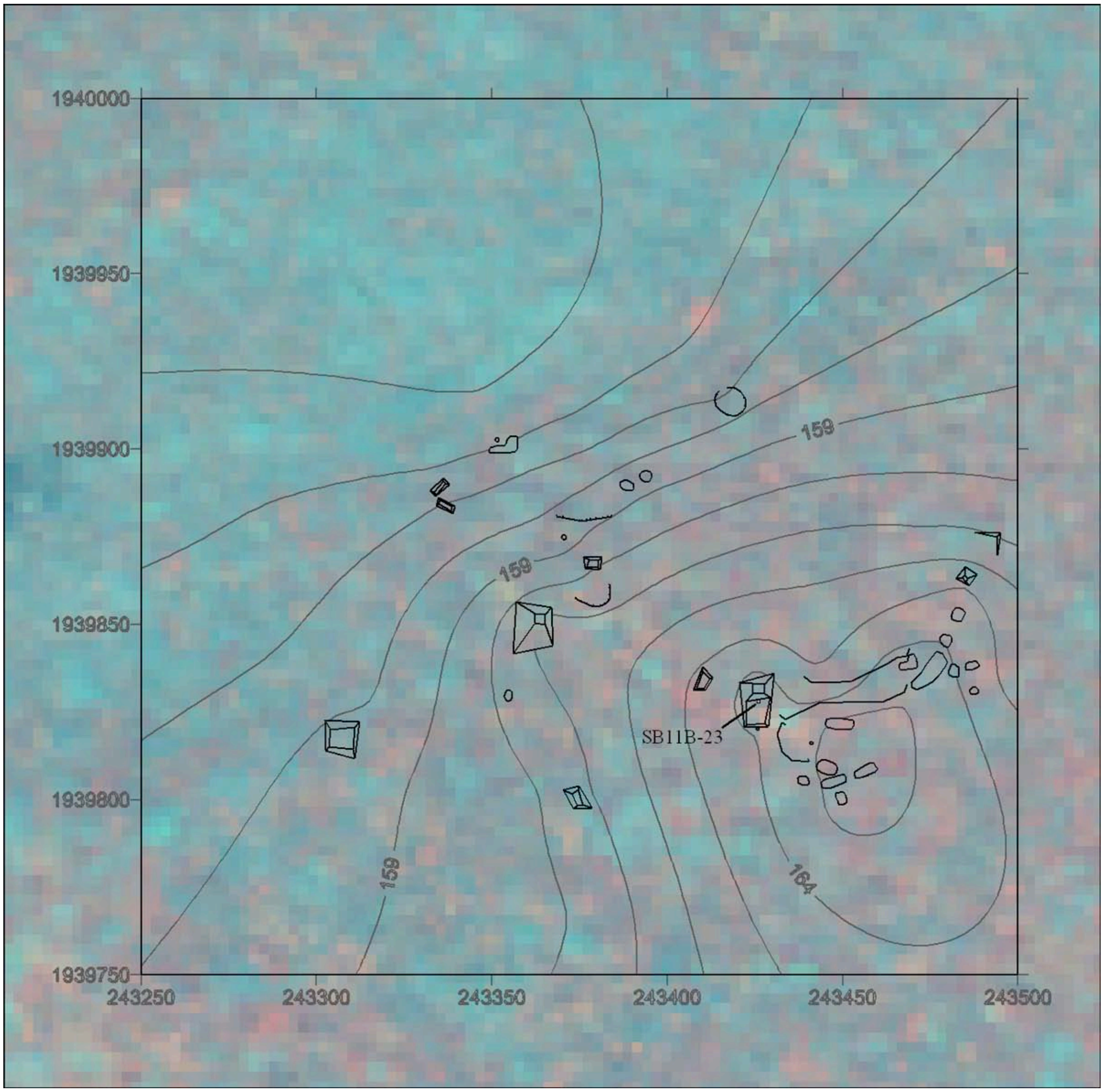

Figure A.26. PS-57-86.

<u>SB11B-23</u>

This unit was excavated with the goal of dating the largest and most complex structure in the survey block. The unit was excavated in two levels and bedrock was encountered at 90 cm (Figure A.27).

- Level 1 (0-72 cm) – There was a 2 cm strata of humus with small roots and pebbles. Some large roots croosed the unit. The fill is almost entirely gravel although the large amount of chert flakes in the fill indicates that refuse from stone tool making was collected to build the structure. The soil was hard and compact with dense amounts of gravel (7.5 YR 2.5/1 Black). 13 sherds.

- Level 2 (72-90 cm) – The soil changed in both texture and color. The color became clearer, almost the color of limestone, and the texture was much fined. The gravel continued all the way to bedrock. The soil was hard and compact with a grainy texture (10 YR 4/1 Dark Gray). 2 chert fragments.

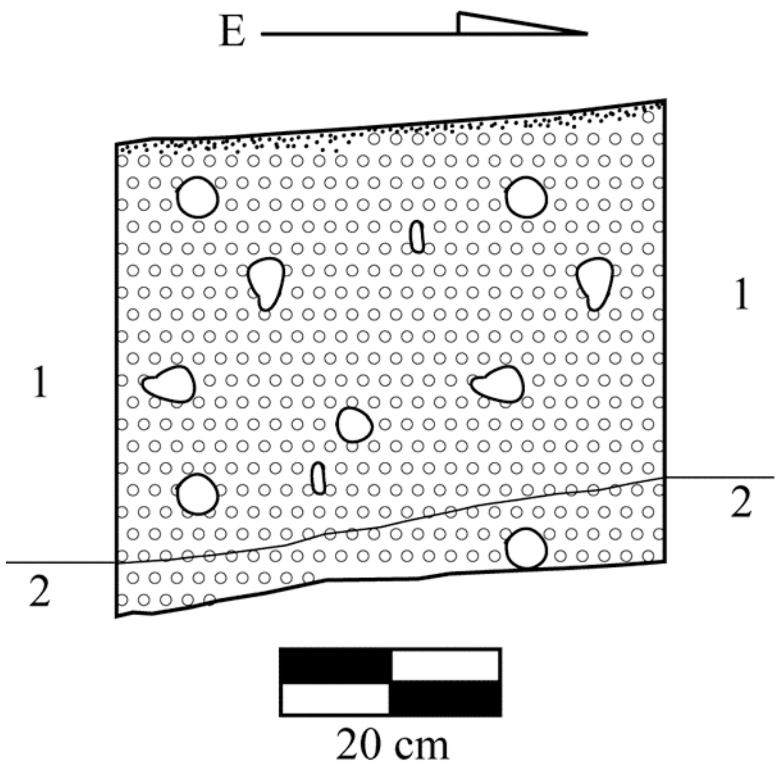

Figure A.27. SB11B-23.

<u>Summary of PS-57-86</u>

Like many of the San Bartolo-Xultun intersite settlements, the structures are made almost entirely of gravel and chert without cut limestone blocks. Very little ceramic material is included in this type of fill, making the structures extremely difficult to date. In these cases features like the terraces suggest a later date. Two sherds were dated to the Late Preclassic, but the unidentified sherds date to the Late Classic based on paste analysis.

PS-71-102

This block (Figure A.28) was surveyed during the 2005 season. The center of the block is at 246625 E, 1939625 N. There were numerous mounds and rock piles found during survey. The workers classified most of the *bajo* in this block as *guayabillal* after a small tree that grows there. The terrain rose to the south, with large deposits of chert. Some of these are agricultural terraces with no associated mounds. To the west there are large, parallel chert rock piles similar to those found in block PS-17-24. These also would have served some agricultural function. There was a small courtyard group on a

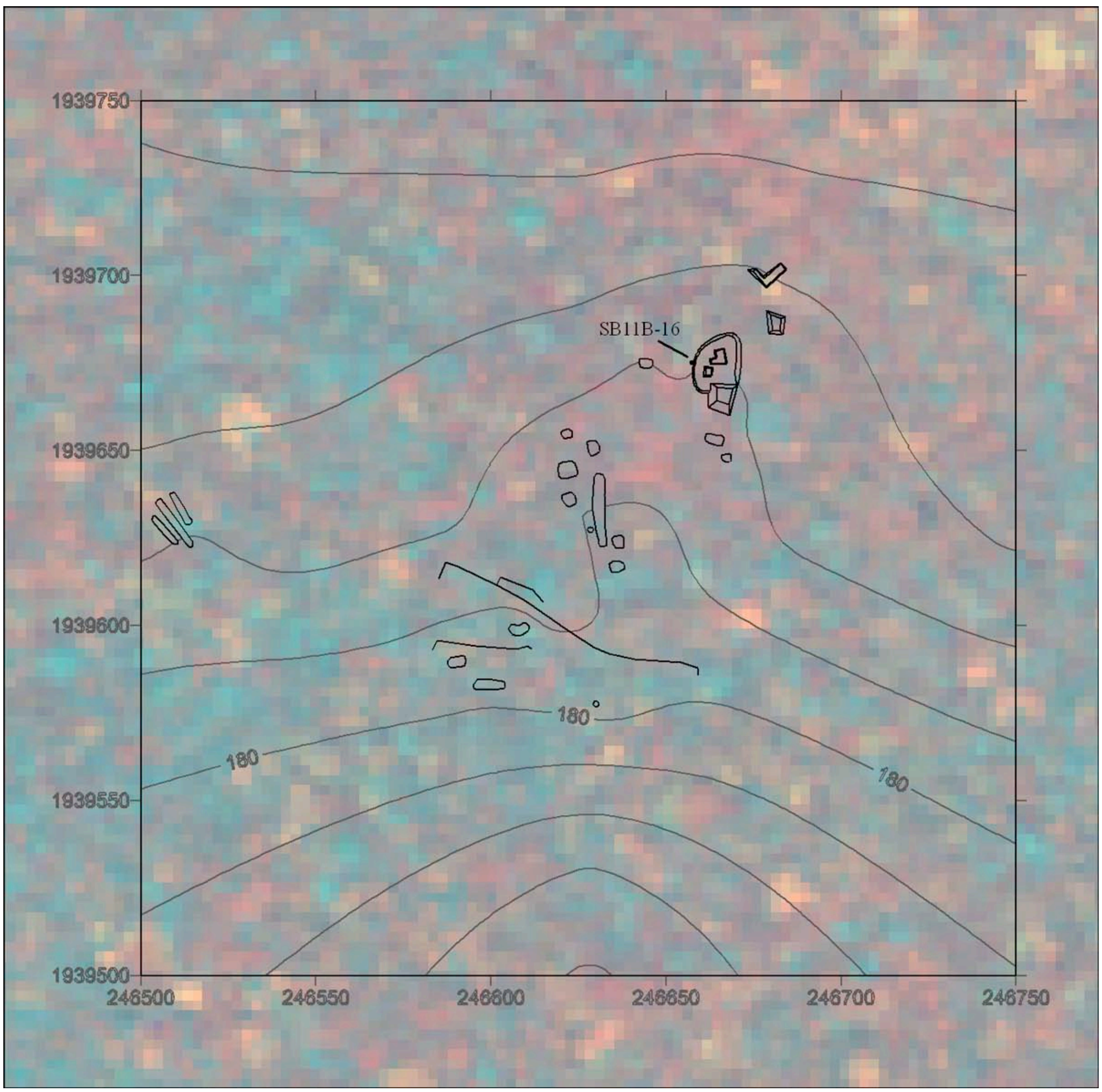

Figure A.28. PS-71-102.

platform to the northeast. Behind the platform there was a small depression that looked like it may have been a *chultun*. I excavated the first four levels uncovering the *chultun* cap stone before Damaris Menéndez took over the excavation and cleaned the *chultun*.

SB11B-16

This unit was placed over a small depression behind the only courtyard group in the block. A *chultun* was encountered leading to a complex excavation, with a second *chultun* found beneath the first one (Figure A.29).

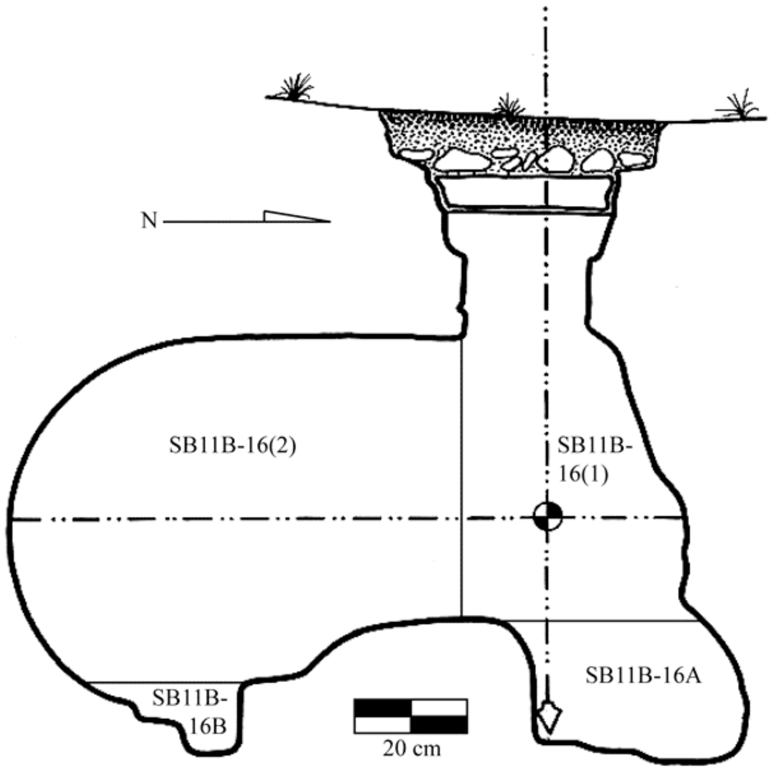

Figure A.29. SB11B-16. Drawing by René Ozaeta and Thomas Garrison.

SB11B-16(1)

- Level 1 (0-10 cm) – This was a humus level with loose soil and lots of organic material. 6 sherds.
- Level 2 (10-18 cm) – The eroded remains of a floor were found in the eastern side of the unit. Excavation continued until the edge of the *chultun* was found. The eroded floor articulated with the lip of the *chultun*. The top of the *chultun* was filled with large chert and limestone rocks. 7 sherds.
- Level 3 (18-40 cm) – The ring of the *chultun* was cleaned and portions of the floor were found everywhere except in the northeast. The unit was extended 5 cm

to the west to incorporate the entire *chultun*. The rocks were removed from the *chultun* neck until the capstone was found. Two smaller stones were wedged in with the capstone to secure it in place. The capstone was 25 cm below the floor and 40 cm below the surface. The capstone measured roughly 52 x 44 cm. 10 sherds.

- Level 4 (40-140 cm) – The capstone was removed revealing a space of 87 cm, meaning that the level actually began at a depth of 127 cm from the surface. The *chultun* entrance had a width of 50 cm. Inside the *chultun* there was a lot of intrusive organic material including seeds and roots. A rat climbed out indicating an unsealed context, probably disturbed by bioturbation. 4 sherds.
- Level 5 (140-150 cm) – The dimensions of the unit inside of the *chultun* were 1.27 (N-S) x 1.40 (E-W) m. Have of the *chultun* was left to excavate under the separate provenience of SB11B-16(2). This level continued with loose earth mixed with small piece of limestone. Land snails were found throughout the level. The soil was smooth (10 YR 5/2 Grayish Brown). 3 sherds.
- Level 6 (150-160 cm) – This level contained the same fill as Level 5. Snails continued to be found. Some chert fragments were in the level. The soil was smooth (10 YR 5/2 Grayish Brown). 3 sherds.
- Level 7 (160-170 cm) – In this level, the loose soil continued for 5 cm until a more clay-like strata was encountered, still with roots and snails. The measurements of the unit at this depth were 2.95 (N-S) x 1.35 (E-W) m. The soil had a high clay content (10 YR 3/2 Very Dark Grayish Brown). 5 sherds.
- Level 8 (170-180 cm) – The clay layer continued with small stones and very few pieces of chert. Snails continued to be found. The soil had a high clay content (10 YR 3/1 Very Dark Gray). 15 sherds, 1 chert fragment.
- Level 9 (180-190 cm) – In the center of this level there were three stones that filled the neck of a second *chultun*. The depth at the center of the circle, after a space of 20 cm, was 210 cm. The level continued to have a high clay content (10 YR 3/1 Very Dark Gray) with small stones. 10 sherds, 2 chert fragments.

SB11B-16(2)

- Level 1 (0-40 cm) – The unit measured 1.10 x 0.60 m at this depth. The level consisted of very fine crushed limestone fill with bits of limestone and land snails. The soil was fine and smooth (10 YR 7/2 Light Gray). There was no material.
- Level 2 (40-60 cm) – The same fill continued. The soil was fine and smooth (10 YR 8/1 White). 2 chert fragments.
- Level 3 (60-80 cm) – The same fill continued with land snails. The soil was very fine and smooth (10 YR 8/1 White). 1 sherd.
- Level 4 (80-100 cm) – The same fill continued. The soil was fine and smooth (10 YR 8/1 White). 1 chert fragment.
- Level 5 (100-120 cm) – The same fill continued. The soil was fine and smooth (10 YR 8/1 White). 2 chert fragments.
- Level 6 (120-145 cm) – The same fill continued. The soil was fine and smooth (10 YR 8/1 White). 4 chert fragments.

SB11B-16A

- Level 1 (210-220 cm) – The rocks described in SB11B-16(1)-9 were lifted to open the second *chultun*. Clay soil with small stones, chert fragments and snails continued. The *chultun* neck had a diameter of 25 cm. The soil was smooth, with a high clay content (10 YR 3/1 Very Dark Gray). 5 sherds, 4 chert fragments.
- Level 2 (220-230 cm) – The soil was very fine with small stones and some chert. The soil was smooth (10 YR 3/1 Very Dark Gray). 5 sherds, 2 chert fragments.
- Level 3 (230-240 cm) – The fill continued but the soil was darker with small roots. The soil was smooth (10 YR 3/1 Very Dark Gray). 16 sherds, 5 chert fragments.
- Level 4 (240-250 cm) – The soil was the same (10 YR 3/1 Very Dark Gray). 17 sherds, 2 chert fragments.
- Level 5 (250-255 cm) – The soil was the same and bedrock was encountered. The soil was smooth (10 YR 3/1 Very Dark Gray). There was no material.

SB11B-16B

- Level 1 (128-138 cm) – Just as in SB11B-16A, there was a cut with small rocks in the southwest. The fill was crushed limestone with small roots. The soil was very fine and smooth (10 YR 8/2 Very Pale Brown). 8 sherds, 4 chert fragments.
- Level 2 (138-148 cm) – The fill was the same as the previous level (10 YR 8/2 Very Pale Brown). 2 sherds, 2 chert fragments.
- Level 3 (148-158 cm) – The crushed limestone fill continued until bedrock was encountered. The soil was very fine (10 YR 8/2 Very Pale Brown). 4 sherds.

SB11B-16B(3)

- Level 1 (158 cm) – This level represents the cleaning of the southeast side. The soil was very fine and smooth (10 YR 8/2 Very Pale Brown). 3 chert fragments.

Summary of PS-71-102

This block is on the San Bartolo side of the intersite zone to the east. The double *chultun* is a rare form. It is likely that this *chultun* was used for storage of agricultural surplus. Agricultural features to the northeast support this interpretation. The ceramic material recovered from the *chultun* was primarily Late Preclassic with a mix of Achiotes Group unslipped types and Paso Caballo Waxy wares. However, there was also some Late Classic material consisting of Encanto Group unslipped wares as well as a few Peten Gloss wares.

NS-28-112

This block (Figure A.30) is in the Bajo Itz'ul and is 500 m south of blcok NS-22-72. The center of the block is at 244125 E, 1939625 N. The scrub *bajo* is primarily *huechal*, with some *navajuelal*. Julio Cotom and I excavated a unit to confirm the absence of material (SB11B-25).

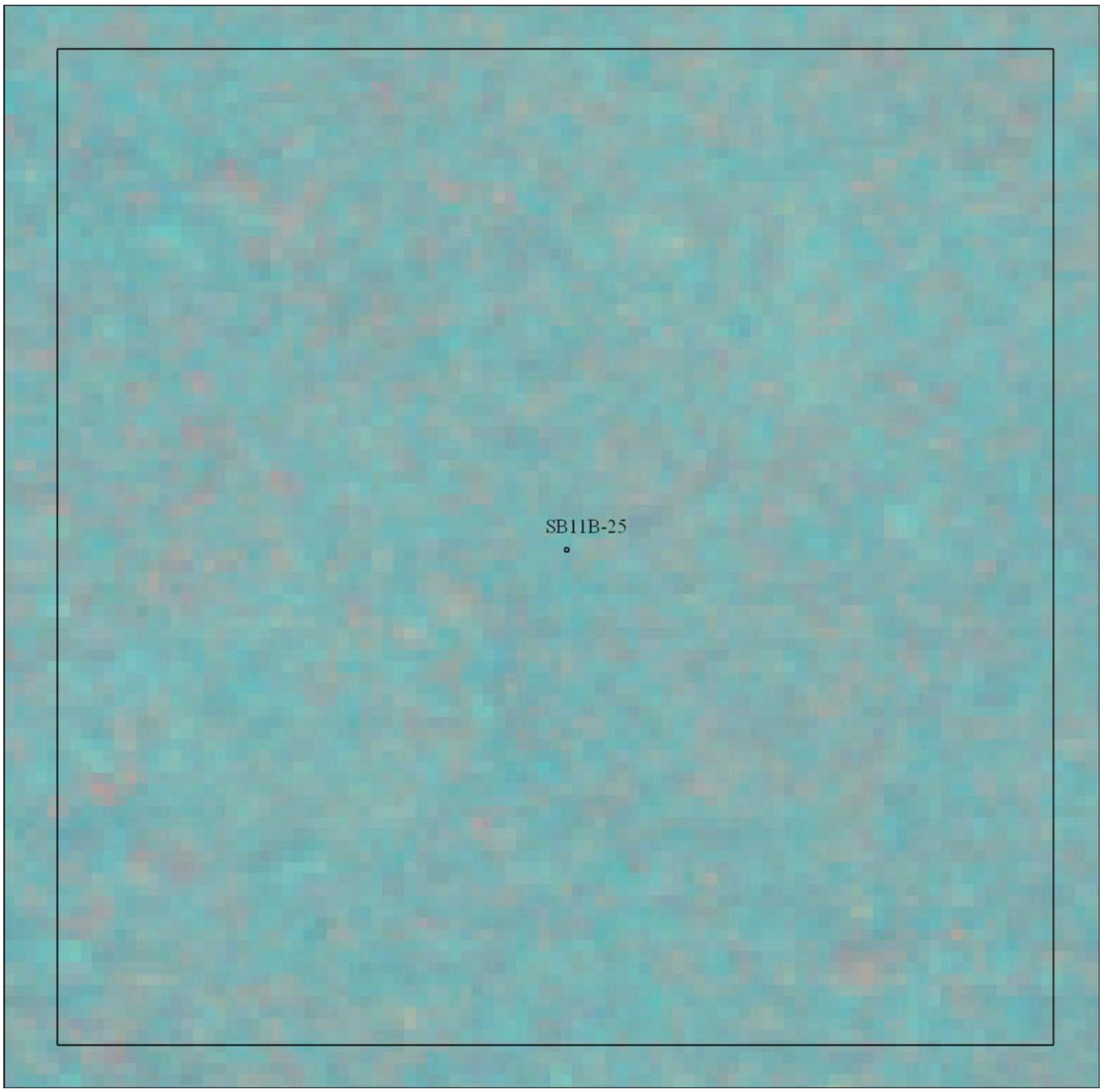

Figure A.30. NS-28-112.

<u>SB11B-25</u>

This unit was in the center of the block. Two levels were excavated to a depth of 20 cm to a sterile clay layer (Figure A.31).

- Level 1 (0-10 cm) – The surface of this level was very uneven due to the gilgai formed during the seasonal drainage of water. There were almost no stones in this level except for two pieces of chalcedony. The soil was hard and compact (10 YR 3/1 Very Dark Gray). There was no material.
- Level 2 (10-20 cm) – This level reached sterile clay. The soil was hard and compact (10 YR 4/2 Dark Grayish Brown). There was no material.

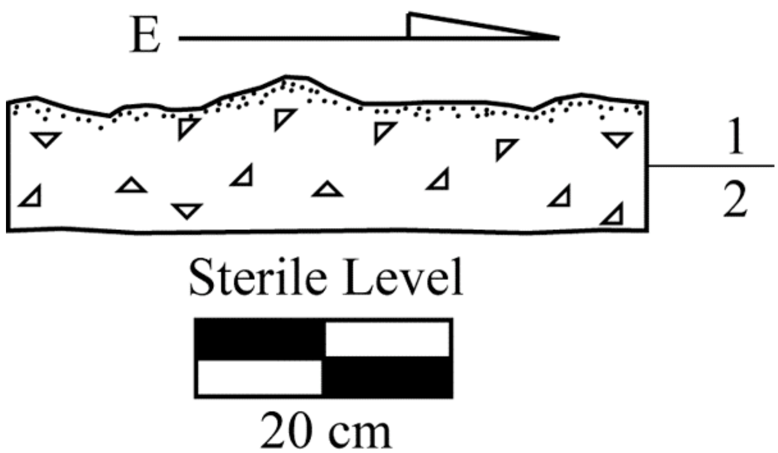

Figure A.31. SB11B-25.

<u>Summary of NS-28-112</u>

The summary of this block is the same as other No Settlement (NS) blocks. No material was recovered.

PS-90-125

This block (Figure A.32) contains Group B of Chaj K'ek' Cue, a small site discovered in 2003 (Garrison 2003a). The center of the block is at 243125 E, 1939375 N. In the northern portion of the block there are a couple of courtyard groups. There are two *chultuns*, a few quarries, and rock piles to the west and northwest. Part of the scrub *bajo* margin was mapped to confirm the accuracy of the IKONOS satellite imagery. The *bajo* in this block is of the *bejuquero* variety, which the workers say is good for agriculture due to the low number of rocks in the terrain. I excavated one unit in the plaza found right on the *bajo* margin (SB11B-1).

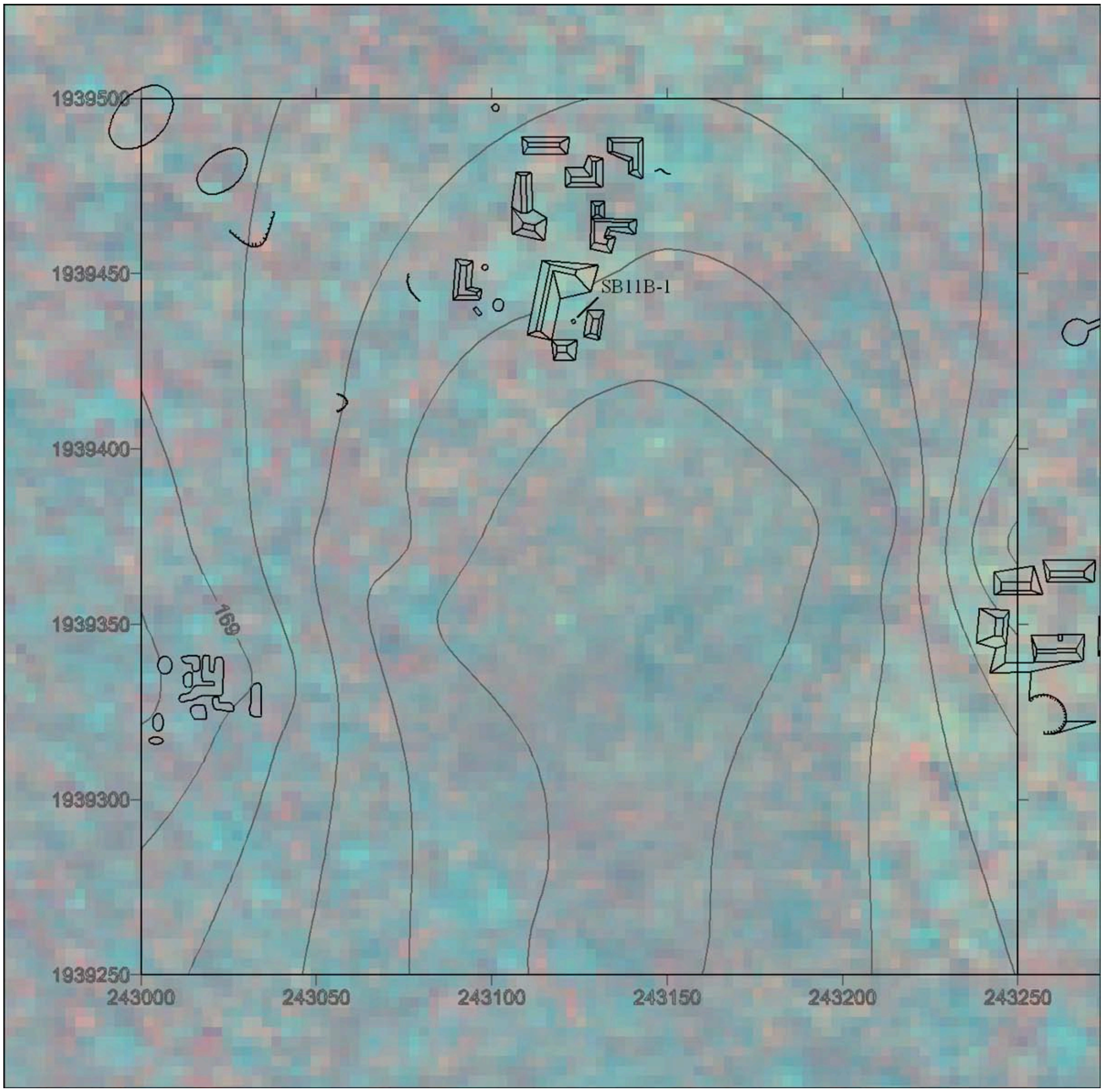

Figure A.32. PS-90-125.

<u>SB11B-1</u>

The goal of this unit was to date the plaza and the surrounding architecture. Six levels were excavated until bedrock was encountered at 60 cm (Figure A.33).

- Level 1 (0-10 cm) – This was the humus level with a lot of organic material, including seeds and roots. The soil was humid and loose (10 YR 2/1 Black). 2 sherds.

- Level 2 (10-20 cm) – There was a soil change, but humic material continued. There were limeston inclusions in the soil, possibly representing an eroded floor. The soil was loose (10 YR 3/1 Very Dark Gray). 6 sherds, 1 chert fragment.
- Level 3 (20-30 cm) – This level consisted of a fill of medium sized stones measuring 6-10 cm in diameter. The soil was loose (7.5 YR 6/1 Gray). 39 sherds, 1 chert fragment.
- Level 4 (30-40 cm) – The same fill continued. The soil was loose (7.5 YR 6/1 Gray). 8 sherds.
- Level 5 (40-50 cm) – The bedrock began in the northern portion of the unit. The soil was the same (7.5 YR 6/1 Gray). There was no material.
- Level 6 (50-60 cm) – Limestone bedrock was encountered in all portions of the unit. The soil was the same (7.5 YR 6/1 Gray). There was no material.

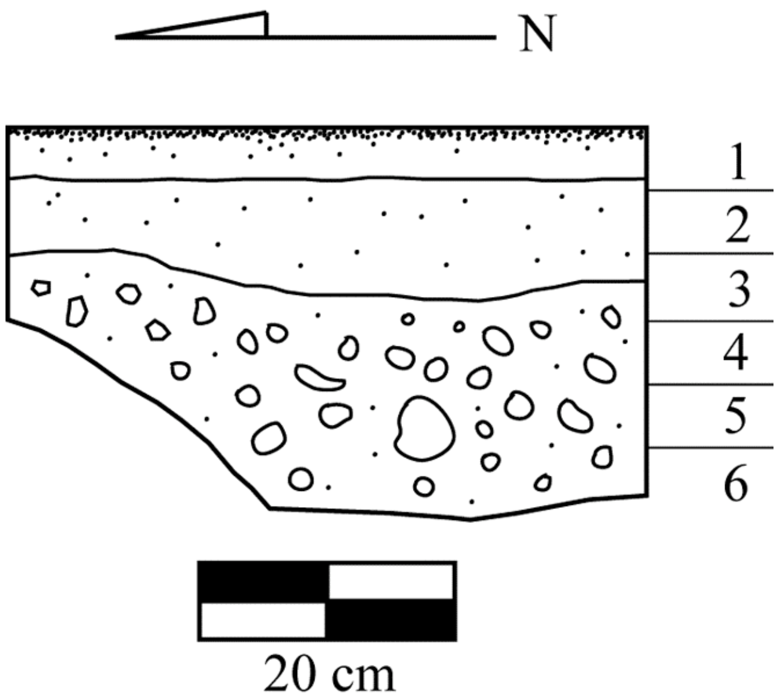

Figure A.33. SB11B-1.

<u>Summary of PS-90-125</u>

The plaza that was excavated was built in a single construction phase and the only floor was deteriorated beyond recognition. Other excavations at Chaj K'ek' Cue indicate a predominantly Late Classic settlement. The architecture in this block is one of the largest examples in the intersite survey sample. The other large examples come from the Xultun periphery, making Chaj K'ek' Cue the largest settlement in the actual intersite area. A more detailed examination of Chaj K'ek' Cue would greatly enhance our understanding of interactions between sites of different sizes in regional dynamics. Most of the ceramics from the excavations in this block were unidentifiable, but both Late Preclassic and Late Classic forms were present.

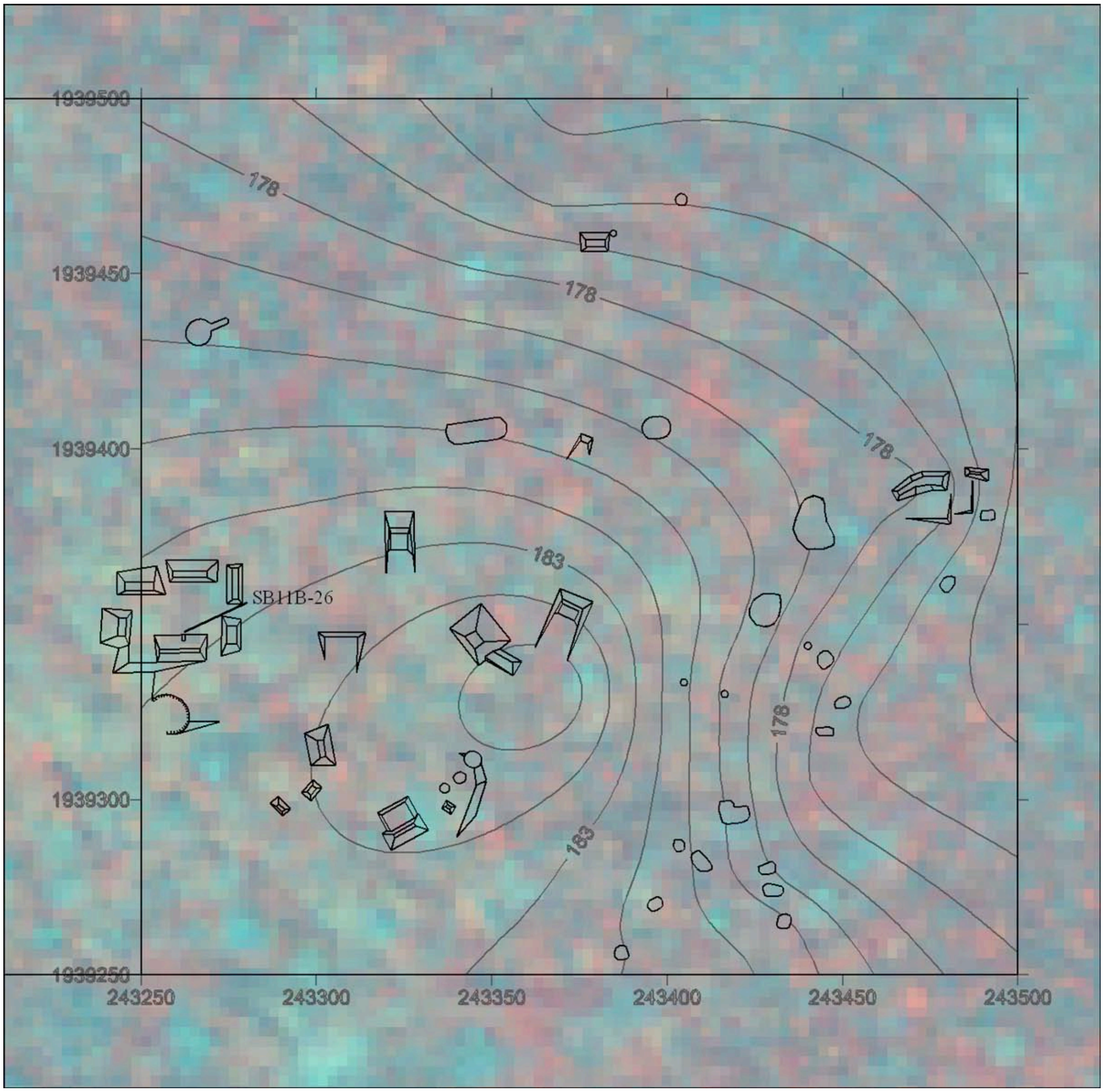

Figure A.34. S-5-126.

S-5-126

This block (Figure A.34) was surveyed during the 2004 season (Garrison 2004:101). The center of the block is at 243375 E, 1939375 N. This was the first Settlement (S) block surveyed and it is immesiately east of block PS-90-125. The southwest cuadrant of this block was mapped in 2003 by Griffin and I as part of the survey of Chaj K'ek' Cue. There is a courtyard in the west of the block that represents one of the best preserved in the whole area. Julio Cotom and I excavated a 2 x 1 m trench in the northern side of the southern structure on the southern side of the plaza of this group with the goal of dating the plaza and the structure (SB11B-26).

SB11B-26

This unit was located on the north side of the largest structure in the group. It was excavated in 19 levels until reaching bedrock at 211 cm below datum. The unit was excavated in 10 cm levels until the first floor was reached. From there the unit was dug as an architectural sequence. Levels are shown in the profile (Figure A.35).

- Level 0 (16 cm) – This level represents the surface collection. There were many leaves and roots. 1 sherd.
- Level 1 (16-30 cm) – This lot measured 1 x 0.30 m with a depth of 14 cm. There were 4 cm of humus that was made up of black earth and a lot of organic material. The soil was soft and sandy (10 YR 5/2 Grayish Brown). There was no material.
- Level 2 (30-40 cm) – This lot measures 1 x 0.57 m with light brown earth, roots, and small stones. The soil was soft and sandy (10 YR 6/2 Light Brownish Gray). 2 sherds, 1 figurine fragment.
- Level 3 (40-50 cm) – This lot measured 1 x 0.95 m with light brown earth, large roots, and small stones. The soil was smooth and sandy (10 YR 7/2 Light Gray). 2 sherds, 2 chert fragments.
- Level 4 (50-60 cm) – This lot measured 1 x 1.25 m cwith light brown earth, large roots, and small stones. The earth was soft and sandy (10 YR 7/2 Light Gray). 4 sherds, 2 chert fragments.
- Level 5 (60-70 cm) – This lot measured 1 x 1.74 m with light brown earth, roots, and small stones. The soil was soft and sandy (10 YR 7/2 Light Gray). 29 sherds, 2 chert fragments.
- Level 6 (70-80 cm) – This lot measured 1 x 1.65 m from the first (top) step to the northern edge of the unit. A step made of cut limestone blocks was found at 72 cm. The architecture was left intact. Wall fall from the structure was found on top of the steps. There was light brown earth with roots and small stones. The soil was loose and sandy (10 YR 7/1 Light Gray). 21 sherds, 3 chert fragments.
- Level 7 (80-90 cm) – This lot measured 1 x 1.65 m from the first (top) step to the northern edge of the unit. There was light brown earth with small stones and some roots. The soil was smooth and sandy (10 YR 7/1 Light Gray). 15 sherds.

- Level 8 (90-100 cm) – This lot measured 1 x 1.65 m from the first (top) step to the northern edge of the unit. The second (middle) step of cut limestone blocks was found. There was light brown earth with very small stones (10 YR 7/1 Light Gray). 14 sherds, 4 chert fragments.
- Level 9 (100-110 cm) – This lot measured 1 x 1.26 m from the second (middle) step to the northern edge of the unit. There was light brown earth with small stones. The soil was smooth (10 YR 7/1 Light Gray). 28 sherds, 1 chert fragment.
- Level 10 (110-116 cm) – This lot measured 1 x 1.26 m from the second (middle) step to the northern edge of the unit. The third (bottom) step was found as well as what appeared to be a ceramic offering. There was light brown earth with small stones. The soil was smooth (10 YR 5/1 Gray). 5 sherds.
- Level 11 (116-130 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. More sherds were found, most coming from large *olla*. There was light brown earth with very few stones. The soil was smooth and sandy (10 YR 7/2 Light Gray). 24 sherds, 2 chert fragments.
- Level 12 (130-134 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. There were many sherds on top of the first floor, found at 134 cm. There was light brown earth. The soil was smooth and sandy (10 YR 7/2 Light Gray). 68 sherds.
- Level 13 (134-147 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. The eroded floor was 1 cm thick. There was a mix of light brown earth with gravel composed mostly of limestone. A lot of extremely fragmented material was found in the fill before reaching the second floor at 147 cm. The soil was sandy and smooth (2.5 Y 8/2 Pale Yellow). 219 sherds, 12 chert fragments.
- Level 14 (147-152 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. Beneath the second floor (10 YR 7/1 Light Gray) there was gravel fill with light brown earth until reaching the third floor at 152 cm. The soil was loose (10 YR 6/1 Gray). 43 sherds, 2 chert fragments.
- Level 15 (152-157 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. Beneath the third floor (10 YR 8/1 White) there was gravel fill mixed with light brown earth until the fourth floor was found at 157 cm. The soil was loose (10 YR 7/1 Light Gray). 25 sherds, 1 chert fragment.
- Level 16 (157-170 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. Beneath the fourth floor (10 YR 6/1 Gray) the earth was gray and ashy. The soil (ash) was smooth and sandy (10 YR 6/1 Gray). 138 sherds, 2 chert fragments.
- Level 17 (170-190 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. The ash laye continued. The soil (ash) was very fine and sandy (2.5 Y 6/1 Gray). 353 sherds, 14 chert fragments, 3 obsidian, 4 shells, 4 bones.
- Level 18 (190-211 cm) – This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit. There was gray earth mixed in with gravel fill. The soil was compact (10 YR 6/1 Gray). 69 sherds.

- Level 19 (211 cm) - This lot measured 1 x 0.91 m from the third (bottom) step to the northern edge of the unit and represents the level of bedrock(2.5 Y 8/1 White). There was no material.

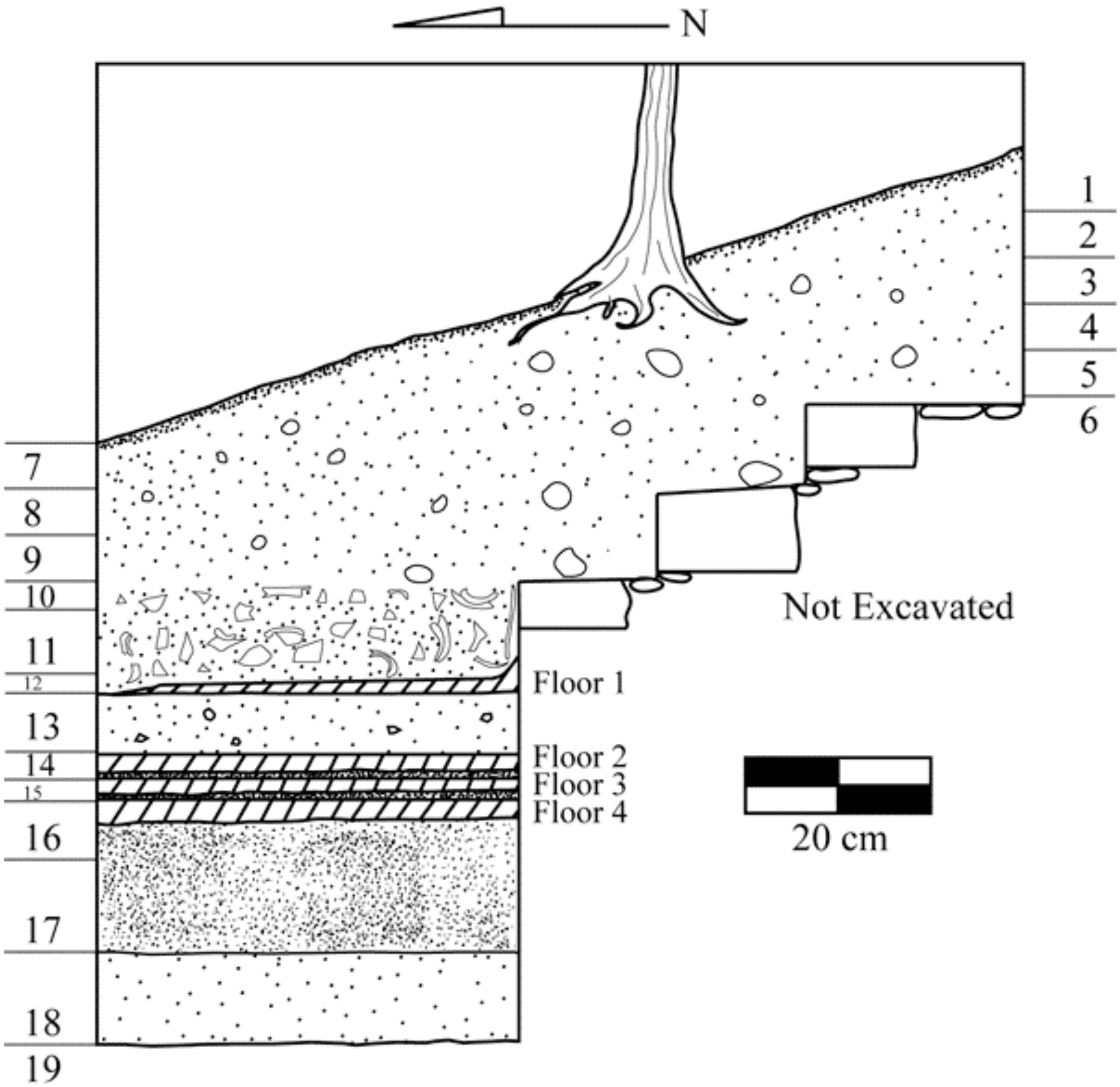

Figure A.35. SB11B-26.

Summary of S-5-126

The excavated unit from this block had a large quantity of material. The ceramic deposit at the base of the steps of the final construction phase probably represents a termination ritual for the structure. There were at least four phase of construction in the plaza and all of them date to the Late Classic although abundant Late Preclassic material suggests that there was an earlier occupation somewhere nearby. It is likely that Chaj K'ek' Cue grew at about the same time that the Xultun population began to expand.

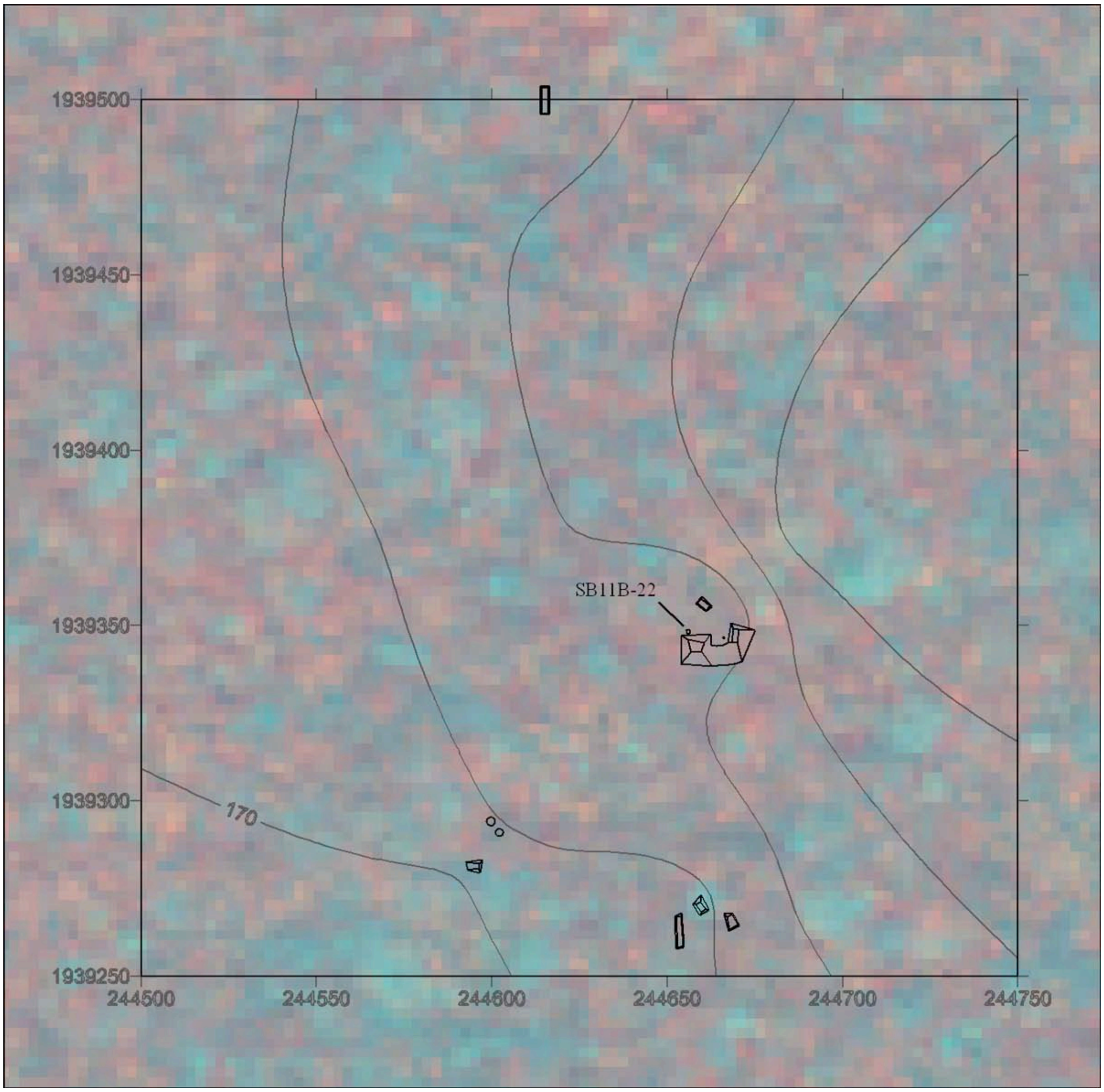

Figure A.36. PS-95-131.

PS-95-131

The center of this block (Figure A.36) is at 244625 E, 1939375 N. The majority of the block consists of *montaña* with a small portion of palm *bajo*. Although there were some mounds, there were not as many as expected for the amount of elevated terrain found here and the proximity to a nearby arroyo. The largest architecture in the block was near the center, to the southeast, consisting of a three sided courtyard group and a well cut *chultun*. To the south there were small mounds and some rock piles. Julio Cotom and I excavated a unit near the center of the block in the courtyard group (SB11B-22).

SB11B-22

This unit was located on the north side of the structure on the south side of the courtyard group near the center of the block. Five levels were excavated until bedrock was reached at 50 cm (Figure A.37).

- Level 1 (0-10 cm) – Humus level with black earth, roots, and small stones. The soil was loose and smooth (7.5 YR 2.5/1 Black). 6 sherds.
- Level 2 (10-20 cm) – This level consisted of brown earth with roots and small stones. The soil was smooth (7.5 YR 2.5/1 Black). 44 sherds, 1 chert fragment.
- Level 3 (20-30 cm) – This level consisted of a rocky fill with some roots and brown earth. The soil was smooth (10 YR 2/2 Very Dark Brown). 41 sherds, 2 chert fragments.
- Level 4 (30-40 cm) – This level consisted of a rocky fill with some roots and brown earth. The soil was smooth (10 YR 4/1 Dark Gray). 40 sherds, 4 chert fragments.
- Level 5 (40-50 cm) – This level consisted of gray soil with small stones before reaching bedrock. The soil was smooth (10 YR 5/1 Gray). 18 sherds.

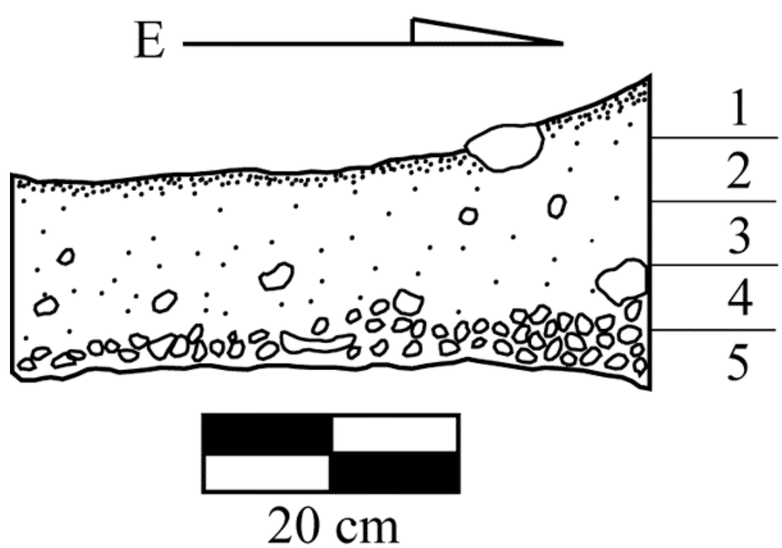

Figure A.37. SB11B-22.

Summary of PS-95-131

The group near the center of the block was habitational, as confirmed by the associated *chultun*. Some of the chert pieces found in the fill were bifacial axes that broke in the process of production. Although more settlement was expected on this terrain, the predictive capabilities of the settlement signature are not as strong in the intersite area. While there is no clear stratigraphy in the ceramic material recovered, both

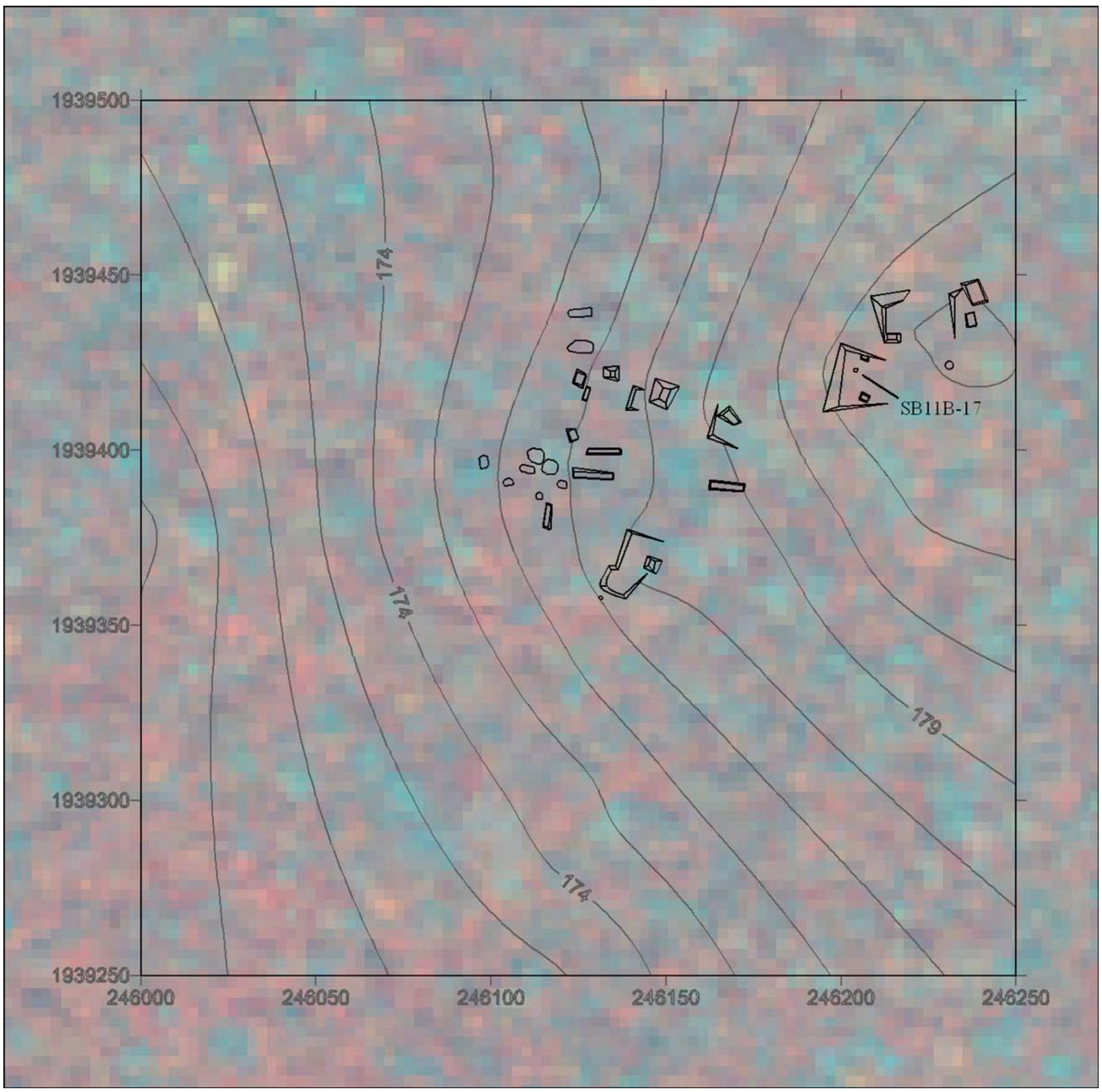

Figure A.38. PS-101-137.

Late Preclassic and Late Classic sherds were identified to type, including some eroded Saxche/Palmar polychromes for the latter period.

PS-101-137

This block (Figure A.38) is east-southeast of San Bartolo, near block PS-71-102. The center of the block is at 246125 E, 1939375 N. The vegetation is a mix of *montaña* and palm *bajo*, although the majority of the terrain is uplands. The majority of settlement was concentrated in the north and the east. There was no settlement in the southern half of the block. La mayoría del asentamiento estaba concentrado en el centro y al norte y este. No había asentamiento en la mitad sur de la cuadra. There were large numbers of mounds and rock piles and many of the mounds were on platforms. There were three platforms to the northeast. Julio Cotom and I excavated a unit in the westernmost of these platforms (SB11B-17).

<u>SB11B-17</u>

This unit was located on top of a leveling platform with the goal of dating the construction sequence. The unit consisted of 16 levels and bedrock was reached at 140 cm (Figure A.39).

- Level 1 (0-10 cm) – Humus level with a lot of organic material, including seeds and roots. The soil was loose (10 YR 2/2 Very Dark Brown). 13 sherds, 1 obsidian.
- Level 2 (10-20 cm) – The humus continued with medium rocks (4-5 cm diameter) included. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). 13 sherds.
- Level 3 (20-30 cm) – This level had brown soil with large stones that may have been collapse from nearby mounds. The soil was hard and compact (10 YR 4/2 Dark Grayish Brown). 3 sherds.
- Level 4 (30-40 cm) – This level was composed of a gravel fill, but no floor was found on top. The soil was hard and compact (10 YR 6/1 Gray). 3 sherds.
- Level 5 (40-50 cm) – This level had limestone blocks running southeast to northwest in the south west corner. It was unclear whether or not they represented and architectural feature, so they were left in place. The soil was hard and compact (10 YR 7/1 Light Gray). 3 sherds.

- Level 6 (50-61 cm) – This level was composed of gravel laying on top of the first floor encountered. The soil was hard and compact (10 YR 7/1 Light Gray). 6 sherds, 1 chert fragment.

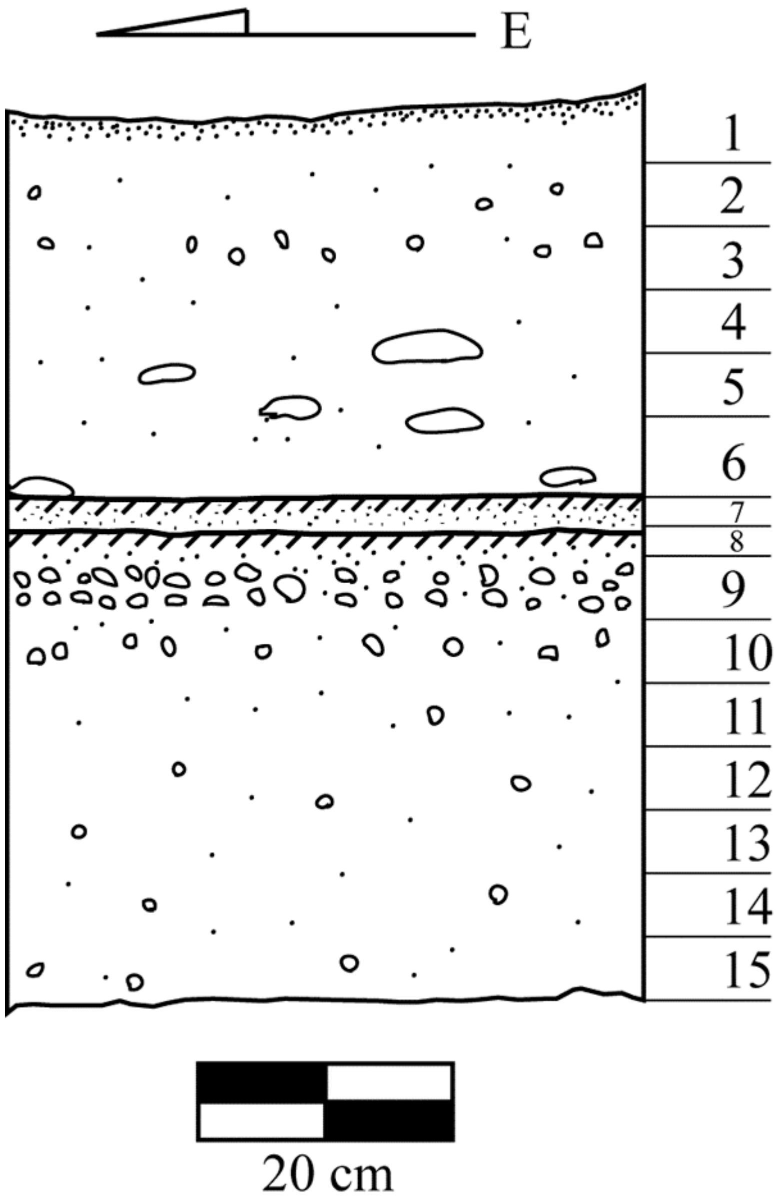

Figure A.39. SB11B-17.

- Level 7 (61-65 cm) – The limestone blocks ddescribed in Level 5 were lifted. This level was composed of an ash layer between the first and second floors. The ash was smoot, but contained no carbon (10 YR 6/1 Gray). There was no material.
- Level 8 (65-70 cm) – There was earth beneath the second floor. The soil was smooth and compact (10 YR 8/1 White). There was no material.
- Level 9 (70-80 cm) – This level was fill composed of limestone fragments mixed with light gray earth. The soil was sandy (10 YR 7/1 Light Gray). 4 shells.

- Level 10 (80-90 cm) – This level was fill composed of limestone fragments mixed with light gray earth. The soil was sandy (10 YR 6/1 Gray). 11 shells.
- Level 11 (90-100 cm) – This level was fill composed of limestone fragments mixed with dark gray earth. The soil was sandy (2.5 Y 4/1 Dark Gray). 14 shells.
- Level 12 (100-110 cm) – This level was fill composed of limestone fragments mixed with black earth. The soil was sandy (10 YR 2/1 Black). There was no material.
- Level 13 (110-120 cm) – This level was fill composed of limestone fragments mixed with light gray earth. The soil was sandy (2.5 Y 4/1 Dark Gray). There was no material.
- Level 14 (120-130 cm) – This level was fill composed of limestone fragments mixed with light gray sand (2.5 Y 4/1 Dark Gray). There was no material.
- Level 15 (130-140 cm) – This level was fill composed of limestone fragments mixed with light gray sand (10 YR 6/1 Gray). There was no material.
- Level 16 (140 cm) – Level of bedrock (10 YR 8/1 White). There was no material.

Summary of PS-101-137

The material that was excavated above the first floor dates to the Late Classic. The ash layer between the two floors is something that occurs frequently at San Bartolo, usually indicating the reoccupation of an abandoned Late Preclassic structure during the Late Classic (William Saturno, personal communication 2005). Unfortunately, there was not a single datable sherd beneath the second floor, making it impossible to confirm the same settlement pattern for the intersite area. Most of the identified sherds dated were Late Preclassic Paso Caballo Waxy wares, but these were in mixed contexts with Encanto Group unslipped wares dating to the Late Classic.

PS-116-152

This block (Figure A.40) is south of San Bartolo, near block PS-95-131 and 500 m south of block NS-28-112. The center of the block is at 244125 E, 1939125 N. The dominant vegetation is *montaña*, with significant portions of palm and scrub *bajo* as well. All of the mounds found in this block were made entirely of chert cobbles. These were associated with a large chert quarry located to the north. The terrain was raised and uneven with dense concentrations of chert

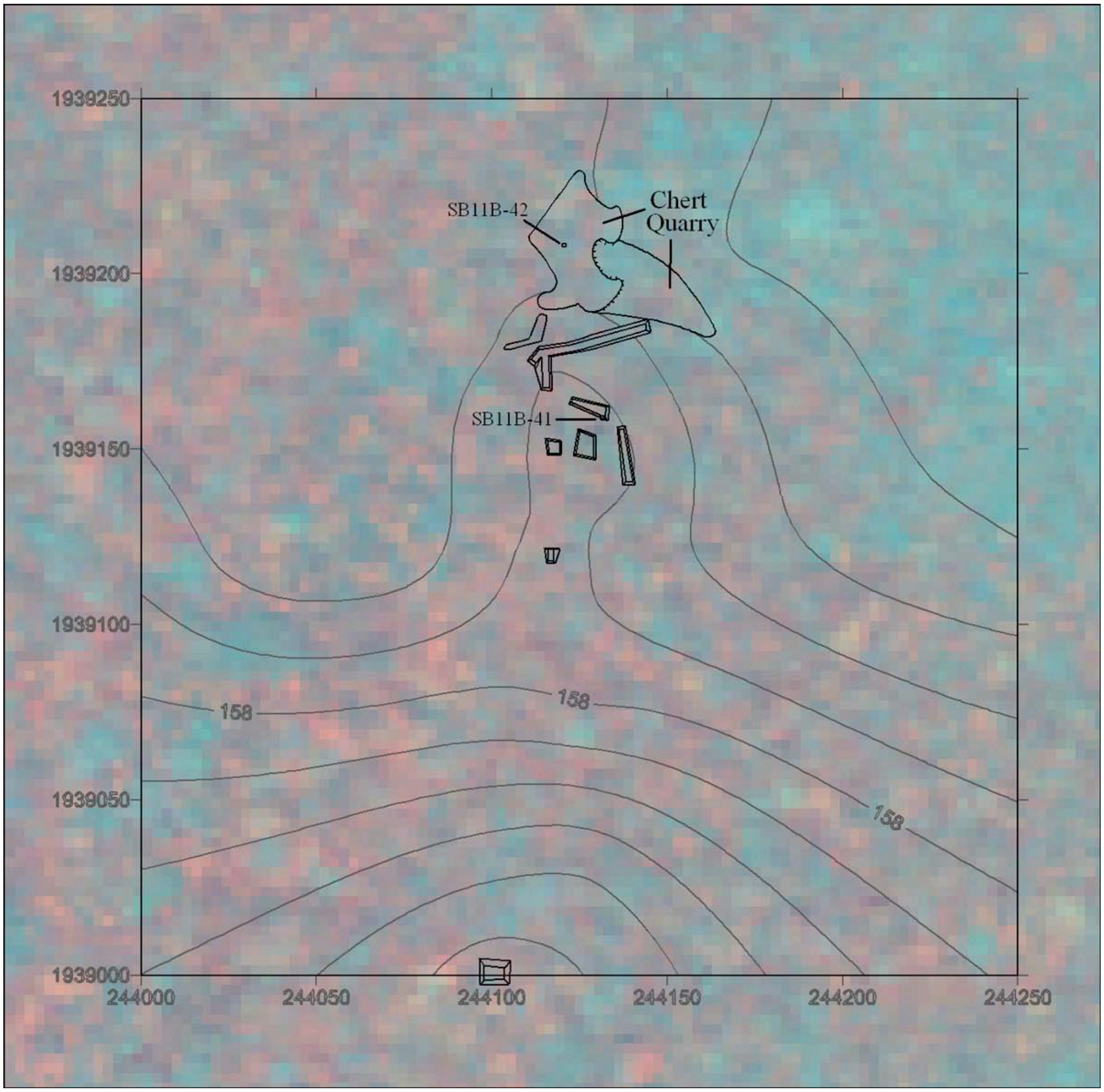

Figure A.40. PS-116-152.

cobbles, many of them broken in half. To the west, the terrain rose and there was a large structure outside of the block. To the south there was a courtyard group, of which only one structure was inside of the block. I excavated a unit on the corner of one of the mounds (SB11B-41) while Joshua Kwoka excavated a unit in the chert quarry (SB11B-42).

SB11B-41

This unit was located on the southeast corner of a mound composed almost entirely of chert cobbles. The goal of the unti was to date the structure and uncover a small part of the construction sequence. The levels are presented as averages below datum. Four levels were excavated, reaching bedrock at 86 cm below datum (Figure A.41).

- Level 1 (26-39 cm) – This level represents the removal of the humus layer accumulated on top of the chert cobbles. There was a lot of organic material including seeds and roots. The soil was dark and loose (10 YR 2/2 Very Dark Brown). 24 sherds, 16 chert fragments, 7 pieces of burnt mud/clay.
- Level 2 (39-64 cm) – The chert cobbles were removed revealing a layer of gravel underneath at 64 cm. The cobbles were extremely compacted. The soil was humid and loose (10 YR 2/2 Very Dark Brown). 27 sherds.
- Level 3 (64-77 cm) – This level was composed primarily of gravel fill. Much of the gravel is covered in iron oxide (hematite) indicating that it was harvested from the nearby quarry where hematite is prevalent (5 YR 4/4 Reddish Brown). The soil was hard and compact (10 YR 2/2 Very Dark Brown). 1 sherd, 3 chert fragments, 2 pieces of burnt mud/clay.
- Level 4 (77-86 cm) – This level was a white sandy mix, possibly a local *sascab*, that lay between the bedrock and the gravel layer above. Bedrock was encountered at 86 cm below datum. The soil was sandy (10 YR 8/2 Very Pale Brown). 2 chert fragments.

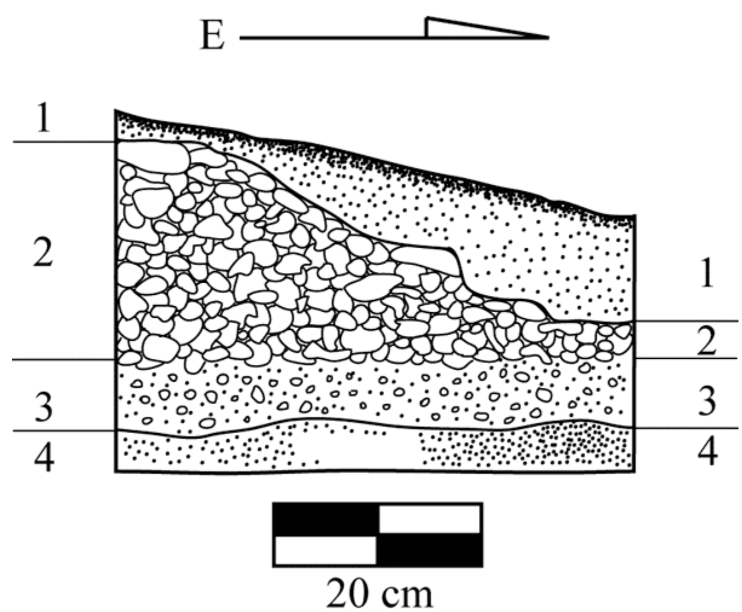

Figure A.41. SB11B-41.

SB11B-42

This unit was excavated by the San Bartolo project lithicist, Joshua Kwoka. The goal of the unit was to confirm the ancient exploitation of the chert quarry found within the survey block. Two levels were excavated to a depth of 99 cm (Figure A.42).

- Level 1 (0-38 cm) – Humus level with a lot of organic material, including roots. The level was composed almost entirely of chert cobbles. The soil was very loose around the nodules (10 YR 2/2 Very Dark Brown). 697 primary reduction flakes, 1 preformed fragment, 37 cobbles with primary decortation flake scars.
- Level 2 (38-99 cm) – The chert continued, but with a change of soil indicated by iron oxide (hematite). The soil was very loose (10 YR 3/3 Dark Brown) and mixed with red powder (2.5 YR 4/8 Red). It became obvious that this feature was exploited as a quarry. No material was saved.

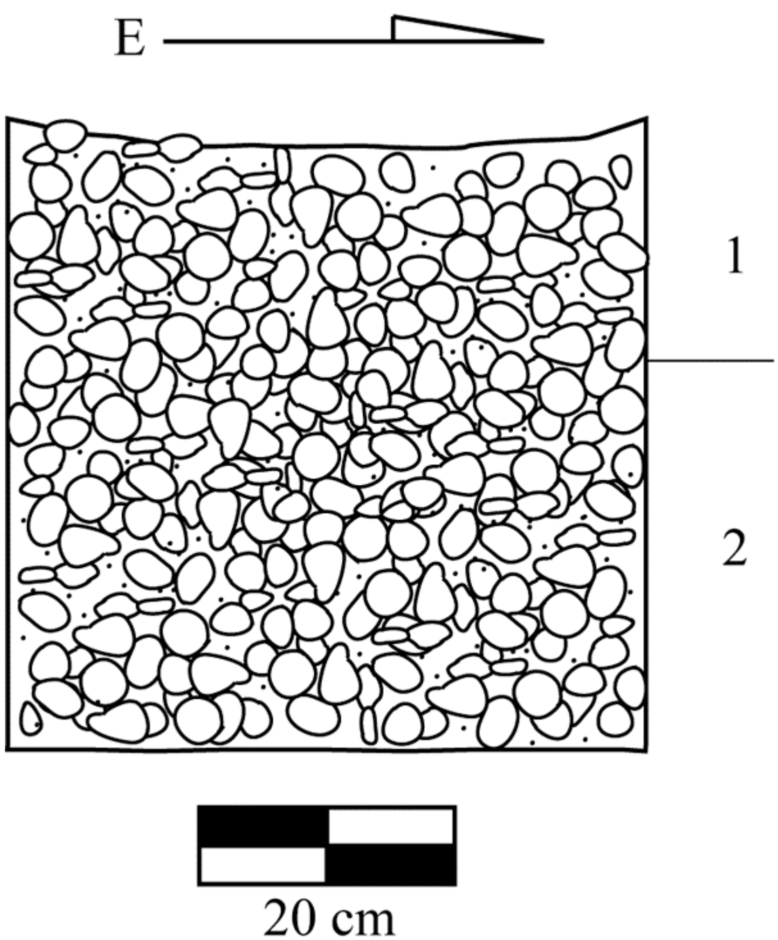

Figure A.42. SB11B-42.

<u>Summary of PS-116-152</u>

The settlement in this block may represent a "resource-specialized community" (Scarborough and Valdez 2003). It appears that a small group of people was living near the chert quarry and exploiting its resources. The presence of burnt mud or clay suggests that unused chert was piled up into housemounds and covered with earthen floors. This mound would have supported a perishable superstructure. Most of the lithic production identified at San Bartolo to this point dates to the Late Classic, but there were Late Preclassic sherds found in the excavations associated with the quarry. Unidentified sherds from the excavations date to the Late Classic based on their paste.

PS-131-173

This block (Figure A.43) is located south of San Bartolo near the main road between that site and Uaxactun. The center of the block is at 245125 E, 1938875 N. The vegetation in this block consists of both palm and scrub *bajo* varieties, with a clear transition marked by a 20 cm rise covered in both limestone and chert cobbles. Julio Cotom and I excavated a unit at this transition (SB11B-36).

<u>SB11B-36</u>

The goal of this unit was to see if cultural material could be found despite a lack of settlement remains on the surface. This was important since the IKONOS satellite imagery suggested that some settlement would be found in this block. There were 11 levels excavated to bedrock at 120 cm (Figure A.44).

- Level 1 (0-10 cm) – Humus level made up of brown clay with many roots. The soil was hard and compact (10 YR 2/2 Very Dark Brown). There was no material.
- Level 2 (10-20 cm) – This level consisted of dark brown clay with roots and some chert cobbles. The soil was hard and compact (10 YR 3/1 Very Dark Gray). There was no material.

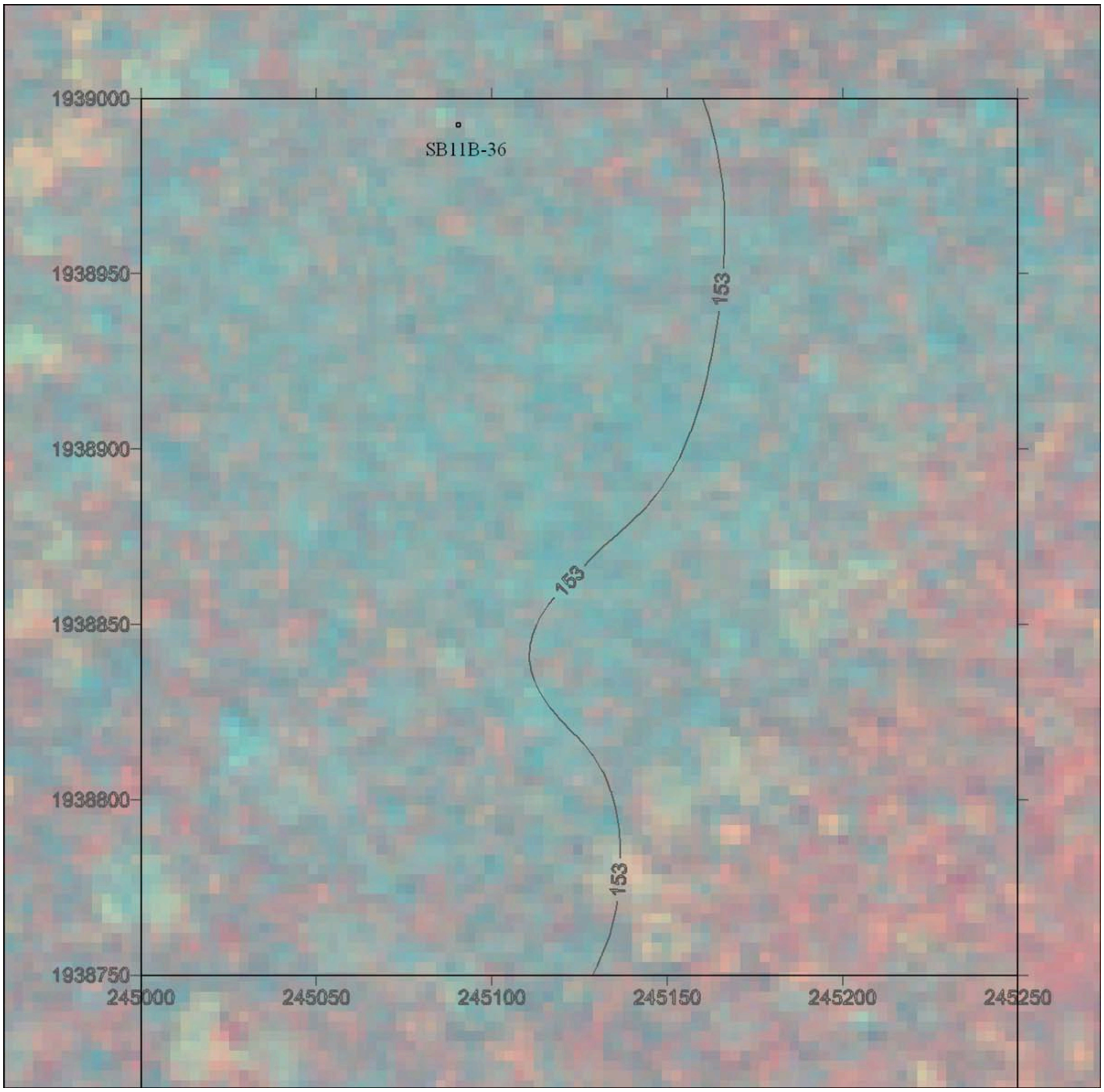

Figure A.43. PS-131-173.

- Level 3 (20-30 cm) – This level consisted of brown clay with roots and some chert cobbles. The soil was hard and compact (10 YR 3/1 Very Dark Gray). 1 sherd.
- Level 4 (30-40 cm) – This level consisted of dark gray clay with abundant chert cobbles. The soil was hard and compact (10 YR 4/1 Dark Gray). There was no material.
- Level 5 (40-50 cm) – This level consisted of gray clay with abundant chert. The soil was hard and compact (10 YR 6/1 Gray). 5 sherds.
- Level 6 (50-60 cm) – This level consisted of gray clay with pulverized limestone and chert gravel. The soil was hard and compact (10 YR 5/2 Grayish Brown). 8 sherds.

- Level 7 (60-70 cm) – This level consisted of light gray clay with pulverized limestone and gravel. The soil was hard and compact (10 YR 4/1 Dark Gray). 22 sherds.
- Level 8 (70-80 cm) – This level was composed of pulverized limestone and gravel mixed together. The soil was hard and compact (10 YR 8/1 White). 1 sherds.
- Level 9 (80-90 cm) – This level was composed of pulverized limestone mixed with gravel, with a few larger pieces of chert. The soil was hard and compact (10 YR 8/1 White). 3 sherds.
- Level 10 (90-110 cm) - This level was composed of pulverized limestone mixed with gravel, with a few larger pieces of chert. The soil was hard and compact (10 YR 8/1 White). 4 sherds.
- Level 11 (110-120 cm) – Bedrock was encountered in this level. The soil was hard and compact (10 YR 8/1 White). There was no material.

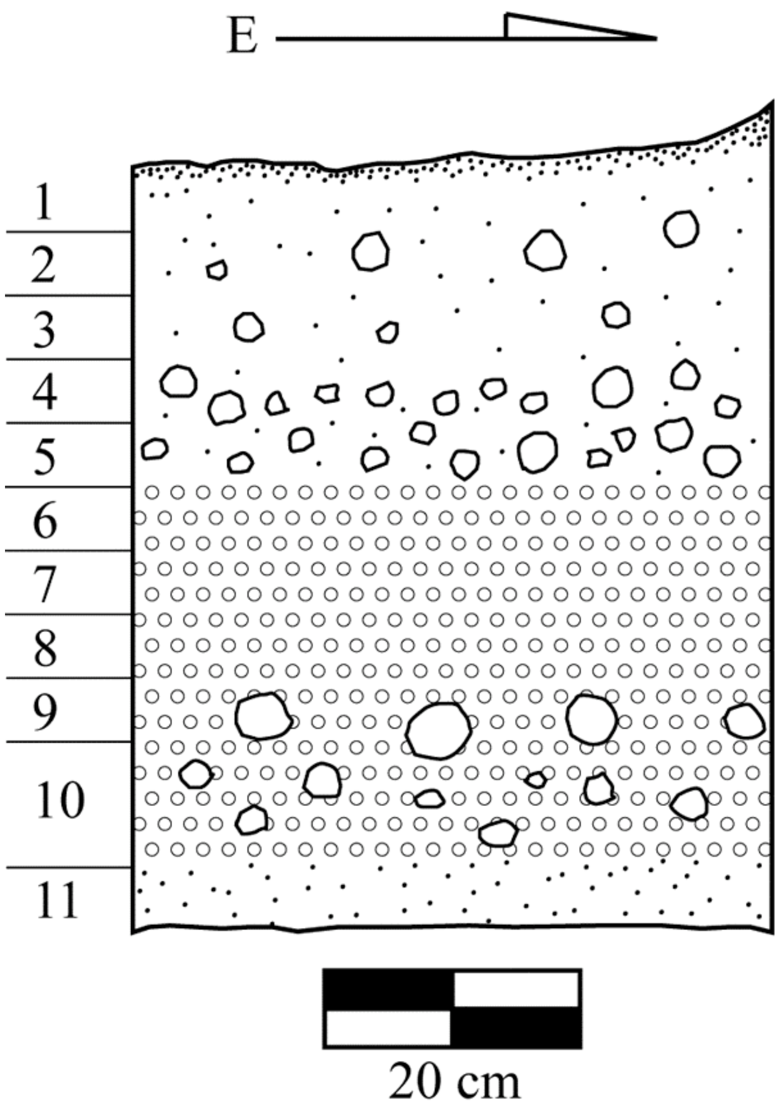

Figure A.44. SB11B-36.

Summary of PS-131-173

The excavations in this block present an interpretive problem. Is the feature excavated at the vegetation transition natural or was it made by the ancient Maya? If it is natural, why are there ceramics in the excavation? The answers are not clear. It is possible that the sherds were eroded into the excavation area during the seasonal drainage of water. It is also possible that there was settlement in this area that has since been obscured by changes in the forms of *bajos*. Another possibility is that the *bajo* margin represents an extremely ruined ancient terrace that had been used to retain soil. All of the ceramics analyzed to type date to the Late Preclassic, the majority being Paso Caballo Waxy wares. Some of the unidentified ceramics date to the Late Classic based on paste and form.

PS-145-188

This block (Figure A.45) is located directly south of PS-131-173. The center of the block is at 245125 E, 1938625 N. There was no surface settlement in this block. The block consists entirely of palm *bajo* with *escobal*, *botanal*, and *julubal* varieties present. I excavated a unit in the *bajo escobal* to see if any cultural material could be recovered (SB11B-40).

SB11B-40

This unit was placed near the center of the block with the goal of uncovering evidence of ancient occupation. Five levels were excavated to the level of eroded limestone (*sascab*) at 78 cm (Figure A.46).

- Level 1 (0-23 cm) – This was the humus level with a lot of organic material, including seeds and roots. The soil was humid (10 YR 3/1 Very Dark Gray). 1 sherd.

- Level 2 (23-37 cm) – This level was composed of dark soil with high clay content (10 YR 3/1 Very Dark Gray). 4 sherds, 4 chert fragments.

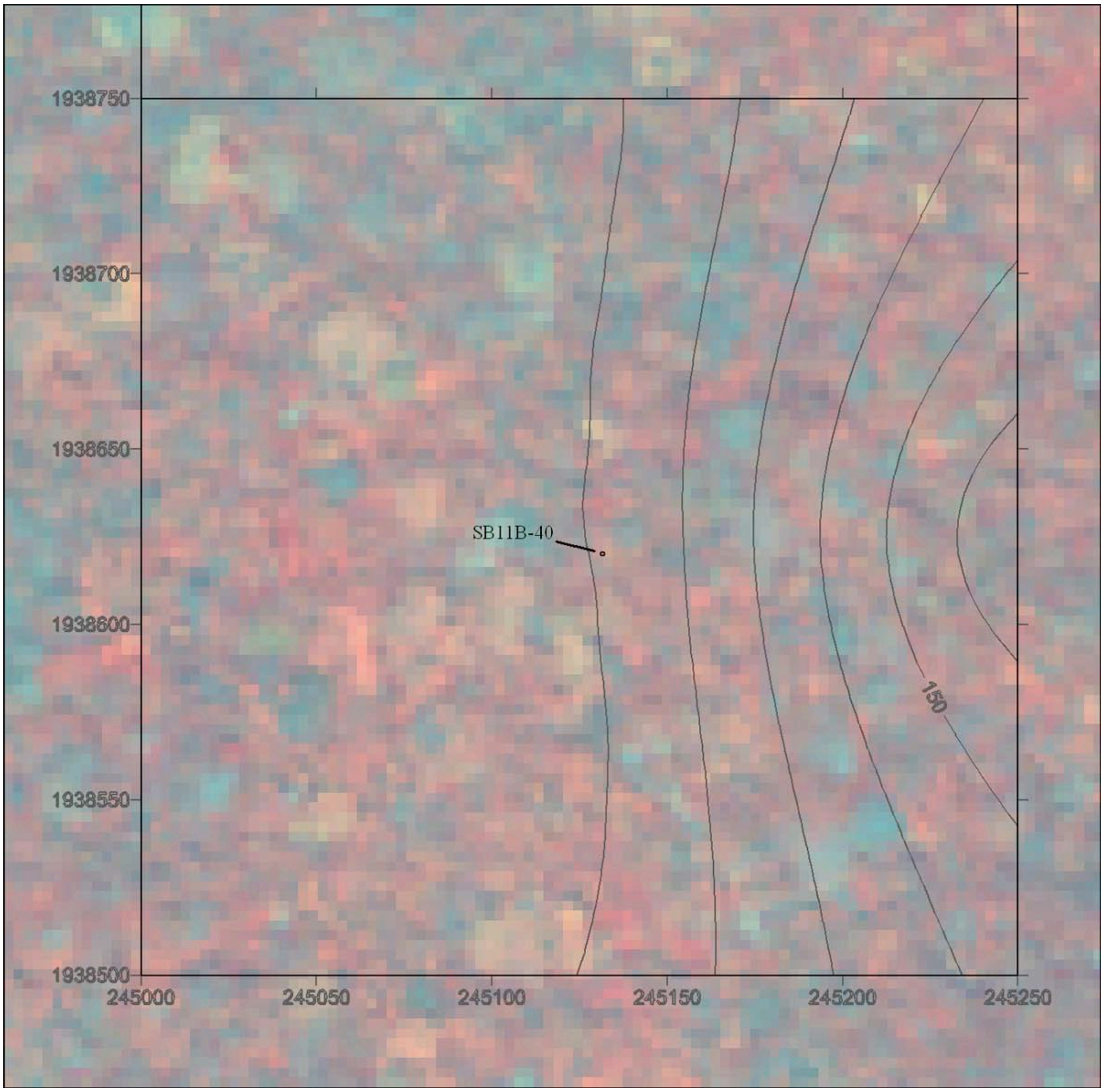

Figure A.45. PS-145-188.

- Level 3 (37-56 cm) – This level was composed of clay mixed with pulverized limestone. The soil had a high clay content (10 YR 3/1 Very Dark Gray) and was lighter in the southwest corner (10 YR 8/2 Very Pale Brown). 5 sherds.
- Level 4 (56-67 cm) – This level was composed of clay mixed with pulverized limestone until a gravel level was reached. The soil had a high clay content (10 YR 7/1 Light Gray). 1 chert fragment.
- Level 5 (67-78 cm) – This was a gravel level found between the clay level above and the *sascab* level below. The soil was loose and sandy (10 YR 7/2 Light Gray). 1 sherd.

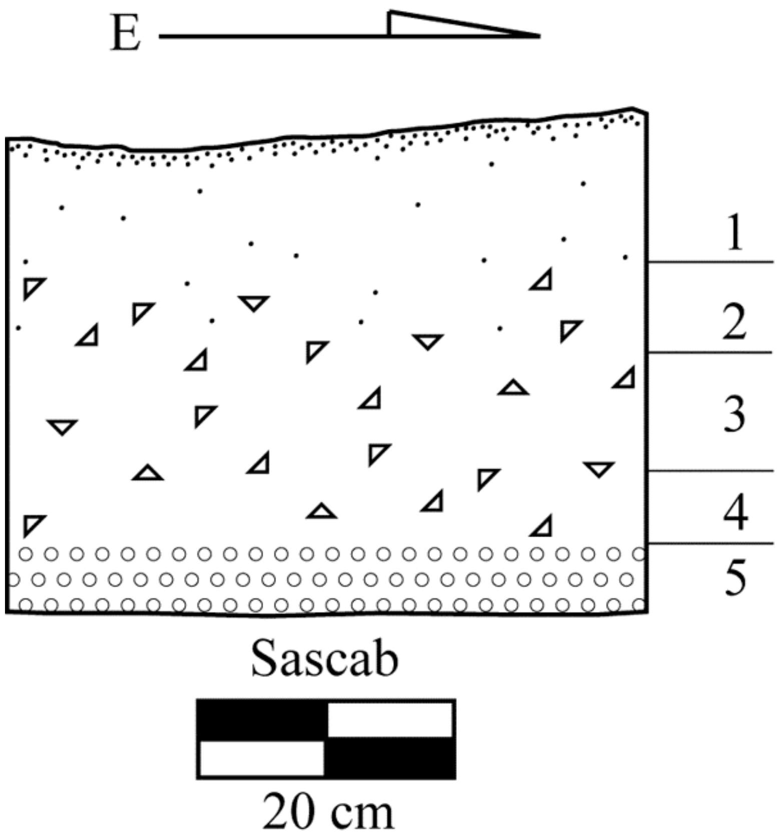

Figure A.46. SB11B-40.

<u>Summary of PS-145-188</u>

Just as in block PS-131-173, there was no surface settlement even though cultural material was found during excavations. The gravel layer beneath the *bajo* clay is confusing. It is possible that the ancient landscape was very different and that the upland palm *bajos* were formed by erosion processes. More study would be necessary in the upland *bajos* to confirm if this was the case. None of the sherds recovered from the excavations were identified to type, although some were Late Classic based on paste.

PS-150-193

This block (Figure A.47) is located south of San Bartolo. The center of the block is at 243875 E, 1938625 N. There is a large terrace system rising out of the *tintal bajo* toward the west. To the northeast there are mounds and rock piles that were probably associated with these terraces. Keith Ferguson and I excavated a unit in one of the terraces (SB11B-43). Nicholas Dunning excavated a soil pit in the *bajo* 15 m east of the excavated terrace (SB11B-52) as well as a unit behind the terrace excavated by Ferguson and me (SB11B-53).

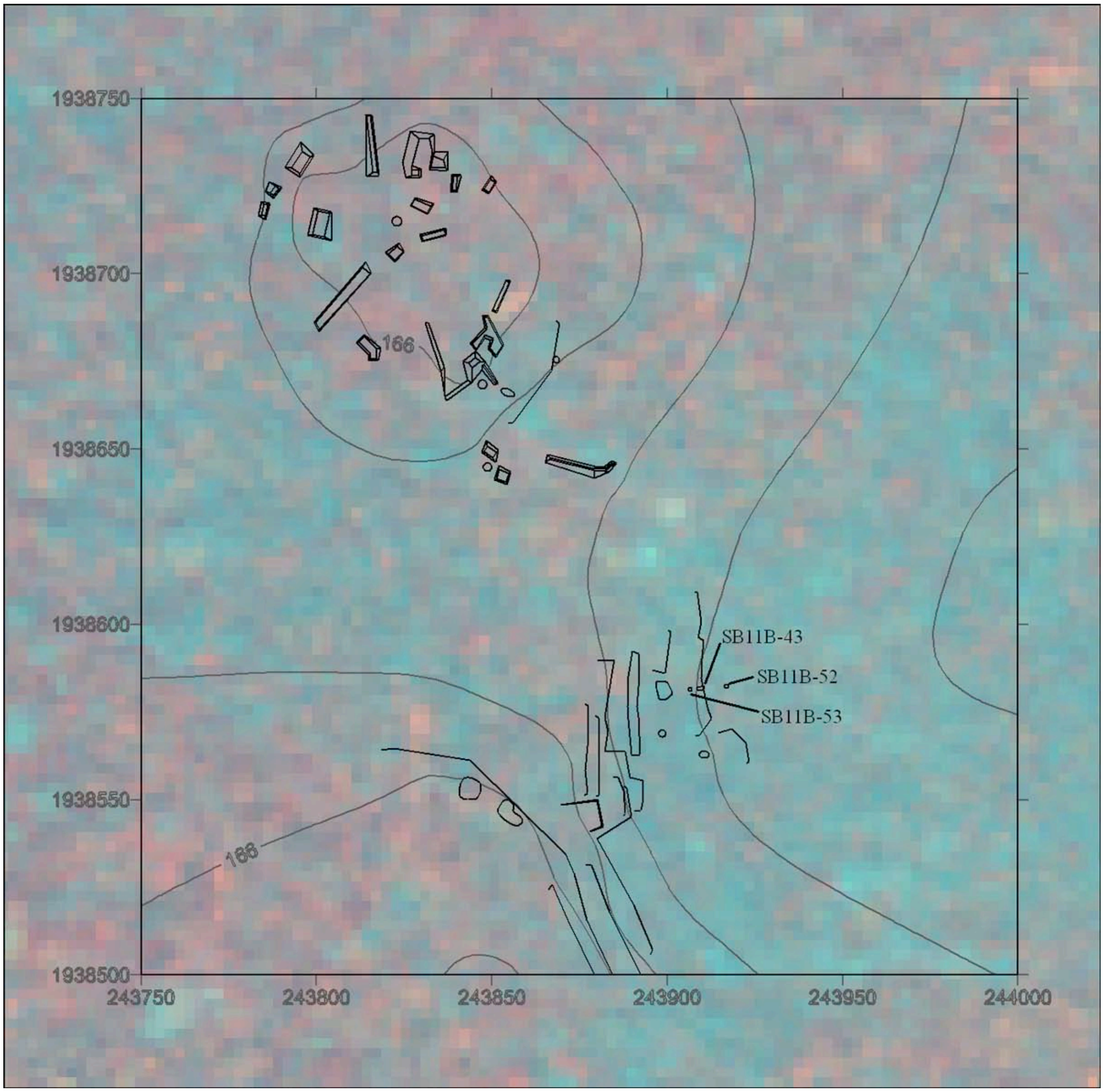

Figure A.47. PS-150-193.

<u>SB11B-43</u>

This unit was excavated to determine the construction techniques used to make the terraces and to look for any evidence that may be able to date the terrace sequence.

After determining that the feature was indeed a terrace (SB11B-43), the 2 x 1 trench was excavated in two different parts (SB11B-43A y SB11B-43B) to see if there was a difference in material between the area outside of the terrace (43A) and the area that made up the terrace (43B). All of the measurements are averages below datum (Figure A.48).

SB11B-43

This unit was excavated to 50 cm before it was divided.

- Level 1 (29-31 cm) – Humus level on the edge of the terrace with a lot of organic material. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (31-50 cm) – This level consisted of chert cobble fill that made up the bulk of the ancient terrace. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). 5 chert fragments.

SB11B-43A

This unit measured 1 x 0.20 m and was outside of the terrace on the *tintal bajo* side.

- Level 3 (50-73 cm) – The humus continued in this level. The soil was loose with small stones (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 4 (73-83 cm) – This level was composed of gray clay mixed with pulverized limestone. The soil had a high clay content (10 YR 5/3 Brown). There was no material.

SB11B-43B

This unit measured 1 x 1.13 m and was on part of the terrace.

- Level 3 (50-66 cm) – This was a level of sandy earth beneath the chert cobbles. The soil was loose with many small stones (10 YR 5/4 Yellowish Brown). There was no material.
- Level 4 (66-84 cm) – This level consisted of white clay mixed with gravel. The soil had a high clay content (10 YR 6/2 Light Brownish Gray). There was no material.
- Level 5 (84-106 cm) – This level consisted of white clay mixed with gravel. The soil had a high clay content (10 YR 6/3 Pale Brown). There was no material.

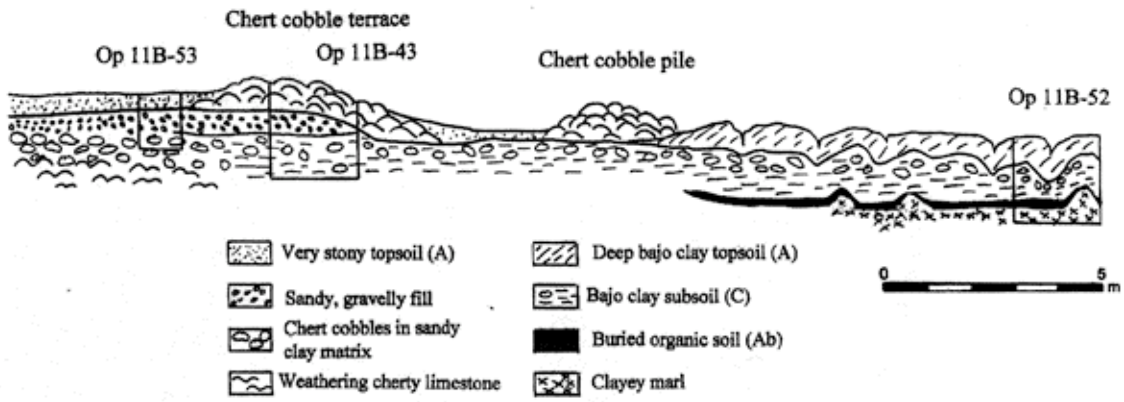

Figure A.48. Profile of *bajo* soils and excavations in PS-150-193. Drawing by Nicholas Dunning.

SB11B-52

This unit was located 15 m east of SB11B-43 (Figure A.48). The goal of this unit was to register the soil sequence for the Bajo Majunche. A buried Ab horizon with preserved carbon and pollen was revealed during excavations. The radiocarbon date was 920-800 cal B.C. (2 sigma) and the pollen analysis, carried out by John Jones, including cattail reed and waterlily pollen.

SB11B-53

This unit was excavated behind the same terrace uncovered in SB11B-43 (Figure A.48). The goal was to reveal the soil sequence behind the terrace. There was very little of interest in this unit.

Summary of PS-150-193

The most important data in this block came from the buried Ab horizon in th Bajo Majunche (SB11B-52). According to the rediocarbon date and pollen analysis, the scrub *bajos* in this area were much wetter at the beginning of the Middle Preclassic than they are today. This is indicated by the cattail and waterlily pollen, which are perennial wetland species. Today the *bajos* only hold water during the wet season meaninig that those species cannot survive. This means that the *bajos* in the intersite area underwent great change during the ancient Maya occupation. The terraces in the block were built following the aggrading of sediment into the Bajo Majunche, based on their physical positions. The cause of the aggradation was caused by erosion resulting from agriculture, a prolonged climate change, or some combination of the two. The Maya had to change their resource exploitation and agricultural strategies to survive this change. For these reasons I suggest an early Late Classic date for the terraces, although there is no ceramic or radiocarbon evidence to support this claim.

PS-154-197

This block (Figure A.49) is located near the western limit of the intersite area. The center of the block is at 242875 E, 1938625 N. The majority of this block consists of *tintal bajo* with a transition to palm *bajo* to the north, followed by an incline into *montaña*. There was a little bit of settlement on the incline. To the northwest there was a drainage into the *bajos*. Aaron Carter excavated a unit into a leveling platform near a *chultun* (SB11B-54).

<u>SB11B-54</u>

The goal of this unit was to date settlement in the transition between palm *bajo* and *montaña*. Three levels were excavated until bedrock was reached at 35 cm. Unfortunately there is no profile drawing of this excavation.

- Level 1 (0-5 cm) – Humus level with a lot of organic material. The soil was loose (10 YR 3/3 Dark Brown). 2 sherds.
- Level 2 (5-25 cm) – This level consisted of chert cobble fill. The soil was loose due to the quantity of cobbles (10 YR 3/1 Very Dark Gray). 14 sherds, 2 chert fragments.
- Level 3 (25-35 cm) – This level consisted of gravel mixed into gray earth before arriving at bedrock. The soil was hard and compact (10 YR 6/1 Gray). There was no material.

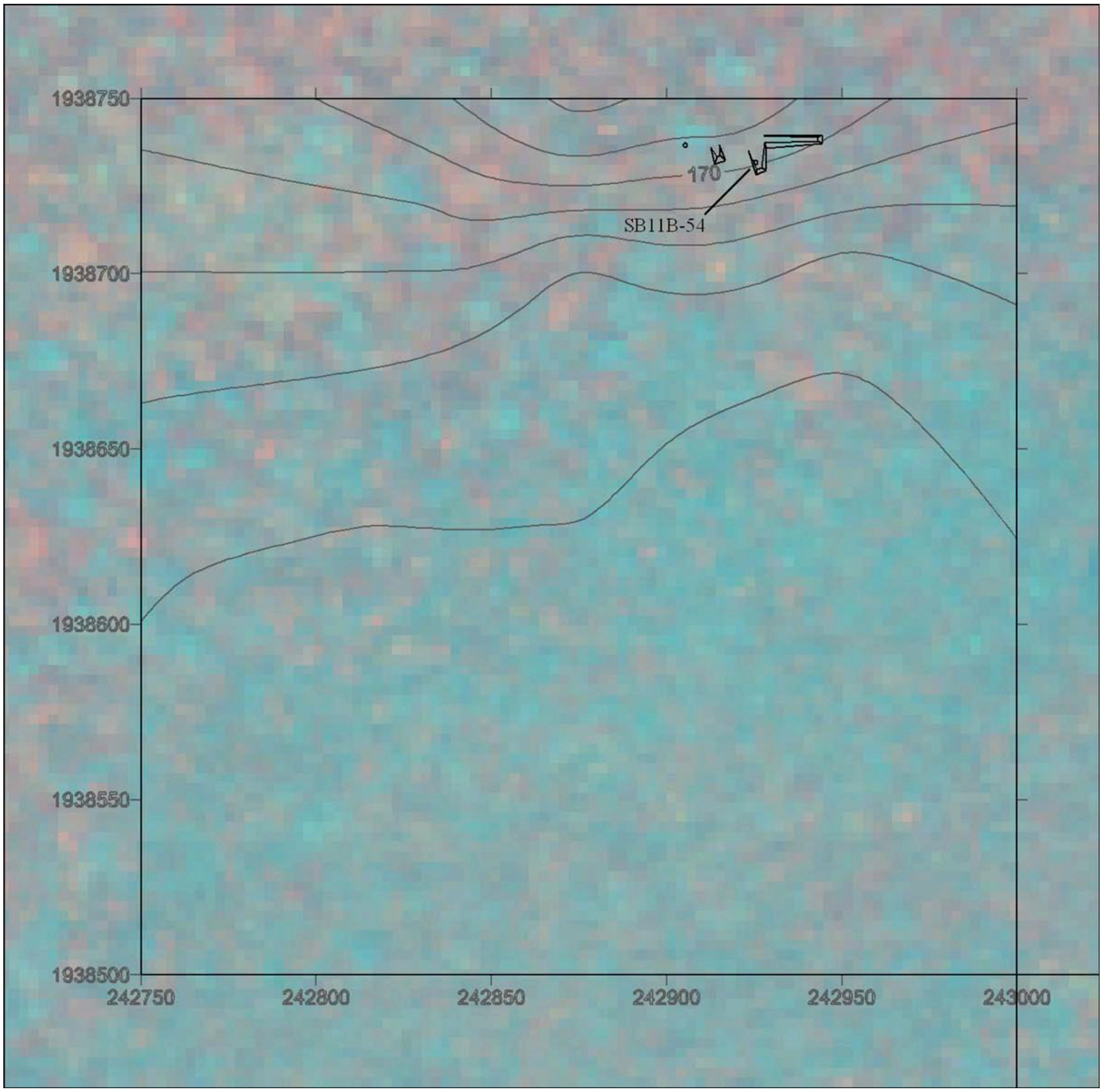

Figure A.49. PS-154-197.

Summary of PS-154-197

There was very little settlement and very little excavated material in this block. Many of the blocks surveyed near PS-154-197 were also lacking in cultural material. This may have been the least utilized portion of the intersite zone, possibly due to the steep slopes. None of the sherds recovered were analyzed to type, but some were identified as Late Classic based on paste analysis.

PS-160-205

This block (Figure A.50) is located immediately southeast of block PS-154-197. The center of the block is at 243125 E, 1938375 N. The settlement is found on a portion of elevated terrain between two *bajos*. There are low mounds near the center of the block. There are also rock piles, leveling platforms, and a terrace. Aaron Carter excavated a unit into the largest mound (SB11B-51).

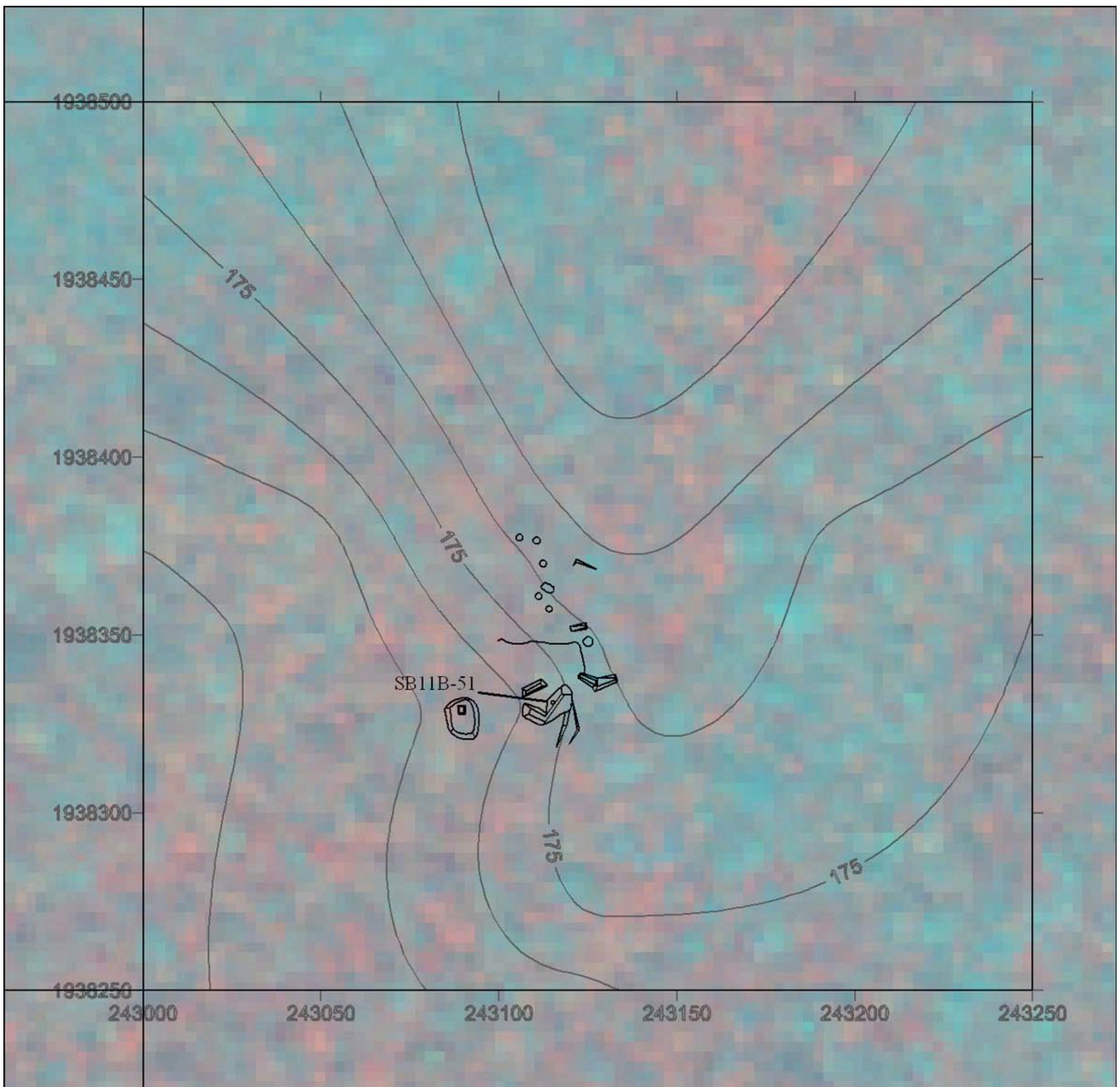

Figure A.50. PS-160-205.

SB11B-51

This unit was located in the center of the tallest mound of the block. The goal of the unit was to determine whether the mound was residential or simply just a large rock pile. Three levels were excavated until sterile levels at 67 cm (Figure A.51).

- Level 1 (0-5 cm) – Humus level with a lot of organic material. Numerous chert cobbles were small to medium in size. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). 1 sherd.
- Level 2 (5-45 cm) – This level consisted of chert fill. The soil was loose (2.5 Y 3/1 Very Dark Gray). 1 chert fragment.
- Level 3 (45-67 cm) – The chert fill continued until raching a layer of compact gravel. The soil was loose due to the rocks (7.5 YR 2.5/1 Black). There was no material.

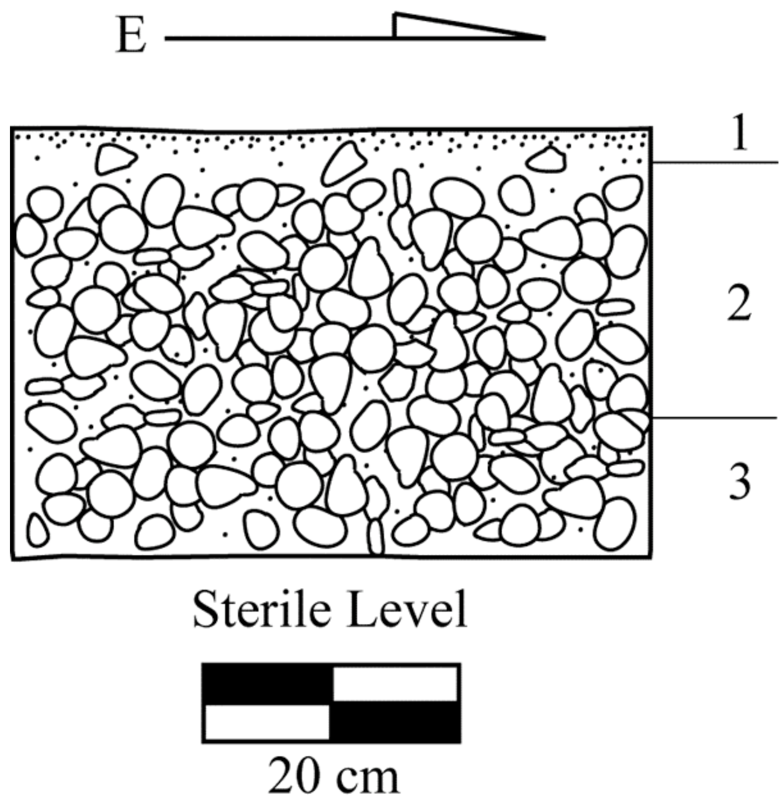

Figure A.51. SB11B-51.

Summary of PS-160-205

Only one sherd came out of excavations in this block. It it possible that the excavated structure was only a rock pile, but its form and construction sequence suggest that it was a structure. Although it may have been a field house which would explain the lack of material. Like other blocks in this part of the intersite area, it appears that there was very little activity here. The one sherd recovered was identified as Late Classic based on paste.

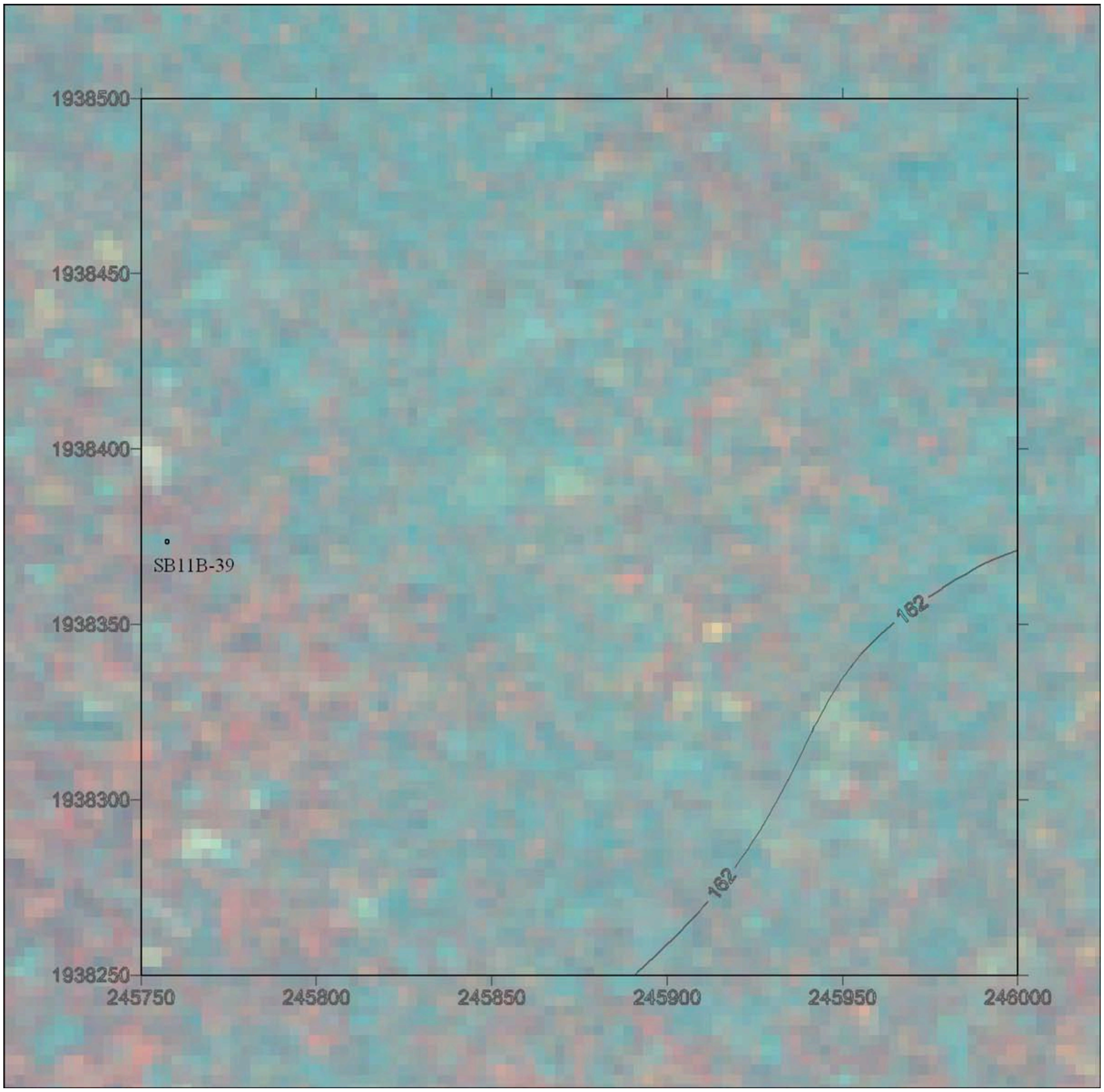

Figure A.52. PS-171-216.

PS-171-216

This block (Figure A.52) is located southeast of San Bartolo in the center of the intersite area. The center of the block is at 245875 E, 1938375 N. This block is composed entirely of *tintal* and *escobal bajo* varieties. I excavated a unit near the western limit of the block (SB11B-39).

SB11B-39

The goal of this unit was to confirm if there was any evidence of cultural material. Three levels were excavated until a sterile level at 49 cm (Figure A.53).

- Level 1 (0-21 cm) – Humus level with lots of organic material. The soil had a high clay content (10 YR 3/1 Very Dark Gray). 3 sherds.
- Level 2 (21-33 cm) – Gray clay level. The soil had a high clay content (10 YR 5/1 Gray). 5 sherds.
- Level 3 (33-49 cm) – Level of dark gray clay (10 YR 4/1 Dark Gray). The unit was abandoned when a light gray clay level was reached at 49 cm (10 YR 7/1 Light Gray). There was no material.

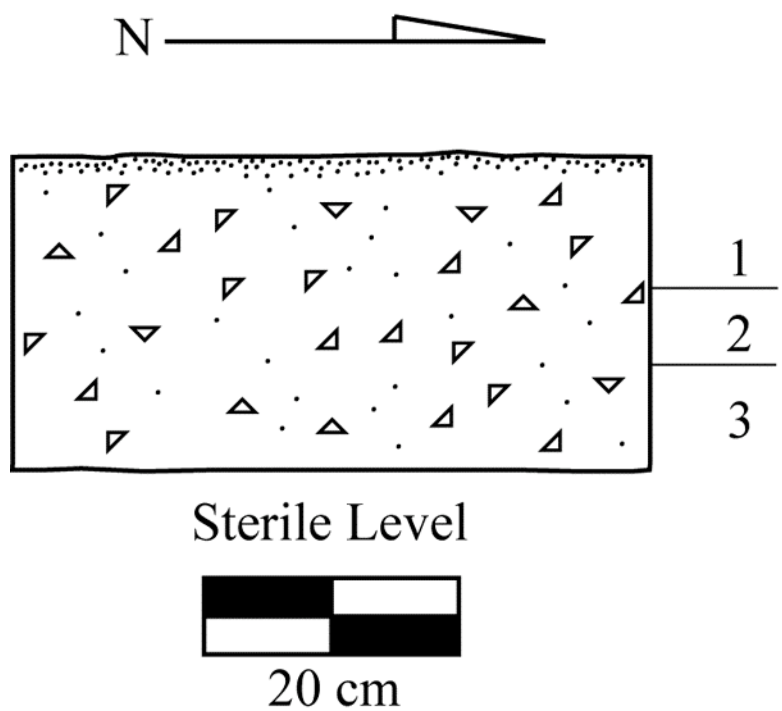

Figure A.53. SB11B-39.

Summary of PS-171-216

This block, like other Partial Settlement (PS) blocks that did not have surface settlement, did have ceramic material in the excavation. One recovered sherd was typed to the Late Preclassic, while the rest were dated to the Late Classic based on paste.

PS-176-223

This block (Figure A.54) is near the eastern limit of the survey universe. The center of the block is at 246375 E, 1938125 N. The terrain rises out of *escobal bajo* from west to east. There is a courtyard group immediately south of center. To the east, there are three limestone quarries, small mounds, rock piles, and a *chultun*. Julio Cotom excavated a unit in the plaza of the courtyard group to date the settlement (SB11B-35).

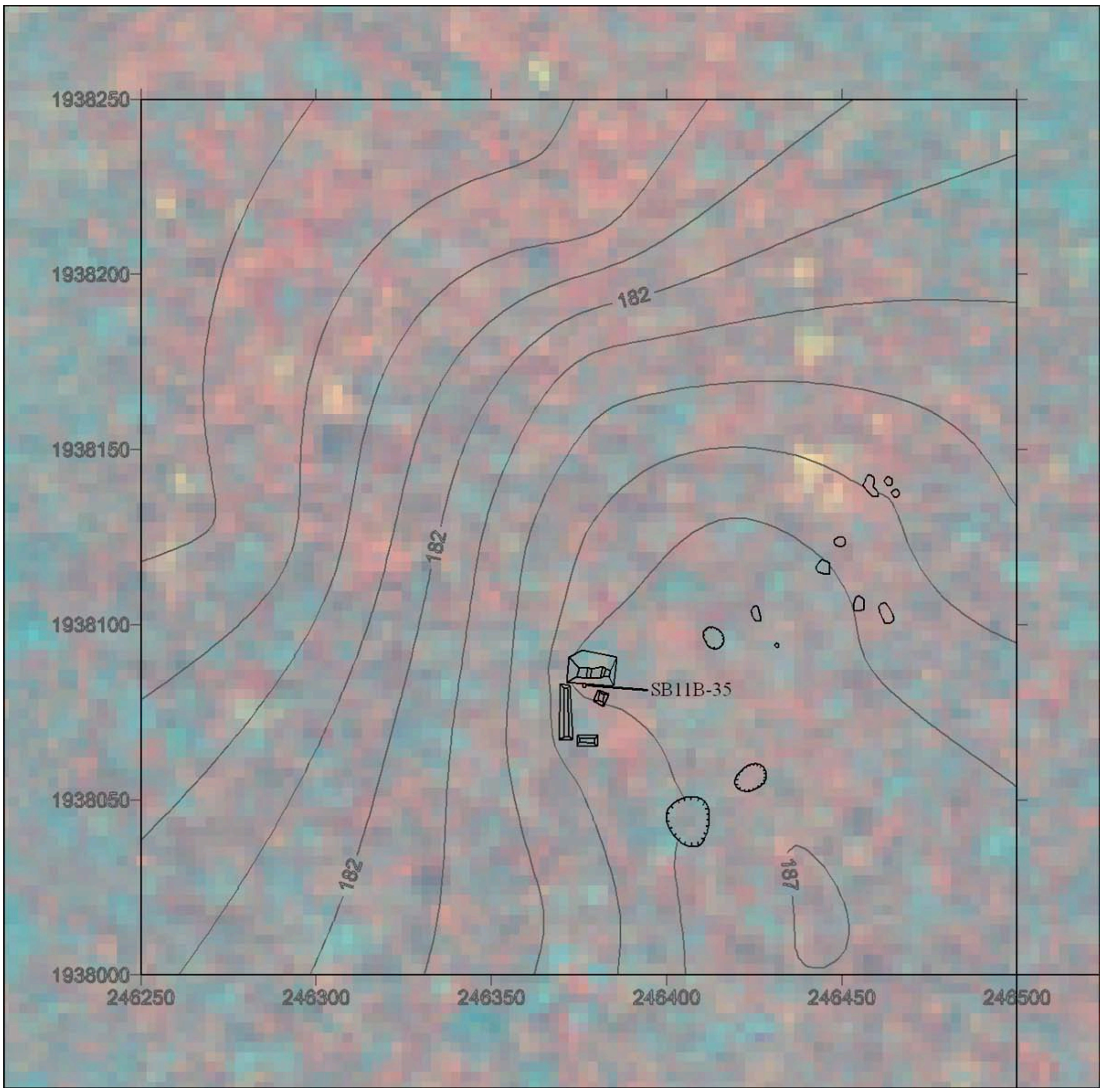

Figure A.54. PS-176-223.

SB11B-35

This unit was located on the southern side of the northern structure in the courtyard group. Eight levels were excavated until bedrock was reached at 70 cm. There were no Munsell soil colors recorded during this excavation (Figure A.55).

- Level 1 (0-10 cm) – Humus level with many roots. The soil was smooth. There was no material.
- Level 2 (10-20 cm) – Level of brown soil, still with many roots. The soil was smooth. 1 chert fragment.
- Level 3 (20-30 cm) – Level of brown soil, still with some roots. The soil was rocky and smooth. 21 sherds.
- Level 4 (30-40 cm) – This level consisted of gravel fill mixed with brown earth. The soil was loose. 85 sherds, 1 obsidian.
- Level 5 (40-50 cm) – This level consisted of dense gravel mixed in with gray earth. The soil was compact. 67 sherds.
- Level 6 (50-60 cm) – This level was made up primarily of gray earth with small stones. The soil was sandy. 155 sherds.
- Level 7 (60-70 cm) – Level of gray earth with small rocks. 101 sherds, 1 obsidian, 2 figurines.
- Level 8 (70 cm) – Bedrock was reached at this level. There was no material.

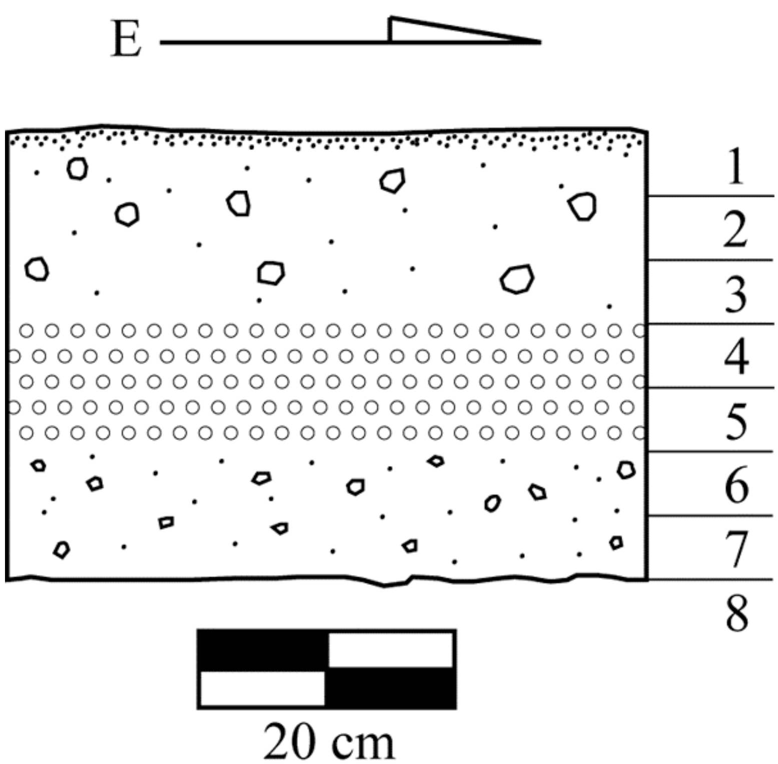

Figure A.55. SB11B-35.

Summary of PS-176-223

The courtyard group found in this block was one of the largest settlements in the intersite area outside of Chaj K'ek' Cue. The structures were probably made from limestone blocks cut from the nearby quarries. The presence of both obsidian and figurines indicate an assemblage of slightly higher class than most of the intersite inhabitants although it may have just been a particularly well off extended family. There is an almost identical courtyard group to the south of the block. It was unclear whether or not there were agricultural fields near this block or if there was some other exploited resource. This block had ceramic material dating to the Late Preclassic with diagnostic sherds being Paso Caballo Waxy wares. There were two domestic Early Classic sherds, one from the Quintal Group and the other from the Triunfo Group. The most common sherds were from the Late Classic, with diagnostic types coming predominately from the Tinaja Group and the Saxche/Palmar Polychrome Group, both being Peten Gloss wares.

PS-180-227

This block (Figure A.56) is southeast of San Bartolo, near the center of the intersite area. The center of the block is at 245375 E, 1938125 N. The block consists of a piece of raised terrain surrounded by palm and scrub *bajo* on its sides. There are various small mounds and rock piles, as well as a large platform. I excavated a unit in the large platform northwest of the center of the block (SB11B-38).

SB11B-38

This unit was located on the southeast corner of the platform on the edge of a superstructure. Six levels were excavated until bedrock was found at 100 cm (Figure A.57).

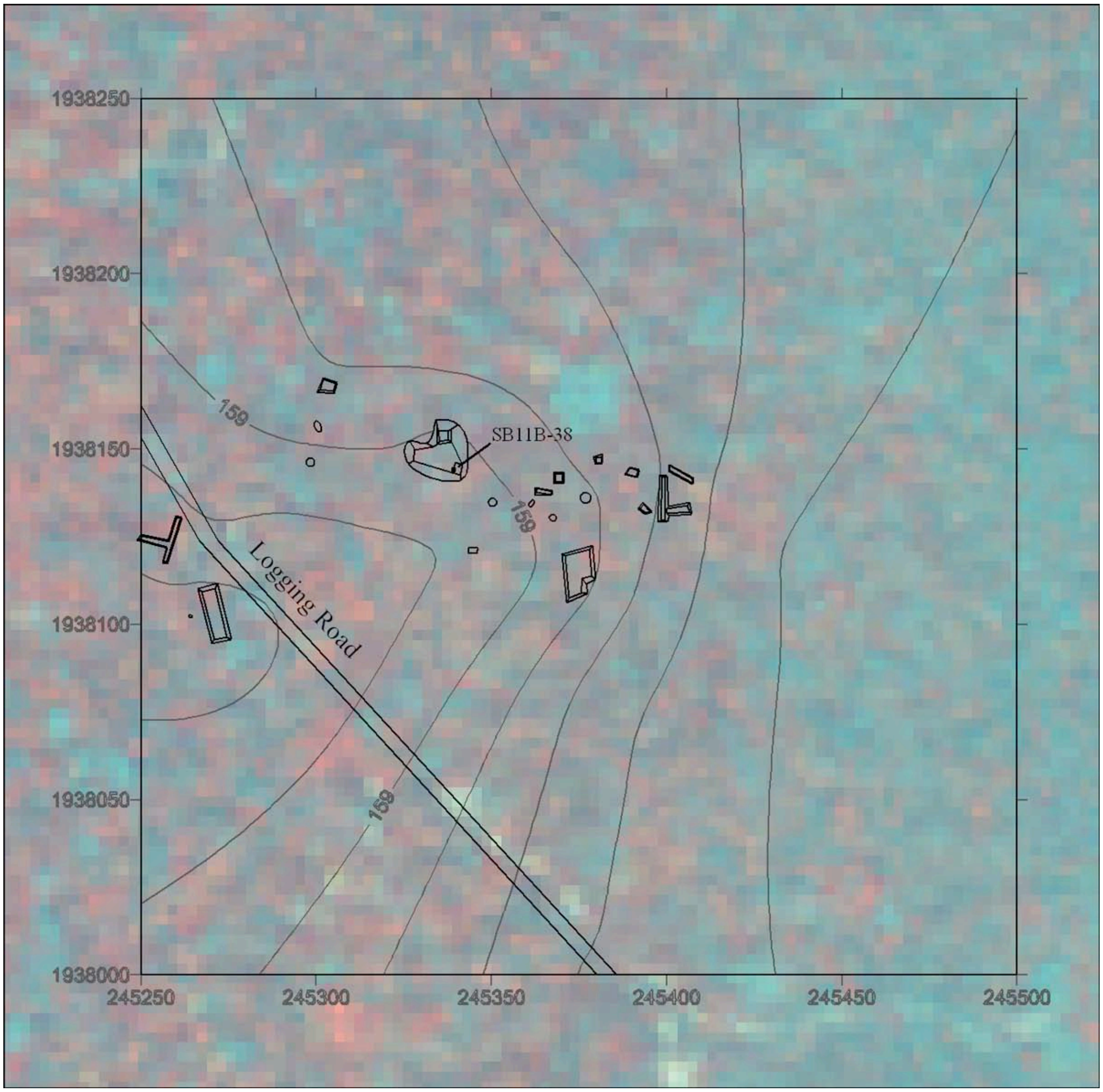

Figure A.56. PS-180-227.

- Level 1 (0-20 cm) – Humus level with a lot of organic material. There was a lot of burnt mud or clay, some which had embedded chert fragments (Figure 5.6). The soil was loose (10 YR 2/2 Very Dark Brown). 89 sherds, 19 chert fragments, 1 ground stone, 40 pieces of burnt mud or clay.
- Level 2 (20-36 cm) – This level was composed of chert fill. The gray soil was humid and fine (7.5 YR 3/1 Very Dark Gray). 46 sherds, 5 chert fragments, 20 pieces of burnt mud or clay.
- Level 3 (36-51 cm) – The chert fill continued with smaller sized cobbles. The soil was dry (10 YR 3/2 Very Dark Grayish Brown). 38 sherds, 28 chert fragments, 33 pieces of burnt mud or clay.
- Level 4 (51-60 cm) – This level was made up of chert fill mixed with pulverized limestone. The rocks were smaller. The soil had a lighter color and was sandy (10 YR 5/2 Grayish Brown). 5 sherds, 14 chert fragments, 2 shells, 2 pieces of burnt mud or clay.

- Level 5 (60-99 cm) – This level was composed of gravel fill mixed with gray earth. The soil was sandy (10 YR 6/2 Light Brownish Gray). 70 sherds, 9 chert fragments, 5 shells.
- Level 6 (99-100 cm) – Bedrock was reached at this level (10 YR 8/1 White). There was no material.

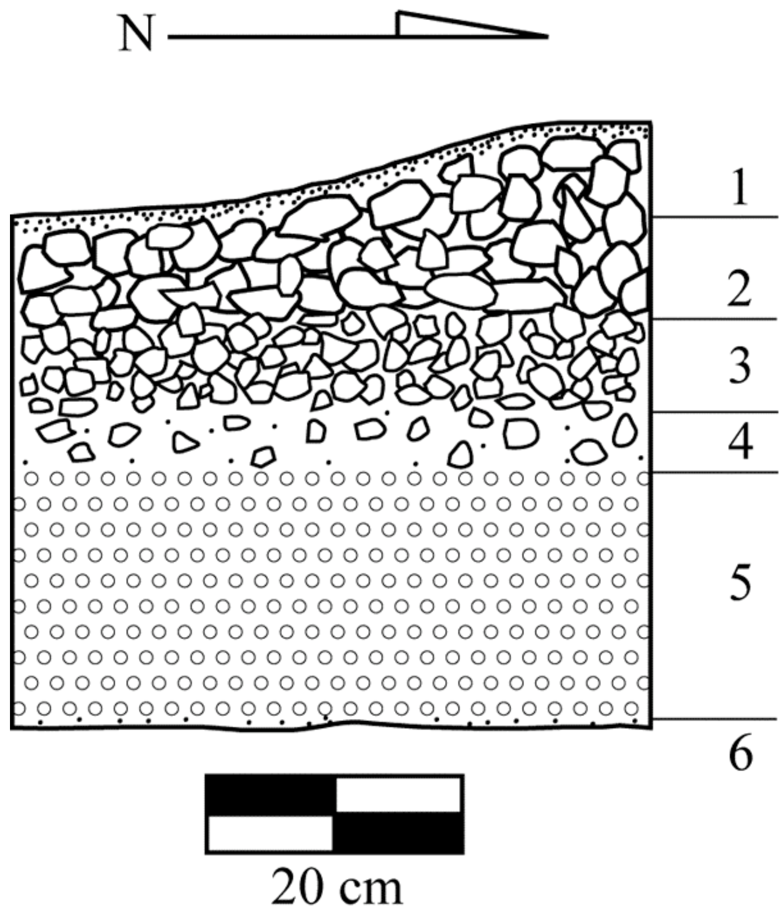

Figure A.57. SB11B-38.

Summary of PS-180-227

This excavation provided the evidence that the burnt clay or mud were not simply rocks. The presence of chert debitage embedded in some examples suggests that they were made by the Maya. Most likely, there was a platform of chert cobbles that was covered in a heavy coat of *bajo* mud, which was was either burnt or baked naturally in the sun. Of the ceramics identified to type, the Late Preclassic Paso Caballo Waxy wares were the most common. One sherd was identified as a Pijuy Slipped type, providing the only clear Middle Preclassic sherd in the entire intersite assemblage.. Numerous Late Classic Encanto Group domestic sherds were also recovered.

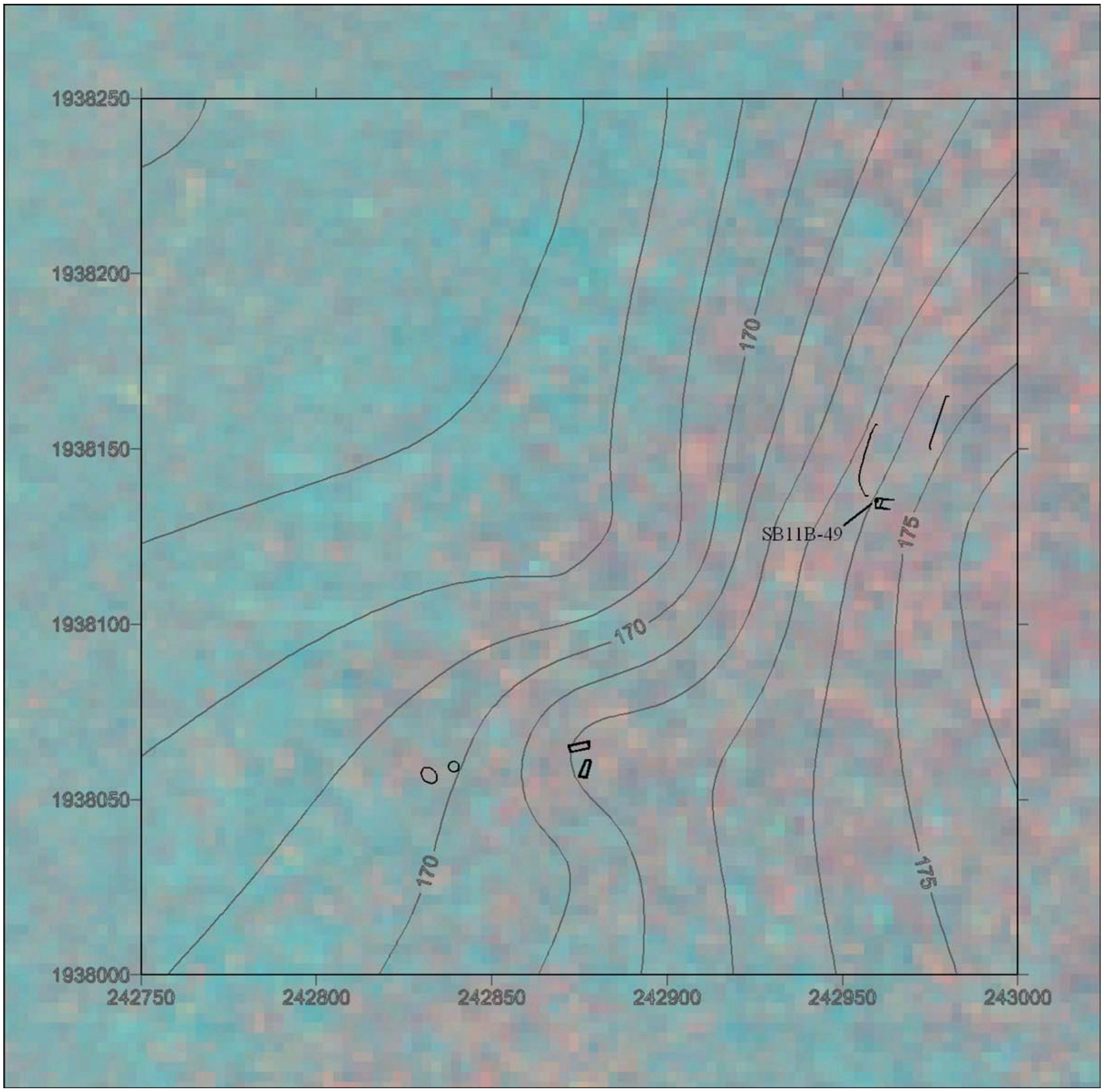

Figure A.58. PS-190-237.

PS-190-237

This block (Figure A.58) is located southwest of PS-160-205. The center of the block is at 242875 E, 1938125 N. Like other blocks in this part of the intersite area, there was not much settlement. There is an incline coming out of the *tintal bajo*, with a band of palm *bajo* before reaching *montaña* vegetation. To the south there are two small structures and a couple of rock piles. To the east there was a platform and a couple of small terraces. Aaron Carter excavated a unit on the edge of the platform associated with the terraces (SB11B-49).

<u>SB11B-49</u>

The goal of this unit was to confirm if there was any cultural material associated with the platform that could be dated. Three levels were excavated until bedrock was reached at 42 cm (Figure A.59).

- Level 1 (0-5 cm) – This level was humus with a lot of organic material and some large rocks. The soil was loose (10 YR 8/1 White). 1 sherd.
- Level 2 (5-35 cm) – This was a fill level made up of medium sized rocks mixed with gravel. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). 11 sherds.
- Level 3 (35-42 cm) – This level consisted of gravel fill mixed with some larger stones placed on top of bedrock. The gray soil was hard and compact (10 YR 7/2 Light Gray). 1 sherd.

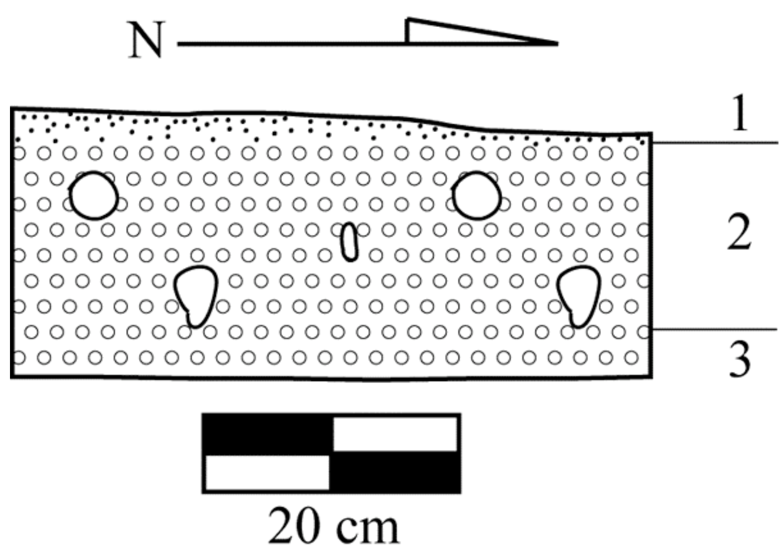

Figure A.59. SB11B-49.

<u>Summary of PS-190-237</u>

Like other blocks in this part of the intersite area, there was very little settlement and very little cultural material. Dunning reconnoitered an arroyo found near the block to look for indications of major climatic events, such as hurricanes, but had little success.

All of the sherds recovered from the excavations date to the Late Classic based on their paste and decoration.

NS-34-242

This block (Figure A.60) is northwest of Xultun in the Bajo Itz'ul. The center of the block is at 242375 E, 1937875 N. The block is composed entirely of *tintal bajo* and has no settlement. I excavated a unit in the center of the block (SB11B-50).

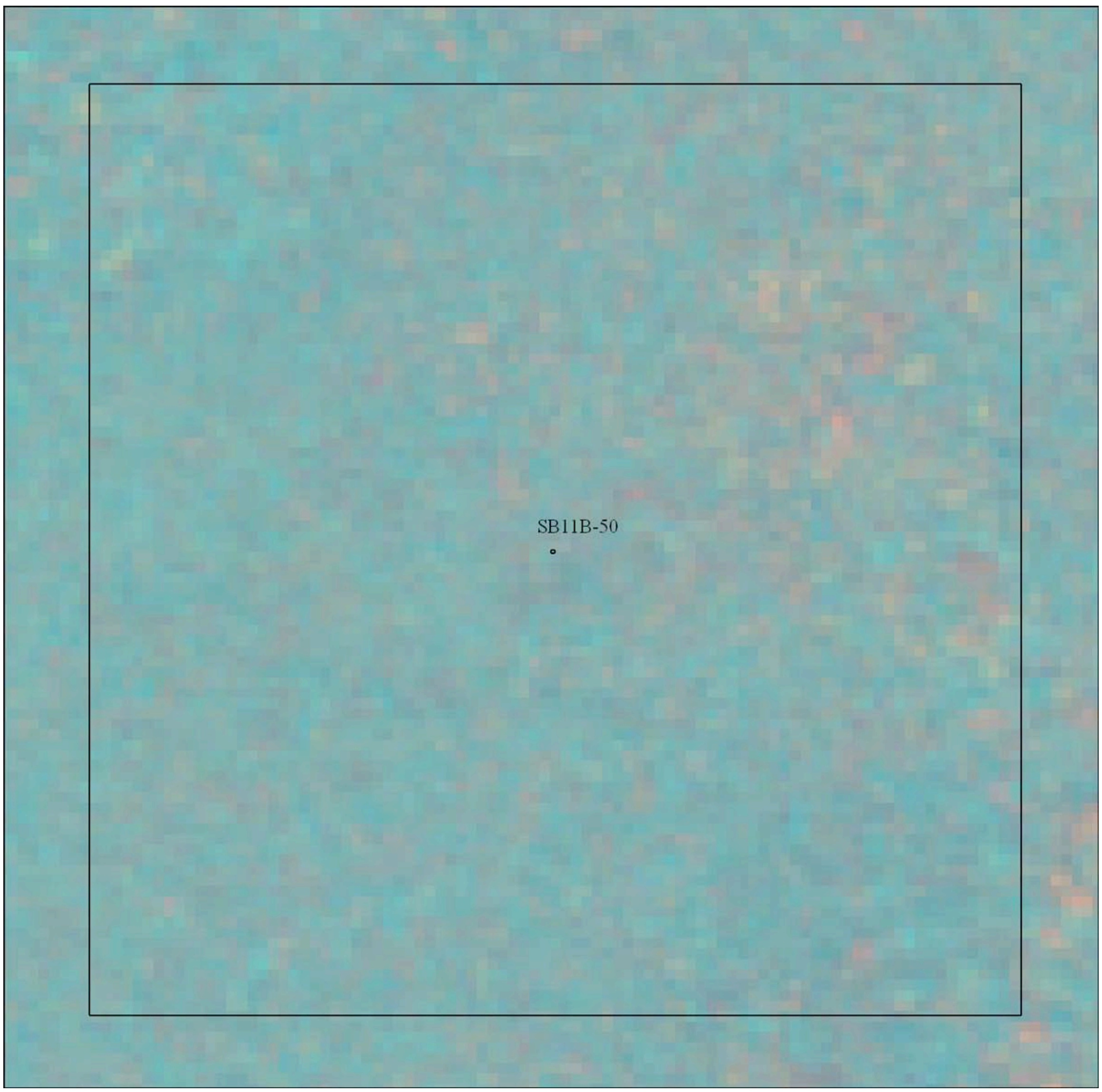

Figure A.60. NS-34-242.

SB11B-50

This unit was near the center of the block and had the goal of registering the *bajo* soil sequence for Dunning. One level was excavated to a depth of 130 cm (Figure A.61).

- Level 1 (0-130 cm) – This level was excavated quickly to reveal soil changes in the stratigraphic profile. Excavation ended at a buried Ab horizon found at a depth of 130 cm.

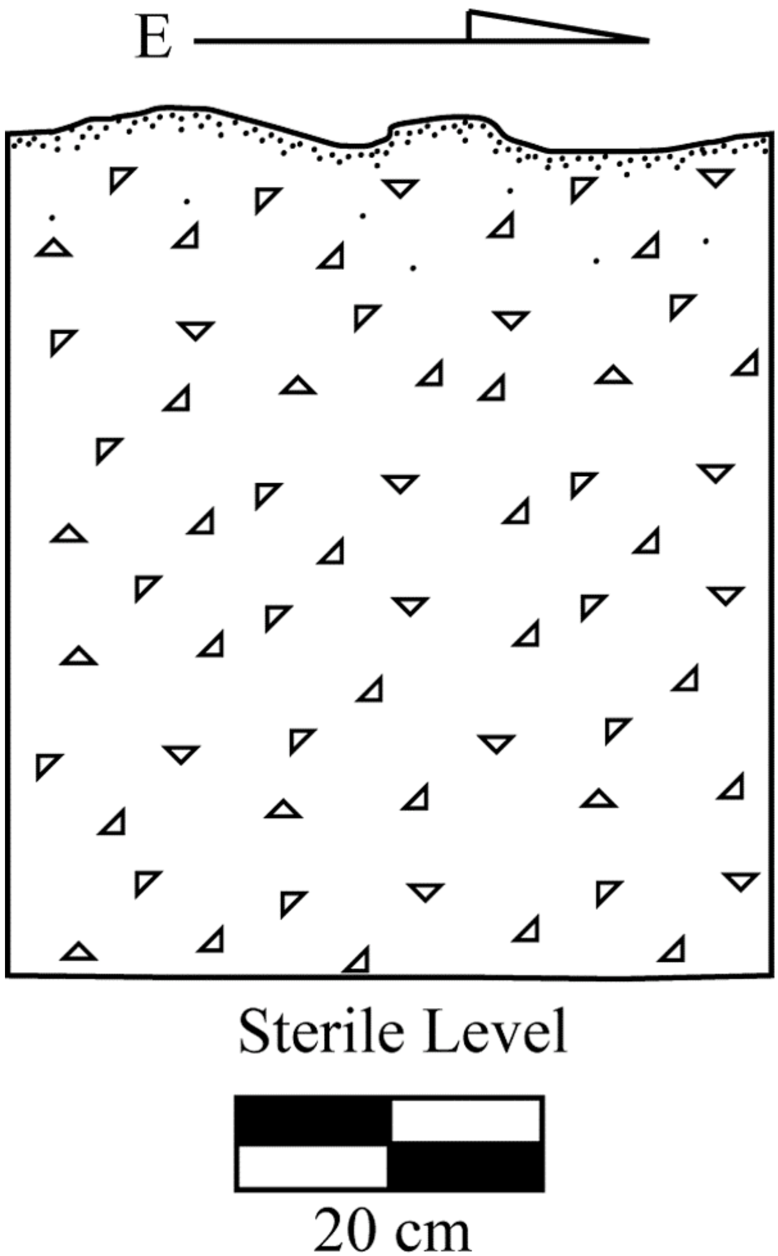

Figure A.61. SB11B-50.

Summary of NS-34-242

This block was the same as the others classified as No Settlement (NS). There was no evidence of ancient Maya activity. A radiocarbon date from the paleosol was dated to 5240-4960 cal B.C. (2 sigma). This indicates a pre-Maya Holocene surface soil further demonstrating the dynamic character of the Maya lowland environment. No material was recovered.

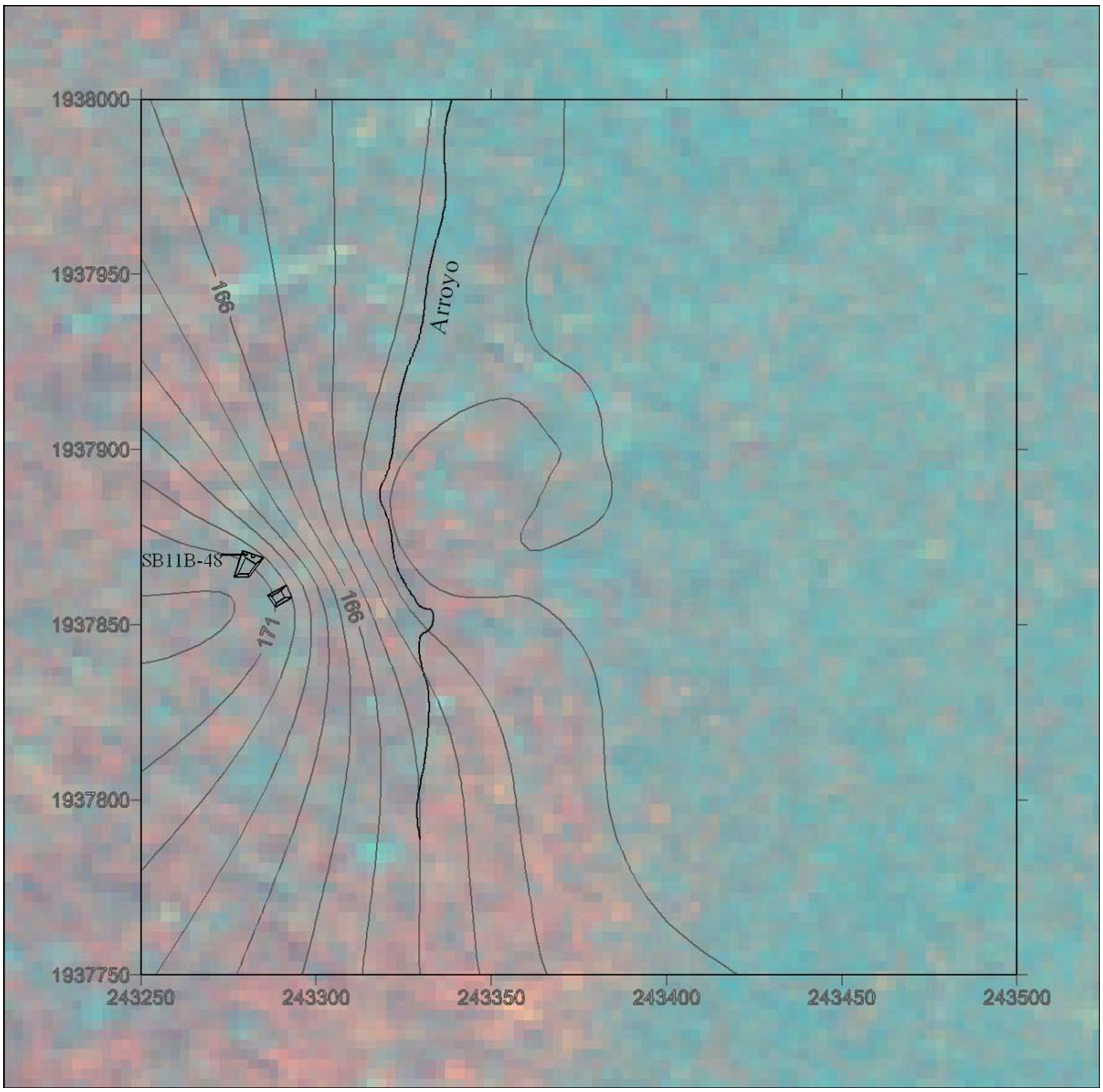

Figure A.62. PS-196-246.

PS-196-246

This block (Figure A.62) is located north of Xultun. The center of the block is at 243375 E, 1937875 N. The majority of the block is composed of palm *bajo* and *tintal bajo*. The terrain rises from east to west. At the base of the rise there is a small water drainage. There are two mounds on top of the incline. Aaron Carter a unit behind one of these (SB11B-48).

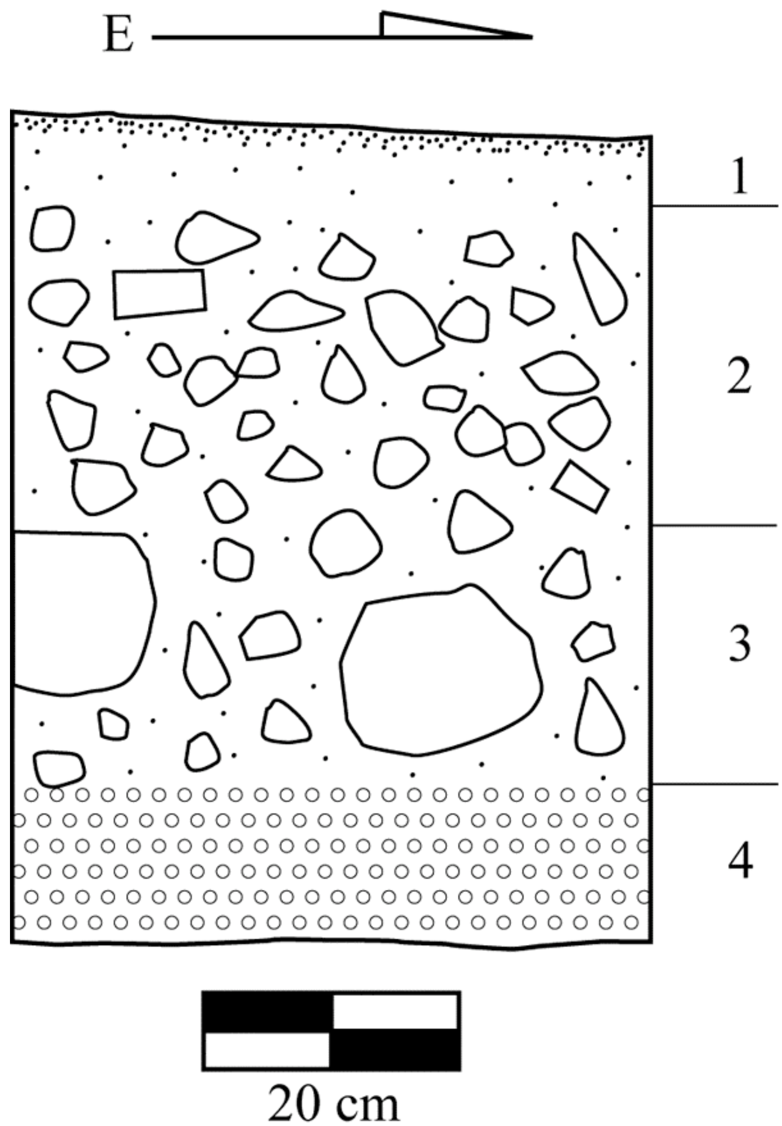

Figure A.63. SB11B-48.

<u>SB11B-48</u>

This unit was on the eastern side of the easternmost mound on the incline. Four levels were excavated until bedrock was reached at 130 cm (Figure A.63).

- Level 1 (0-15 cm) – Humus level with a lot of organic materia. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). 1 sherd.
- Level 2 (15-65 cm) – This level consisted of wall fall and fill. The soil was dry with many rocks (2.5 Y 4/3 Olive Brown). 4 sherds, 2 chert fragments, 2 pieces of burnt mud or clay.
- Level 3 (65-105 cm) – This level consisted of rocky fill, including five boulders, but no cut stones. The brown soil was dry (10 YR 4/2 Dark Grayish Brown). 5 sherds.
- Level 4 (105-130 cm) – This level consisted of gravel mixed with earth placed on top of bedrock. The soil was sandy and gray (10 YR 5/2 Grayish Brown). There was no material.

<u>Summary of PS-196-246</u>

This block is in the portion of the intersite area that had little settlement. There was not a lot of material recovered from excavations. It is unclear whether the Maya would have modified or exploited the microdrainage system found at the base of the incline in this block. All of the ceramic material recovered dates to the Late Classic Period based on paste.

PS-207-259

This block (Figure A.64) is located northeast of Xultun near the eastern limit of the intersite area. The center of the block is at 246625 E, 1937875 N. The settlement in the block is very dense, being found on both sides of a small arroyo. Settlement on the western side of the arroyo consisted exclusively of rock piles. Three limestone quarries were found in the block which were probably used for construction of some of the 28 mounds found on the eastern side of the arroyo. A logging road passes through the northeast of the block. To the south, the terrain descends into palm *bajo*. The most complex structure surveyed is located northeast of the center. This structure has a small platform running out of the western side of the mound. Julio Cotom excavated units in the platform (SB11B-31 y SB11B-31A), behind the platform (SB11B-33), and away from the mound (SB11B-32).

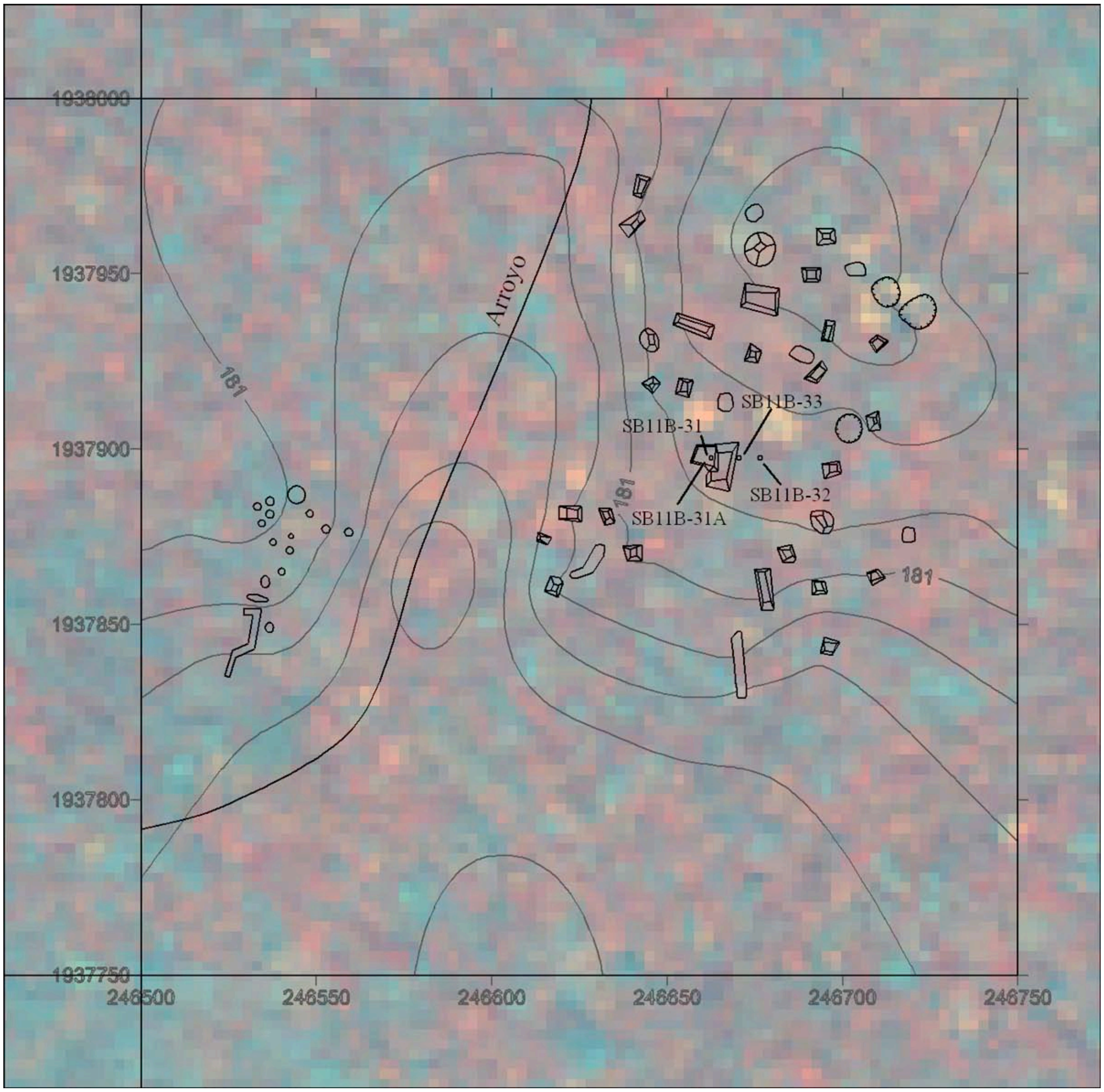

Figure A.64. PS-207-259.

<u>SB11B-31</u>

Unfortunately there are no stratigraphic profiles for SB11B-31 or SB11B-31A due to heavy rains on the walk back to the field camp, which soiled Cotom's field drawings.

SB11B-31

This unit was located on top of the platform on the edge of the mound. The goal of the unit was to date the construction sequence. Four levels were excavated to just below the first floor at 50 cm.

- Level 1 (0-10 cm) – Humus level consisting of dark brown earth with roots and small stones. The soil was smooth (10 YR 2/2 Very Dark Brown). 13 sherds.
- Level 2 (10-20 cm) – This level consisted of gray earth with many roots and small stones. The soil was smooth (10 YR 5/1 Gray). 22 sherds.
- Level 3 (20-30 cm) – The first floor was reached and a layer of gravel was excavated underneath. The soil was hard (10 YR 6/2 Light Brownish Gray). 22 sherds.
- Level 4 (30-50 cm) – This level consisted of a *sascab* mortar beneath the gravel layer. The soil was hard (2.5 Y 8/1 White). 52 sherds.

SB11B-31A

This unit was a western extension of SB11B-31 to further investigate the platform fill. Nine levels were excavated until bedrock was reached at 115 cm.

- Level 1 (0-10 cm) – Humus level consisting of dark brown earth with many roots. The soil was smooth (10 YR 2/2 Very Dark Brown). 1 sherd.
- Level 2 (10-20 cm) – This level consisted of gray earth with stones. The soil was smooth (10 YR 5/1 Gray). 7 sherds.
- Level 3 (20-30 cm) – Gravel level mixed with brown earth. The soil was smooth (10 YR 6/2 Light Brownish Gray). There was no material.
- Level 4 (30-40 cm) – Gravel mixed with brown earth. The soil was smooth (2.5 Y 4/1 Dark Gray). 11 sherds.
- Level 5 (40-50 cm) – This level consisted of light brown earth with many small stones. The soil was loose (2.5 Y 6/2 Light Brownish Gray). 8 sherds.
- Level 6 (50-60 cm) – This level reached the first floor of the platform, which was below the first floor found on top of the architecture in SB11B-31. The soil was hard (2.5 Y 7/1 Light Gray). 1 sherd.
- Level 7 (60-70 cm) – This level consisted of rocky fill with gravel and pulverized limestone mixed with gray earth. The soil was hard (10 YR 8/1 White). 1 sherd.
- Level 8 (70-115 cm) – This level consisted of rocky fill mixed with brown earth. The soil was hard and compact (10 YR 4/1 Dark Gray). There was no material
- Level 9 (115 cm) – This was the level of bedrock. The soil was hard (10 YR 5/1 Gray). There was no material.

SB11B-32

This unit was located east of the structure and platform tested in SB11B-31. The goal of the unit was to look for ancient remains in an open space. Three levels were excavated to bedrock at 20 cm (Figure A.65).

- Level 1 (0-10 cm) – Humus level of brown earth with many roots. The soil was smooth (10 YR 2/2 Very Dark Brown). There was no material.
- Level 2 (10-20 cm) – This level consisted of brown earth with roots and limestone fragments. The soil was smooth (10 YR 3/2 Very Dark Grayish Brown). 1 sherd.
- Level 3 (20 cm) – This level was at bedrock (10 YR 8/1 White). There was no material.

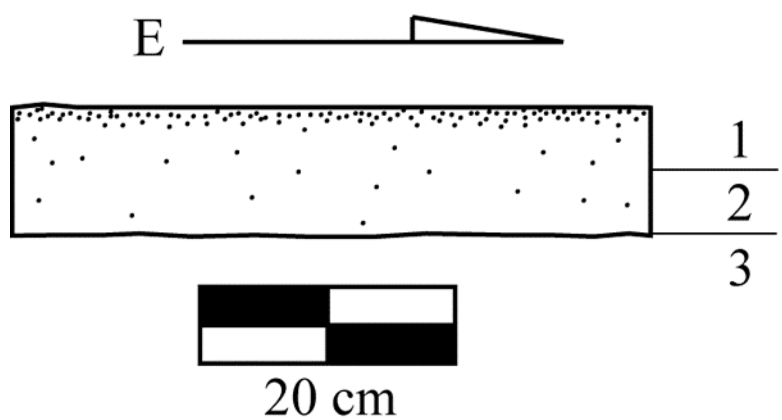

Figure A.65. SB11B-32.

SB11B-33

This unit was on the eastern margin of the mound tested in SB11B-31. The goal of the unit was to find datable material. Eight levels were excavated until reaching bedrock at 59 cm (Figure A.66).

- Level 1 (0-10 cm) – Humus level of dark brown earth with roots and stones. The soil was smooth (10 YR 3/2 Very Dark Grayish Brown). 6 sherds.
- Level 2 (10-20 cm) – This level consisted of dark brown earth with roots. The soil was smooth (10 YR 3/2 Very Dark Grayish Brown). 14 sherds.
- Level 3 (20-30 cm) – This level consisted of rocky fill mixed with brown earth. The soil was smooth (10 YR 4/1 Dark Gray). 15 sherds.
- Level 4 (30-40 cm) – This level consisted of gravel mixed with light brown earth. The soil was smooth (10 YR 6/2 Light Brownish Gray). 34 sherds.
- Level 5 (40-50 cm) – This level consisted of gravel mixed with gray earth. The soil was compact (10 YR 7/1 Light Gray). 60 sherds.

- Level 6 (50-54 cm) – This level consisted of gravel mixed with brown earth until arriving at the first preserved floor. The soil was rocky (10 YR 7/1 Light Gray). There was no material.
- Level 7 (54-59 cm) – The first floor was found at this level, directly on top of bedrock. The purpose of the floor was to level the bedrock. The soil was hard (10 YR 8/1 White). There was no material.
- Level 8 (59 cm) – This level consisted of bedrock (10 YR 8/1 White). There was no material.

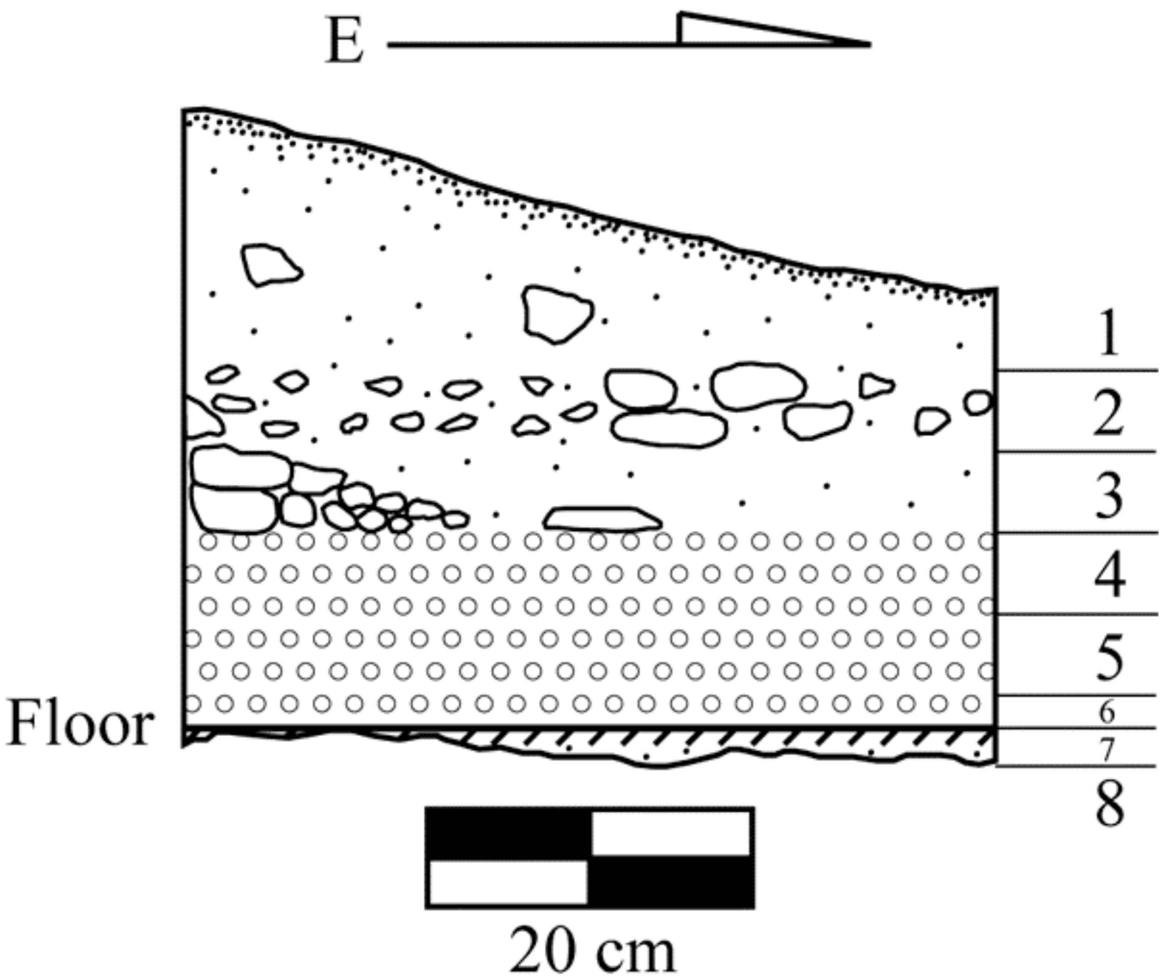

Figure A.66. SB11B-33.

<u>Summary of PS-207-259</u>

The settlement in this block appears to have been an expansion of the Xultun population that constructed their homes directly on the bedrock. There is very shallow topsoil in this area, with bedrock found at a depth of 20 cm where there is no settlement. The density of rock piles on the other side of the arroyo suggests that this was a designated activity area for testing chert quality for stone tool making. The transition to palm *bajo* would have provided good agricultural lands to support the settlement. All of the architecture tested in this block dates to the Late Classic, with Tinaja Group ceramics being found in the deepest levels. However there were a significant number of Sierra Group Late Preclassic sherds found in the fill. A single Quintal Group Early Classic domestic sherd was also recovered in these excavations.

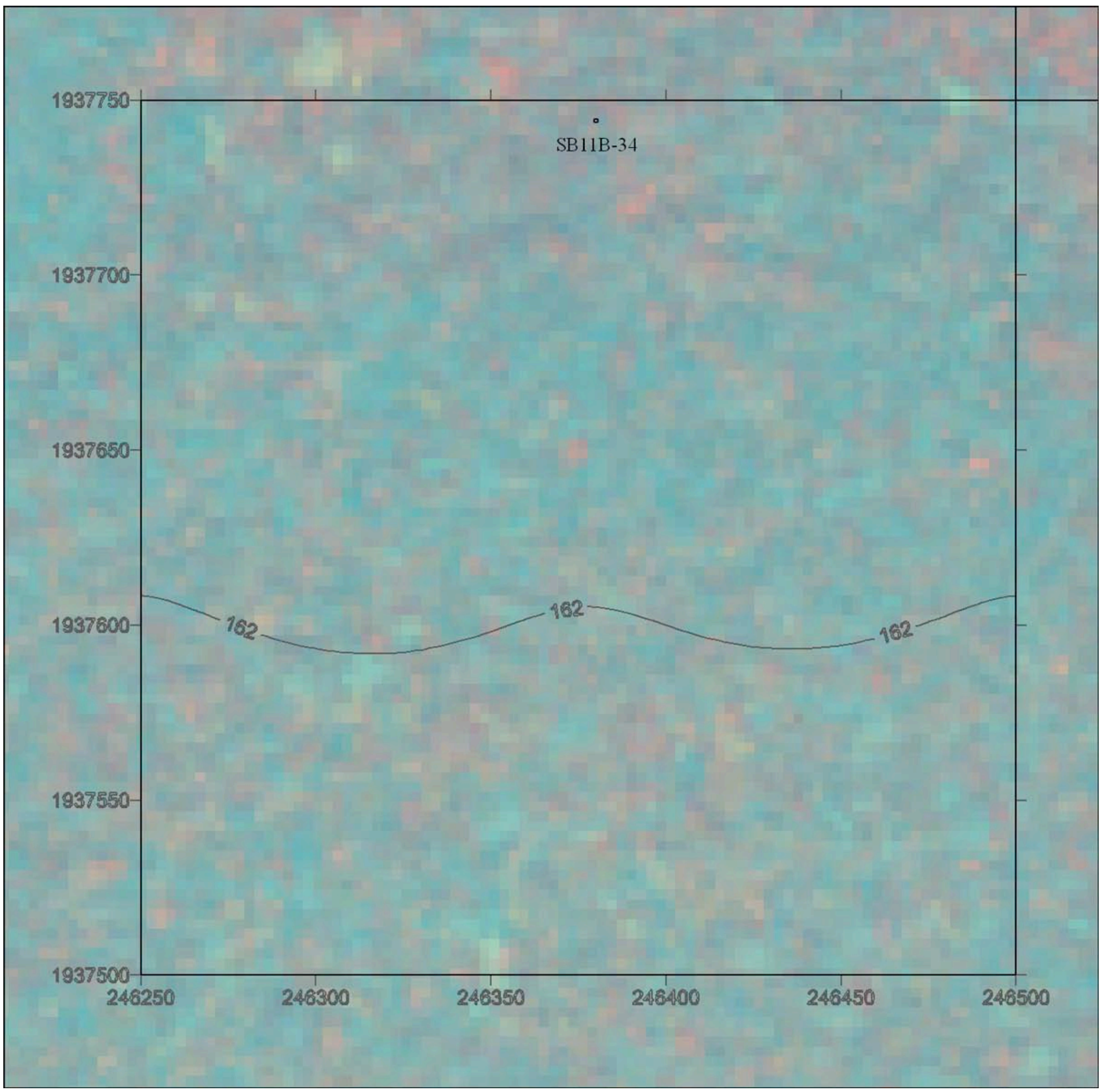

Figure A.67. PS-211-263.

PS-211-263

This block (Figure A.67) is located northeast of Xultun and southwest of block PS-207-259. The center of the block is at 246375 E, 1937625 N. This block was misclassified during the initial survey design. This was due to the presence of the *pucte* (*Bucida buceras*) tree, whose crown displays in the same light blue color as portions of the settlement signature. The block consists almost entirely of *tintal bajo* with some plam *bajo* in the northern portion. Julio Cotom excavated a unit at this transition to confirm if there was any evidence of use or occupation by the Maya (SB11B-34).

<u>SB11B-34</u>

This unit was located at the scrub to palm *bajo* transition. The goal of the unit was to find any evidence of ancient Maya culture. Four levels were excavated to sterile soil at 30 cm (Figure A.68).

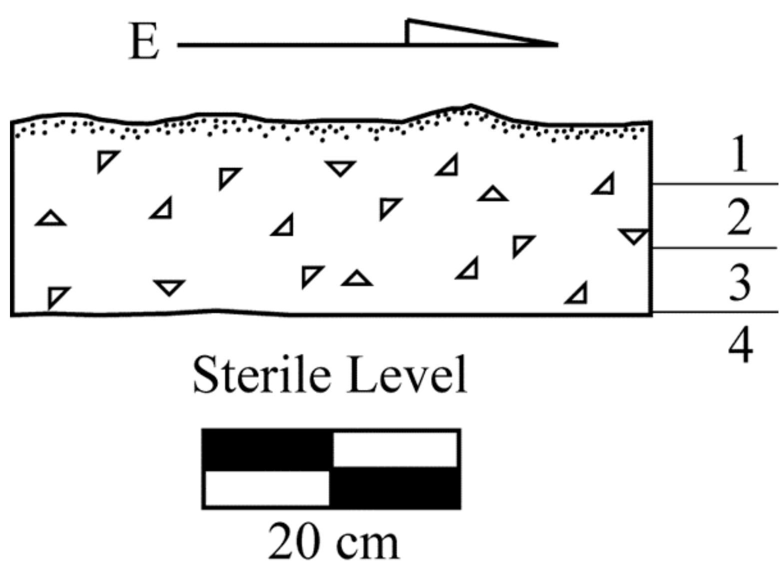

Figure A.68. SB11B-34.

- Level 1 (0-10 cm) – This level consisted of *bajo* humus with lots of organic material. The surface of the level was uneven due to the gilgai formed during seasonal drainage. The earth was mostly dark brown clay. The soil was hard and compact (10 YR 2/2 Very Dark Brown). There was no material.

- Level 2 (10-20 cm) – In this level the clay changed to a lighter gray tone. There were some roots. The soil was hard and compact (10 YR 2/2 Very Dark Brown). There was no material.
- Level 3 (20-30 cm) – The gray clay continued with some roots. The soil was hard and compact (10 YR 3/1 Very Dark Gray). There was no material.
- Level 4 (30 cm) – The unit was abandoned here due to lack of material. The soil was hard and compact (10 YR 4/1 Dark Gray). There was no material.

<u>Summary of PS-211-263</u>

This was the only block classified as Partial Settlement (PS) that had neither surface settlement nor excavated material. The identification of the *pucte* tree has helped refine our understanding of IKONOS image interpretation.

PS-215-267

This block (Figure A.69) is northeast of Xultun and 500 m south of PS-180-227. The center of the block is at 245375 E, 1937625 N. The majority of this block consists of *julubal bajo* with various *pucte* trees interspersed. The *pucte* makes the area seem like *montaña* uplands in the satellite imagery. There was one mound in this block along the northern survey transect. I excavated a single unit on the edge of this mound (SB11B-37).

<u>SB11B-37</u>

This unit was located on the northwest corner of the mound. The goal of the unit was to test if the chert cobbles were arranged in a form that would support a perishable superstructure, and to date the feature. All of the depths are averaged from a level line. Four levels were excavated until bedrock was reached at 67 cm (Figure A.70).

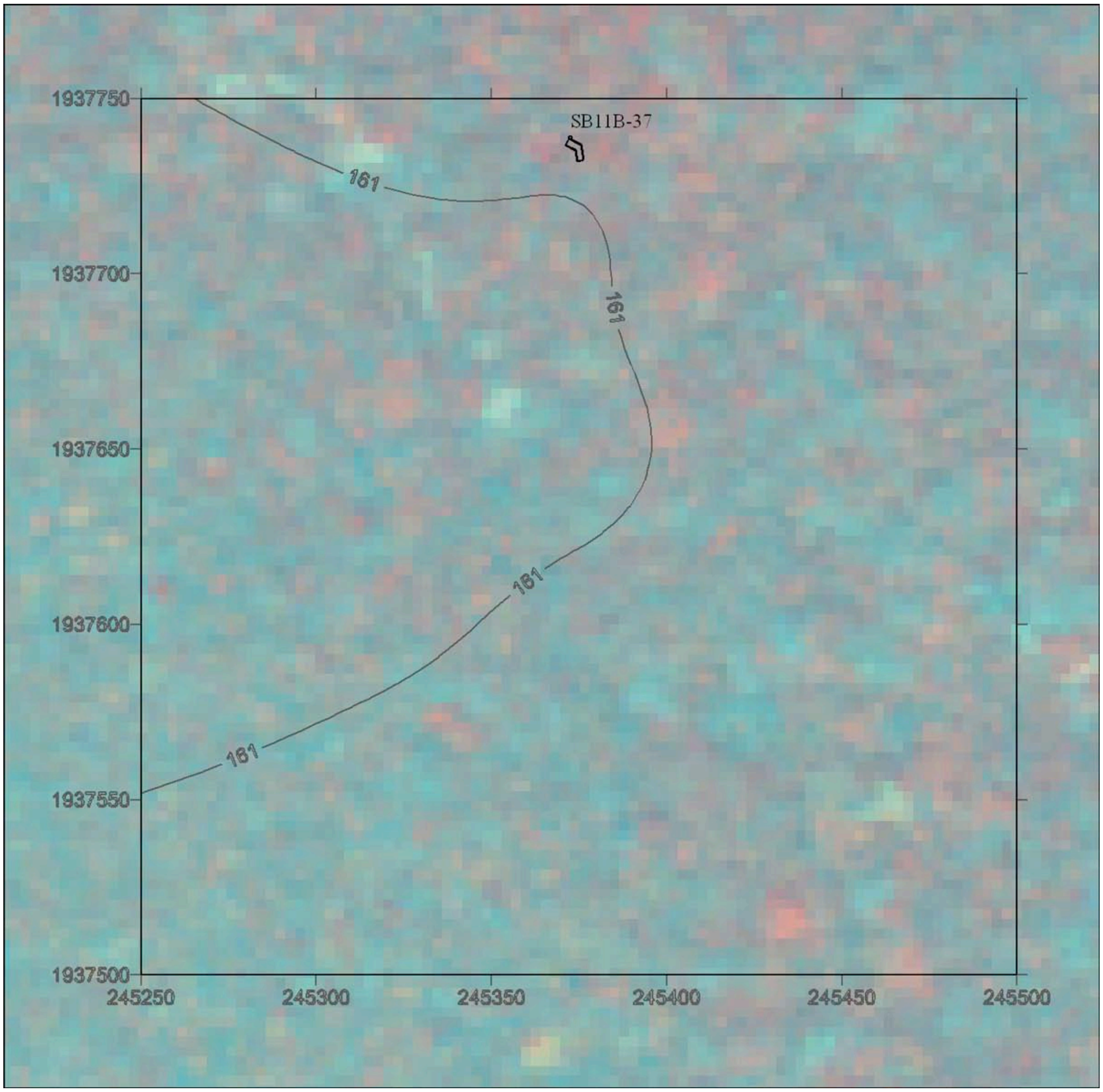

Figure A.69. PS-215-267.

- Level 1 (24.5-35 cm) – This level represented the cleaning of the entire mound with a rake, removing the humus layer. The soil was humid (10 YR 2/1 Black). 1 sherd.
- Level 2 (35-39 cm) – This level lowered the northern portion of the unit, leaving the chert cobbles composing the bulk of the mound in place. The chert appeared to form three crude steps. The soil was compact (10 YR 2/1 Black). 1 sherd, 1 chert fragment.
- Level 3 (16-50 cm) – This level consisted of removing the chert cobbles that made up the bulk of the mound. The soil was very compact (10 YR 2/2 Very Dark Brown). 89 sherds, 17 chert fragments, 24 pieces of burnt mud or clay.
- Level 4 (50-67 cm) – This level consisted of the eroded *sascab* (10 YR 8/1 White) fill upon which the mound was built. Bedrock was reached at 67 cm. 6 sherds, 5 chert fragments.

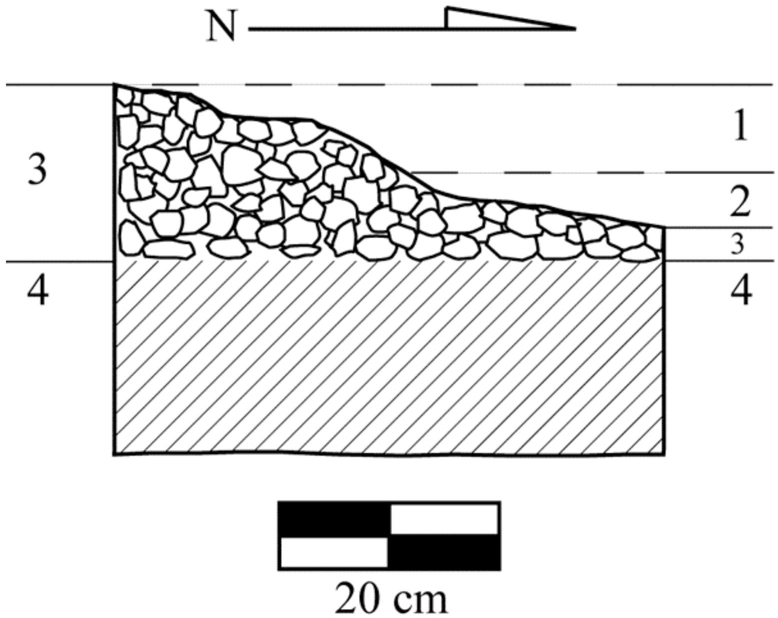

Figure A.70. SB11B-37.

Summary of PS-215-267

The excavations in this block confirmed without doubt that some of the chert rock piles were housemounds, built to support perishable superstructures, possibly including crude staircases. It seems likely that whoever lived in this structure was exploiting the resources provided by the vegetational ecotones in the surrounding area. Both Late Preclassic and Late Classic sherds were recovered from the construction fill of the structure.

PS-252-316

This block (Figure A.71) is northwest of Xultun in an area with a lot of chert on the surface. The center of the block is at 243125 E, 1937125 N. This block consists of the intersection of various vegetation classes, including *tintal*, *julubal*, *escobal*, and *huayabial bajos*, and montaña. To the southeast there is a leveling platform, rock piles, and three small mounds. Trevor Emond and Keith Ferguson excavated a unit in one of these mounds (SB11B-46).

SB11B-46

This unit was located on the western edge of a small mound. The goal of the unit was to find datable material. All of the measurements are averages below a level line. Three levels were excavated until bedrock was reached at 64 cm (Figure A.72).

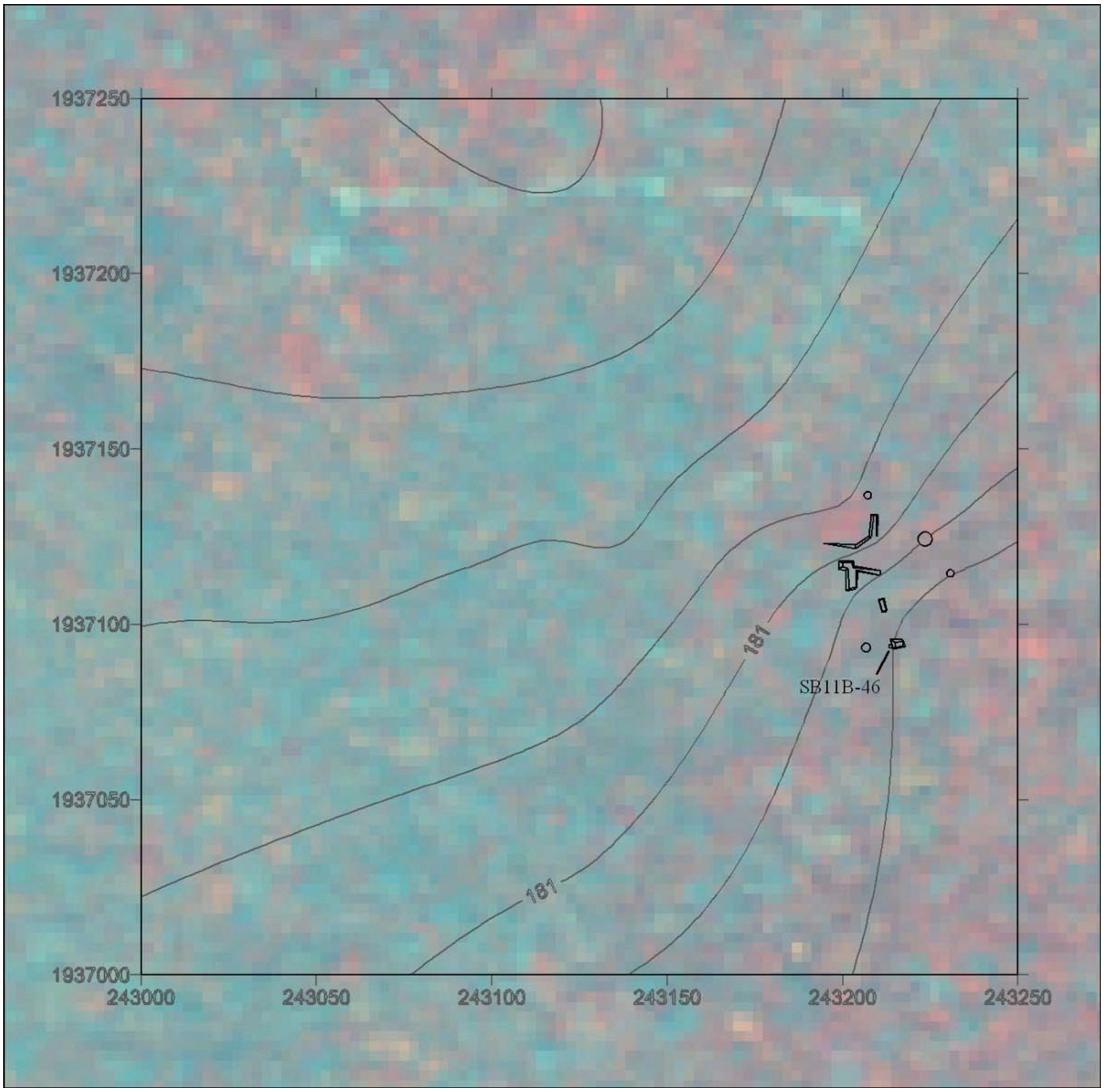

Figure A.71. PS-252-316.

- Level 1 (32-33 cm) – Humus level with a lot of organic material. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (33-52 cm) – This level consisted of black earth with large chert boulders. The soil had a high clay content (10 YR 2/1 Black). 10 sherds, 3 chert fragments.

- Level 3 (52-64 cm) – This level consisted of chert fill mixed with pulverized limestone before reaching bedrock. The gray soil was compact (10 YR 4/1 Dark Gray). There was no material.

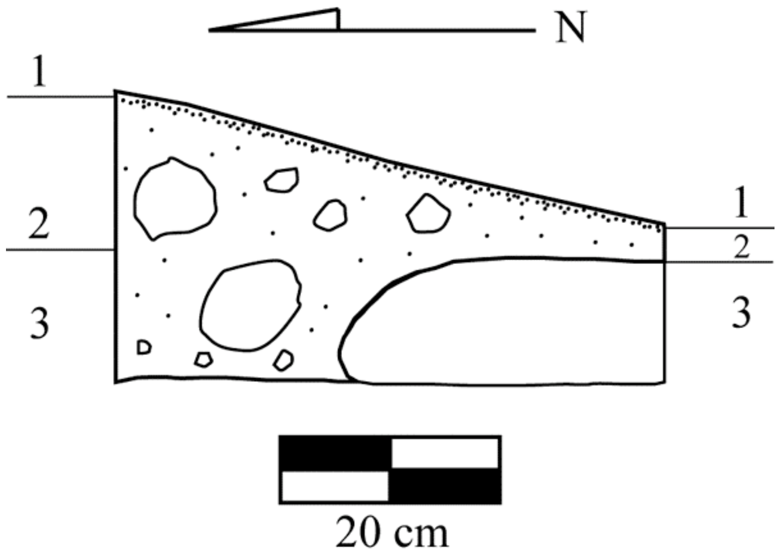

Figure A.72. SB11B-46.

<u>Summary of PS-252-316</u>

Very little material was recovered from excavations in this block. It is likely that the inhabitants of this block were agriculturalists exploiting the various types of *bajo* found nearby. One sherd was identified as Late Preclassic based on paste. The rest of the sherds are believed to be Late Classic based on their paste.

PS-255-323

This block (Figure A.73) is northwest of Xultun. The center of the block is at 242625 E, 1936875 N. The block consists of a piece of *montaña* in what is mostly *escobal bajo*. The logging road to Hormiguero crosses the unit in the north and can be seen in satellite imagery. There are a dozen housemounds, a platform, and six rock piles in the unit. One of these rock piles, to the north, is a long line of chert that extended more than 50 m outside of the block. Trevor Emond and Keith Ferguson excavated a unit on the margin of one of the mounds in the block (SB11B-47).

SB11B-47

This unit was located on the western margin of a mound that runs north to south. The goal of the unit was to find datable material. All of the measurements are averages

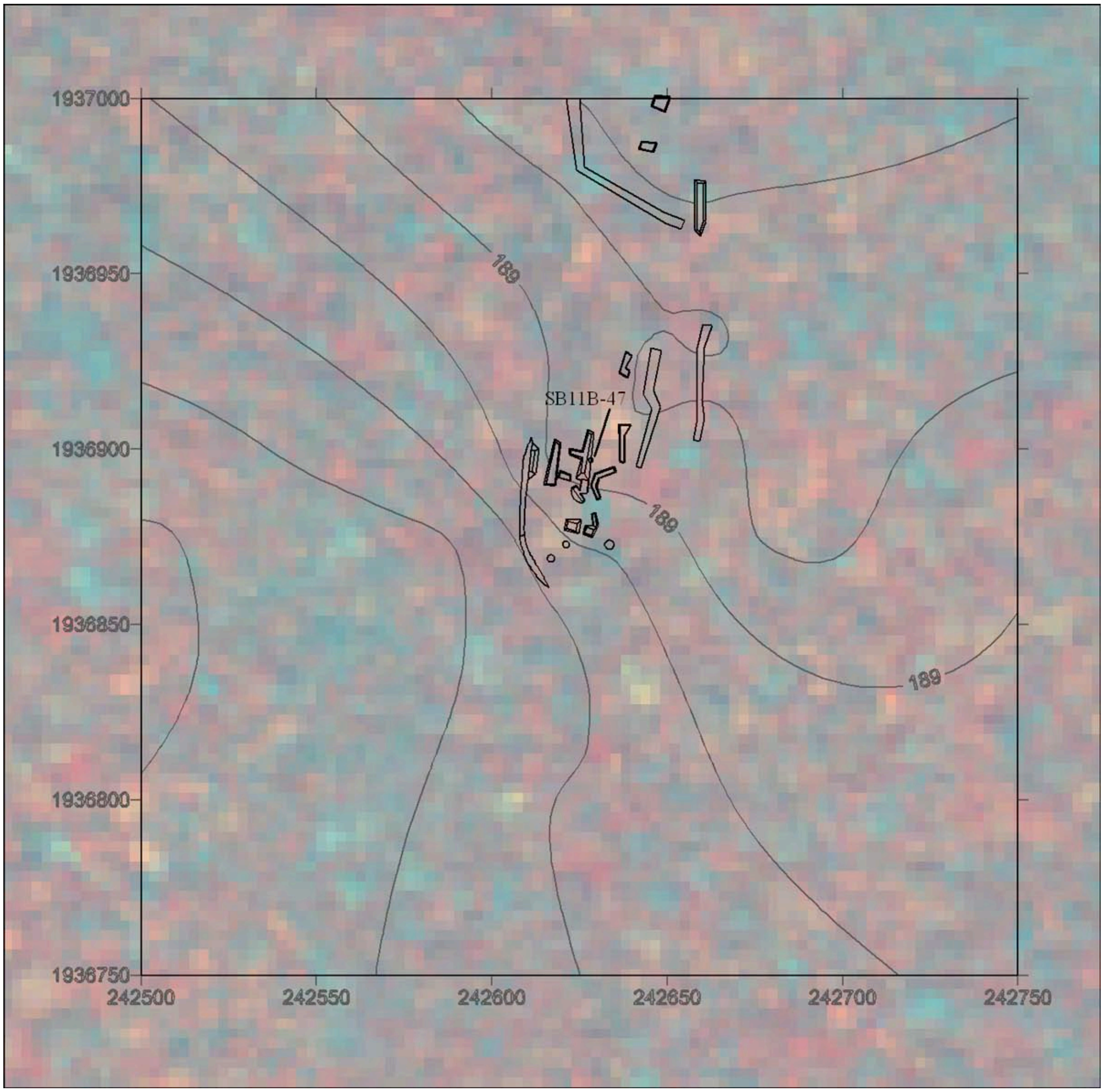

Figure A.73. PS-255-323.

below a level line. Three levels were excavated until bedrock was reached at 63 cm (Figure A.74).

- Level 1 (15-17 cm) – Humus level with lots of organic material. The soil was dark brown with chert cobbles of various sizes. The soil was humid and loose (10 YR 2/1 Black). There was no material.

- Level 2 (17-36 cm) – This level consisted of fill of small chert cobbles. The soil was humid and loose (10 YR 2/1 Black). 1 sherd, 2 pieces of burnt mud or clay.
- Level 3 (36-63 cm) – This level consisted of gravel fill mixed with pulverized limestone and gray earth. Bedrock was reached at 63 cm. The soil was compact (10 YR 7/1 Light Gray). There was no material.

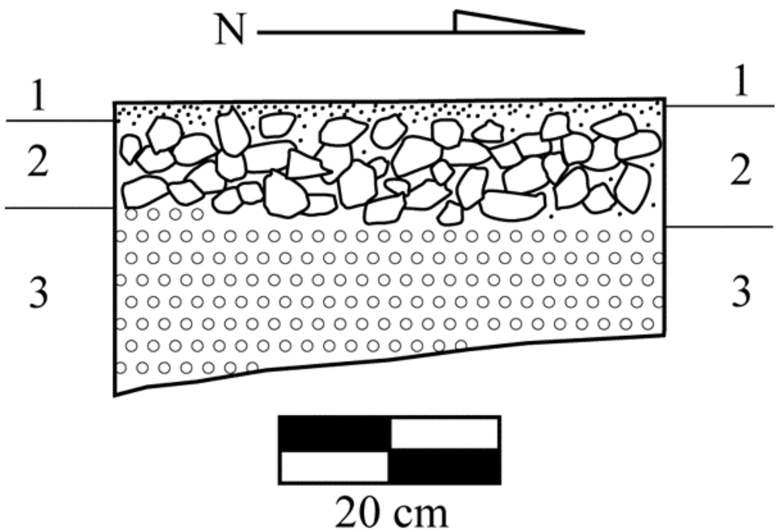

Figure A.74. SB11B-47.

<u>Summary of PS-255-323</u>

Despite the clear evidence of settlement, very little material was recovered in the test unit and time prohibited the excavation of a second unit. It is spossible that the long linear mounds in this block were used for agricultural purposes although they are higher than similar features in other blocks. The long feature running north out of the block is also problematic and the function of this feature is still undetermined. It seems to short to have been a raised causeway and there is nothing of note at the endpoints of the feature. The one sherd recovered from excavations is believed to be Late Classic based on paste.

PS-264-335

This block (Figure A.75) is located northeast of Xultun. The center of the block is at 245625 E, 1936875 N. The block consists entirely of *escobal bajo*, including where it is deforested for a large logging *bacadilla* used to saw lumber. The main road to the

San Bartolo camp also passes through this block. There is no surface settlement in the block. To the south, outside of the block, there is a medium sized courtyard group. I excavated a unit near the southern edge of the block (SB11B-14).

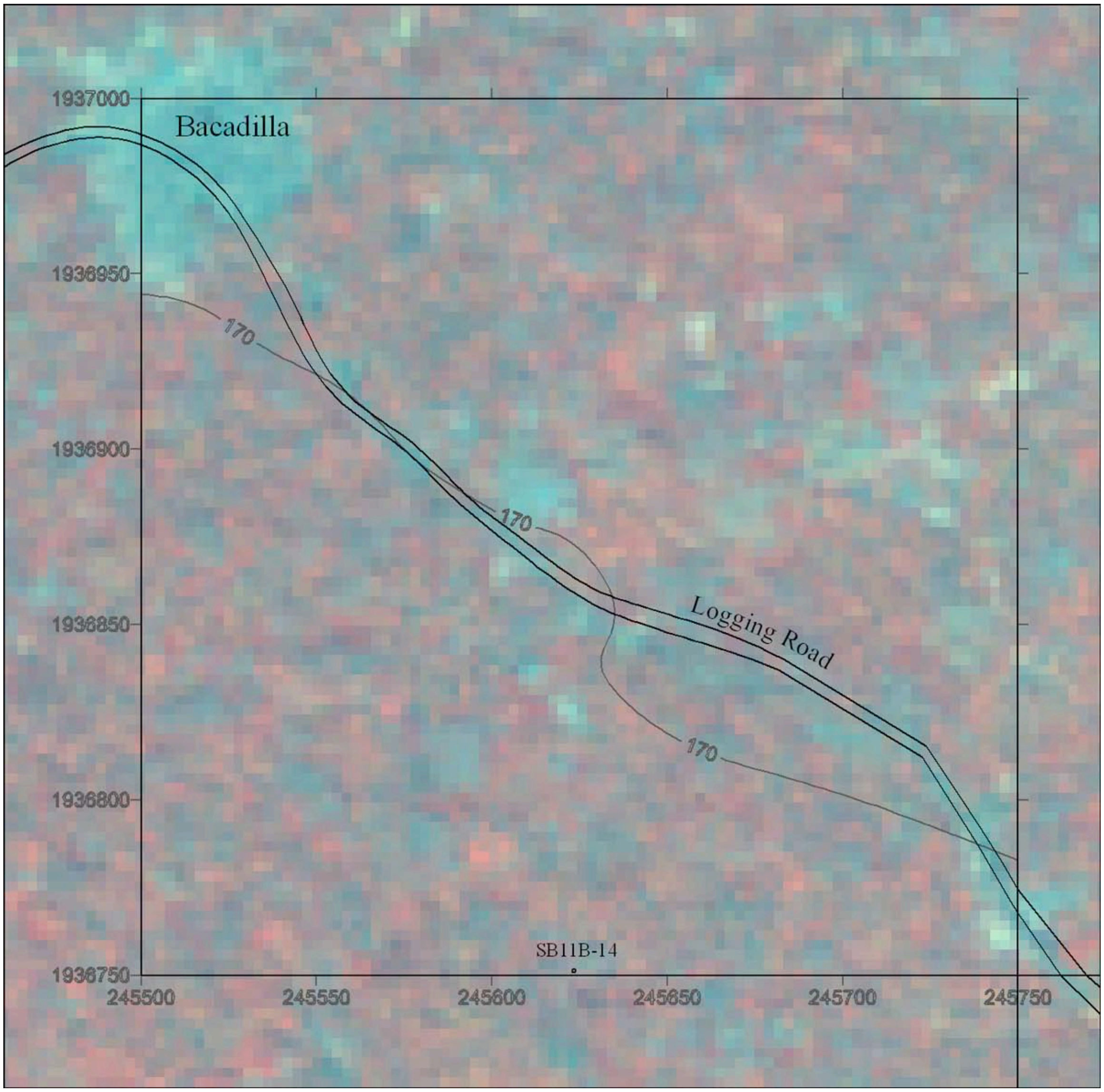

Figure A.75. PS-264-335.

<u>SB11B-14</u>

The goal of this unit was to uncover any evidence of ancient Maya activity. Five levels were excavated to a sterile clay layer at 50 cm (Figure A.76).

- Level 1 (0-10 cm) – Humus level with a lot of organic material. The soil had a high clay content (10 YR 2/1 Black). 7 sherds.

- Level 2 (10-20 cm) – This level consisted of *bajo* clay (2.5 Y 3/3 Dark Olive Brown). 8 sherds, 4 chert fragments.
- Level 3 (20-30 cm) – This level consisted of *bajo* clay that was slightly more gray in color (2.5 Y 3/2 Very Dark Grayish Brown). There was no material.
- Level 4 (30-40 cm) – This level consisted of the same gray *bajo* clay (2.5 Y 3/2 Very Dark Grayish Brown). There was no material.
- Level 5 (40-50 cm) – The unit was abandoned at this level due to lack of material. The soil was gray *bajo* clay (2.5 Y 4/1 Dark Gray). There was no material.

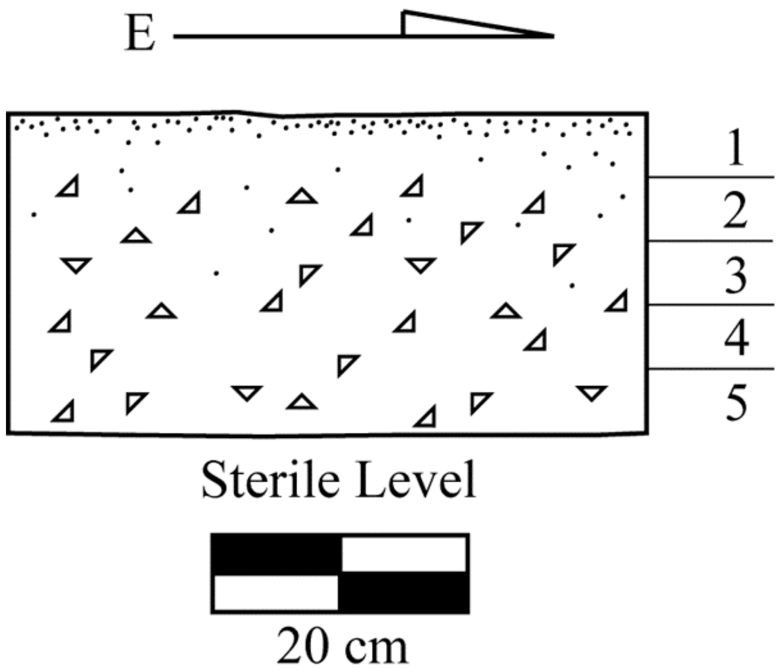

Figure A.76. SB11B-14.

<u>Summary of PS-264-335</u>

This block helped refine satellite interpretations of palm *bajos*. The *escobal bajo* appears as very fine, bright red pixels. It is difficult to say whether the sherds recovered arrived through erosion processes or if they are in their original contexts, but the former seems most likely, especially due to the poor condition of the material. It is possible that they were remains from the courtyard group just to the south. The sherds were recovered were heavily eroded. One was definitely Late Classic based on the style of impressed decoration around the exterior. The rest of the sherds are believed to be Late Classic based on paste.

S-17-338

This block (Figure A.77) is to the northeast of Xultun center and represents part of that site's periphery. The center of the block is at 246375 E, 1936875 N. The terrain

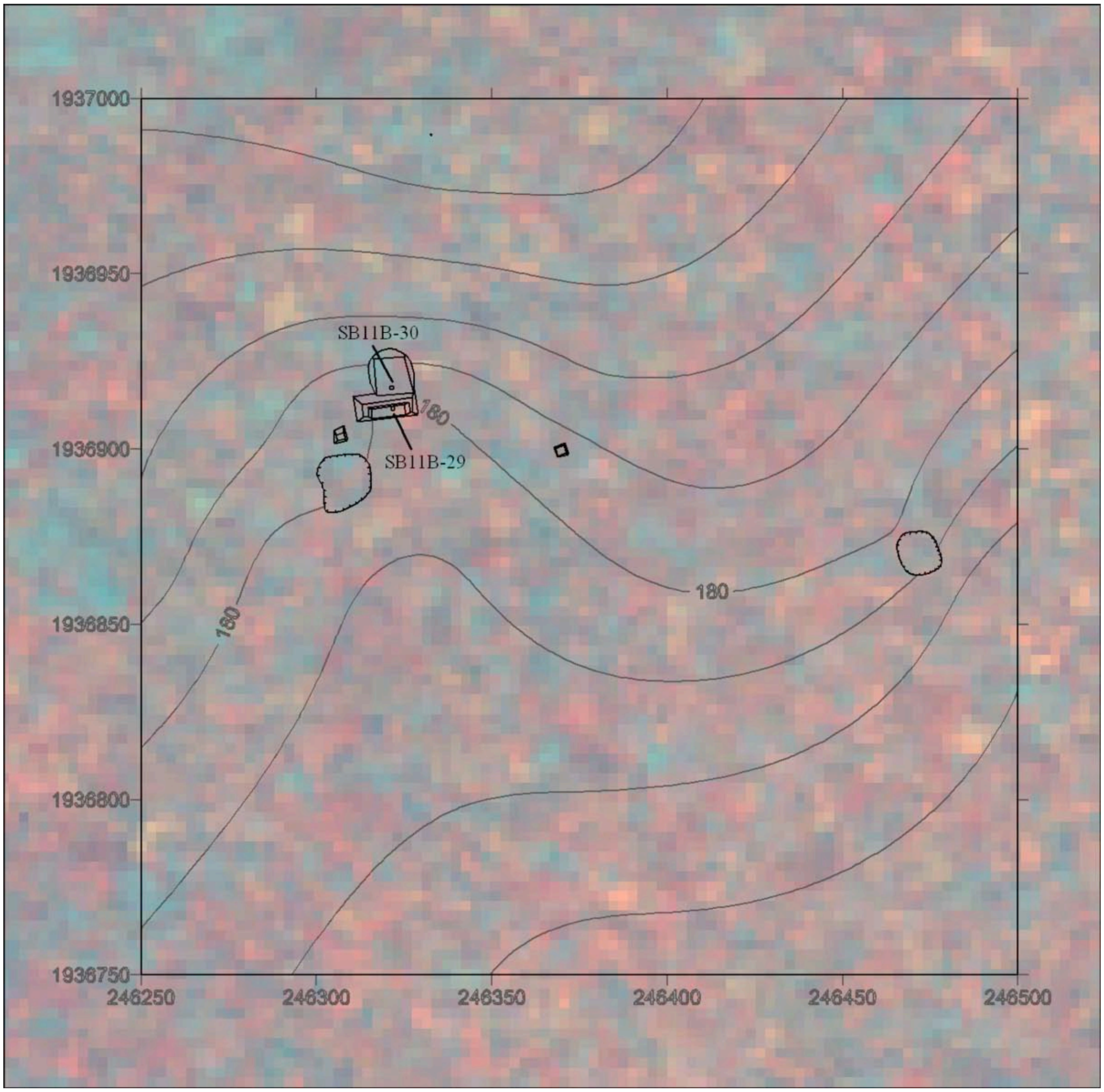

Figure A.77. S-17-338.

in this block rises from north to south. The settlement was not as dense as expected given the Settlement (S) classification, although there were many mounds just east of the block. There are two large limestone quarries to the west and east of center. There are three mounds in the block. One is small and low and near the center of the block. Another is small and near the western quarry. The third mound has a "U" form, with a platform coming out of the northern side. The long axis of the wall has an intact wall with three tiers of cut limestone blocks. Julio Cotom excavated a unit on the plaza side of the mound (SB11B-29) as well as in the mound platform (SB11B-30).

SB11B-29

This unit was located in the plaza of the largest mound found in the block. Ten levels were excavated until bedrock was reached at 98 cm (Figure A.78).

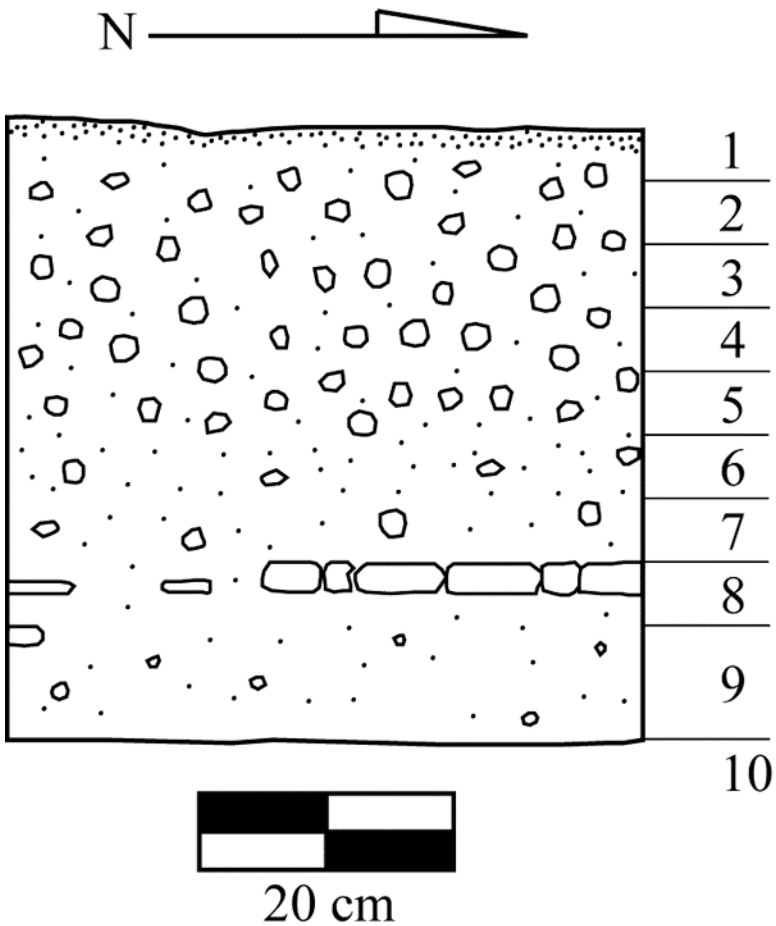

Figure A.78. SB11B-29.

- Level 1 (0-10 cm) – Humus level with many roots and small rocks. The dark brown soil was loose (10 YR 2/1 Black). There was no material.
- Level 2 (10-20 cm) – This level consisted of rocky fill. The soil was smooth (10 YR 2/2 Very Dark Brown). 2 sherds.

- Level 3 (20-30 cm) – This level consisted of rocky fill. The soil was smooth and rocky (10 YR 3/2 Very Dark Grayish Brown). 9 sherds.
- Level 4 (30-40 cm) – This level consisted of brown earth mixed with many rocks. The soil was smooth and rocky (10 YR 3/1 Very Dark Gray). 6 sherds.
- Level 5 (40-50 cm) – This level consisted of gray earth mixed with rocks. The soil was smooth and rocky (10 YR 4/1 Dark Gray). 9 sherds.
- Level 6 (50-60 cm) – Relleno de tierra cafe con menas piedras que los Leveles anteriores. La tierra era suave y pedregosa (10 YR 3/1 Very Dark Gray). 3 sherds.
- Level 7 (60-70 cm) – This level consisted of dark gray earth mixed with small stones until the first surviving floor was reached. This floor consisted of limestone cobbles and was not plastered. The soil was smooth (10 YR 4/1 Dark Gray). 1 sherd.
- Level 8 (70-80 cm) – This level consisted of gravel fill mixed with pulverized limestone found beneath the first floor (10 YR 8/1 White). The soil was smooth (10 YR 5/1 Gray). There was no material.
- Level 9 (80-98 cm) – This level consisted of gray earth mixed with small stones. The soil was smooth (10 YR 5/1 Gray). 1 sherd.
- Level 10 (98 cm) – This level consisted of bedrock (10 YR 8/1 White). There was no material.

SB11B-30

This unit was located on the platform associated with the same mound as in the previous unit. The goal of the unit was to recover more datable material. Six levels were excavated until bedrock was reached at 50 cm (Figure A.79).

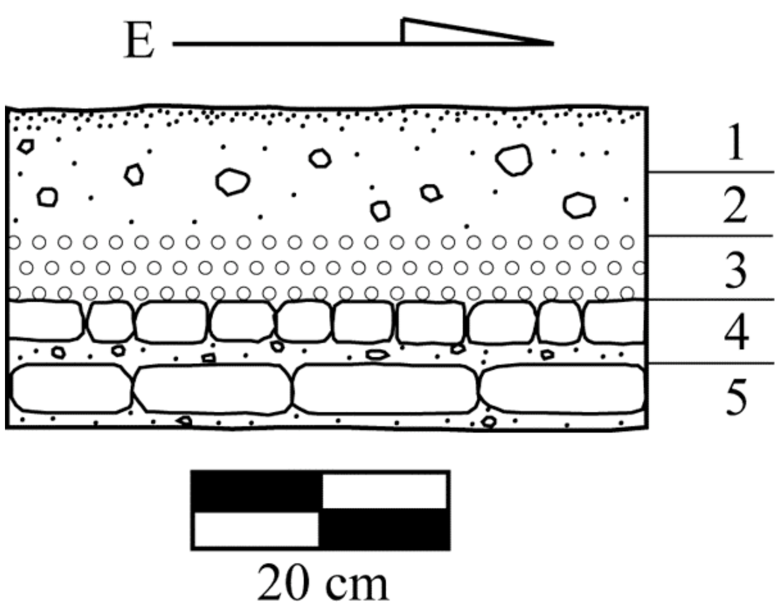

Figure A.79. SB11B-30.

- Level 1 (0-10 cm) – Humus level of dark brown earth with many roots and small stones. The soil was smooth (10 YR 2/1 Black). 2 sherds.
- Level 2 (10-20 cm) – This level consisted of brown earth with roots and stones. The soil was smooth and rocky (10 YR 2/1 Black). 1 sherd, 2 chert fragments.
- Level 3 (20-30 cm) – This level consisted of gravel mixed with brown earth and roots until reaching the first surviving floor, which was made of limestone cobbles. The soil was rocky and smooth (10 YR 3/2 Very Dark Grayish Brown). 1 sherd.
- Level 4 (30-40 cm) – This level consisted of gravel fill mixed with brown earth, below the first floor (10 YR 8/1 White) until arriving at the second floor. The soil was hard and compact (10 YR 3/1 Very Dark Gray). 1 sherd.
- Level 5 (40-50 cm) – This level consisted of gravel fill beneath the second limestone cobble floor (10 YR 8/1 White) until reaching bedrock. The soil was hard and compact (10 YR 5/1 Gray). There was no material.
- Level 6 (50 cm) – This level was bedrock (10 YR 8/1 White). There was no material.

Summary of S-17-338

Although there was less settlement then expected, this block had well preserved architecture and a lot of nearby settlement outside of the block. The quarries in the block were undoubtedly used for local construction of nearby settlement. The *chultun* suggests a residential settlement. Most of the ceramics were weathered and identified to the Late Classic based on paste. However, there were a couple of Tinaja Group diagnostic sherds from the Late Classic as well as Late Preclassic Paso Caballo Waxy wares.

PS-270-345

This block (Figure A.80) is in the periphery northeast of Xultun and southeast of block PS-264-335. The center of the block is at 245875 E, 1936625 N. The mounds in this block were large and heavily looted. The main road to San Bartolo passes through this block. There are two large and four small limestone quarries that would have provided the building material for the structures in this block. The courtyard group south-southwest of the center has ten looter trenches and is where are investigation was focused. Julio Cotom cleaned the ten looter trenches (SB11A-2 a SB11A-11) and excavated a unit on the plaza side of the group (SB11B-28). Unfortunately there are no profile drawings of the looter trenches.

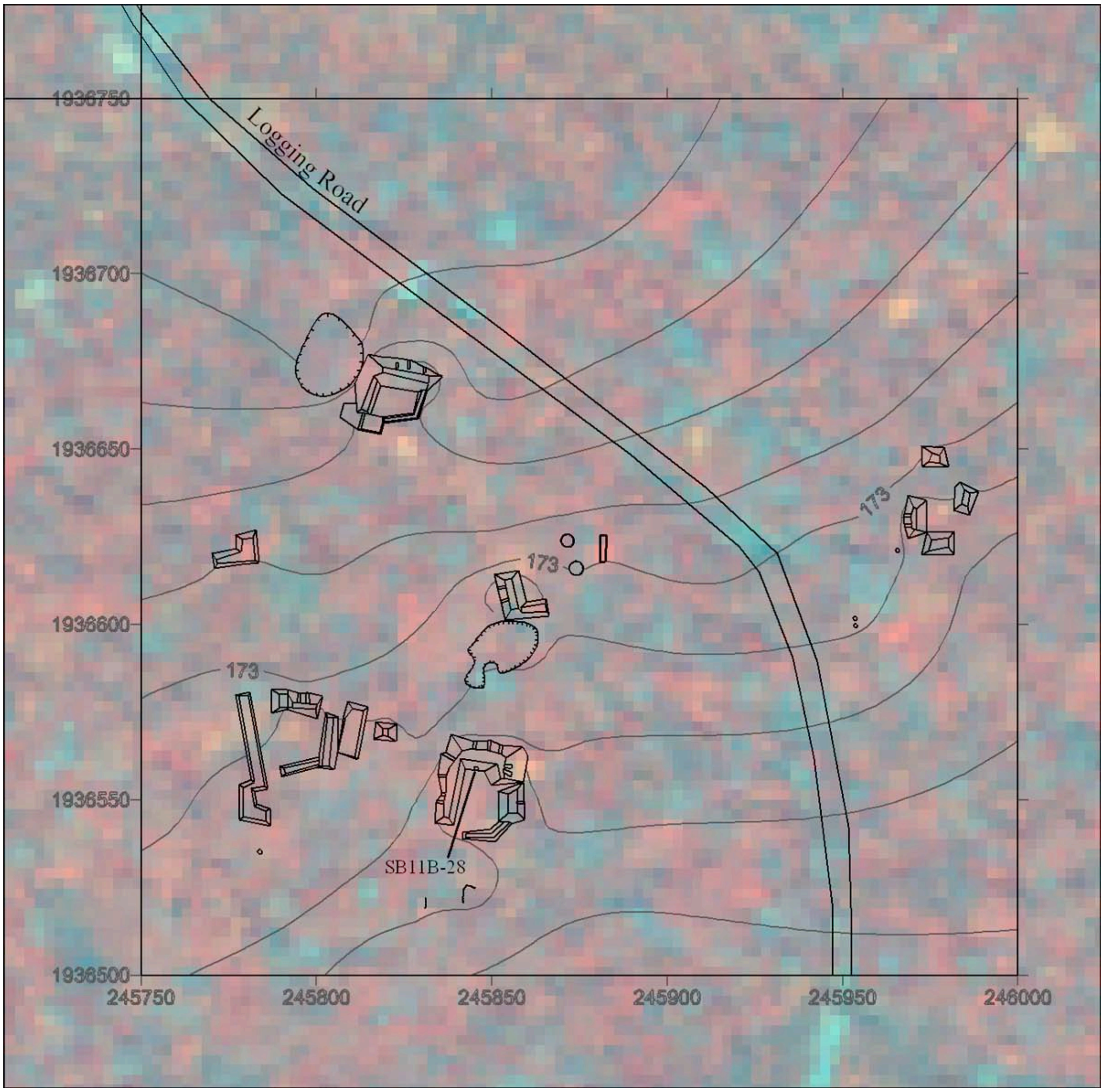

Figure A.80. PS-270-345.

<u>SB11A-2</u>

- Cleaning of looter trench – There were three floors in the trench. Human remains found discarded by the side of the trench were reburied. 12 sherds, 2 chert fragments.

<u>SB11A-3</u>

- Cleaning of looter trench – There was no material.

<u>SB11A-4</u>

- Cleaning of looter trench – There were two floors in the trench. 19 sherds.

<u>SB11A-5</u>

- Cleaning of looter trench – There was no material.

<u>SB11A-6</u>

- Cleaning of looter trench – There were three floors in the trench. 15 sherds.

<u>SB11A-7</u>

- Cleaning of looter trench – There were three floors in the trench. 4 sherds.

<u>SB11A-8</u>

- Cleaning of looter trench – There were three floors in the trench. 9 sherds.

<u>SB11A-9</u>

- Cleaning of looter trench – There were two floors in the trench. 4 sherds.

<u>SB11A-10</u>

- Cleaning of looter trench – There were two floors in the trench. 4 sherds.

<u>SB11A-11</u>

- Cleaning of looter trench – There were no floors. Human remains were reburied. 1 vessel, 27 sherds.

<u>SB11B-28</u>

This unit was on the southern edge of the northern structure in the courtyard group. The goal of the unit was to date the settlement. The unit was excavated in 18 levels until bedrock was reached at 211 cm (Figure A.81).

- Level 1 (0-20 cm) – This lot measured 1 x 0.40 m. Humus level with a lot of organic material. The soil was smooth (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (20-30 cm) – This lot measured 1 x 0.70 m. This level consisted of light brown earth mixed with roots and stones. The soil was smooth (10 YR 6/1 Gray). There was no material.
- Level 3 (30-40 cm) – This lot measured 1 x 1 m. This level consisted of light brown earth mixed with roots and stones. The soil was smooth (10 YR 6/3 Pale Brown). 36 sherds.
- Level 4 (40-50 cm) – This level consisted of light brown earth mixed with roots and stones. The soil was smooth (10 YR 6/3 Pale Brown). There was no material.
- Level 5 (50-60 cm) – This level consisted of light brown earth mixed with small stones. The soil was smooth (10 YR 6/2 Light Brownish Gray). There was no material.
- Level 6 (60-70 cm) - This level consisted of light brown earth mixed with small stones. The soil was smooth (10 YR 6/3 Pale Brown). 2 sherds.
- Level 7 (70-80 cm) – This level consisted of light brown earth mixed with small stones and possible rock fall. The soil was smooth (10 YR 6/3 Pale Brown). 1 sherd.
- Level 8 (80-90 cm) – This level consisted of very light brown earth with small stones and some roots. The soil was smooth (10 YR 6/2 Light Brownish Gray). 21 sherds.
- Level 9 (90-99 cm) – This level consisted of light brown earth until reaching the first preserved floor. The soil was smooth (10 YR 7/2 Light Gray). 106 sherds, 1 chert fragment, 1 obsidian, 1 shell.
- Level 10 (99-110 cm) – The first floor (10 YR 8/1 White) has a thickness of 3 cm. Beneath the floor was gravel fill mixed with gray earth. The soil was smooth and compact (10 YR 7/1 Light Gray). 25 sherds.
- Level 11 (110-118 cm) – This level consisted of gravel fill mixed with gray earth. The soil was compact and smooth (10 YR 7/1 Light Gray). 15 sherds.
- Level 12 (118-150 cm) – This strata consisted of large boulders mixed with gray earth. The soil was smooth (10 YR 7/1 Light Gray). 33 sherds, 3 chert fragments.
- Level 13 (150-160 cm) – This level consisted of rocky fill mixed with brownish gray earth. The soil was smooth (10 YR 6/2 Light Brownish Gray). 26 sherds, 1 shell.
- Level 14 (160-170 cm) – This level consisted of rocky fill mixed with brownish gray earth. The soil was smooth (10 YR 6/2 Light Brownish Gray). 5 sherds.
- Level 15 (170-180 cm) – This level consisted of brown earth mixed with some stones. The soil was smooth (10 YR 5/2 Grayish Brown). 3 sherds, 1 chert fragment.
- Level 16 (180-190 cm) – This level consisted of brown earth with very few stones. There were some limestone blocks, possibly from an earlier wall. The soil was smooth (10 YR 5/2 Grayish Brown). 5 sherds.

- Level 17 (190-211 cm) – This level consisted of dark brown earth before arriving at bedrock. The soil was smooth (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 18 (211 cm) – This level was bedrock. There was no material.

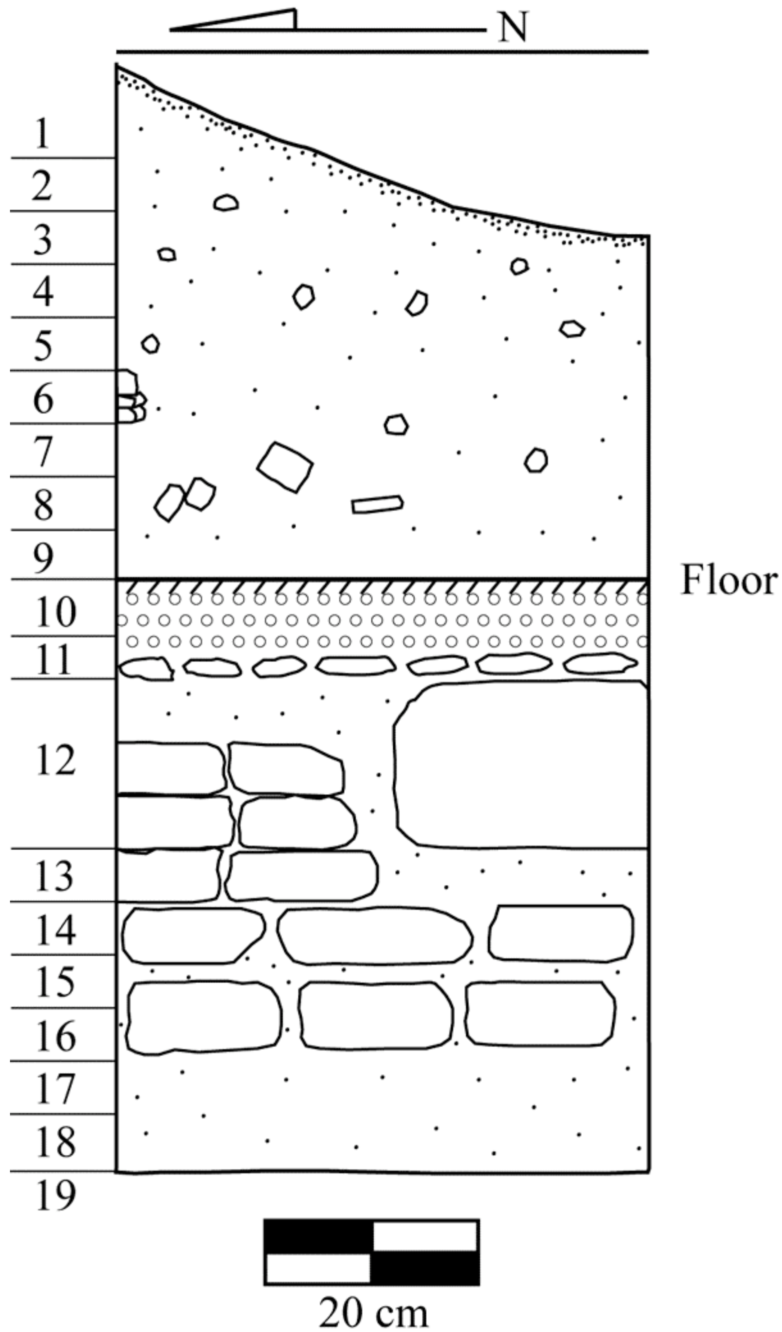

Figure A.81. SB11B-28.

Summary of PS-270-345

This block was definitely a part of the Xultun periphery. This substantial settlement is 2 km removed from the site center, giving some indication of the immense size of the Xultun capital. The presence of burials, polychrome sherds and obsidian indicate either a higher social class or alternatively, general wealth throughout Xultun. The former of these hypotheses is the more likely. There were at least three construction phases in the structures of the courtyard group and at least two construction phases in the plaza of the same group. All of the construction appears to have been Late Classic based on the presence of Tinaja and Encanto Group sherds in the deepest levels. However, abundant Late Preclassic Paso Caballo Waxy wares were recovered as well as a single Early Classic Actuncan/Dos Arroyos polychrome sherd.

PS-273-348

This block (Figure A.82) is in the northeast Xultun periphery. The center of the block is at 245125 E, 1936625 N. There are 13 mounds and two platforms in the block, the majority in the northern half. There area two limestone quarries as well. Two Arbol Verde logging roads joined in the square, exiting to the north. Two mounds showed evidence of looting. I excavated one unit in front (SB11B-9) and one unit behind (SB11B-12) the largest mound, northwest of center.

SB11B-9

This unit was in the plaza side of the largest mound in the block. The goal of the unit was to date the settlement. Three levels were excavated until bedrock was reached at 30 cm (Figure A.83).

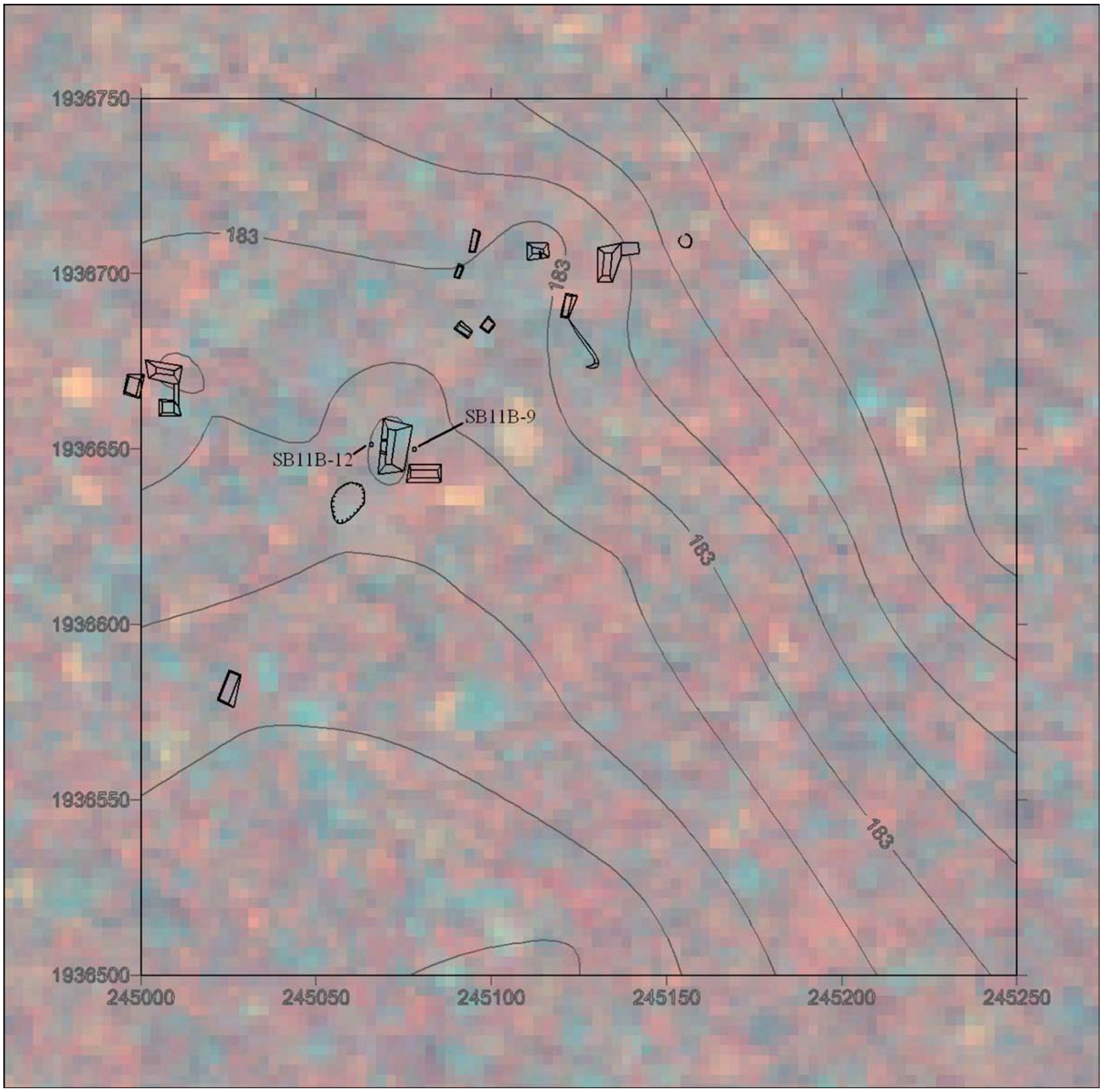

Figure A.82. PS-273-348.

- Level 1 (0-10 cm) – Humus layer with a lot of organic material and wall fall. The soil was loose (10 YR 2/1 Black). 3 sherds, 1 obsidian.
- Level 2 (10-20 cm) – This level consisted of wall fall and flat stones places in a circle around a natural rise in bedrock. One ground stone mano was found on the bedrock rise. The soil was hard and compact (10 YR 4/1 Dark Gray). 46 sherds, 3 chert fragments, 1 ground stone.
- Level 3 (20-30 cm) – This level uncovered bedrock in all portions of the unit. The soil was hard and compact (10 YR 4/1 Dark Gray). 61 sherds.

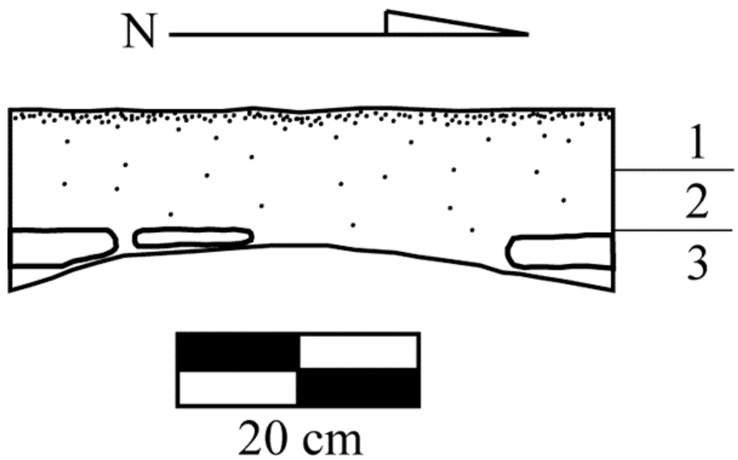

Figure A.83. SB11B-9.

SB11B-12

This unit was placed on the other side of the same mound. The goal was to find more datable ceramic material. Four levels were excavated until bedrock was reached at 42 cm (Figure A.84).

- Level 1 (0-10 cm) – Humus level with a lot of organic material. The soil was hard and compact (10 YR 2/1 Black). 1 sherd.
- Level 2 (10-20 cm) – This level consisted of *bajo* clay. The soil was compact with high clay content (7.5 YR 3/1 Very Dark Gray). There was no material.
- Level 3 (20-30 cm) – This level consisted of *bajo* clay. The soil had a high clay content (7.5 YR 3/1 Very Dark Gray). 3 sherds.
- Level 4 (30-42 cm) – This level consisted of *bajo* clay with a possible eroded floor beneath before reaching bedrock. The soil had a high clay content (7.5 YR 3/3 Dark Brown). There was no material.

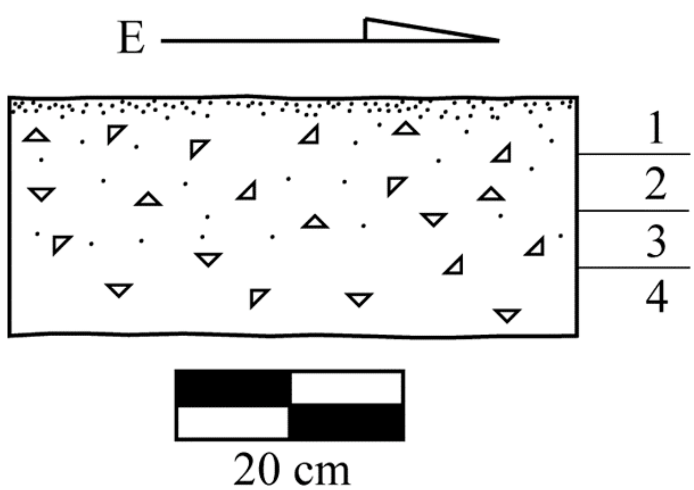

Figure A.84. SB11B-12.

Summary of PS-273-348

This block is part of the Xultun periphery. The mounds were built directly on bedrock, right at the palm *bajo* transition. The presence of the mano suggests a residential function for the associated structure. The most common diagnostic types recovered were Late Preclassic Paso Caballo Waxy wares and Late Classic Tinaja Group ceramics. There was a single Terminal Classic Pantano Impressed sherd as well.

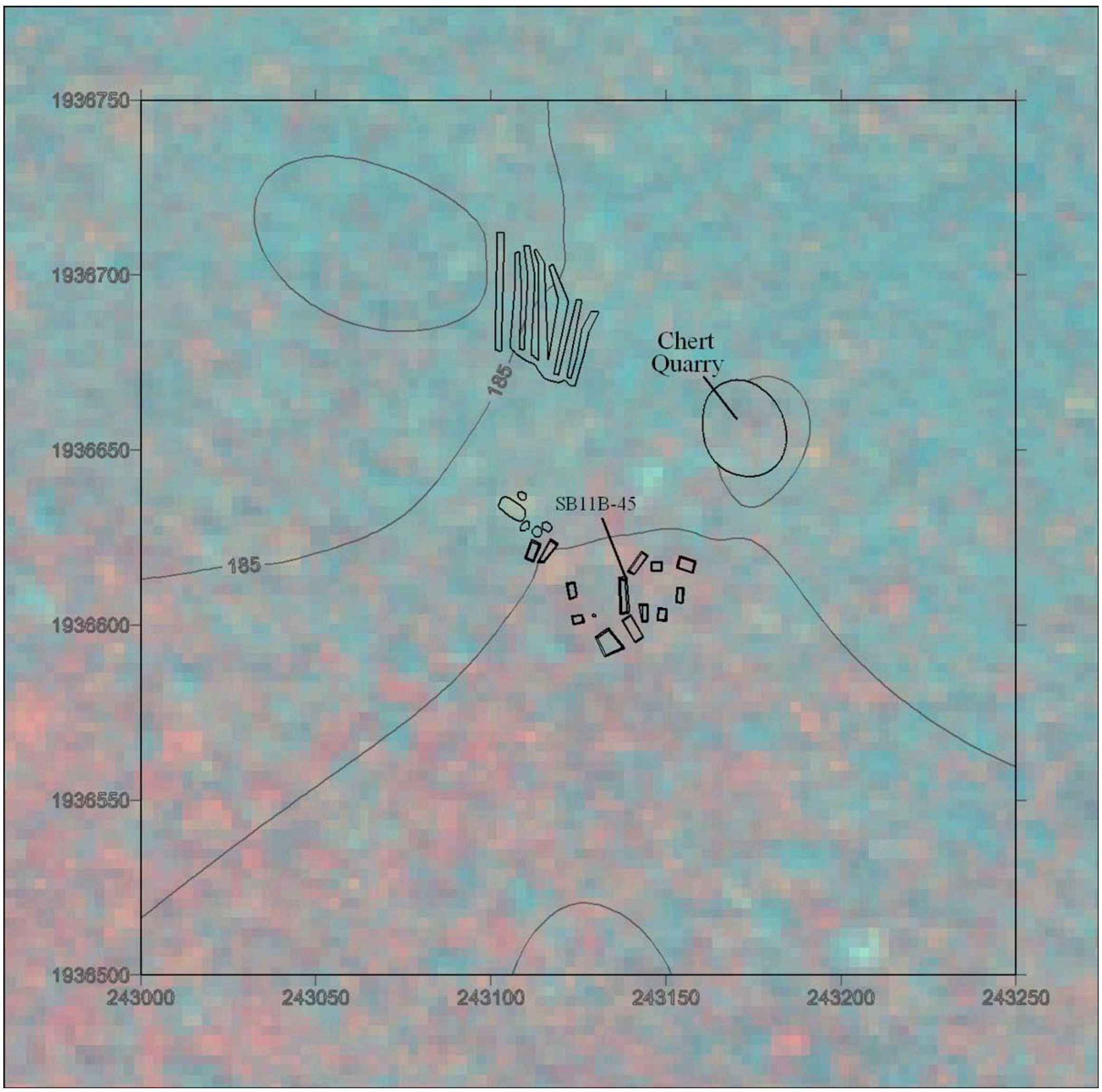

Figure A.85. S-21-356.

S-21-356

This block (Figure A.85) is located in the northern Xultun periphery. The center of the block is at 243125 E, 1936625 N. This block was misclassified during the initial survey design and should have been classified as Partial Settlement (PS). The misclassification occurred because the scrub to palm *bajo* transition in this block has a texture similar to the settlement signature, although closer examination revealed them to be quite distinct. There are 13 mounds, seven rock piles and a *chultun* in the block. In addition there is a large chert quarry near the center. One of the rock piles is actually a large complex of linear features found in the scrub *bajo* that undoubtedly pertained to some form of ancient agriculture. I excavated a unit on the edge of a mound in the palm *bajo* (SB11B-45).

<u>SB11B-45</u>

This unit was placed on the edge of a mound in the palm *bajo*. The goal of the unit was to recover datable material. The depths are displayed as averages below a level line. Three levels were excavated until bedrock was reached at 63 cm (Figure A.86).

- Level 1 (7-23 cm) – Humus level with a lot of organic material. The soil was humid and loose (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (23-46 cm) – This level consisted of chert fill mixed with dark brown earth. The soil was loose (10 YR 2/2 Very Dark Brown). 6 sherds, 7 chert fragments.
- Level 3 (46-63 cm) – This level consisted of *sascab* laying on top of bedrock. The soil was smooth (10 YR 7/1 Light Gray). 2 chert fragments.

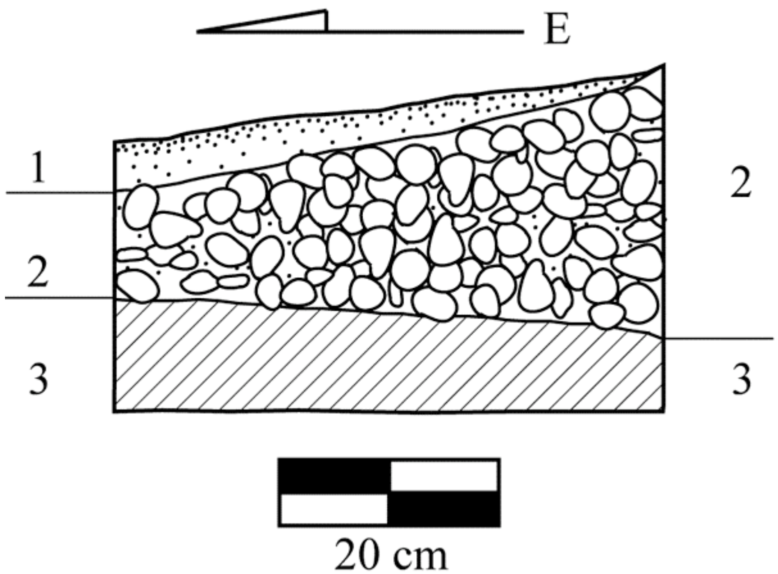

Figure A.86. SB11B-45.

<u>Summary of S-21-356</u>

It is unclear whether the structure excavated supported a perishable superstructure or served some other function. Unlike other excavations, there was no evidence of burnt mud or clay in the excavations. The most likely role of this settlement was agricultural, supplemented by raw material harvesting for stone tool production. The complex of linear agricultural features is right on the *bajo* boundary. All of the ceramic material recovered was heavily weathered but is believed to date to the Late Classic based on paste.

S-32-370

This block (Figure A.87) is located on the northern delimitation transect of Xultun. The center of the block is at 244375 E, 1936375 N. This block did not have the amount of settlement that was expected, although there were some large structures just north of the block. The vegetation was mostly palm *bajo*, with small patches of both *montaña* and *tintal bajo*. There was a medium sized mound near the western boundary of the block. There was a depression immediately to the west of this structure that was thought to indicate a *chultun*. I excavated a unit in this depression (SB11B-2).

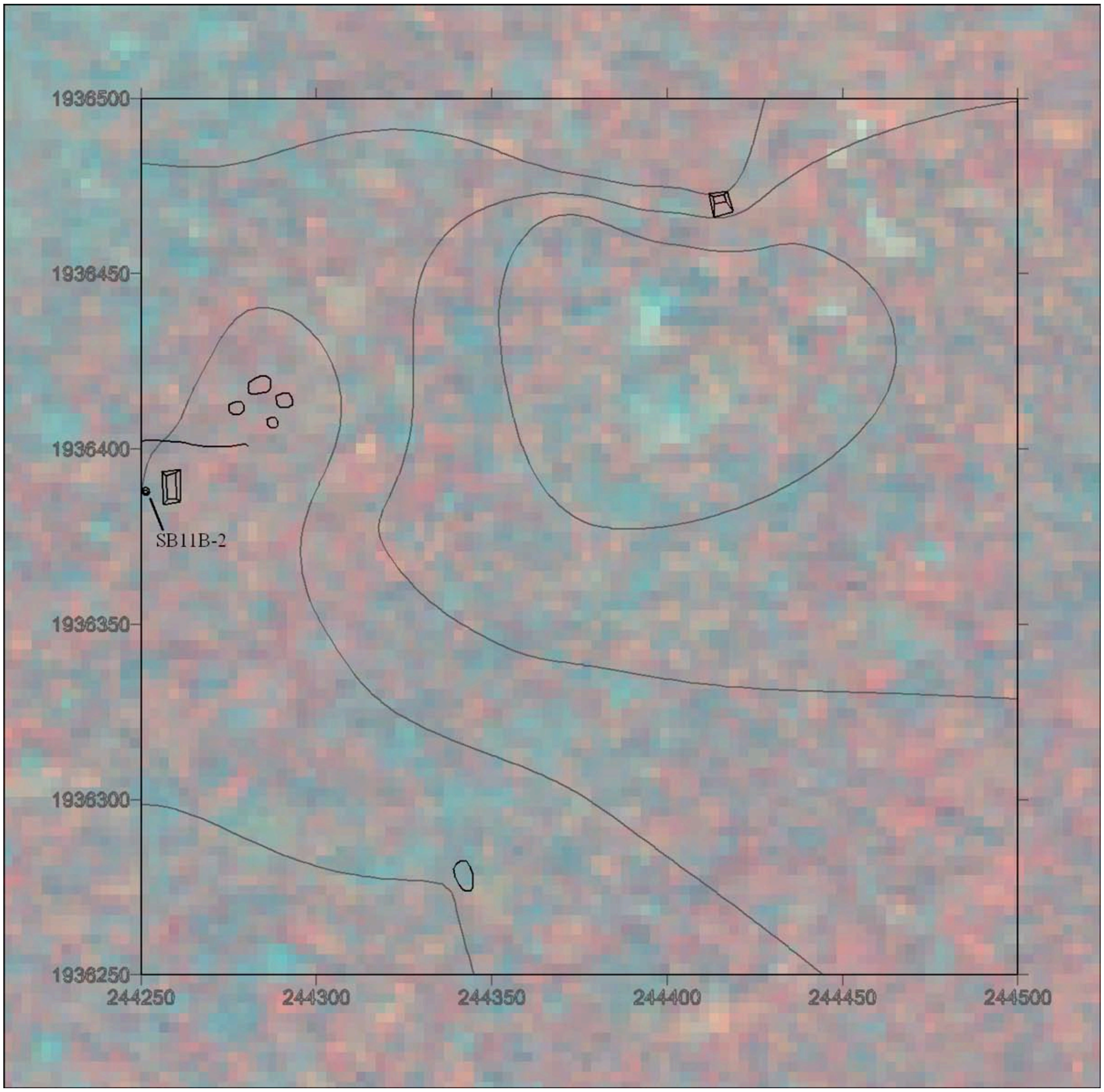

Figure A.87. S-32-370.

SB11B-2

This unit was located in a depression west of the largest mound in the block. The goal of the unit was to look for a covered *chultun* and to try to recover datable material. The unit was excavated in 13 levels until bedrock was encountered at 130 cm (Figure A.88).

- Level 1 (0-10 cm) – Humus level with lots of organic material and small stones. The soil was loose (10 YR 2/1 Black). 3 sherds.
- Level 2 (10-20 cm) – This level consisted of gray earth with many snail shells. There was a possible eroded floor covering what appeared to be a trash pit for shell processing. The soil was hard and compact (10 YR 5/1 Gray). 6 sherds, 64 chert fragments, 151 shells.
- Level 3 (20-30 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 2 sherds, 19 chert fragments, 282 shells.
- Level 4 (30-40 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 5 sherds, 38 chert fragments, 323 shells.
- Level 5 (40-50 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 7 sherds, 87 chert fragments, 301 shells.
- Level 6 (50-60 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 6 sherds, 107 chert fragments, 506 shells.
- Level 7 (60-70 cm) - This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 39 chert fragments, 480 shells.
- Level 8 (70-80 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 5 sherds, 34 chert fragments, 1 obsidian, 390 shells.
- Level 9 (80-90 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 10 sherds, 18 chert fragments, 377 shells.
- Level 10 (90-100 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 11 sherds, 38 chert fragments, 349 shells.
- Level 11 (100-110 cm) – This level consisted of gray earth with many snail shells. There was a partial vessel in the northeast corner. The soil was hard and compact (10 YR 5/1 Gray). 11 sherds, 8 chert fragments, 351 shells.
- Level 12 (110-120 cm) – This level consisted of gray earth with many snail shells. The soil was hard and compact (10 YR 5/1 Gray). 10 sherds, 5 chert fragments, 162 shells.
- Level 13 (120-130 cm) – The snails stopped and bedrock was encounteres. There was a cut in the bedrock that run east out of the unit. In the northwest corner there were blocks of cut limestone that may have been part of an early structure built on top of the bedrock. The soil was hard and compact (10 YR 3/1 Very Dark Gray). 5 sherds, 4 chert fragments.

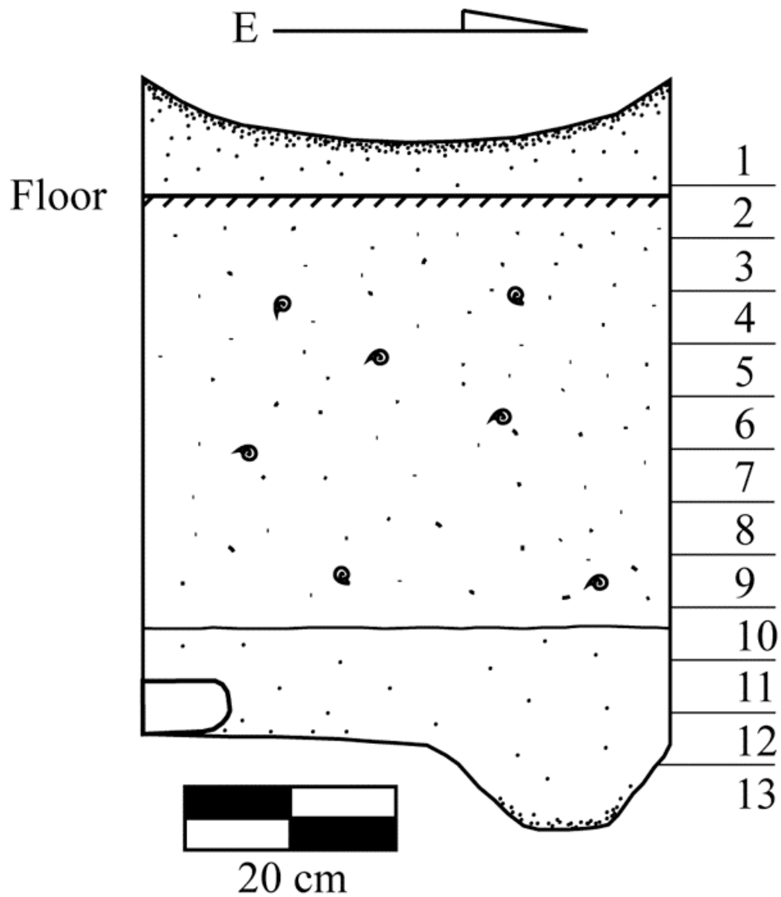

Figure A.88. SB11B-2.

Summary of S-32-370

The depression was not a *chultun* but rather a snail midden in which the soil seems to have settled. The ceramic sequence suggests that some of this material may have eroded down from higher up leading to some inverted levels. The quantity of snails found could not have been natural and the way that many of them were broken suggests some sort of processing. This block represents a peripheral Xultun settlement that was utilizing the resources of the nearby *bajos*. Both Late Preclassic and Late Classic sherds were found throughout the deposit.

S-40-388

This block (Figure A.89) is within the Xultun delimitation, 500 m south of PS-273-348. The center of the block is at 245125 E, 1936125 N. This block has settlement all over except for in the northeast corner which was predominately palm *bajo*. To the southwest there is an "L" shaped structure that forms a plaza with another small mound. The southern portion of the block has many terraces and linear features associated with agricultural production. There are numerous rock piles in the sections of *bajo* as well as in the *montaña*. To the northwest there are three large limestone quarries that provided local building material for the two large courtyard groups to the northwest, one of which is inside the block. Only the eastern temple structure of the other group is inside of the block. I excavated one unit behind the "L" shaped mound (SB11B-6), cleaned one looter trench in the courtyard group to the northwest (SB11A-1), and excavated a unit in the plaza of the same group. Unfortunately there is no profile of the looter trench due to its instability.

<u>SB11A-1</u>

- Cleaning of looter trench – 105 sherds including polychromes and some hieroglyphs.

<u>SB11B-6</u>

This unit was on the northern edge of the "L" shaped structure west of the center. The goal of the unit was to date the settlement. Four levels were excavated and the unit was abandoned at 40 cm after three sterile levels. No Munsell soil colors were recorded for this excavation (Figure A.90).

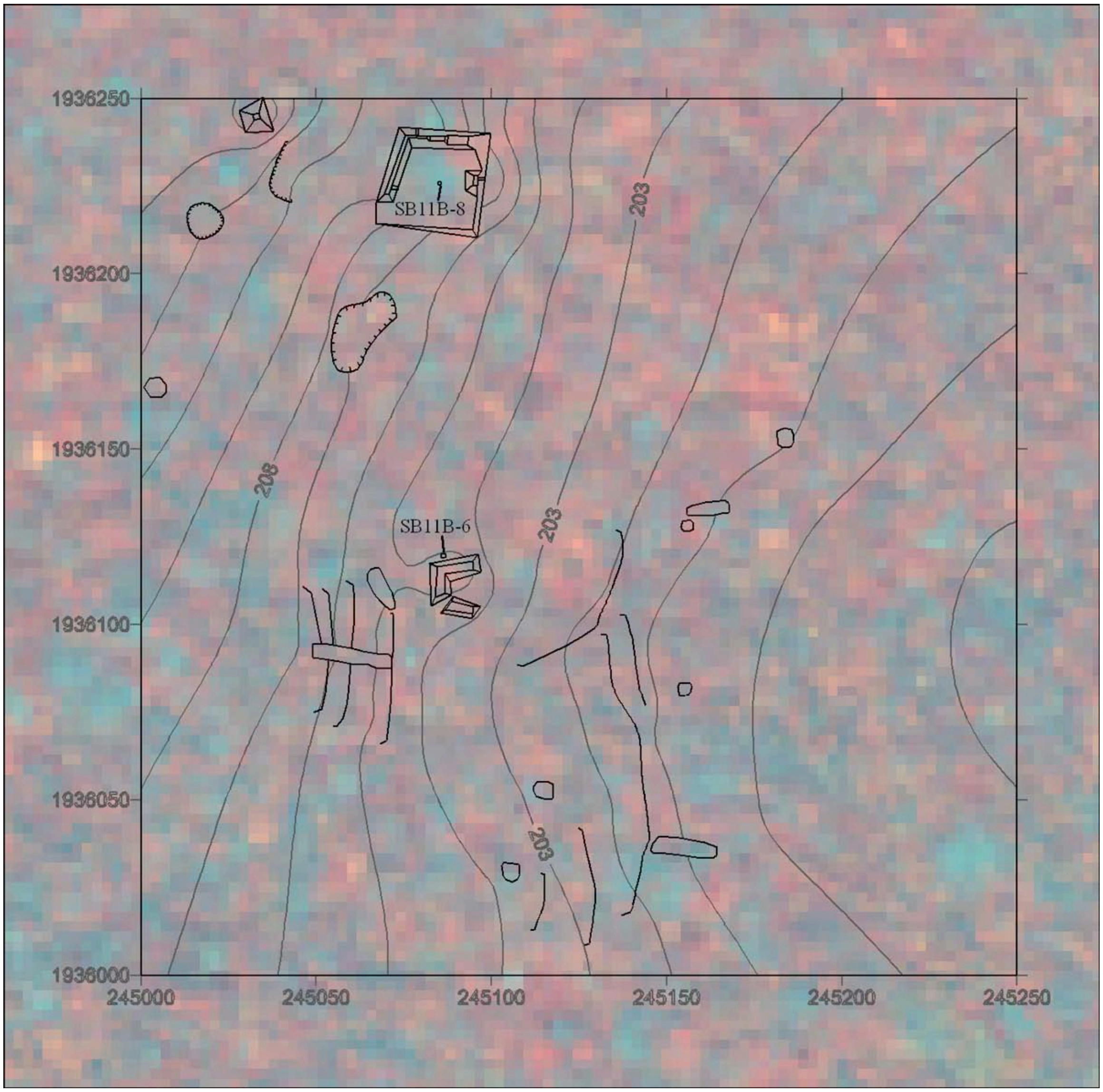

Figure A.89. S-40-388.

- Level 1 (0-10 cm) – Humus level with a lot of organic material. The soil was humid. 2 sherds, 16 chert fragments.
- Level 2 (10-20 cm) – The humus level continued into this level. The soil was humid. 16 chert fragments.
- Level 3 (20-30 cm) – This level consisted of brown soil. There was no material.
- Level 4 (30-40 cm) – This level consisted of brown soil. The unit was abandoned. There was no material.

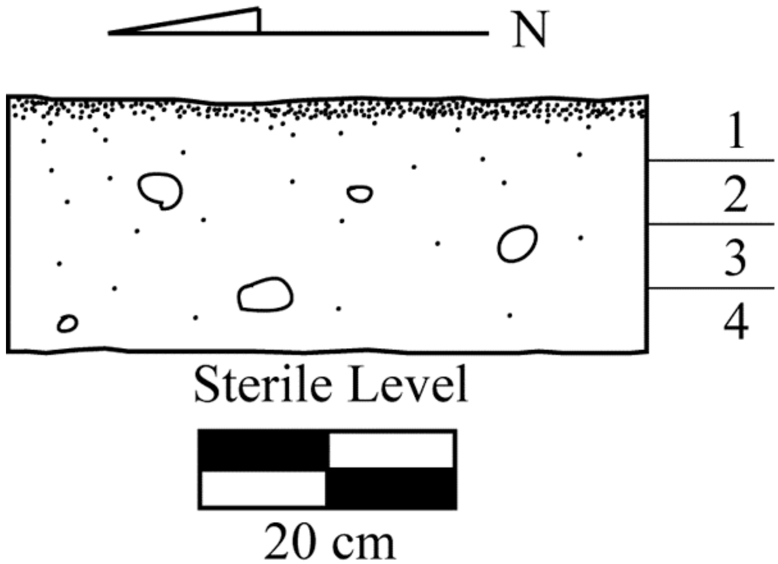

Figure A.90. SB11B-6.

SB11B-8

This unit was located in the center of the plaza of the courtyard group located to the northwest. The goal of the unit was to recover datable material as well as understand the construction sequence of the plaza. The unit was excavated in 11 levels until bedrock was reached at 100 cm (Figure A.91).

- Level 1 (0-10 cm) – Humus level with lots of organic material. The soil was loose (10 YR 2/1 Black). 52 sherds, 297 chert fragments.
- Level 2 (10-20 cm) – The humus level continued with organic material and small rocks. The soil was loose (10 YR 2/1 Black). 44 sherds, 428 chert fragments.
- Level 3 (20-30 cm) – This level consisted of a lot of rocks and lithic material that appeared to be collapse from nearby structures. The soil was hard and compact (10 YR 4/1 Dark Gray). 56 sherds, 318 chert fragments.
- Level 4 (30-40 cm) – This level consisted of structure collapse material. The soil was hard and compact (10 YR 4/1 Dark Gray). 46 sherds, 97 chert fragments.
- Level 5 (40-50 cm) – There was an eroded floor in the southwest corner at a depth of 40 cm with fill below. The soil was smooth (10 YR 6/1 Gray). 43 sherds, 30 chert fragments.
- Level 6 (50-60 cm) – This level consisted of rocky fill beneath the first floor. The soil was smooth (10 YR 6/1 Gray). 42 sherds, 45 chert fragments.
- Level 7 (60-70 cm) – This level consisted of rocky fill beneath the first floor. The soil was smooth (10 YR 6/1 Gray). 65 sherds, 95 chert fragments, 1 figurine.
- Level 8 (70-80 cm) – This level consisted of rocky fill beneath the first floor. The soil was smooth (10 YR 6/1 Gray). 60 sherds, 34 chert fragments.

- Level 9 (80-90 cm) – This level consisted of rocky fill beneath the first floor. The soil was smooth (10 YR 6/1 Gray). 15 sherds, 20 chert fragments.
- Level 10 (90-91 cm) – This level consisted of a very thin layer of black earth placed on top of the second floor. The soil was fine and smooth (10 YR 4/1 Dark Gray). There was no material.
- Level 11 (91-100) – The second floor was placed directly on top of the bedrock in order to level the uneven surface. The soil was fine and smooth (10 YR 4/1 Dark Gray). 2 sherds.

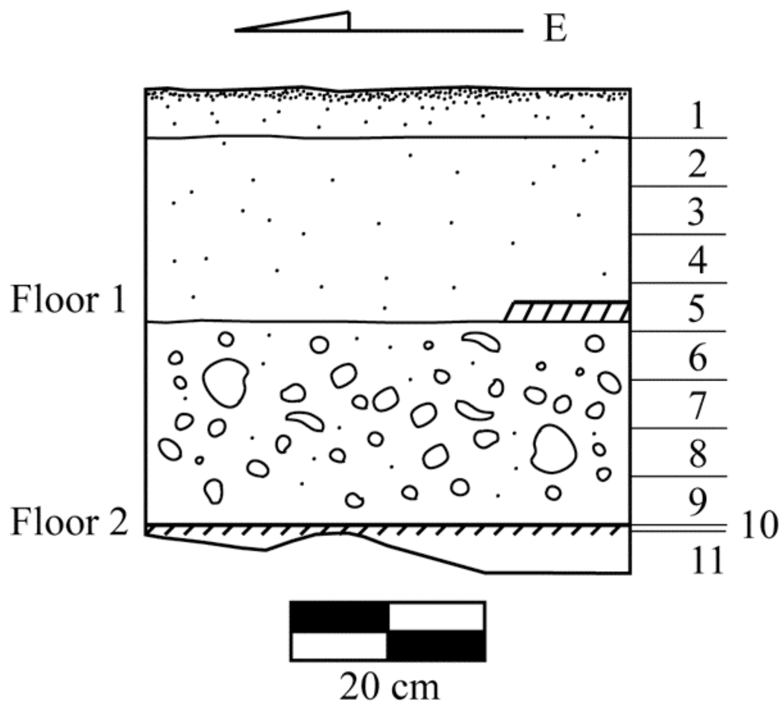

Figure A.91. SB11B-8.

Summary of S-40-388

This block is one of the closest to Xultun center (less than 2 km) in the entire survey sample. The architecture is impressive and is further evidence of the size of Xultun at its Late Classic population peak. The plaza sequence of the large courtyard group only had two construction phases, although the associated structures may have been more complex. The deepest floor, placed directly on bedrock may have been Late Preclassic based on the two sherds found beneath it. Ceramics were mixed in the rest of the levels with Paso Caballo Waxy wares and Peten Gloss wares being the most common

Late Preclassic and Late Classic diagnostic sherds respectively. Three sherds dated to the Early Classic from the Triunfo and Quintal Groups of domestic ceramics.

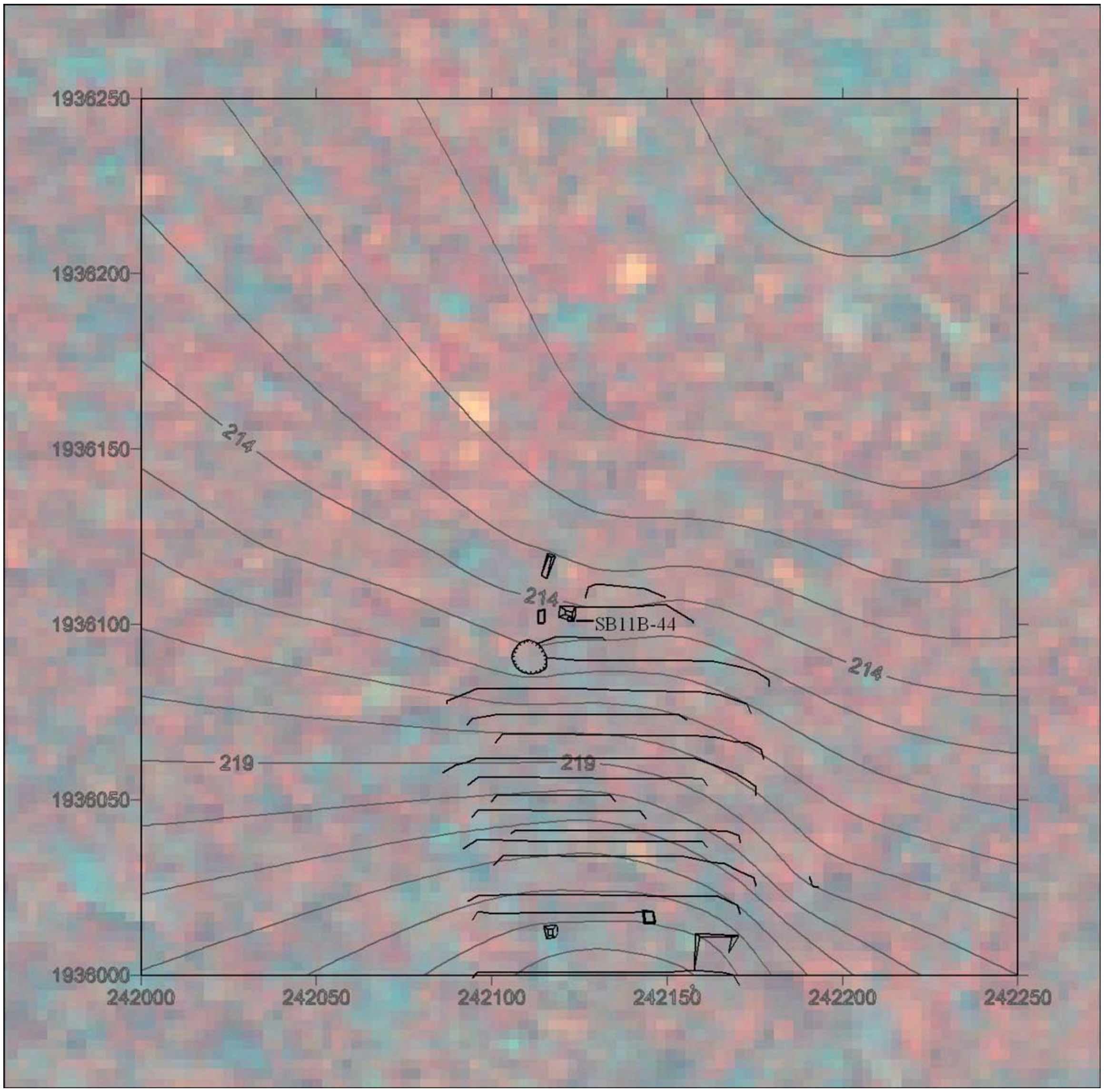

Figure A.92. S-46-400.

S-46-400

This block (Figure A.92) is in the very southeast corner of the survey universe, and northwest of Xultun center. The center of the block is at 242125 E, 1936125 N. The northern delimitation transect of Xultun crosses the block. The northern portion of the block consists of *escobal bajo* with a steep rise (15 m) to the south into the *montaña*.

This incline has 17 small terraces running along the natural contour of the slope. There are a couple of small structures near the base of the slope as well as a large limestone quarry. On top of the slope there are a few more mounds and a platform. To the east there is another small quarry. Trevor Emond and Keith Ferguson in a small structure located at the end of one of the terraces (SB11B-44).

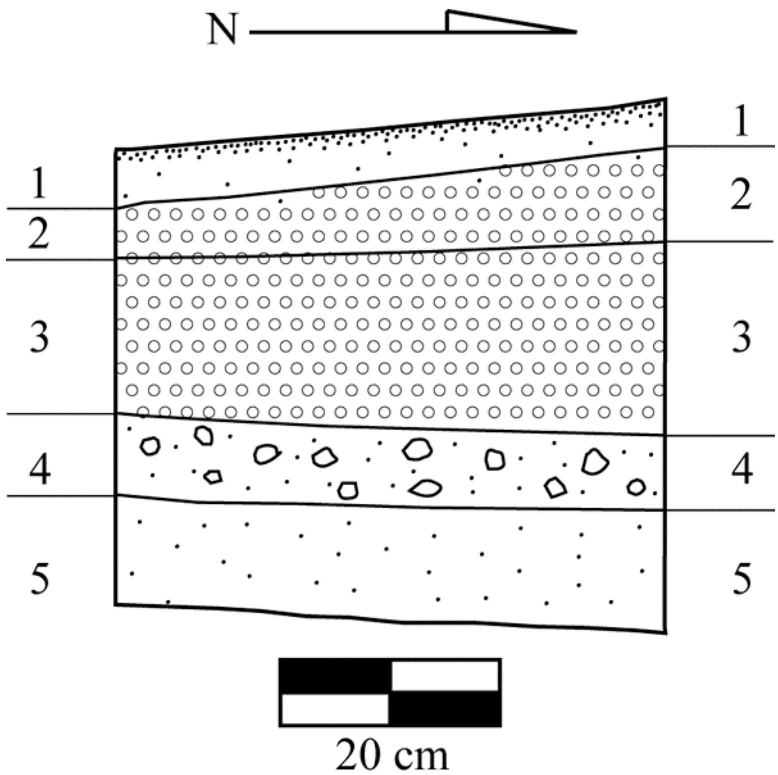

Figure A.93. SB11B-44.

SB11B-44

The goal of this unit was to date the settlement found near the terraces. The measurements are presented as averages below a level line. The unit was excavated in five level until bedrock was reached at 101 cm (Figure A.93).

- Level 1 (16-23 cm) – Humus level with a lot of organic material. The soil was loose (10 YR 3/2 Very Dark Grayish Brown). There was no material.
- Level 2 (23-34 cm) – This level consisted of gravel fill with some large rocks. The soil was hard and compact (10 YR 2/2 Very Dark Brown). 3 sherds, 2 chert fragments, 1 obsidian, 1 piece of burnt mud or clay.

- Level 3 (34-65 cm) – This level consisted of gravel fill. The soil was hard and compact (10 YR 2/2 Very Dark Brown). 4 sherds, 2 chert fragments, 4 pieces of burnt mud or clay.
- Level 4 (65-80 cm) – This level consisted of brown earth mixed with small stones. The soil was smooth (10 YR 5/2 Grayish Brown). There was no material.
- Level 5 (80-101 cm) – This level consisted of gray earth fill mixed with pulverized limestone. The soil was smooth (10 YR 5/1 Gray). There was no material.

Summary of S-46-400

This block was dedicated to agricultural production to support a large Xultun population. The large quarry provided the necessary material to construct the terraces on this steep slope. Due to the size of Xultun, it is probable that all major slopes were cultivated in one way or another in order to have enough food to support everyone. One sherd was identified as a Late Preclassic Paso Caballo Waxy ware. The rest of the material was believed to be Late Classic based on paste.

Appendix B: Intersite Ceramic Analysis

Introduction

This appendix presents the raw ceramic data from excavations in the San Bartolo-Xultun intersite area. The material comprises Operation SB11B of the San Bartolo Project, under the direction of William Saturno. Ceramic analysis was conducted in the project laboratory in Antigua, Guatemala from 2005 to 2007 under the supervision of ceramicist Patricia Rivera Castillo. The analysis was done by Rivera with assistance from Licda. Damaris Menéndez. Analysis was done using a type-variety methodology. I assigned the types to phases based on analogy with the ceramics of Tikal (Culbert 1993), but in accordance with the dates used in this dissertation (Table B.1). There were very few units with clear, sealed stratigraphic contexts. The general interpretation of the ceramics as they pertain to each survey block are presented in Appendix A under the block summaries. The overall interpretation of the ceramics in terms of intersite settlement is presented in Chapter Five, including maps by period (Figures 5.17-5.19). In the following analysis (Table B.2), all sherds marked as 'UND' (or unidentified) are almost certainly Late Classic based on analysis of paste, but were left unassigned to phase because no chemical tests were done to prove this assumption. Table B.3 presents the breakdown by time period and unit.

Table B.1. Chronology and ceramic phases used for the San Bartolo-Xultun intersite area analysis.

Time Period	Dates	Ceramic Phases
Middle Preclassic	1000-400 B.C.	Eb/Tzec
Late Preclassic	400 B.C.-A.D 300	Chuen/Cauac/Cimi
Early Classic	A.D. 300-600	Manik
Late Classic	A.D. 600-850	Ik/Imix
Terminal Classic	A.D. 850-1100	Eznab

Table B.2. Ceramic analysis of the San Bartolo-Xultun intersite material. Analysis performed by Patricia Rivera and Damaris Menéndez. Phases modified by Thomas Garrison after Culbert (1993).

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
1	1	UND	2	UND	UND	Saved	base			7.9	
1	2	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	rim/body/special	neck		15.6	
1	2	UND	1	UND	UND	Saved	rim			9.6	
1	2	UND	4	UND	UND	Saved	body			13.1	
1	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			3.5	
1	3	Ik/Imix	1	UND	Late Classic	Fluted	rim			23.3	
1	3	UND	1	UND	UND	Saved	rim/special body/app.		handle	16.7	
1	3	UND	1	UND	UND	Saved	rim/body/special	collar		27.7	
1	3	UND	3	UND	UND	Saved	rim			24.3	
1	3	UND	1	UND	UND	Saved	rim			9	
1	3	UND	10	UND	UND	Discarded	body			38.2	
1	3	UND	5	UND	UND	Saved	body			29.9	
1	3	UND	13	UND	UND	Discarded	base			42.5	
1	3	UND	3	UND	UND	Saved	base			14.1	
1	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			12	
1	4	UND	3	UND	UND	Saved	body			9.4	
1	4	UND	4	UND	UND	Saved	base			22.5	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
2	1	Chuen/Cauac/Cimi	3	UND	Late Preclassic	Simple	base			17.9	
2	2	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	base			15.6	
2	2	Chuen/Cauac/Cimi	4	UND	Late Preclassic	Simple	base			14.9	
2	3	UND	2	UND	UND	Saved	base			3.4	
2	4	UND	5	UND	UND	Saved	base			37.3	
2	5	UND	1	UND	UND	Saved	base			38.3	Killed
2	5	UND	1	UND	UND	Saved	rim			19.5	
2	5	UND	5	UND	UND	Saved	base			17.1	
2	6	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	base			10.5	
2	6	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	collar		11.1	
2	6	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	rim/body/special	neck		4.2	
2	6	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	neck		19.8	
2	6	UND	1	UND	UND	Saved	body			0.5	
2	8	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			1.5	
2	8	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	neck		9.5	
2	8	Chuen/Cauac/Cimi	3	UND	Late Preclassic	Simple	base			7.7	
2	9	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			10.8	
2	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		19	
2	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			13	
2	9	Chuen/Cauac/Cimi	4	UND	Late Preclassic	Simple	base			23.6	
2	9	UND	3	UND	UND	Saved	body			23	
2	10	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			1.6	
2	10	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	neck		19.9	
2	10	Chuen/Cauac/Cimi	6	UND	Late Preclassic	Simple	body			26	
2	10	Chuen/Cauac/Cimi	3	UND	Late Preclassic	Simple	base			56.5	
2	11	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			6.4	
2	11	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim/body/special	collar		1297	
2	11	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim/body/special	collar		573.6	
2	11	UND	7	UND	UND	Saved	base			42.8	
2	12	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim/body/base			152.3	
2	12	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			33.9	
2	12	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	collar		32.5	

(Table B.2 continued)

2	12	Chuen/Cauac/Cimi	4	UND	Late Preclassic	Simple	base			26.7	
2	12	UND	1	UND	UND	Saved	rim/body/special	neck		33.2	
2	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Chaquiste Impressed	rim			33.8	
2	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Subin Red	rim			83.1	
2	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Subin/Chaquiste	body			27.3	
2	13	UND	2	UND	UND	Saved	base			9.8	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
3	1	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	base			4.9	
3	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			12.2	
3	2	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			4.5	
3	2	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	body			8.8	
3	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			11.3	
3	2	Chuen/Cauac/Cimi	7	UND	Late Preclassic	Simple	base			30.8	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
4	1	UND	1	UND	UND	Saved	special body	neck		4.6	
4	1	UND	1	UND	UND	Saved	rim			1.8	
4	1	UND	2	UND	UND	Saved	body			9.5	
4	1	UND	1	UND	UND	Saved	base			2.8	
4	2	UND	1	UND	UND	Saved	body/base			6.4	
4	2	UND	2	UND	UND	Saved	base			10	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
6	1	Ik/Imix/Eznab	1	Peten Gloss	Azote	Azote Orange	body			5	
6	1	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			10.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
7	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			2.3	
7	4	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	base			9.7	
7	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			3.5	
7	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			9.5	
7	4	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	rim			12.1	
7	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			6.5	
7	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			3.2	
7	4	Chuen/Cauac/Cimi	3	UND	Late Preclassic	Simple	body			9.6	
7	4	Chuen/Cauac/Cimi	9	UND	Late Preclassic	Simple	base			48.4	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
8	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim/body/special	angle		23.1	
8	1	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			10.1	
8	1	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			3.4	
8	1	UND	2	UND	UND	Saved	special body	collar		32.9	
8	1	UND	1	UND	UND	Saved	special body	collar		2.3	
8	1	UND	2	UND	UND	Saved	special body	neck		20	
8	1	UND	1	UND	UND	Saved	base/special/app.	normal flange		12.2	
8	1	UND	8	UND	UND	Saved	base			78.2	
8	1	UND	23	UND	UND	Discarded	body			61.1	
8	1	UND	3	UND	UND	Saved	rim			35.8	
8	1	UND	1	UND	UND	Saved	rim with body			67.9	
8	1	UND	8	UND	UND	Saved	UND			67.6	

(Table B.2 continued)

8	2	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	rim			10.9	
8	2	Ik/Imix	1	UND	Late Classic	Incised	rim			10	
8	2	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Impressed	special body	collar		8.8	
8	2	Ik/Imix	2	UND	UND	Saved	special body	neck		31.6	
8	2	Ik/Imix	8	UND	UND	Saved	base			159.3	
8	2	Ik/Imix	17	UND	UND	Discarded	body			50	
8	2	Ik/Imix	12	UND	UND	Saved	body			90.9	
8	2	Ik/Imix	1	UND	UND	Saved	rim			11.9	
8	3	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	body			13.6	
8	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Chaquiste Impressed	rim			19.9	
8	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			8.7	
8	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			33.3	
8	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		40.1	
8	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Impressed	body			3.8	
8	3	Ik/Imix	1	UND	UND	Saved	appendage		support	13.7	
8	3	Ik/Imix	2	UND	UND	Saved	special body	collar		52	
8	3	Ik/Imix	2	UND	UND	Saved	special body	neck		27.6	
8	3	Ik/Imix	1	UND	UND	Saved	special body	normal flange		6	
8	3	Ik/Imix	2	UND	UND	Saved	base			22.2	
8	3	Ik/Imix	11	UND	UND	Discarded	body			40.5	
8	3	Ik/Imix	23	UND	UND	Saved	body			215.3	
8	3	Ik/Imix	1	UND	UND	Saved	rim			29	
8	3	Ik/Imix	5	UND	UND	Saved	rim			25.7	
8	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			17.3	
8	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			3.7	
8	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			11.5	
8	4	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			36.8	Drill hole for repair
8	4	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			34.2	
8	4	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	rim			46.4	
8	4	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		4.7	
8	4	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			65.7	
8	4	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	body			38	
8	4	Ik/Imix	2	UND	UND	Saved	special body	collar		44	
8	4	Ik/Imix	2	UND	UND	Saved	body/base/special	normal flange		52.9	
8	4	Ik/Imix	6	UND	UND	Saved	base			71.7	
8	4	Ik/Imix	12	UND	UND	Discarded	body			43.1	
8	4	Ik/Imix	4	UND	UND	Saved	body			29.3	
8	4	Ik/Imix	2	UND	UND	Saved	rim			37.1	
8	4	Ik/Imix	3	UND	UND	Saved	rim			44	
8	5	Eb/Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	rim			19.7	Middle/Late Precl. and E. Cl.
8	5	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			7.1	
8	5	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		43.8	
8	5	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			12.8	
8	5	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim			26.3	
8	5	Ik/Imix	1	UND	UND	Saved	body/base			27.5	1 fragment was in Level 7
8	5	Ik/Imix	1	UND	UND	Saved	base			7.8	ring
8	5	Ik/Imix	1	UND	UND	Saved	base and support			5.9	Support scar
8	5	Ik/Imix	1	UND	UND	Saved	special body	neck		49.5	
8	5	Ik/Imix	5	UND	UND	Saved	base			42.3	
8	5	Ik/Imix	1	UND	UND	Saved	base			8.2	
8	5	Ik/Imix	16	UND	UND	Discarded	body			49.3	

(Table B.2 continued)

8	5	Ik/Imix	7	UND	UND	Saved	body			77.2	
8	5	Ik/Imix	1	UND	UND	Saved	rim			5.7	
8	5	Ik/Imix	3	UND	UND	Saved	rim			29.3	
8	6	Cimi	1	Paso Caballo Waxy	Sierra	Alta Mira Fluted	body			13.8	
8	6	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			2.3	
8	6	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			38.6	
8	6	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			23.4	
8	6	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	rim			50.3	Classic
8	6	Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Sapote	Sapote Striated	base			30.5	
8	6	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			6.6	
8	6	Eb/Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote/Sapote	rim			9	
8	6	UND	2	UND	UND	Saved	special body	neck		55.5	
8	6	UND	10	UND	UND	Saved	base			136.3	
8	6	UND	1	UND	UND	Saved	body			14.5	
8	6	UND	15	UND	UND	Discarded	body			66.1	
8	6	UND	1	UND	UND	Saved	rim			13.4	
8	6	UND	3	UND	UND	Saved	rim			39.1	
8	7	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body				
8	7	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body				
8	7	Imix/Eznab	1	Peten Gloss	Saxche Palmar	Red on Cream	rim with body				
8	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body/special/app.				angle and support scar
8	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body/base/special				Flange scar
8	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body				
8	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim/body/special				
8	7	Tzec/Chuen/Cauac/Cimi	5	Uaxactun Unslipped	Sapote	Sapote Striated	body				
8	7	Ik/Imix/Eznab	5	Uaxactun Unslipped	Encanto	Encanto Striated	base				
8	7	Manik	1	Uaxactun Unslipped	Triunfo	Triunfo Striated	special body	collar			
8	7	Manik	1	Uaxactun Unslipped	Triunfo	Triunfo Striated	body				
8	7	Manik	1	Uaxactun Unslipped	Quintal	Quintal Unslipped	rim				
8	7	Ik/Imix	1	UND	UND	Saved	special body	collar			
8	7	Ik/Imix	11	UND	UND	Saved	base				
8	7	Ik/Imix	14	UND	UND	Discarded	body				
8	7	Ik/Imix	14	UND	UND	Saved	body				
8	7	Ik/Imix	1	UND	UND	Saved	body/base				
8	7	Ik/Imix	1	UND	UND	Saved	rim				
8	7	Ik/Imix	2	UND	UND	Saved	rim				
8	7	Ik/Imix	1	UND	UND	Saved	special body				
8	8	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			3.9	
8	8	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			83.9	
8	8	Tzec/Chuen/Cauac/Cimi	4	Uaxactun Unslipped	Sapote	Sapote Striated	body			12.9	
8	8	Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Sapote	Sapote Striated	base			11	
8	8	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	neck		83.5	
8	8	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim			18	
8	8	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			17.3	
8	8	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			101.2	
8	8	Ik/Imix	1	UND	Late Classic	Incised	rim			12.1	
8	8	Ik/Imix	4	UND	UND	Saved	base	collar		39.4	
8	8	Ik/Imix	1	UND	UND	Saved	special body	neck		9.6	
8	8	Ik/Imix	4	UND	UND	Saved	rim			165.3	
8	8	Ik/Imix	4	UND	UND	Saved	rim			101.8	
8	8	Ik/Imix	21	UND	UND	Discarded	body			74.3	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
8	8	Ik/Imix	7	UND	UND	Saved	body			49.9	
8	8	Ik/Imix	2	UND	UND	Saved	body/base/special			59.9	
8	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim			65.6	
8	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			6.9	
8	9	Ik/Imix	1	UND	UND	Saved	rim			23.7	There are 2 frags. from Level 8
8	9	Ik/Imix	1	UND	UND	Saved	special body	collar		8.9	
8	9	Ik/Imix	9	UND	UND	Saved	body			72.2	
8	9	Ik/Imix	1	UND	UND	Saved	body/base			6.3	
8	9	Ik/Imix	1	UND	UND	Saved	base			17.7	
8	11	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	body			4.2	
8	11	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			3.6	
Unit	**Level**	**Phase**	**Freq.**	**Ware**	**Group**	**Type**	**Part**	**Spec. Body**	**Appendix**	**Wt.**	**Observations**
9	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			2.9	
9	1	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			3.8	
9	1	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		37.4	
9	2	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	special body	collar		7.6	
9	2	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	UND	base			3.3	
9	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			2.5	
9	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			21.2	
9	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			1.8	
9	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			11.6	
9	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Cameron Incised	rim			44.3	
9	2	Ik/Imix/Eznab	4	Peten Gloss	Tinaja	Tinaja Red	base			24.8	
9	2	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio/Encanto	base			58.9	
9	2	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio/Encanto	base			200.3	
9	2	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			45.8	
9	2	UND	1	UND	UND	Saved	rim			4.1	
9	2	UND	6	UND	UND	Discarded	body			17.5	
9	2	UND	4	UND	UND	Saved	body			25	
9	2	UND	13	UND	UND	Discarded	base			71	
9	2	UND	5	UND	UND	Saved	base			46.1	
9	3	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Fluted	rim/body/special	neck		21.8	
9	3	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	rim			6.6	
9	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body	collar		101.2	
9	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			13.5	
9	3	Eznab	1	Peten Gloss	Tinaja	Pantano Impressed	special body	collar		45.6	
9	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	special body	collar		15.6	
9	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	UND	special body	collar		48.6	
9	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			7.3	
9	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Subin/Chaquiste	base			23.7	
9	3	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			12.9	
9	3	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	base			10.3	
9	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim/body/special	collar		62.9	
9	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	collar		26.7	
9	3	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio/Encanto	base			205	
9	3	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	base			17.9	
9	3	UND	1	UND	UND	Saved	rim			1.9	
9	3	UND	7	UND	UND	Saved	body			29.1	
9	3	UND	27	UND	UND	Discarded	base			120.9	
9	3	UND	7	UND	UND	Saved	base			34.9	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
11	1	UND	3	UND	UND	Discarded	body			6.5	
11	1	UND	3	UND	UND	Saved	body			27.3	
11	1	UND	2	UND	UND	Saved	base			49.3	
11	2	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			5.2	
11	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			3.4	
11	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			36.2	
11	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			22.4	
11	2	UND	1	UND	UND	Saved	rim/body/base/special		spout	48.5	
11	2	UND	1	UND	UND	Saved	body/base/special	angle		67.3	
11	2	UND	1	UND	UND	Saved	rim/body/special	neck		54.4	
11	2	UND	2	UND	UND	Saved	rim			24	
11	2	UND	1	UND	UND	Saved	rim			7.6	
11	2	UND	13	UND	UND	Discarded	body			66.9	
11	2	UND	8	UND	UND	Saved	body			133.5	
11	2	UND	4	UND	UND	Saved	base			44.1	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
12	1	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			5.8	
12	3	UND	3	UND	UND	Saved	base			12.9	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
13	1	UND	1	UND	UND	Saved	rim/body/special	neck		11.6	
13	1	UND	3	UND	UND	Saved	base			9	
13	2	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			14.4	
13	2	UND	1	UND	UND	Saved	special body	normal flange		9.6	
13	2	UND	4	UND	UND	Saved	rim			47.3	
13	2	UND	1	UND	UND	Saved	rim			35	
13	2	UND	2	UND	UND	Saved	rim			24.8	
13	2	UND	7	UND	UND	Saved	body			38.8	
13	2	UND	11	UND	UND	Discarded	base			62.5	
13	2	UND	5	UND	UND	Saved	base			52.9	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
14	1	UND	1	UND	UND	Saved	special body	neck		12.5	
14	1	UND	1	UND	UND	Saved	rim			2.6	
14	1	UND	1	UND	UND	Saved	rim			5.1	
14	1	UND	4	UND	UND	Saved	base			11.1	
14	2	Ik/Imix	1	UND	Late Classic	Impressed	rim			47.9	
14	2	UND	4	UND	UND	Saved	body			2.9	
14	2	UND	3	UND	UND	Saved	base			12.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
16(1)	1	UND	5	UND	UND	Saved	body			8.6	
16(1)	1	UND	1	UND	UND	Saved	base			33.6	
16(1)	2	UND	7	UND	UND	Saved	body			31.8	
16(1)	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			8.5	
16(1)	3	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	body			3	
16(1)	3	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	base			10	
16(1)	3	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	special body	neck		5.1	
16(1)	3	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	rim			6.9	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
16(1)	3	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			2.4	
16(1)	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	body			1.2	
16(1)	4	UND	1	UND	UND	Saved	special body	collar		3.7	
16(1)	4	UND	1	UND	UND	Saved	body			3.7	
16(1)	4	UND	1	UND	UND	Saved	base			6.3	
16(1)	5	UND	1	UND	UND	Saved	body			3.5	
16(1)	5	UND	1	UND	UND	Saved	base			8.2	
16(1)	5	UND	1	UND	UND	Saved	special body	collar		7.4	
16(1)	6	UND	3	UND	UND	Saved	body			7	
16(1)	7	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			6	
16(1)	7	UND	3	UND	UND	Saved	body			4.9	
16(1)	7	UND	1	UND	UND	Saved	body/base			11.3	
16(1)	8	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			15.9	
16(1)	8	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			3.3	
16(1)	8	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body/base			5.9	
16(1)	8	UND	12	UND	UND	Saved	body			56.5	
16(1)	9	Ik/Imix	6	Uaxactun Unslipped	Encanto	Encanto Striated	body			39.7	
16(1)	9	UND	4	UND	UND	Saved	body			10.4	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
16(2)	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			1.4	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
16A	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			9.4	
16A	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			3.4	
16A	1	UND	3	UND	UND	Saved	body			9.3	
16A	2	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			17.9	
16A	2	UND	3	UND	UND	Saved	body			10.5	
16A	3	Chuen/Cauac/Cimi	4	UND	Late Preclassic	Simple	body			6.8	
16A	3	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	base			2.7	
16A	3	UND	1	UND	UND	Saved	body			6.1	
16A	3	UND	5	UND	UND	Saved	body			14.5	
16A	3	UND	5	UND	UND	Saved	base			33.3	
16A	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			4.9	
16A	4	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			1.8	
16A	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			2.8	
16A	4	Imix	1	Peten Gloss	Tinaja	Corozal Incised	rim			10.4	
16A	4	UND	1	UND	UND	Saved	rim			1.8	
16A	4	UND	11	UND	UND	Saved	body			40.1	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
16B	1	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			8.9	
16B	1	Eb/Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			7.8	
16B	1	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	body			122.9	
16B	1	UND	2	UND	UND	Saved	body			4.4	
16B	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			6.9	
16B	2	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			42	
16B	3	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	body			255.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
17	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			2.6	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
17	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			2.3	
17	1	UND	6	UND	UND	Saved	body			16.7	
17	1	UND	5	UND	UND	Saved	base			20.9	
17	2	Tzec/Chuen/Cauac/Cimi	5	Paso Caballo Waxy	Sierra	UND	base			11.1	
17	2	UND	3	UND	UND	Saved	body			6.1	
17	2	UND	5	UND	UND	Saved	base			14.5	
17	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			3.5	
17	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim/body/special	collar		4.2	
17	3	UND	1	UND	UND	Saved	body			3.5	
17	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			7.6	
17	4	UND	1	UND	UND	Saved	body			3.2	
17	4	UND	1	UND	UND	Saved	base			4.6	
17	5	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			3.1	
17	5	UND	2	UND	UND	Saved	body			9	
17	6	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	base			14.5	
17	6	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			7.9	
17	6	UND	2	UND	UND	Saved	body			4.4	
17	6	UND	1	UND	UND	Saved	base			4.9	
22	1	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	base			35.2	
22	1	UND	5	UND	UND	Saved	base			30.6	
22	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			40.4	
22	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			2.7	
22	2	UND	1	UND	UND	Saved	body/base/special	normal flange		22.2	
22	2	UND	2	UND	UND	Saved	special body	collar		27.3	
22	2	UND	2	UND	UND	Saved	rim			59.8	
22	2	UND	2	UND	UND	Saved	rim			10.2	
22	2	UND	4	UND	UND	Saved	body			54.6	
22	2	UND	26	UND	UND	Discarded	body			89.4	
22	2	UND	5	UND	UND	Saved	base			136.2	
22	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body	collar		34.2	
22	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			10.8	
22	3	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	body			4.5	
22	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			34.1	
22	3	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	base/special form/app.		support	25.8	
22	3	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			9.2	
22	3	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	angle		24	
22	3	UND	2	UND	UND	Saved	rim			20.3	
22	3	UND	1	UND	UND	Saved	rim			7.1	
22	3	UND	13	UND	UND	Discarded	body			64.5	
22	3	UND	12	UND	UND	Saved	body			80.2	
22	3	UND	3	UND	UND	Saved	base			34.1	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	body			47.7	
22	4	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	UND	body			3.7	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			10.1	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim with body			68.1	
22	4	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			6.2	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			19.4	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body			12.8	
22	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			47.7	

(Table B.2 continued)

22	4	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body			8.7	
22	4	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			3.7	
22	4	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			3.3	
22	4	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			71.6	
22	4	UND	2	UND	UND	Saved	special body	collar		35.5	
22	4	UND	1	UND	UND	Saved	rim			9.5	
22	4	UND	13	UND	UND	Discarded	body			40.5	
22	4	UND	7	UND	UND	Saved	body			67.8	
22	4	UND	1	UND	UND	Saved	body/base			14	
22	4	UND	1	UND	UND	Saved	base			9.8	
22	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim/body/special	neck		8.4	
22	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Subin Red	rim			45.5	
22	5	Imix	1	Peten Gloss	Tinaja	Corozal Incised	body			5.3	
22	5	Imix	1	Peten Gloss	Tinaja	Corozal Incised	base			14.8	
22	5	Eb/Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			11.3	
22	5	Ik/Imix/Eznab	3	Uaxactun Unslipped	Cambio	Cambio Rough Surface	body			39.3	
22	5	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Rough Surface	base			41.9	
22	5	UND	1	UND	UND	Discarded	body			0.8	
22	5	UND	3	UND	UND	Saved	body			11	
22	5	UND	2	UND	UND	Saved	base			57.2	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
23	1	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			1.4	
23	1	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			14.2	
23	1	UND	2	UND	UND	Saved	rim			10.8	
23	1	UND	4	UND	UND	Saved	body			9.5	
23	1	UND	1	UND	UND	Saved	body/base			6.7	
23	1	UND	4	UND	UND	Saved	base			52.1	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
26	0	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			29.4	
26	2	UND	2	UND	UND	Saved	body			5.1	
26	3	UND	2	UND	UND	Saved	body			33.4	
26	4	UND	4	UND	UND	Saved	body			15.5	
26	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			12.2	
26	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	special body	neck		5.5	
26	5	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Impressed	body			82.7	
26	5	UND	5	UND	UND	Saved	body			38.5	
26	5	UND	20	UND	UND	Discarded	body			86.4	
26	6	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			24.8	
26	6	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Impressed	body			6.7	
26	6	Ik/Imix/Eznab	5	Peten Gloss	Tinaja	Tinaja Red	body			133	
26	6	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			4.5	
26	6	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	body			12.1	
26	6	UND	1	UND	UND	Saved	rim			30.8	
26	6	UND	1	UND	UND	Saved	body			8	
26	6	UND	2	UND	UND	Saved	base			33	
26	6	UND	7	UND	UND	Discarded	body			32.3	
26	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			18.9	
26	7	UND	1	UND	UND	Saved	rim			306.9	
26	7	UND	4	UND	UND	Saved	body			22.4	

(Table B.2 continued)

26	7	UND	9	UND	UND	Discarded	body			27.6	
26	8	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			2.6	
26	8	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim			13.4	
26	8	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			6.7	
26	8	UND	1	UND	UND	Saved	special body	collar		6.1	
26	8	UND	1	UND	UND	Saved	special body	neck		23.7	
26	8	UND	3	UND	UND	Saved	body			34.5	
26	8	UND	6	UND	UND	Discarded	body			17.8	
26	9	Chuen/Cauac/Cimi	4	Uaxactun Unslipped	Sapote	Sapote Striated	body			40	
26	9	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			71.9	
26	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			1662	
26	9	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			43.6	
26	9	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote/Sapote	rim			29.9	
26	9	UND	3	UND	UND	Saved	body			30.1	
26	9	UND	17	UND	UND	Discarded	body			66.3	
26	10	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			350.4	
26	10	Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja/Pantano	body/base			20.1	
26	10	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			3.8	
26	10	UND	2	UND	UND	Saved	body			7.8	
26	11	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			12.5	
26	11	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			30.5	
26	11	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		96.6	
26	11	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	body			249	
26	11	Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja/Pantano	body/base			143.4	
26	11	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	rim with body			25.5	
26	11	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			75.6	
26	11	UND	1	UND	UND	Saved	special body	collar		103.1	
26	11	UND	13	UND	UND	Discarded	body			39.4	
26	12	Eznab	1	Peten Gloss	Tinaja	Pantano Impressed	rim/body/special			474.9	Various frags. of same vessel
26	12	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body			47.1	Incised base
26	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim/body/base			811.2	
26	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body/base			626.2	Various frags. of same vessel
26	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Cameron Incised	rim			204.7	
26	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			10.7	
26	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			37.7	
26	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim			177.4	
26	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim			459.3	
26	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			247.7	
26	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			216.9	
26	12	Ik/Imix/Eznab	9	Uaxactun Unslipped	Encanto	Encanto Striated	body			456.3	
26	12	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	special body	collar		6.5	
26	12	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			1.2	
26	12	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	body			128.1	
26	12	UND	1	UND	UND	Saved	special body	neck		12	
26	12	UND	2	UND	UND	Saved	body			24.9	
26	12	UND	42	UND	UND	Discarded	body			107.6	
26	13	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			5	
26	13	Chuen/Cauac/Cimi	23	Uaxactun Unslipped	Sapote	Sapote Striated	body			92.6	
26	13	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			6.2	
26	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			10.8	
26	13	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim/body/special			52.1	

(Table B.2 continued)

26	13	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	base			19	
26	13	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		43.7	
26	13	Ik/Imix/Eznab	3	Uaxactun Unslipped	Cambio	Cambio/Encanto	rim			25.4	
26	13	Ik/Imix/Eznab	6	Peten Gloss	Tinaja	Tinaja Red	body			70.4	
26	13	Ik/Imix/Eznab	8	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			27	
26	13	Ik/Imix/Eznab	16	Uaxactun Unslipped	Encanto	Encanto Striated	body			123.4	
26	13	Imix	1	Peten Gloss	Tinaja	Corozal Incised	rim			19.7	
26	13	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	base			5.9	
26	13	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	special body	collar		8.6	
26	13	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	body			8	
26	13	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	base			42	
26	13	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			9.8	
26	13	UND	1	UND	UND	Saved	rim			10.7	
26	13	UND	2	UND	UND	Saved	base			11.8	
26	13	UND	20	UND	UND	Saved	body			91.6	
26	13	UND	121	UND	UND	Discarded	body			412.5	
26	14	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			1.3	
26	14	Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			2.8	
26	14	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			19.4	
26	14	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		57.6	
26	14	Ik/Imix/Eznab	3	Peten Gloss	Saxche Palmar	Eroded Polychrome	body/base			13.8	
26	14	Ik/Imix/Eznab	4	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			12	
26	14	Ik/Imix/Eznab	9	Peten Gloss	Tinaja	Tinaja Red	body			38.4	
26	14	Ik/Imix/Eznab	10	Uaxactun Unslipped	Encanto	Encanto Striated	body			61.3	
26	14	Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			10.2	
26	14	UND	8	UND	UND	Saved	body			30.9	
26	15	Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	body			2.2	
26	15	Chuen/Cauac/Cimi	4	Uaxactun Unslipped	Sapote	Sapote Striated	base			19.5	
26	15	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		8.4	
26	15	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			60	
26	15	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	body			9.4	
26	15	UND	2	UND	UND	Discarded	body			1.5	
26	15	UND	13	UND	UND	Saved	body			49.8	
26	16	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body	collar		7.5	
26	16	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			2.3	
26	16	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	base			10.3	
26	16	Chuen/Cauac/Cimi	27	Uaxactun Unslipped	Sapote	Sapote Striated	body			161.6	
26	16	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim/body/base/spec/app	normal flange	support	400.2	Support with rattle
26	16	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim/body/special	normal flange		47.6	
26	16	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Chaquiste Impressed	rim			23.3	
26	16	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			5.7	
26	16	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		3.7	
26	16	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			39.6	
26	16	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body			315.2	
26	16	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			24.5	
26	16	Ik/Imix/Eznab	7	Uaxactun Unslipped	Encanto	Encanto Striated	body			91.7	
26	16	Ik/Imix/Eznab	9	Peten Gloss	Tinaja	Tinaja Red	body			150.6	
26	16	Imix/Eznab	1	Uaxactun Unslipped	Cambio	Manteca Impressed	rim with body			34.8	
26	16	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	body			19.3	
26	16	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	UND	rim			14.5	
26	16	Tzec/Chuen/Cauac/Cimi	9	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			43.2	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
26	16	UND	1	UND	UND	Saved	special body	neck		4.2	
26	16	UND	2	UND	UND	Saved	base			108.2	
26	16	UND	3	UND	UND	Saved	rim			19.7	
26	16	UND	19	UND	UND	Saved	body			1552	
26	16	UND	41	UND	UND	Discarded	body			119.3	
26	17	Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	rim/body/special	collar		137.9	
26	17	Chuen/Cauac/Cimi	28	Uaxactun Unslipped	Sapote	Sapote Striated	body			370.2	
26	17	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			5.8	
26	17	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			38	
26	17	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio/Encanto	special body	collar		43.8	
26	17	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			69.3	
26	17	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			11.1	
26	17	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body			92	
26	17	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	base			19.3	
26	17	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Subin/Chaquiste	body			102.1	
26	17	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	body			7.6	
26	17	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	neck		40.5	
26	17	Ik/Imix/Eznab	3	Peten Gloss	Tinaja	Subin Red	rim/body/special	normal flange		196.2	
26	17	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		63.7	
26	17	Ik/Imix/Eznab	13	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			55.3	
26	17	Ik/Imix/Eznab	13	Peten Gloss	Tinaja	Tinaja Red	body			154	
26	17	Ik/Imix/Eznab	83	Uaxactun Unslipped	Encanto	Encanto Striated	body			955.4	
26	17	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			9.5	
26	17	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			7.5	
26	17	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote/Sapote	rim			12.2	
26	17	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	rim			18.7	
26	17	Tzec/Chuen/Cauac/Cimi	39	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			243.2	
26	17	UND	2	UND	UND	Saved	base			55.3	
26	17	UND	3	UND	UND	Saved	rim			53.5	
26	17	UND	14	UND	UND	Saved	body			306	
26	17	UND	130	UND	UND	Discarded	body			335.6	
26	18	Chuen	1	Paso Caballo Waxy	Sierra	Sierra Red:Society Hall	body			11.4	
26	18	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			9.7	
26	18	Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	body			6	
26	18	Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	base			48.6	
26	18	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	rim			56.3	
26	18	Chuen/Cauac/Cimi	4	Paso Caballo Waxy	Sierra	Sierra Red	base			111.2	
26	18	Chuen/Cauac/Cimi	11	Paso Caballo Waxy	Sierra	Sierra Red	body			45	
26	18	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			21	
26	18	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		6.5	
26	18	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			16.5	
26	18	Ik/Imix/Eznab	17	Uaxactun Unslipped	Encanto	Encanto Striated	body			191.7	
26	18	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			3.6	
26	18	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	UND	body			1.1	
26	18	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	base			13	
26	18	UND	1	UND	UND	Saved	rim			4.5	
26	18	UND	3	UND	UND	Saved	base			29.3	
26	18	UND	7	UND	UND	Discarded	body			37.2	
26	18	UND	8	UND	UND	Saved	body			46.8	

(Table B.2 continued)

28	3	UND	1	UND	UND	Saved	special body	neck		11.5
28	3	UND	18	UND	UND	Saved	body			111.8
28	3	UND	17	UND	UND	Discarded	body			32.2
28	6	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			26.7
28	6	UND	1	UND	UND	Saved	body			74.5
28	7	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			25.5
28	8	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	rim			3.4
28	8	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			5.3
28	8	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body/base/special/app.			14.1
28	8	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			1.9
28	8	Tzec	1	Paso Caballo Waxy	Sierra	Ahchab Red on Buff	body			5.1
28	8	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Cameron Incised	rim			147.2
28	8	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			122.7
28	8	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		66.6
28	8	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim			14.5
28	8	Ik/Imix/Eznab	3	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			96.8
28	8	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	body			80.7
28	8	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			33.2
28	8	UND	1	UND	UND	Saved	body			47.5
28	8	UND	1	UND	UND	Saved	body/base			102.9
28	9	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	rim			5.7
28	9	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	body			17.4
28	9	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	base			3.6
28	9	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	body			3.5
28	9	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	body/base/app.			6.6
28	9	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body/base/app.		support	83
28	9	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body	collar		125
28	9	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			29.7
28	9	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	body			7.6
28	9	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body/base			42.3
28	9	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim with body			76.6
28	9	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			11
28	9	Tzec/Chuen/Cauac/Cimi	11	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			47.2
28	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		38.7
28	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio/Encanto	rim/body/special	neck		96.7
28	9	Ik/Imix/Eznab	3	Uaxactun Unslipped	Cambio	Cambio/Encanto	special body	neck		80.3
28	9	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio/Encanto	rim			13.4
28	9	Ik/Imix/Eznab	8	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			323.7
28	9	Ik/Imix/Eznab	33	Uaxactun Unslipped	Encanto	Encanto Striated	body			458.1
28	9	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	base			57.7
28	9	UND	1	UND	UND	Saved	appendage		support	24
28	9	UND	1	UND	UND	Saved	rim with body			39.4
28	9	UND	1	UND	UND	Saved	rim/body/base			126.6
28	9	UND	8	UND	UND	Discarded	body			19.8
28	9	UND	15	UND	UND	Saved	body			182.6
28	9	UND	1	UND	UND	Saved	base			10.7
28	10	Tzec/Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Flor	Flor Cream	body			41.3
28	10	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	rim			15.1
28	10	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			26.6
28	10	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			13.7
28	10	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			18.9

(Table B.2 continued)

28	10	Ik/Imix/Eznab	10	Uaxactun Unslipped	Encanto	Encanto Striated	body			91.1
28	10	UND	1	UND	UND	Saved	rim/body/special	collar		77.7
28	10	UND	1	UND	UND	Saved	rim			9.6
28	10	UND	4	UND	UND	Saved	body			37
28	11	Manik	1	Peten Gloss	Actuncan/Dos Arroyos	Polychrome	body/base/special	large flange		65.9
28	11	Ik/Imix/Eznab	4	Peten Gloss	Encanto	Tinaja Red	body			48.1
28	11	Ik/Imix/Eznab	4	Uaxactun Unslipped	Encanto	Encanto Striated	body			28.7
28	11	UND	1	UND	UND	Saved	special body	normal flange		13.5
28	11	UND	1	UND	UND	Saved	special body	neck		17.7
28	11	UND	4	UND	UND	Saved	body			18.3
28	12	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	rim			4.7
28	12	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			12.9
28	12	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	Flor Cream	body			15.1
28	12	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim/body/base/special	large flange		83.2
28	12	Ik	1	Peten Gloss	Saxche Palmar	Bichrome Red on Orange	rim			10.7
28	12	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			1.2
28	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			21.8
28	12	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			5.9
28	12	Imix	1	Peten Gloss	Tinaja	Corozal Incised	body			1.6
28	12	Ik/Imix/Eznab	4	Peten Gloss	Tinaja	Tinaja Red	body			64.4
28	12	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			41.4
28	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		64
28	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio/Encanto	rim			73.1
28	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			24
28	12	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			172
28	12	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	base			36.9
28	12	UND	1	UND	UND	Saved	special body	collar		4.3
28	12	UND	1	UND	UND	Saved	special body	neck		31
28	12	UND	1	UND	UND	Saved	rim			58.2
28	12	UND	6	UND	UND	Saved	body			36.9
28	12	UND	2	UND	UND	Saved	base			42.9
28	13	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Flor	Flor Cream	body			18.3
28	13	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim/body/base/special	normal flange		50.3
28	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	special body	large flange		6
28	13	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			11.7
28	13	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	collar		38.1
28	13	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	neck		34.2
28	13	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim			102.6
28	13	Ik/Imix/Eznab	6	Uaxactun Unslipped	Encanto	Encanto Striated	body			50.8
28	13	UND	1	UND	UND	Saved	special body	collar		21.3
28	13	UND	6	UND	UND	Discarded	body			20
28	13	UND	5	UND	UND	Saved	body			23.1
28	14	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			7.8
28	14	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			5.3
28	14	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	body			12.4
28	14	UND	1	UND	UND	Saved	rim			22
28	15	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			2.9
28	15	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			1.5
28	15	UND	1	UND	UND	Saved	body			3.6
28	16	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			25.5
28	16	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	body			11.8

(Table B.2 continued)

28	16	UND	1	UND	UND	Saved	body			4.9	
28	16	UND	1	UND	UND	Saved	base			16.5	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
29	2	UND	1	UND	UND	Saved	special body	normal flange		13.8	
29	2	UND	1	UND	UND	Saved	base			18.7	
29	3	UND	4	UND	UND	Saved	body			11	
29	3	UND	5	UND	UND	Saved	base			18.9	
29	4	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			1.3	
29	4	Ik/Imix/Eznab	1	UND	Late Classic	Incised	rim			7.7	
29	4	UND	1	UND	UND	Saved	rim			7.4	
29	4	UND	3	UND	UND	Saved	base			14.9	
29	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim/body/special	normal flange		7.8	
29	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			1.7	
29	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			9.6	
29	5	UND	1	UND	UND	Saved	special body	normal flange		15.1	
29	5	UND	1	UND	UND	Saved	rim			3.4	
29	5	UND	1	UND	UND	Saved	body			2.8	
29	5	UND	3	UND	UND	Saved	base			27.7	
29	6	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			8.5	
29	6	UND	2	UND	UND	Saved	base			10.8	
29	7	Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			2.6	
29	9	UND	1	UND	UND	Saved	special body	normal flange		7.1	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
30	1	Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			4.8	
30	1	UND	1	UND	UND	Saved	base			3.3	
30	2	UND	1	UND	UND	Saved	rim			34.6	
30	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			4.4	
30	4	UND	1	UND	UND	Saved	body			6.8	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
31	1	UND	1	UND	UND	Saved	special body	collar		9.9	
31	1	UND	1	UND	UND	Saved	special body	neck		14.2	
31	1	UND	9	UND	UND	Saved	body			36	
31	1	UND	2	UND	UND	Saved	base			8.2	
31	2	UND	1	UND	UND	Saved	body			23.5	applied
31	2	UND	12	UND	UND	Saved	body			47.2	Chert?
31	2	UND	6	UND	UND	Saved	base			50.7	Chert?
31	2	UND	1	UND	UND	Saved	special body	collar		35.5	
31	2	UND	1	UND	UND	Saved	rim			13.6	
31	2	UND	1	UND	UND	Saved	body/base			5.8	
31	3	Ik/Imix/Eznab	4	Peten Gloss	Tinaja	Tinaja Red	base			47.3	
31	3	Ik/Imix/Eznab	7	Uaxactun Unslipped	Encanto	Encanto Striated	base			56.5	
31	3	Ik/Imix/Eznab	1	UND	Late Classic	Incised	base			6.5	
31	3	UND	1	UND	UND	Saved	appendage		handle	3.1	
31	3	UND	1	UND	UND	Saved	rim			16.6	
31	3	UND	2	UND	UND	Saved	body			30.8	
31	3	UND	8	UND	UND	Saved	base			40.8	
31	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	special body	large flange		62	Tzakol basal flange
31	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			21.7	Tzakol

(Table B.2 continued)

31	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			1.6	
31	4	Chuen/Cauac/Cimi	5	Paso Caballo Waxy	Sierra	Sierra Red	body			18.1	
31	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body/base			14.8	
31	4	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	special body	large flange		25.8	
31	4	Ik/Imix/Eznab	8	Peten Gloss	Tinaja	Tinaja Red	base			48.5	
31	4	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	collar		111.6	
31	4	Ik/Imix/Eznab	15	Uaxactun Unslipped	Encanto	Encanto Striated	base			209.7	
31	4	Manik	1	Uaxactun Unslipped	Quintal	Quintal Unslipped	rim			33.8	
31	4	UND	1	UND	UND	Saved	rim			9.2	
31	4	UND	8	UND	UND	Saved	body			19.8	
31	4	UND	7	UND	UND	Saved	base			75.5	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
31A	1	UND	1	UND	UND	Saved	body			3.4	
31A	2	UND	2	UND	UND	Saved	special body	collar		46.4	
31A	2	UND	2	UND	UND	Saved	body			9.2	
31A	2	UND	1	UND	UND	Saved	body/base			7.4	
31A	2	UND	2	UND	UND	Saved	base			18.9	
31A	4	Chuen/Cauac/Cimi	4	Paso Caballo Waxy	Sierra	Sierra Red	body			25.4	
31A	4	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			3.4	
31A	4	UND	1	UND	UND	Saved	body			3.2	
31A	4	UND	5	UND	UND	Saved	base			42.8	
31A	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			2.3	
31A	5	Ik/Imix/Eznab	3	Uaxactun Unslipped	Encanto	Encanto Striated	base			58.8	
31A	5	UND	2	UND	UND	Saved	body			7.6	
31A	5	UND	2	UND	UND	Saved	base			9.8	
31A	6	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			4.6	
31A	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			4.8	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
32	2	UND	1	UND	UND	Saved	rim			5.4	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
33	1	UND	1	UND	UND	Saved	special body	large flange		31.7	
33	1	UND	2	UND	UND	Saved	body			5.1	
33	1	UND	3	UND	UND	Saved	base			63.3	
33	2	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body			47.4	
33	2	UND	3	UND	UND	Saved	base			20.8	ring
33	2	UND	1	UND	UND	Saved	special body	neck		37.2	
33	2	UND	2	UND	UND	Saved	rim			32.1	
33	2	UND	1	UND	UND	Saved	rim			5.7	
33	2	UND	6	UND	UND	Saved	body			19.9	
33	3	UND	1	UND	UND	Saved	special body	large flange		8.8	
33	3	UND	1	UND	UND	Saved	rim			10.4	
33	3	UND	7	UND	UND	Saved	body			24	
33	3	UND	6	UND	UND	Saved	base			119.1	
33	4	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	base			10.5	
33	4	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			2.3	
33	4	Ik/Imix/Eznab	6	Uaxactun Unslipped	Encanto	Encanto Striated	base			78.7	
33	4	Ik/Imix/Eznab	1	UND	Late Classic	Fluted	rim			9.8	
33	4	UND	5	UND	UND	Saved	body	large flange		34.2	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
33	4	UND	1	UND	UND	Saved	special body	neck		8	
33	4	UND	1	UND	UND	Saved	rim			15.7	
33	4	UND	1	UND	UND	Saved	rim			14.7	
33	4	UND	9	UND	UND	Discarded	body			28.1	
33	4	UND	2	UND	UND	Saved	special body			14.1	
33	4	UND	5	UND	UND	Saved	base			71.9	
33	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	body/base			4.4	
33	5	Ik/Imix/Eznab	5	Peten Gloss	Tinaja	Tinaja Red	base			14.3	
33	5	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Impressed	body			3.3	
33	5	Ik/Imix/Eznab	7	Uaxactun Unslipped	Encanto	Encanto Striated	base			44	
33	5	UND	1	UND	UND	Saved	special body	neck		8.3	
33	5	UND	1	UND	UND	Saved	rim			12	
33	5	UND	1	UND	UND	Saved	rim			26	
33	5	UND	4	UND	UND	Saved	rim			13.9	
33	5	UND	27	UND	UND	Discarded	body			73.5	
33	5	UND	4	UND	UND	Saved	body			55.2	
33	5	UND	8	UND	UND	Saved	base			67	
35	3	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	base			1.6	
35	3	UND	8	UND	UND	Saved	body			17.5	
35	3	UND	8	UND	UND	Discarded	base			73.4	
35	3	UND	4	UND	UND	Saved	base			28.4	
35	4	Tzec/Chuen/Cauac/Cimi	3	Paso Caballo Waxy	UND	UND	base			17.3	
35	4	Ik/Imix/Eznab	6	Peten Gloss	Tinaja	Tinaja Red	base			11.2	
35	4	Ik/Imix/Eznab	1	Uaxactun Unslipped	Cambio	Cambio Unslipped	rim/body/special	collar		28.5	
35	4	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	rim/body/special	collar		42.8	
35	4	Ik/Imix/Eznab	31	Uaxactun Unslipped	Encanto	Encanto Striated	base			266.8	
35	4	UND	1	UND	UND	Saved	special body	normal flange		7.4	
35	4	UND	2	UND	UND	Saved	rim			10.4	
35	4	UND	8	UND	UND	Discarded	body			21.6	
35	4	UND	4	UND	UND	Saved	body			8.2	
35	4	UND	22	UND	UND	Discarded	base			183.9	
35	4	UND	6	UND	UND	Saved	base			55.9	
35	5	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			39.4	
35	5	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			10.1	
35	5	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	special body	normal flange		17.2	Basal flange
35	5	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	rim			21.2	
35	5	Ik/Imix/Eznab	2	Peten Gloss	Tinaja	Tinaja Red	base			2.5	
35	5	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	special body	collar		33.7	
35	5	Ik/Imix/Eznab	12	Uaxactun Unslipped	Encanto	Encanto Striated	base			94.8	
35	5	UND	1	UND	UND	Saved	rim			4.1	
35	5	UND	10	UND	UND	Discarded	body			48.4	
35	5	UND	4	UND	UND	Saved	body			25.8	
35	5	UND	27	UND	UND	Discarded	base			163.8	
35	5	UND	3	UND	UND	Saved	base			27.2	
35	6	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim/body/special	collar		57.4	
35	6	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			26.5	
35	6	Tzec/Chuen/Cauac/Cimi	3	Paso Caballo Waxy	UND	UND	base			12.1	
35	6	Ik/Imix/Eznab	5	Peten Gloss	Azote	UND	body/base			50	
35	6	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			22.8	

(Table B.2 continued)

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
35	6	Ik/Imix/Eznab	7	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			35.4	
35	6	Ik/Imix/Eznab	2	Peten Gloss	Saxche Palmar	Eroded Polychrome	base			4.5	
35	6	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	special body	collar		14.8	
35	6	Ik/Imix/Eznab	3	Peten Gloss	Tinaja	Tinaja Red	rim			23.5	
35	6	Ik/Imix/Eznab	9	Peten Gloss	Tinaja	Tinaja Red	base			30.4	
35	6	Eb/Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote Incised	rim/body/special	neck		4.4	
35	6	Eb/Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote/Sapote	special body	neck		8.5	
35	6	Eb/Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Achiotes	Achiotes Unslipped	body			12.3	
35	6	Tzec/Chuen/Cauac/Cimi	13	Uaxactun Unslipped	Sapote	Sapote Striated	base			38.4	
35	6	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		10.2	
35	6	Ik/Imix/Eznab	2	Uaxactun Unslipped	Cambio	Cambio Unslipped	body			21.6	
35	6	Ik/Imix/Eznab	17	Uaxactun Unslipped	Encanto	Encanto Striated	base			93.5	
35	6	UND	3	UND	UND	Saved	rim			24.5	
35	6	UND	28	UND	UND	Discarded	body			88.8	
35	6	UND	7	UND	UND	Saved	body			37.7	
35	6	UND	37	UND	UND	Discarded	base			187.3	
35	6	UND	7	UND	UND	Saved	base			38.9	
35	7	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Flor	UND	body			3.9	
35	7	Chuen/Cauac/Cimi	4	Paso Caballo Waxy	Sierra	Sierra Red	base			32.3	
35	7	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	special body	normal flange		8.5	
35	7	Ik/Imix/Eznab	1	Peten Gloss	Saxche Palmar	Eroded Polychrome	rim			4.9	
35	7	Ik/Imix/Eznab	3	Peten Gloss	Saxche Palmar	Eroded Polychrome	body			5.5	
35	7	Ik/Imix/Eznab	3	Peten Gloss	Tinaja	Tinaja Red	rim			23.4	
35	7	Ik/Imix/Eznab	1	Peten Gloss	Tinaja	Tinaja Red	rim			3.4	
35	7	Ik/Imix/Eznab	3	Peten Gloss	Tinaja	Tinaja Red	body			16.6	
35	7	Ik/Imix/Eznab	3	Peten Gloss	Tinaja	Tinaja Red	body			3	
35	7	Ik/Imix/Eznab	23	Peten Gloss	Tinaja	Tinaja Red	base			116.5	
35	7	Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Sapote	Sapote Striated	base			6.6	
35	7	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		42.3	
35	7	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	body			9.9	
35	7	Ik/Imix/Eznab	9	Uaxactun Unslipped	Encanto	Encanto Striated	base			53.5	
35	7	Manik	1	Uaxactun Unslipped	Quintal	Quintal Unslipped	rim/body/special	collar		46.9	
35	7	Manik	1	Uaxactun Unslipped	Triunfo	Triunfo Striated	rim/body/special	collar		100.5	
35	7	UND	2	UND	UND	Saved	rim			9.2	
35	7	UND	11	UND	UND	Saved	body			32.9	
35	7	UND	22	UND	UND	Discarded	base			209.8	
35	7	UND	6	UND	UND	Saved	base			47.3	
36	3	UND	1	UND	UND	Saved	base			5.4	
36	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body/base			121.3	
36	5	UND	1	UND	UND	Saved	appendage		handle	4.6	
36	5	UND	3	UND	UND	Saved	body			4.2	
36	6	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	UND	UND	base			15.1	
36	6	UND	1	UND	UND	Saved	rim			2.7	
36	6	UND	5	UND	UND	Saved	base			32	
36	7	Tzec/Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	UND	body			2.9	
36	7	Tzec/Chuen/Cauac/Cimi	4	Paso Caballo Waxy	Sierra	UND	base			15.5	
36	7	UND	1	UND	UND	Saved	rim/body/special	collar		147.9	
36	7	UND	9	UND	UND	Saved	body			24.8	
36	7	UND	6	UND	UND	Saved	base			40.4	

(Table B.2 continued)

36	8	UND	1	UND	UND	Saved	base			11.2	
36	9	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	UND	base			8.9	
36	9	UND	2	UND	UND	Saved	base			9.2	
36	10	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			2.6	
36	10	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			18.3	
36	10	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			12	
36	10	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Achiotes	Achiote/Sapote	base			9	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
37	1	UND	1	UND	UND	Saved	base			0.8	
37	2	UND	1	UND	UND	Saved	body			0.8	
37	3	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	base			3.6	
37	3	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	base			3.4	
37	3	UND	1	UND	UND	Saved	rim			12.5	
37	3	UND	6	UND	UND	Saved	rim			10.5	
37	3	UND	47	UND	UND	Discarded	body			55.9	
37	3	UND	6	UND	UND	Saved	body			15.7	
37	3	UND	21	UND	UND	Discarded	base			73.7	
37	3	UND	6	UND	UND	Saved	base			33.4	
37	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			0.3	
37	4	UND	5	UND	UND	Saved	body			9.1	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
38	1	Ik/Imix/Eznab	2	Uaxactun Unslipped	Encanto	Encanto Striated	base			8.9	
38	1	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Impressed	special body	collar		36.3	
38	1	UND	1	UND	UND	Saved	special body	neck		12.4	
38	1	UND	3	UND	UND	Saved	rim			29.4	
38	1	UND	3	UND	UND	Saved	rim			8.7	
38	1	UND	44	UND	UND	Discarded	body			80.9	
38	1	UND	8	UND	UND	Saved	body			39.7	
38	1	UND	23	UND	UND	Discarded	base			106.8	
38	1	UND	4	UND	UND	Saved	base			33.9	
38	2	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	UND	base			7.2	
38	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	rim			1.3	
38	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			12.6	
38	2	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	base			11.4	
38	2	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Impressed	special body	collar		11.9	
38	2	Ik/Imix/Eznab	1	Uaxactun Unslipped	Encanto	Encanto Striated	special body	collar		11.8	
38	2	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	normal flange		9.4	
38	2	UND	1	UND	UND	Saved	rim/body/special	collar		33.4	
38	2	UND	2	UND	UND	Saved	rim			13	
38	2	UND	10	UND	UND	Discarded	body			20.1	
38	2	UND	4	UND	UND	Saved	body			16.5	
38	2	UND	15	UND	UND	Discarded	base			79.4	
38	2	UND	6	UND	UND	Saved	base			40.3	
38	3	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	rim			14.3	
38	3	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	body			3	
38	3	Chuen/Cauac/Cimi	2	Paso Caballo Waxy	Sierra	Sierra Red	base			10	
38	3	Tzec/Chuen/Cauac/Cimi	3	Uaxactun Unslipped	Achiotes	Achiote/Sapote	base			33.7	
38	3	Tzec/Chuen/Cauac/Cimi	2	Uaxactun Unslipped	Sapote	Sapote Striated	base			4.4	
38	3	UND	9	UND	UND	Discarded	body			12.5	

(Table B.2 continued)

38	3	UND	4	UND	UND	Saved	body			16.1	
38	3	UND	10	UND	UND	Discarded	base			56.5	
38	3	UND	4	UND	UND	Saved	base			33.7	
38	4	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			2.9	
38	4	UND	1	UND	UND	Saved	rim/body/special	collar		89.2	
38	4	UND	3	UND	UND	Saved	base			14.5	
38	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	body			2.7	
38	5	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Polvero	Polvero Black	base			1.6	
38	5	Chuen/Cauac/Cimi	3	Paso Caballo Waxy	Sierra	Sierra Red	rim			78.5	
38	5	Chuen/Cauac/Cimi	6	Paso Caballo Waxy	Sierra	Sierra Red	body			34	
38	5	Chuen/Cauac/Cimi	10	Paso Caballo Waxy	Sierra	Sierra Red	body			16.8	
38	5	Chuen/Cauac/Cimi	10	Paso Caballo Waxy	Sierra	Sierra Red	base			117.6	
38	5	Eb/Tzec	1	Uaxactun Unslipped	Achiotes	Pijuy Slipped	base			3.5	
38	5	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			7.6	
38	5	UND	2	UND	UND	Saved	special body	collar		89.7	Chert?
38	5	UND	6	UND	UND	Saved	base			41.4	Chert?
38	5	UND	1	UND	UND	Saved	rim/body/special	neck		19.5	
38	5	UND	11	UND	UND	Saved	body			13.3	
38	5	UND	17	UND	UND	Discarded	base			119.4	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
39	1	UND	1	UND	UND	Saved	rim			1.7	
39	1	UND	2	UND	UND	Saved	body			1.6	
39	2	Tzec/Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	UND	body			0.6	
39	2	UND	4	UND	UND	Saved	body			3	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
40	1	UND	1	UND	UND	Saved	base			1.4	
40	2	UND	2	UND	UND	Saved	body			6.3	
40	2	UND	2	UND	UND	Saved	base			6.5	
40	3	UND	3	UND	UND	Saved	body			16.2	
40	3	UND	2	UND	UND	Saved	base			32.8	
40	5	UND	1	UND	UND	Saved	base			5.2	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
41	1	UND	1	UND	UND	Saved	rim			7.3	
41	1	UND	9	UND	UND	Saved	body			15.3	
41	1	UND	11	UND	UND	Discarded	base			42.7	
41	1	UND	3	UND	UND	Saved	base			47	
41	2	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	base			2.5	
41	2	Tzec/Chuen/Cauac/Cimi	1	Uaxactun Unslipped	Sapote	Sapote Striated	base			5.1	
41	2	UND	1	UND	UND	Saved	special body	collar		6.8	
41	2	UND	1	UND	UND	Saved	rim			14	
41	2	UND	9	UND	UND	Saved	body			48.1	
41	2	UND	10	UND	UND	Discarded	base			70.2	
41	2	UND	4	UND	UND	Saved	base			30.9	
41	3	UND	1	UND	UND	Saved	base			6.5	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
44	2	UND	3	UND	UND	Saved	base			10.1	
44	3	Chuen/Cauac/Cimi	1	Paso Caballo Waxy	Sierra	Sierra Red	body			12.7	

(Table B.2 continued)

44	3	UND	1	UND	UND	Saved	body			13.6	
44	3	UND	2	UND	UND	Saved	base			6.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
45	2	UND	1	UND	UND	Saved	body			27.7	
45	2	UND	5	UND	UND	Saved	base			31.3	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
46	2	Chuen/Cauac/Cimi	1	UND	Late Preclassic	Simple	special body	normal flange		27.5	
46	2	UND	1	UND	UND	Saved	special body	normal flange		1.8	
46	2	UND	4	UND	UND	Saved	body			14	
46	2	UND	4	UND	UND	Saved	base			15	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
47	2	UND	1	UND	UND	Saved	base			4.8	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
48	1	UND	1	UND	UND	Saved	body			8.4	
48	2	UND	1	UND	UND	Saved	rim			22.8	
48	2	UND	3	UND	UND	Saved	base			14.7	
48	3	UND	1	UND	UND	Saved	special body	normal flange		28.9	
48	3	UND	4	UND	UND	Saved	base			14.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
49	1	UND	1	UND	UND	Saved	body			3.9	
49	2	Ik/Imix/Eznab	1	UND	Late Classic	Incised	rim			7.6	
49	2	UND	1	UND	UND	Saved	rim/body/special	neck		14.2	
49	2	UND	2	UND	UND	Saved	body			13.2	
49	2	UND	7	UND	UND	Saved	base			40.2	
49	3	UND	1	UND	UND	Saved	base			6.9	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
51	1	UND	1	UND	UND	Saved	rim			4.7	

Unit	Level	Phase	Freq.	Ware	Group	Type	Part	Spec. Body	Appendix	Wt.	Observations
54	1	UND	2	UND	UND	Saved	base			6.9	
54	2	UND	1	UND	UND	Saved	rim			8.8	
54	2	UND	5	UND	UND	Saved	body			9.7	
54	2	UND	8	UND	UND	Saved	base			48.6	

Table B.3. Sherd counts by unit and time period. MPC = Middle Preclassic; LPC = Late Preclassic; EC = Early Classic; LC = Late Classic; TC = Terminal Classic; UND = Unidentified.

Unit	MPC	LPC	EC	LC	TC	UND	Total
1	0	3	0	1	0	51	55
2	0	41	0	12	0	28	81
3	0	13	0	0	0	0	13
4	0	0	0	0	0	8	8
6	0	0	0	2	0	0	2
7	0	21	0	0	0	0	21
8	0	35	3	306	0	81	425
9	0	13	0	25	1	71	110
11	0	2	0	3	0	39	44
12	0	0	0	1	0	3	4
13	0	1	0	0	0	35	36
14	0	0	0	1	0	14	15
16(1)	0	15	0	6	0	42	63
16(2)	0	0	0	1	0	0	1
16A	0	13	0	1	0	29	43
16B	0	4	0	8	0	2	14
17	0	11	0	3	0	27	41
22	0	20	0	20	0	109	149
23	0	2	0	0	0	11	13
26	0	209	0	299	1	551	1060
28	1	43	1	128	0	105	278
29	0	3	0	4	0	24	31
30	0	2	0	0	0	3	5
31	0	9	1	38	0	63	111
31A	0	4	0	7	0	18	29
32	0	0	0	0	0	1	1
33	0	2	0	23	0	104	129
35	0	35	2	161	0	231	429
36	0	14	0	0	0	30	44
37	0	2	0	1	0	94	97
38	1	50	0	5	0	192	248
39	0	1	0	0	0	7	8
40	0	0	0	0	0	11	11
41	0	2	0	0	0	50	52
44	0	1	0	0	0	6	7
45	0	0	0	0	0	6	6
46	0	1	0	0	0	9	10
47	0	0	0	0	0	0	2
48	0	0	0	0	0	10	10
49	0	0	0	1	0	12	13
51	0	0	0	0	0	1	1
54	0	0	0	0	0	16	16
Totals	**2**	**572**	**7**	**1057**	**2**	**2094**	**3736**