THESIS

ARCHITECTURAL PATTERNING IN THE PUREPECHA HEARTLAND: AN INTRASITE SETTLEMENT STUDY AT THE URBAN CENTER OF SACAPU ANGAMUCO, MICHOACÁN, MÉXICO

Submitted By

Jason W. Bush

Department of Anthropology

In partial fulfillment of the requirements

For the Degree of Master of Arts

Colorado State University

Spring 2012

Master's Committee:

Advisor: Christopher Fisher

Mary Van Buren
Melinda Laituri

ABSTRACT

ARCHITECTURAL PATTERNING IN THE PURÉPECHA HEARTLAND: AN INTRASITE SETTLEMENT STUDY AT THE URBAN CENTER OF SACAPU ANGAMUCO, MICHOACÁN, MÉXICO

The overall goal of this thesis is to examine the architectural patterns of Sacapu Angamuco (Angamuco), a recently discovered Early-Middle Postclassic (A.D. 900-1350) urban settlement in the Lake Pátzcuaro Basin (LPB), Michoacán, Mexico that is located on an ancient lava flow, or *malpais*, and was extensively modified by prehispanic inhabitants to construct thousands of structures such as platforms, mounds, plazas, passages, stairs, and temples.

Central to this thesis is how prehispanic residents of Angamuco organized their buildings and social space. The study of architectural remains is one critical component of ancient urbanism which is fundamental to Mesoamerican societies. Angamuco provides a rich opportunity to understand urbanism in the LPB. Understanding the spatial context of buildings and how they are grouped in functionally discernable ways is crucial to interpreting the internal function(s) of the settlement, as well as contributing to regional settlement pattern analyses.

This thesis incorporates intensive survey using GPS, GIS, and remote sensing to document architecture and analyze the spatial patterns of architecture at Angamuco using

data from the 2010 field season. An overview of relevant definitions and approaches to Mesoamerican urban settlement studies and the study of spatial patterning and classification of architecture is presented. A description of the physical setting of the LPB and Angamuco, the cultural-historical background of the region, and background information on previous archaeological work addressing urbanism, settlement patterns, and architecture in the LPB region is discussed. The research methodology used to collect data on Angamuco's architecture and settlement patterns is reviewed. The core of this work concerns an analysis of Angamuco architecture, beginning with description of the form and function of individual architectural features and analysis of architectural group form and patterning in the study area. Finally, the analysis is synthesized with the questions guiding this research, as well as current knowledge about Postclassic urbanism in the LPB and beyond. Ultimately, it is hoped that work at Angamuco will improve understanding of Postclassic LPB architecture, settlement patterns, and the role of cities before and during the development of the Tarascan Empire.

ACKNOWLEDGEMENTS

I would like to express gratitude to the members of my committee Dr. Christopher Fisher, Dr. Mary Van Buren, and Dr. Melinda Laituri for their valuable suggestions and encouragement. I would especially like to thank Dr. Fisher for giving me the opportunity to be a part of the LORE-LPB Project and must recognize the Consejo de Instituto Nacional de Antropología e Historia, Mexico (INAH) for permission to work in Mexico. Data for this thesis would not exist without the help of the 2009-2010 LORE-LPB crew members who spent many long hot and humid days surveying Angamuco amidst the rattlesnakes, spiders, and biting insects. The crew includes Florencia Pezzutti, Anna Cohen, Andrea Torvinen, Alejandro Uriarte, Marion Forest, Raquel Bautista, Olivia Navarro-Farr, Jennifer Johns, Annie Maggard, Chris Stawski, Corrie Ahern, and Francois Dengah. I am grateful for the mentorship of Michelle Rich and John Seebach, and to Robert Mallouf for inspiring me to pursue a career in archaeology. I would like to thank my family for their unceasing support during graduate school. Finally, I am immensely grateful to my family, and the many friends, colleagues, and strangers who selflessly helped me navigate through the treacherous journey of cancer.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

The study of architectural remains is one critical component of ancient urbanism which is fundamental to Mesoamerican societies (Smith 2008). Buildings such as residential platforms, plazas, temples, ballcourts, shrines, and granaries reflect the organization of an urban settlement, as well the ways in which the larger society was organized (Kowalewski et al. 1989; Smith 1992). Understanding the spatial context of buildings and how they are grouped in functionally discernable ways is crucial to interpreting broader organizational processes in a settlement. Understanding these processes is important for understanding not only the internal function(s) of the settlement, but also for regional settlement pattern analyses.

As an artifact, architecture holds great potential for the archaeological analysis of urban settlements. Archaeological research concerning the spatial patterning of architecture and social space follows the archaeological principle that the spatial patterning of features has cultural significance (Binford 1982; Butzer 1982) and has long been a component of Mesoamerican settlement studies where architecture is present (Johnston and Gonlin 1998). Interpreting the spatial dimension of architecture aids in deriving meaning from objects because they have similar spatial relationships such as how they are clustered, spaced, and how patterns recur throughout a settlement (Hodder and Orton 1976).

In this thesis, I examine architectural patterning at the recently discovered prehispanic settlement of Sacapu Angamuco (Angamuco) in the Lake Pátzcuaro Basin (LPB), Michoacán, Mexico (figure 1) to understand how prehispanic residents of Angamuco organized their buildings and social space and how these patterns reflect urban elements such as planning and standardization. This thesis will discuss Sacapu Angamuco's urban qualities in light of concepts proposed by Mesoamerican scholars. Two definitions fundamental to this thesis include first, *urbanism* as "centers whose activities and institutions (i.e.- economic, administrative, or religious) affect a larger hinterland" (Smith 2007:4) and *cities* as large urban centers with numerous urban functions (Smith 2007).

An additional approach important in this thesis involves identifying components of a settlement and inferring their function within larger organizational scheme of the settlement. One approach used in the Lowland Mayan region (Ashmore 1981) pertinent to this thesis involves identifying formal building groups, which have been previously referred to as "patio groups" and "structure aggregates" (Willey 1981), as well informal building arrangements that also provide information about settlement organization. Each type of arrangement provides different types of information about how settlements are organized.

Fig.1. Map of Mexico with Michoacán highlighted in red (© ESRI Global Data 2010).

The Late Postclassic period (A.D. 1350-1520) in central Mexico was a time of dynamic social, economic, and political change that involved population growth and migration, the creation and expansion of cities, states, and empires, increased levels of commerce, information exchange, and material goods exchange (Smith 2005: 403).

At the time of Contact (ca. AD 1520s), the LPB (figure 1.1) was the geopolitical core of the *Purépecha*, or *Tarascan*, empire (A.D. 1350-1520) and comprised of a large, socially stratified population distributed among several cities (Pollard 1980, 2003). Among these cities, the imperial capital of Tzintzuntzan (Pollard 1977) and at least 90 other settlements of varying size and form are known from ethnohistoric documentation

(Gorenstein and Pollard 1983). Correspondingly, the environment of the LPB was extensively modified to maximize agrarian potential and stabilize the landscape in order to sustain large, nucleated populations (Fisher et al. 2003).

Fig. 1.1. Map of Michoacán with Lake Pátzcuaro Basin highlighted in red (© ESRI ShadedRelief_World_2D).

Prior to this period of time in the LPB region at Contact (ca. AD 1520s), little is known about this core Mesoamerican region (Palerm and Wolf 1957). Relative to other critical Mesoamerican regions such as the Basin of Mexico, Valley of Oaxaca, and the Maya region, knowledge of settlement patterns in the LPB is rudimentary. Previous work in the LPB region (Gorenstein and Pollard 1983; Pollard 1993) and the adjacent Zacapu

Basin (Michelet et al. 1988; Michelet 1998, 2008; Migeon 1998; Darras 2008) over the last three decades has documented different types of settlements. Scholarly interpretations of ethnohistoric documents are limited as well. One of the most cited accounts of European exploration of the region is the *Relación de Michoacán* (1956, 1980, 2000, 2001) and is an important source of information for Tarascan culture on the eve of Spanish contact (ca. AD 1520s).

The recent discovery of Angamuco by the Legacies of Resilience-Lake Pátzcuaro Basin Project (LORE-LPB) provides a unique opportunity to understand ancient architecture in the LPB region and better understand the pre-Empire period (< ca. AD 1320s). Fieldwork at Angamuco began in 2009 as part of a larger settlement pattern survey by the LORE-LPB Project aimed at documenting a 62 km^2 portion of the eastern lake basin. The density and extent of architectural features at Angamuco are ideal for systematic classification of architecture and understanding how buildings are patterned into functionally discernable groups.

Although ethnohistoric evidence (Gorenstein and Pollard 1983) suggests several settlements of varying size occur in the LPB, there is little archaeological evidence of the form and function of Early/Middle Postclassic LPB cities. Most work has focused on the Tarascan imperial capital of Tzintzuntzan (Pollard 1977, 1980, 1993), Ihuatzio (Cardenas 1992), and Pátzcuaro (figure 1.2).

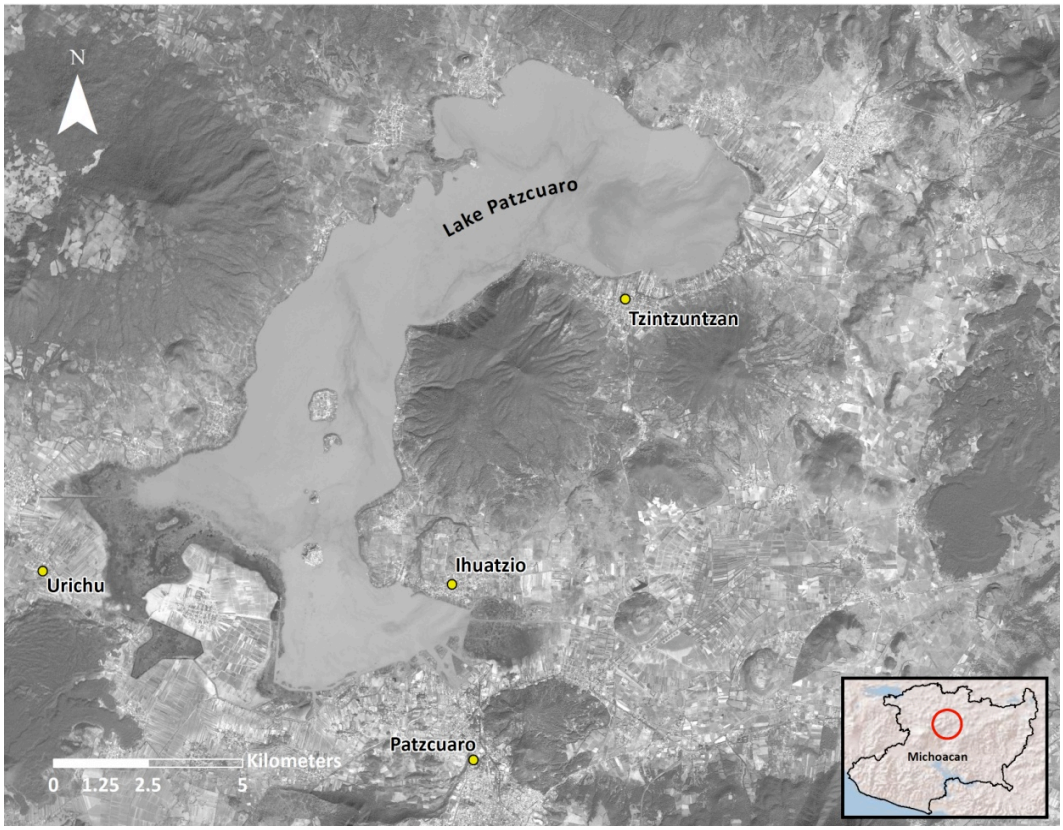

Fig. 1.2. Map of Lake Pátzcuaro Basin with malpaís of Sacapu Angamuco on right (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

Among these earlier settlements several are known to occur on ancient lava flows, or *malpaís*, that are common throughout the region (Israde-Alcántara et al. 2005). Prehispanic malpaís settlements have been documented in the neighboring Zacapu Basin by French archaeologists with the Centre Français d'Etudes Mexicaines et Centre-Américaines (CEMCA) (Migeon 1998; Michelet 1995, 2008), near the modern town of Santa Clara del Cobre (Maldonado 2008), and portions of malpaís have been explored near the site of Urichu on the western side of Lake Pátzcuaro (Pollard 1992, 2003). These works provide some information on settlement patterns and architecture within the

Tarascan cultural zone during the Postclassic and suggest malpaís were important areas for nucleated settlements. More work, however, is needed to understand why these rugged landscapes were occupied and how they functioned within LPB regional settlement patterns.

Research Objectives

The evidence found at Angamuco (figure 1.3) raises important questions about the form of LPB cities before and during the formation of the Tarascan Empire in the Late Postclassic. In this thesis, I examine the spatial arrangement of buildings at Angamuco to understand how these patterns reflect the settlement organization of Angamuco. In light of this work, several questions concerning the distribution and patterning of architectural groups at Angamuco are proposed.

First, previous work at Angamuco has identified recurring patterns of individual structures that functioned for a variety of domestic, public, and ritual activities (Fisher 2011a). Patterning among these structures is evident but has never been formally examined. How are buildings arranged at Angamuco? Are buildings grouped formally, informally, or are other patterns apparent? Are these groupings standardized and do they recur throughout the settlement?

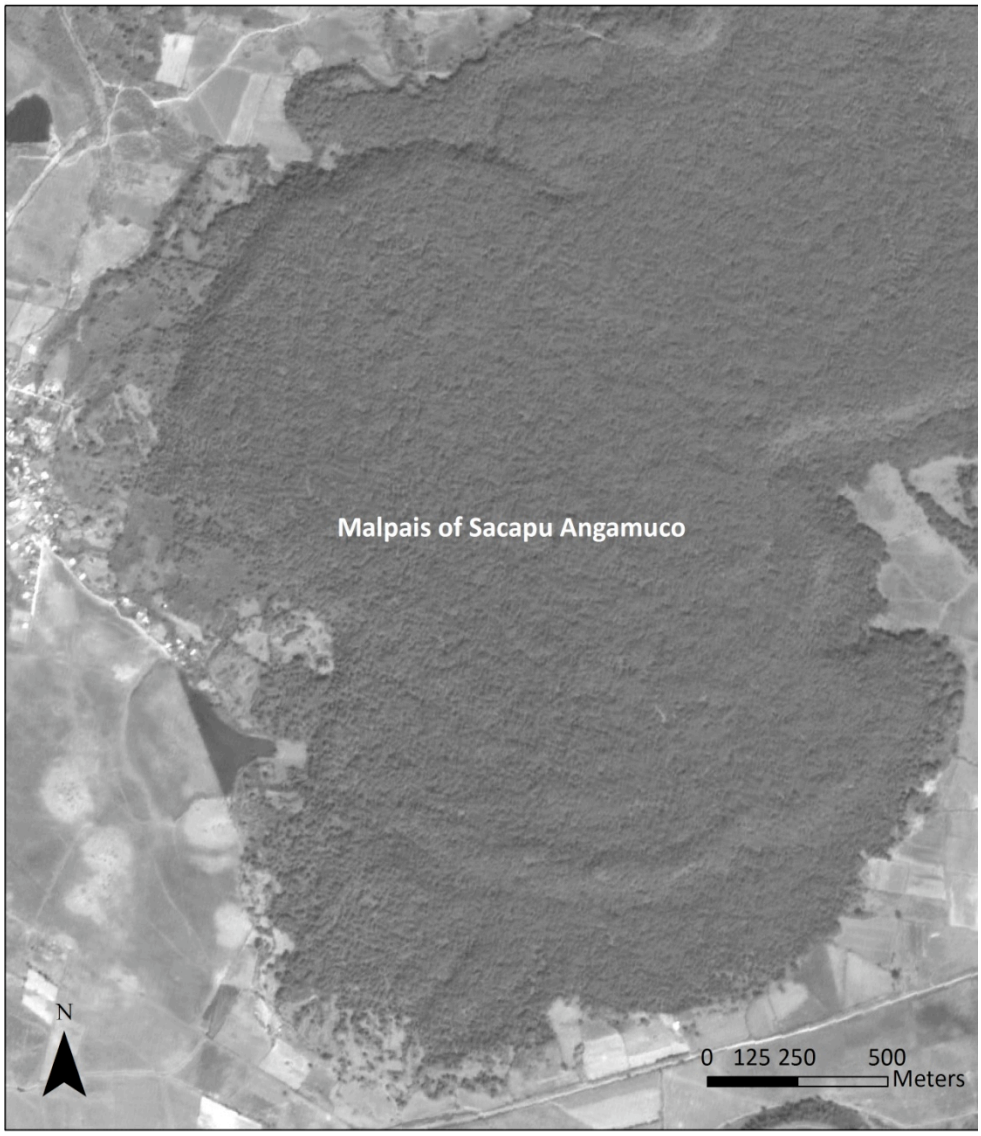

Fig.1.3. Map of the malpaís of Sacapu Angamuco (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

The second question 2) deals with spatial relationships among formal and informal building groups, which provide important information on intrasite organization. If patterns in building group form can be identified are they spatially discreet? Do specific forms occur more often than others? If so, why might this be? What factors

influence building group form and location? Is there a functional, temporal, or topographical relationship or are other factors influencing development?

Finally 3), patterning in the articulation of buildings to form functionally cohesive architectural groups imparts knowledge about broader community-level organizational planning. What do architectural patterns tell us about urbanism at Angamuco? What can these patterns tell us about the level of socio-political complexity? Can this evidence yield clues as to development of the city? What do these forms tell us about the spatial organization in terms of planning of the settlement? Does Angamuco exhibit characteristics of organic urban planning and development, a formal orthogonal layout like Teotihuacan (Cowgill 1988, 1997), or does the settlement exhibit characteristics similar to the nucleated ceremonial centers (with corresponding dispersed residential areas) of the Maya region (Arnauld 2008)?

The remainder of this work is organized into five parts. In the first chapter, I provide an overview of relevant definitions and approaches to Mesoamerican urban settlement studies and the study of spatial patterning and classification of architecture. Chapter two describes the physical setting of the LPB and Angamuco, the cultural-historical background of the region, and includes background information on previous archaeological work addressing urbanism, settlement patterns, and architecture in the LPB region. In chapter three, I describe the research methodology used to collect data about Angamuco's architecture and settlement patterns. Analysis of Angamuco architecture is presented in chapter four. The first part of this chapter begins with description of the form and function of individual architectural features. The second part of chapter four analyzes architectural group form and patterning across the site. The final

chapter in this thesis synthesizes the analysis with the questions guiding this research in light of current knowledge about Postclassic urbanism in the LPB and beyond.

CHAPTER 1

URBANISM AND ARCHITECTURE:

DEFINITONS AND APPROACHES

There has been extensive debate among archaeologists over definitions of *urbanism* in Mesoamerican archaeology (Blanton 1976; Hirth 2003; Marcus 1983; Smith 1989; Webster and Sanders 2001; from Smith 2008) and what constitutes a city. Arguments about urbanism have largely revolved around demographic or functional definitions (Smith 2007). Influenced by the sociologist Louis Wirth, William T. Sanders primarily adopted a demographic perspective for understanding Mesoamerican cities. Sanders defines cities as settlement with large, dense populations and evidence for social or economic complexity (Sanders and Webster 1989). For Sanders, the large Central Mexican imperial capitals of Teotihuacan (Classic period, AD 200-600) and Tenochtitlan (AD 1350-1520) represent the "ideal" Mesoamerican urban forms and views the Classic period lowland Mayan capitals as essentially nonurban ceremonial centers based on the demographic model that placed emphasis on their smaller overall population sizes, lower settlement densities, and lower level of economic specialization.

Another definition proposed by George Cowgill loosely defines a city as a "permanent settlement within the larger territory occupied by a society considered home by a significant number of residents whose activities, roles, practices, experiences, identities, and attitudes that differ significantly from those of other members of the

society who identify most closely with 'rural' lands outside such settlements" (Cowgill 2004: 526).

Functional interpretations of Mesoamerican urbanism emphasize cities as settlements composed of institutions and activities that affect a larger hinterland (Blanton 1976; Marcus 1983; Smith 2005). These scholars have debated Sanders's limited use of the labels *urban* and *city* for only a few of the largest Mesoamerican sites (Chase and Chase 1990; Smith 1989). From a functional perspective, the large Classic Mayan sites were political capitals (Martin and Grube 2000) and are considered urban settlements. In one paper, Sanders and Webster adopted several themes from Richard G. Fox's functional approach to preindustrial cities and suggested that the largest Mayan capitals—notably, Tikal and Copán—are urban. However, recent debate among these scholars has shifted towards arguing that the Mayan settlements are best classified as non-urban (Arnauld 2008). Smith (2005) favors a functional definition of urbanism, yet attempts to bridge understanding between the functional and demographic characteristics of Postclassic Mesoamerican cities and towns and his framework is especially useful for understanding patterns observed at Angamuco because it considers a wider range of nonwestern settlements as *urban* than a demographic definition of urban settlements.

In terms of approaches to studying urbanism, an exemplary approach is in Michael Smith's (2008) study of Aztec urbanism, in which he outlines four themes concerning the description and analysis of Aztec urban centers that includes urban form, urban life, urban functions, and urban meaning (Smith 2008: 449). Urban *form* focuses on settlement size (area, population, and population density), housing, public architecture, layout, and planning. These topics constitute the physical descriptions of an urban

settlement, and form is the most direct and accessible urban theme for archaeological analysis (Smith 2008).

Urban *life* deals with issues of ethnicity, social class, occupation, and gender within urban centers, social organization such as households and neighborhoods, and the economic, religious, and public lives of urban residents (Smith 2008). Archaeological work focusing on non-monumental architecture, household archaeology, and craft production has dealt with this theme. Urban *function* is characterized by activities and institutions in an urban center that affect people in a larger hinterland beyond the settlement itself (Fox 1977; Trigger 1972; Smith 2008).

Finally, urban *meaning* (Smith 2008: 453) concerns the multiple levels of architectural communication described by Amos Rapoport (1988, 1990, 1993), including high, middle, and lower level meaning. High-level meaning deals with the symbolism of buildings and cities within a religious or cultural tradition and is often culturally specific. The level of meaning is typically expressed via written texts, which in some places may be difficult or impossible to trace archaeologically. Middle-level meaning deals with communicating information about identity, status, and power. This level of meaning is often expressed using monumental architecture— which can be defined as those buildings that are significantly larger than they need to be for utilitarian purposes (Blanton 1989) — to transmit messages such as the ability of the state to implement large projects, provide order, or impose political will on lower ranking members of a society. Low-level meaning deals with the influence of the built environment on the psychology of individuals (Blanton 1994; Hillier and Hanson 1984; Lawrence and Low 1990; A.T.

Smith 2003). This level of meaning includes topics such as space syntax (access to spaces) and movement between and among architecture (Smith 2008).

An aspect of urban form considered in this thesis deals with the degree of planning in an urban settlement. Smith (2007) proposed a model of urban planning in ancient cities comprised of two main components that includes coordination among buildings and spaces and standardization among cities. The former deals mainly with intrasite form, whereas the latter concerns comparison between cities. Different types of coordinated arrangements of buildings reflect urban planning. Standardization among cities is analyzed in terms of architectural inventories and spatial patterns. Understanding these components of urban planning has implications on the meaning and social context of ancient buildings (Smith 2007). Smith (2007: 41) argues that basic principles and processes of planning and urban design were similar across cultures, yet their implementation and expression were different in each urban tradition. This concept is especially important in the context of Mesoamerican cultures because of variation that commonly exists between cities both within a region and between core regions such as the Mayan region, central Mexico, and the LPB.

Spatial patterns are an important technique in architectural analyses because these patterns derive meaning from objects that have similar spatial relationships (i.e. - clustered, regularly spaced) (Binford 1982; Hodder 1991). Spatial analysis is an essential component of mapping, but one of its main advantages is in its ability to elucidate patterns from complex datasets at large, densely populated settlements. A Geographic Information System (GIS) is especially useful for examining spatial relationships and managing large datasets of spatial information that comes with surveying large

settlements. Remote sensing using aerial photography, satellite imagery, or LiDAR is another useful tool for examining visible and hidden dimensions of a site and as an aid in mapping and observing patterns that are not otherwise visible on the ground. Improvements in mapping technology using GPS, GIS, and remote sensing have tremendously affected the way in which archaeologists document large settlements, but these techniques remain surprisingly underutilized by Mesoamerican archaeologists.

An important consideration in studies of the spatial relationships of architecture is the scale at which patterns are sought, for different variables and processes come into play at different scales of analysis (Kowalewski et al. 1989; Smith 1993). Certain settlement components are best understood at a specific scale and depend on the questions or research goals at hand. For example, household studies often focus on individual buildings such as house platforms and ancillary structures (i.e. - kitchens or granaries), whereas research aimed at addressing regional issues may examine architectural patterns between different settlements. The classification of settlement components is a useful heuristic tool and allows for a more integrated approach towards understanding the complexity of a large, densely nucleated urban settlement. Two scales employed in this thesis include the examination of individual structures, how these structures are arranged, and what these patterns reveal in terms of their function. At the smallest scale, for example, individual house form (i.e. - size and construction quality of houses) and variability can indicate differences in wealth and status of a community. At the next largest scale, the spatial articulation of individual structures is examined for relationships among houses, building compounds, and patio groups and points towards larger intrasite organizational processes (Smith 1993).

The manner in which individual buildings are arranged relative to each other in formal and informal groups is an important concern in this thesis. Both types can provide clues to how social space was organized beyond the level of the individual building. An approach by Wendy Ashmore (1981) in the Lowland Mayan region that is used similarly in this thesis involves classifying settlement components from the smallest unit, the individual building (or "minimum residential unit"), and then on to the next level of how buildings are arranged. At the latter level of inquiry, an example might include examining how different structures functioned within an extended family residential building group or civic ceremonial complex. Ashmore (1981) distinguished between *informal* and *formal* groups based on the presence of ambient space. Informal groups consist of spatially related buildings lacking centralized ambient space, whereas formal groups consist of multiple structures built around a central space.

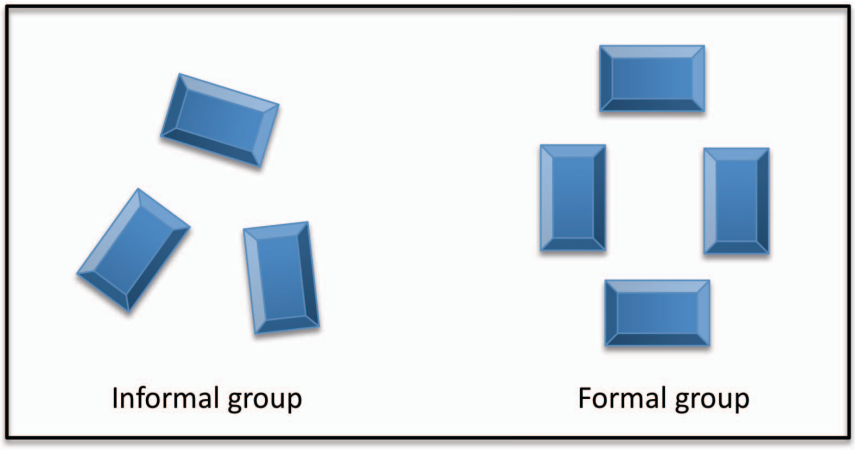

Fig. 2. Schematic of formal and informal building groups (adapted from Ashmore 1981: 49).

This chapter has reviewed the definitions and approaches relevant to the study of urbanism, architecture, and spatial patterning. The key feature of these approaches is that they attempt to link the behavior and ideology of people in ancient cities to the material remains of the urban settlement. Among the themes in Smith's (2008) framework for understanding Mesoamerican urbanism, urban form is of special interest in the study of Angamuco due to its emphasis on the physical characteristics of a settlement, the patterning of architecture, and how this patterning reflects organization of the site. An important theme within urban form concerns urban planning in ancient cities and is used here to address questions proposed earlier concerning Angamuco's intrasite organization. Another approach considered is Smith's (2007) work on the form and meaning of ancient cities, which is a useful framework for interpreting the spatial patterning of architecture at Angamuco. In this chapter, I provided an overview of Smith's model of urban planning, but only a few of the elements described in his model are examined in this thesis. Namely, I look at the coordinated arrangement of buildings and spaces, patterning in the formal arrangement of buildings and spaces (or clearly articulated and directed space), evidence of orthogonality, and causal relationships between the location of specific building types and groups on the Angamuco landscape. By describing the inventory of buildings and architectural features developed by the LORE-LPB Project (Fisher 2011a), I provide a foundation for further testing of the architectural typology developed for Angamuco as more data become available, as well as provide a base for comparative analyses of architectural forms with other settlements in the LPB. This inventory is also presented as a background for analysis of the pattern in the arrangement of buildings in chapter four. This involves another component of Smith's (2007) model of urban

planning that involves looking at the presence of common spatial patterns in order to understand how/if standardization of forms occurs at Angamuco.

CHAPTER 2

ENVIRONMENTAL AND CULTURAL-HISTORICAL CONTEXT

Physical Setting of the LPB

The Lake Pátzcuaro Basin is one of many closed lake basins located in the high volcanic region of northern Michoacán that constitutes the western extension of the *mesa central* or Neo-volcanic belt extending throughout central Mexico. The basin was created by both volcanic and tectonic activity and continues to be seismically active (Israde-Alcántara et al. 2005). The Lake Pátzcuaro Basin covers an area of 928 km^2 and is diverse in terms of topography, climate, soils, and vegetation (West 1948), with elevations ranging from 2035 m to over 3300 m asl. The LPB climate is characterized as a humid, temperate zone that receives approximately 900-1250 mm of rainfall per year. As an 'amplifier' lake, shoreline fluctuation has long been an important characteristic of the basin and has likely had an important affect on the agrarian potential during the prehispanic. The lake is currently an elevation of around 2035 m asl and is primarily influenced by rainfall that causes shifts in lake level as great as 10-13 m in the last decade (Chacon 1993; Pollard 1993; O'Hara 1993). Estimated distance between the Postclassic lake level and edge of the malpaís of Angamuco places the shoreline from 2.5 km to 10 km west of the settlement.

Sacapu Angamuco

The site of Angamuco is located on a geologically a recent lava flow, or *malpaís*, with the start of this volcanic event dating to mid-Holocene period (~6000 BP) (Israde-Alcántara et al. 2005). This volcanic event is represented by two major flow episodes that covered a portion of ancient Lake Pátzcuaro forming a northern and southern malpaís (figure 3). Additionally, specific flow episodes on the southern malpaís formed a zona baja (<2120 m) and a zona alta (>2120 m) (figure 3.1) and these landform likely served as important influences on settlement patterns within the site. Both zones were heavily modified by prehispanic inhabitants for constructing buildings, clearing and leveling areas for open spaces such as plazas, and manipulating the topography to form a built environment.

The zona baja is a foothill zone with relatively extensive soil and terrain more favorable to non-mechanized *milpa*-style agriculture (figure 3.2). As a result, many structures have been impacted by field clearing and often only portions of structures or their edges remain. Most of the zona baja has broader slopes and is considerably less steep than the zona baja and thus more conducive to building monumental architecture and large plazas.

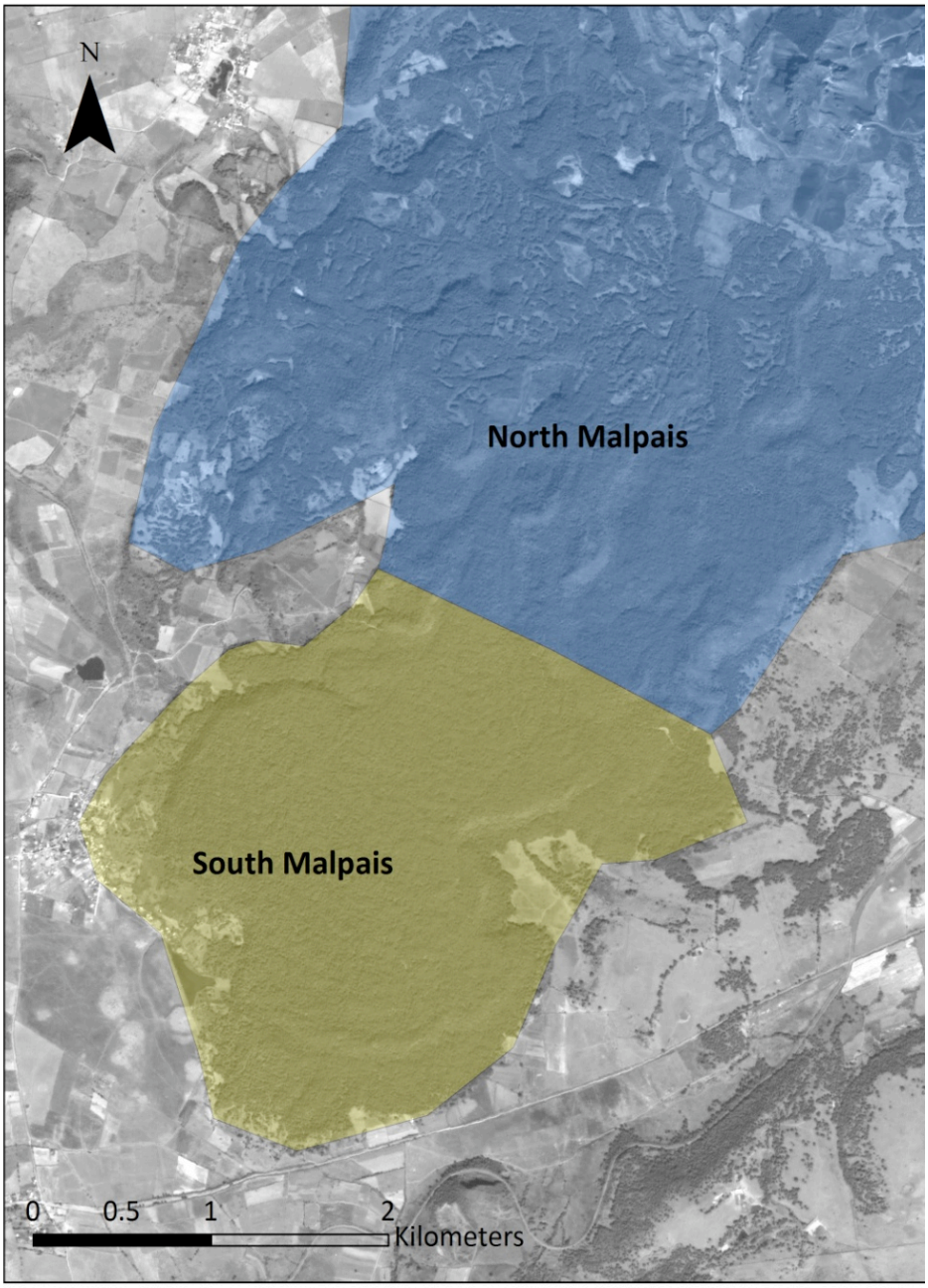

Fig. 3. Map of the north and south sections of the Angamuco malpaís (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

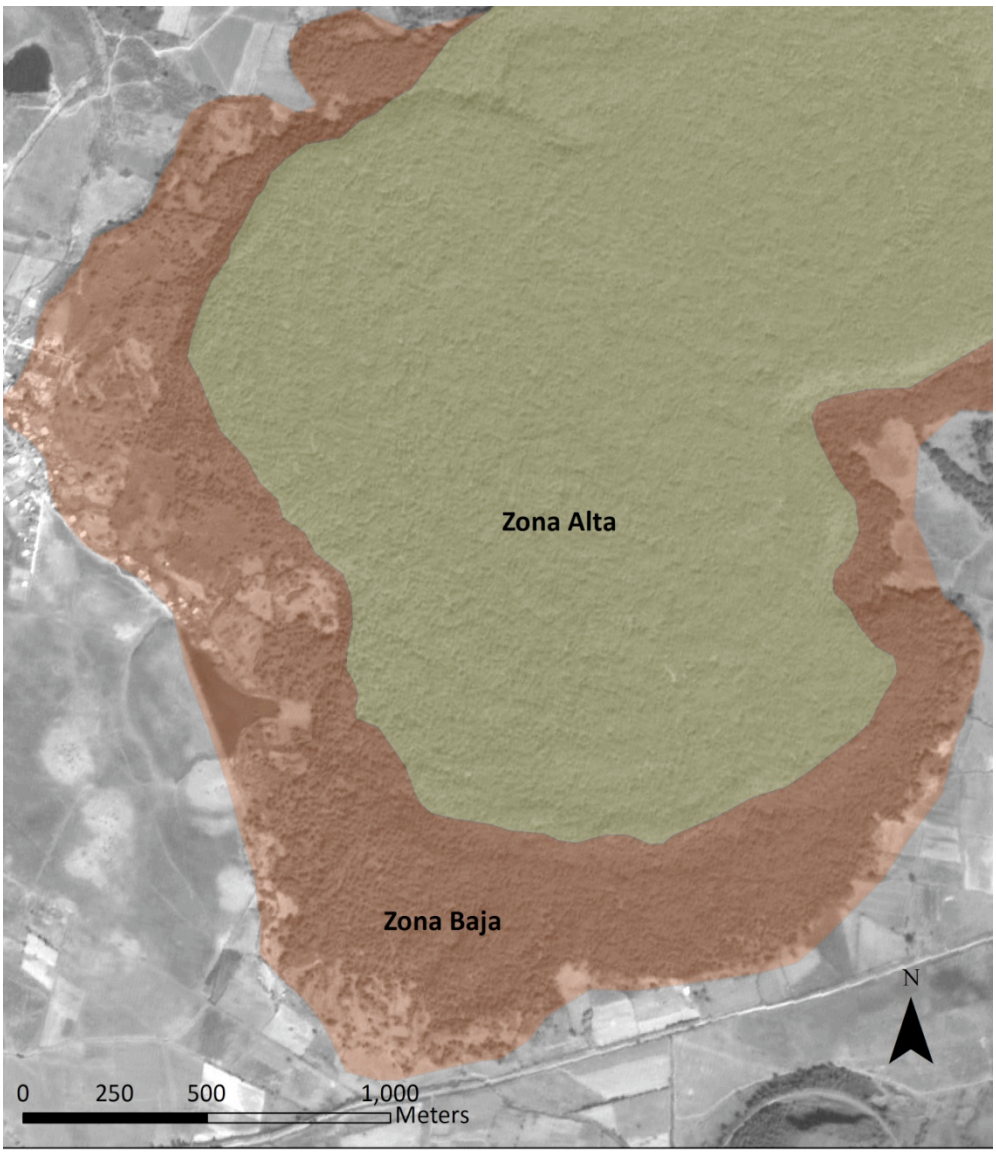

Fig. 3.1. Map of zona alta and zona baja in the south malpaís of Angamuco (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

In contrast to the zona baja, the zona alta is considerably more rugged due to many smaller flow episodes that created an overlapping series of low hills (10-30 m high) and narrow basins (figure 3.2). Architecture in the zona alta is dense and the layout

appears to be largely influenced by topography. Preservation is different in the zona alta because modern agriculture is virtually impossible to practice and as a result most of this zone is forested with oak and occasional pine. Effects on architectural remains in the zona alta are similar to what one might see in the dense tropical forests of the Mayan region. We suspect that much of the soil in the zona alta is of anthropogenic origin, perhaps as a result of midden accumulation and/or transported by residents from the zona baja or lower (Fisher 2011b).

Fig. 3.2. Photo of malpaís of Angamuco from the zona alta (© 2011 LORE-LPB Project).

Fig. 3.3. Photo of malpaís of Angamuco with zona baja in foreground and zona alta in background (© 2011 LORE-LPB Project).

Water sources in the Angamuco malpaís include several small basins along the outer edge of the zona baja that fluctuate in size due to summer monsoonal rainfall. Among these basins, one of the largest is located in the 2010 study area and covers about .50 km^2. Several possible prehispanic *pozos*, or hand dug wells, were documented and modern wells are known to occur near the basins. Preliminary coring by Mexican geologists in 2010 (V.H. Garduño-Monroy, personal communication 2010) suggests that the basin in the 2010 study area may have been artificially dammed in the past.

Previous Research in the LPB

Knowledge of prehispanic settlement patterns and architecture in the LPB region is limited. Since the last half of the 20th century a significant amount of archaeological

research has been devoted to the LPB region by Helen Pollard, Christopher T. Fisher, CEMCA in the Zacapu Basin, and I.N.A.H Mexican salvage archaeological programs. These studies are summarized in Pollard (1995, 2008) and Beekman (2009) and have contributed to a basic understanding of regional settlement patterns in the LPB and the West Central Highlands prehistory.

Work that addresses architecture largely focuses on monumental examples from Tzintzuntzan and Ihuatzio by scholars such as Acosta (1939), Gali (1946), Moedano (1941, 1946), and de la Borbolla (1939, 1941, 1944). Later work in the 20th century by Helen Pollard (1977, 1980, 1993) at the Late Postclassic LPB capital of Tzintzuntzan by described site zones based on surface remains. The archaeological evidence for household structure and other types of architecture in the LPB remains quite limited.

In terms of ethnohistoric evidence, the illustrated plates of the Relación (Alcalá 2008) are the most informative for Tarascan buildings in the LPB region. The Relación shows square residential buildings resembling many of the forms documented at Angamuco with roofs shaped into a crest of straw or palm at the ridge of the roof, and in other cases the roof is pyramidal or conical (figure 3.4). Other examples include verandas or porches and L-shaped buildings with thatched roofs, decorated roof trim, supporting columns, and an enclosed room and an open patio (Alcalá 2008:144) (figure 3.5). In these structures, individuals are seated on chairs, which is an indication of elite status and square shaped buildings sit on platforms, have entrances, and appear to be constructed of wattle and daub (Alcalá 2008: 192). One type of circular structure is relatively smaller with a raised door and protruding edges that was likely a cuexcomate, or granary (Alcalá 2008: 127) (figure 3.5). Another larger variety of circular structure shows a door that is

level with the ground and likely served as a residential structure (figure 3.5). A third type of circular structure (Alcalá 2008: 132) is low to the ground with a small opening and appears to have earthen construction material resembling a *temescal*, or sweat house.

Fig. 3.4. Illustrated plate of L-shaped house from the Relación de Michoacán (Alcalá 2008).

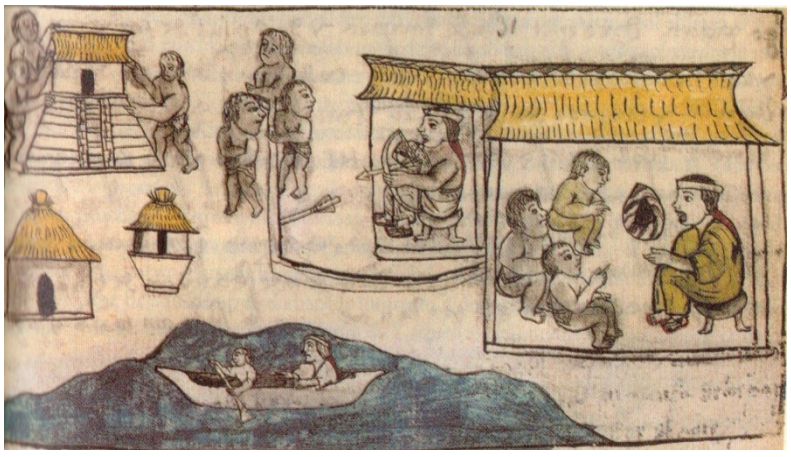

Fig. 3.5. Illustrated plate of residential structures, granaries, and temples from the Relación de Michoacán (Alcalá 2008).

The best documented and most similar to Angamuco in terms of form, temporal placement, and function are the malpaís settlements documented in the adjacent Zacapu

Basin over the last 30 years by French archaeologists at CEMCA (Arnauld et al. 1998; Michelet 1995, 2008; Migeon 1998). The Zacapu malpaís contains over a dozen settlements covering almost 5 km^2 and dating to the Early-Middle Postclassic (AD 900-1350) (Michelet 1995, 2003). The most recent work in the Zacapu malpaís area is Marion Forest's (2010) thesis, which examines spatial patterns at the site of Malpaís Prieto. Houses excavated at the Zacapu malpaís site of Las Milpillas consist of single room rectangular structures measuring 16-32 m^2 (Michelet 2008). These domiciles contained stone foundations and paved patios just outside the single entrance, similar to the house excavated at Tzintzuntzan. The superstructure above the foundations likely consisted of wood and thatch, similar to those depicted in the Relación and several structures have adjacent granaries.

Previous Research at Sacapu Angamuco

Previous work by INAH archaeologists (INAH Gasoducto survey) documented several sites near the edge of the 2009 survey area of Angamuco. A village labeled as Sacapu Angamuco is visible on an early colonial map (ca. 18th century) documented by Beaumont (1932). Two small settlements are named in early historic documents and identified as settlements "X07" and "X08" by Gorenstein and Pollard (1983: 21). These settlements are located near the edge of the southern malpaís of Angamuco and refer to smaller occupations that were present during the Late Postclassic after most of the Angamuco was likely abandoned sometime in the Late Postclassic (AD 1350-1530). The LORE-LPB Project adopted the name Sacapu Angamuco based on these ethnohistoric data, but it is possible the actual location of Angamuco is further north.

LPB Prehistory

There is little evidence of human occupation in the LPB region prior to the Preclassic period (>500 B.C). Deposits comprised of basalt and obsidian debitage, a projectile point, and mano identified in Los Portales cave in the neighboring Zacapu Basin (CEMCA Project, Michelet et al. 1989), north of the Lake Pátzcuaro Basin were linked to the archaic pre-ceramic period (2,500-2,200 BC).

Early Preclassic occupation of the LPB region is represented indirectly from the presence of maize pollen in lacustrine sediment cores dating between 1690-940 B. C. (Bradbury 2000; Hutchinson and Deevey 1956; Watts and Bradbury 1982). The presence of agriculturally based villages with ceramics is best represented at the Formative site of El Opeño (1500 to 800 B.C) (Oliveros 1975, 1988, 1992; Schondube, 1987) in western Michoacán, and contained figurines, ceramic vessels, and objects which suggest a cultural interaction along the Santiago-Lerma River system with other cultures to the west of Jalisco and Nayarit, and also interactions to the east (Pollard 1997). During the Late Preclassic period (<A.D.350) small village societies are known from the adjacent Cuitzeo (Chadwick 1971; Healan and Hernández 1999), Zacapu (Michelet 1992; Michelet et al. 1989) and Pátzcuaro Lake Basins.

During the Middle (~500-150 B.C) and Late Preclassic (150 B.C-A.D 350) (figure 3.6), several cultural groups are identified in Michoacán, including the Chupícuaro, Balsas/Mezcala, and Chumbícuaro (Porter Weaver 1969; Darras et al. 1999; Darras and Faugère 2005). The best known is the Chupícuaro culture, which is associated with distinctive polychrome ceramics, burials, and settlements with no public or monumental architecture located on islands near marshes or along lakeshores and rivers

(Pereira 1996). Evidence of this cultural tradition is found in the highland lake basin of Zacapu and Cuitzeo and along the upper Lerma in the actual states of Michoacán and Guanajuato (Porter Weaver 1969; Darras et al. 1999, Darras and Faugère 2005). Since Chupícuaro tradition ceramics have been, for the most part, found in association to burials, Pollard (1997) has suggested that social ranking may have existed during this time period. However, there is no evidence in the archaeological record of this cultural tradition in the LPB.

Table 1. Phases for the LPB as used in the LORE-LPB Project (Fisher 2011a; Pollard 2008).

Period	**Phases (Fisher 2011a)**	**Phases (Pollard 1993)**	**Timeperiod**
Late Postclassic	Angamuco	Tariacuri	A.D. 1350-1525
Middle Postclassic		Late Urichu	A.D. 1000/1100-1350
Early Postclassic		Early Urichu	A.D. 900-1000/1100
Epiclassic		Lupe-La Joya	A.D. 600/700-900
Middle Classic		Jaracuaro	A.D. 550-600/700
Early Classic		Loma Alta 3	A.D. 350-550
Late/Terminal Classic		Loma Alta 1 & 2	150 B.C.-A.D. 350
Middle Preclassic		Chupicuaro	≥ 500 – 150 B.C.

Evidence for socio-political complexity appears during the Early Classic Period (A.D 350-550), in which the late Loma Alta phases emerge in the LPB, the Zacapu Basin (Carot 2001), and at several sites in the adjacent Cuitzeo Basin (Carot 2001). During this time, characteristics of social stratification appear in the form of burial patterns, settlement sizes, craft specialization, increasingly complex trade networks, and urban development (Pollard 1997). At the type site for Loma Alta in the Zacapu Basin, the appearance of sunken plaza and platform architecture in the Loma Alta 2 phase (A.D. 250–350) is associated with construction materials of basalt and clay transported almost 10 km away and a new burial tradition in which richness of interment is directly related to proximity to platform centrality (Pereira 1996). These burial deposits are currently the best evidence for the timing of the emergence of social ranking among the populations of central Michoacán.

The Classic period (AD 400-900) is a time of major cultural change in Michoacán that involved increasing social stratification and urban development (Pollard 1997). Architectural style changes occur from autonomous villages to the appearance of the first ceremonial centers in the region, some of which contain Teotihuacán-style architecture and artifacts (Pollard 1997). During the Late Classic period (A.D 600/700-900) Teotihuacán culture is suspected of influencing much of western Mexico including the LPB region, but the nature of this process and the ways Teotihuacán culture entered and influenced the region is not well understood. Some of the ceremonial centers and public architecture present in the archaeological record do not show evidence of Teotihuacán‘s influence, such as the large settlement of Urichu (Pollard and Cahue 1999).

Pollard (1997, 2008) proposed that the Purépecha cultural core emerged sometime around the early/middle Postclassic (A.D. 900-1350). According to Pollard (2008), the archaeological and ethnohistoric records suggest that this was a dynamic time in terms of political, economic, and demographic changes. Within the southwest portion of the LPB there is a rise in the number, location, and size of settlements (Pollard 2000) and archeological evidence suggests that inequalities in wealth, status, and power peaked during the Postclassic Period.

Settlement patterns continue to change during the Late Postclassic (AD 1350-1525), perhaps due largely to lake level changes (Pollard 2008). The archaeological data from regions in central and northern Michoacán suggest that population density reached its highest during the Late Postclassic period (Pollard 2008), with the development of a number of functionally differentiated settlements that varied in area and population. Tzintzuntzan was a regional primate center with a large socially stratified population characterized by economic, administrative, and religious hierarchies (Pollard 1993).

Fig.3.6. Photo of twin pyramids at Ihuatzio (Williams 2005).

Fig. 3.7. Aerial photo of the yácatas of Tzintzuntzan (© 2011 LORE-LPB Project).

The emergence and expansion of a centralized state in the Pátzcuaro Basin was associated with a marked increase in the scale of production and a restriction of the control of the technology, raw materials, and products to Purépecha elites (Pollard 1993). Social division between elite and commoner is clearly evident at this time (Pollard 1993)

mt

and stratification within the elite is most apparent in the archaeological record. Diversity in ethnicity, occupation, and status within commoners is also present. Archaeological excavation has defined the material correlates of elite status in residential and mortuary contexts (Pollard and Cahue 1999; Pollard 2005). Elites and commoners located in secondary and tertiary centers of the basin consumed goods identical to those from the capital, shared a Tarascan elite and commoner identity, and participated in a single social system. In terms of architecture, a specialized keyhole-shaped pyramid form, the yácata was constructed at major settlements.

Fig. 3.8. 18th century rendition of Colonial era map (ca. A.D. 1540) of LPB with Sacapu Angamuco in upper left highlighted (from Beaumont 1932).

When the Spanish arrived in the region in the 16th century, the geopolitical core of the Tarascan state was centered in the LPB and their influence extended over 75,000 km^2 in the west-central highlands of Mexico (Pollard 2008) (figure 3.10). The Spanish invasion (ca. AD 1520s) spurred a massive political and economic reorganization, resulting in significant settlement reorganization in the LPB (Pollard 2005). Many settlements, including Angamuco, are absent or rarely mentioned in the historic record (Gorenstein and Pollard 1983; Fisher 2003) and it is not clear whether this settlement reorganization was spurred by Spanish conquest or in response to events predating Spanish contact.

Fig.3.9. Tarascan territory at Spanish Contact (ca. AD 1520's) (adapted from Pollard 2008) (© ESRI ShadedRelief_World_2D).

This chapter has described the environmental and cultural context of the Lake Pátzcuaro Basin, as well as highlighted the gaps in archaeological data that exist in the region, especially in regard to architectural form and layout and settlement pattern studies for the region. Pollard's (1977, 1993) work at Tzintzuntzan is a useful example of urbanism in the region, but it is evident that large gaps remain in knowledge about urban settlement and the ways in which architecture reflect past social organization in the LPB.

CHAPTER 3

Methodology

LORE-LPB Project Background

The LORE-LPB Project was designed to study long-term patterns of socio-natural change in the evolution of complex societies in the LPB. An area of 62 km^2 that has seen little archaeological work in the eastern LPB was chosen by the Project between the Late Postclassic cities of Tzintzuntzan, Ihuatzio, and Pátzcuaro (Fisher 2011a). The study area includes at least one former island, several large hills, or *cerros,* the malpaís of Angamuco, numerous springs, and an extensive portion of former lakebed.

During 2008-2011 the LORE-LPB Project systematically documented over 25 settlements within a 17 km^2 area. Occupations range from the Epiclassic (AD 900/1000) through Contact periods (AD 1520), with the majority dating to the Early-Middle Postclassic periods. Most sites are located on prominent topographic features (*cerros*) between 2040-2100 m asl. The earliest surface evidence comes from the Lupe-La Joya phases (AD 600-1000) with a small occupation (18.3 ha) on the summit of a site within the study area, Cerro Buena Vista, and the newly discovered occupation at Angamuco.

Fieldwork at Angamuco began in 2008 and continues currently. From 2009-2011, the Project documented over 7,000 architectural features covering an area of about 3.5 km^2 (figure 4). This thesis uses data from approximately 1,700 architectural features

documented within a 38 ha area surveyed during from May to July 2010 (figure 4.1) (Fisher 2011a).

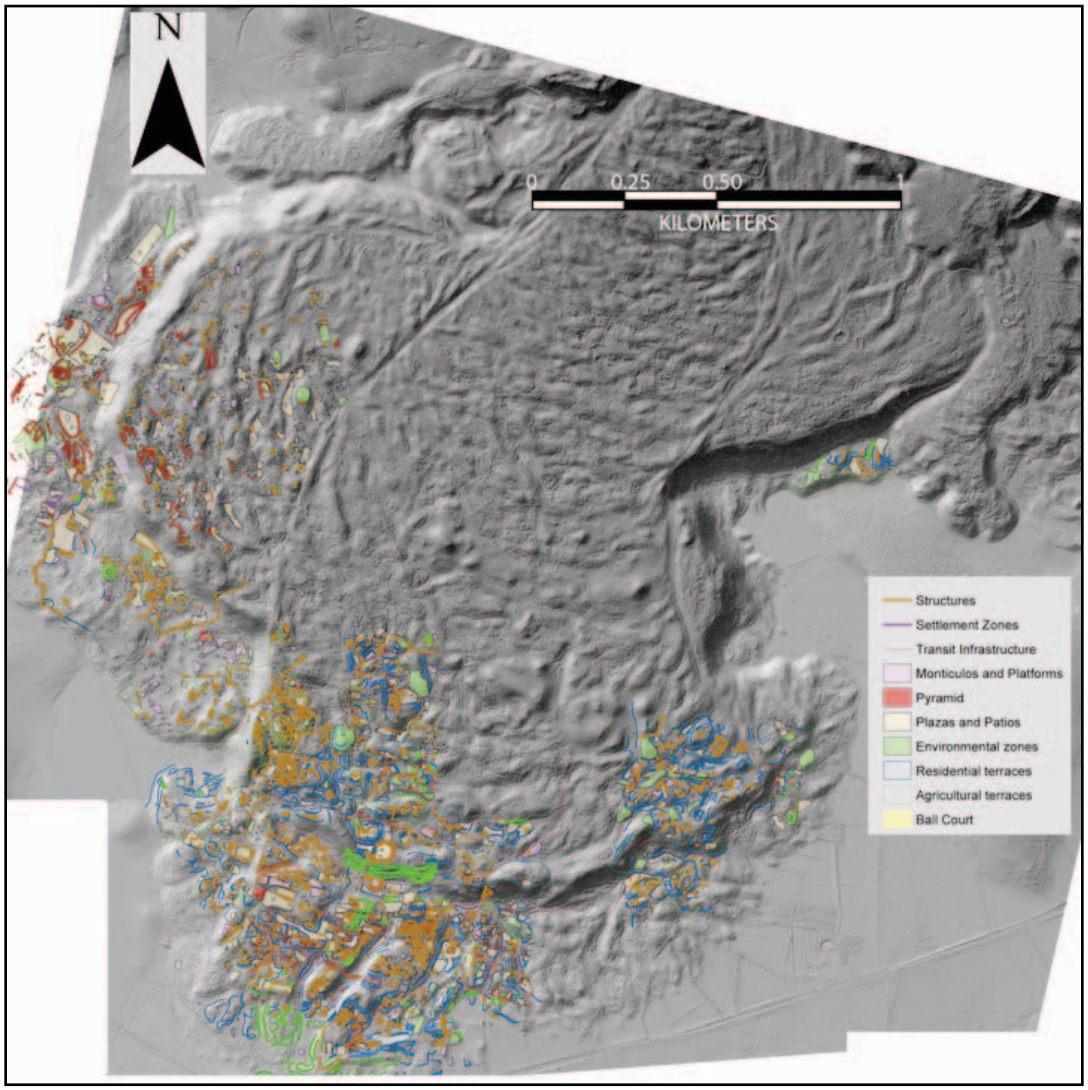

Fig. 4. Map of architectural features documented in the 2009-2011 study area (LiDAR data by Merrick & Company © 2011 LORE-LPB), map produced by Florencia Pezzutti.

To date, the LORE-LPB Project has focused on the western edge of the south malpaís. Reconnaissance by the LORE-LPB Project outside of the 2009-2011 study areas

confirms prehispanic architecture extending over most of the southern malpaís (8 km^2) and into the northern malpaís, with the estimate for the total number of architectural features on the south malpaís is in excess of 20,000 structures (Fisher 2011b). The boundary of occupation is clearly limited to the malpaís landform.

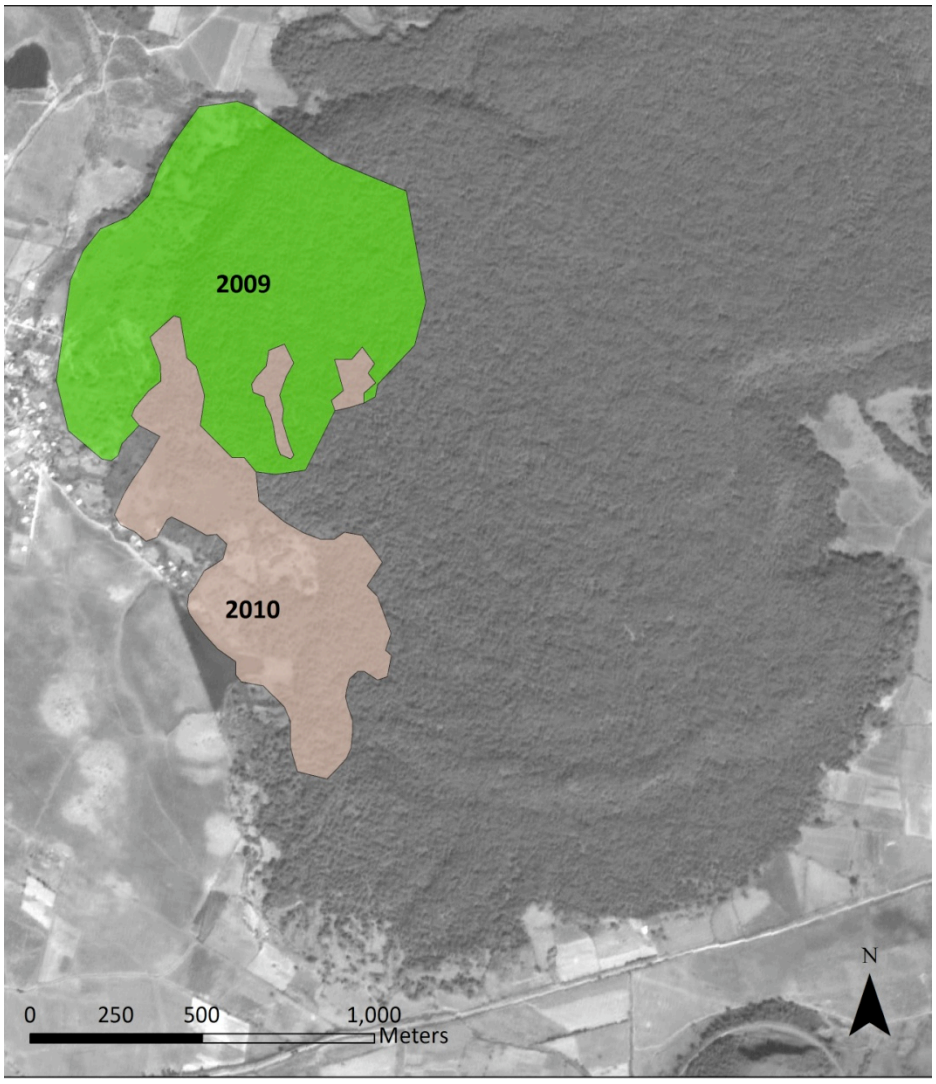

Fig. 4.1. Map of 2009-2010 study area of Sacapu Angamuco (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

Survey Methods

The LORE-LPB Project adapted survey methods from other regions of Highland Mesoamerica such as those implemented in Oaxaca (Balkansky 2002; Billman and Feinman 1999; Nichols 1996) including the Mixteca Region and the Basin of Mexico (Fisher 2011a). These survey techniques were updated to incorporate geospatial tools and techniques including sub-meter accuracy GPS, GIS, satellite imagery, aerial photography, and LiDAR.

For Angamuco, the LORE-LPB Project modified the survey methodology to accommodate the rugged topography and dense vegetation (Fisher 2011a). By taking advantage of the abilities of highly accurate GPS, these modified survey techniques had accuracy closer to full scale mapping with a total station. Survey teams walked transects spaced 10-15 m (figure 4.2) and an inventory of cultural features, artifacts, and ecological information documented in fieldbooks and Trimble® GPS units.

In preparation for field survey and mapping, a nested map grid of the study area was designed in ArcMap™ and incorporated into the GPS units, as well as utilized in the GIS database. The largest scale of the grid begins with 1 km^2 blocks quartered into 500 m^2 square blocks and then divided into 250 m^2 square blocks. A unique designation is assigned to each 1 km^2 and quartered 500 m^2 block (i.e. - block J18NE equals a 1 km^2 block (J18) and 500 m^2 (NE) quarter).

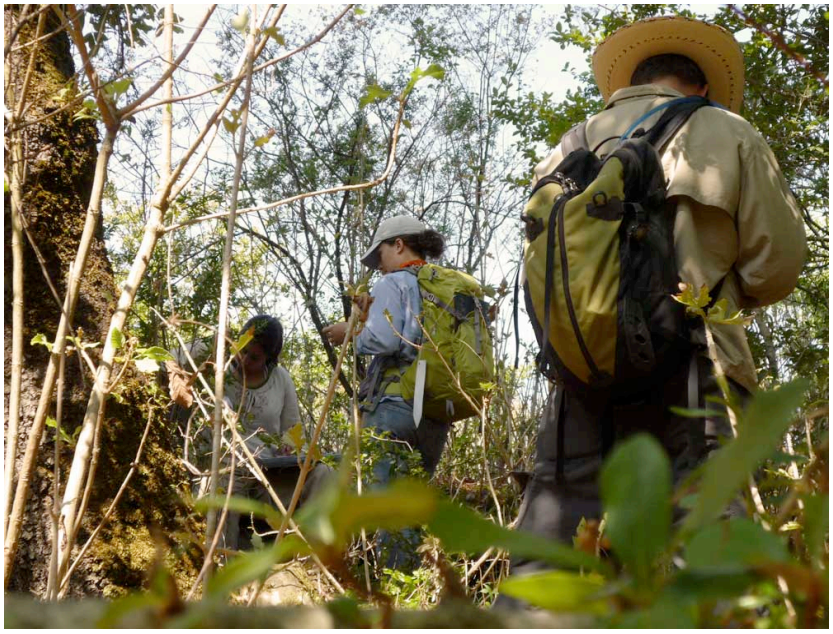

Fig. 4.2. LORE-LPB Project crewmembers surveying in the malpaís of Angamuco (© 2011 LORE-LPB Project).

Structures were measured by field crew with tape measure, photographed, and then cataloged in a Microsoft Access database (ADAM) designed by Steve Sherman at the Center for Environmental Management of Military Lands-Colorado State University. Architectural features were assigned a unique number ordered sequentially.

Archaeological visibility at Angamuco varied throughout the site due to natural and human impacts. Data such as feature integrity and visibility were incorporated into the project database. Additional information regarding site-formation processes includes a preservation index describing the condition of each feature and aids in interpreting the reliability of surface collections and recording of architecture using a classification system comprised of three levels consisting of 1) poor, 2) moderate, and 3) and excellent. In some portions of Angamuco, areas of poorly preserved structures were classified as

zones in the Project map, with most zones consisting of degraded terraces located on slopes between the zona alta and baja or between building groups or as ephemeral building clusters.

Due to rugged topography, heavy vegetation and deep forest cover, material recovery of ceramics and lithics were confined to small areas of minimal ground cover or where soil was exposed from disturbances such a bioturbation or plowing. Materials were often recovered in open fields, plazas, or adjacent to features with ground exposure. Once identified, artifacts larger than 1.5 cm were assigned an annual and sequential lot number, and recorded in the GPS unit.

Mapping and Spatial Analysis

Field data was recorded on a Trimble Nomad™ PDA (Personal Data Assistant) linked via Bluetooth to an external Trimble Pro XT™ GPS receiver using Trimble Terrasync ™ as the mobile GIS software, thus allowing for the collection of accurate and reliable information (figure 4.3). Data such as surface artifact densities, architectural dimensions, and natural and/or anthropogenic features were organized using a data dictionary developed in the Trimble Pathfinder Office™ software.

Fig. 4.3. LORE-LPB Project crewmember using Trimble Nomad GPS (© 2011 LORE-LPB Project).

Both satellite imagery and LiDAR are used in this thesis for maps. The imagery consists of an orthophoto using ALOS PRISM data (© JAXA 2010) processed by the Alaska Satellite Facility of the Geophysical Institute at the University of Alaska Fairbanks. LiDAR was collected over an 8 km^2 area of the southern malpais by Merrick & Company and allowed for development of a high resolution digital terrain model that includes a model of the surface of Angamuco devoid of all vegetation and modern structures (Fisher et al. 2011).

The data dictionary utilized in the GPS proved to be especially useful for organizing large quantities of information collected in the field and served as a "living document" that could be easily modified as new information became available. Each GPS-PDA used a data dictionary using Trimble Terrasync™ software that included a

classification system for architectural features recorded as points, lines, or polygons using real time logging or digitally "sketched" on the unit. The GPS-PDA utilized a Wide Area Augmentation System (WAAS) signal, which allowed real-time horizontal accuracy to within .50-2 m and vertical accuracy to within 1-4 m depending on the availability of the WAAS signal.

GPS data was post-processed daily and corrected in Pathfinder Office™ software to increase horizontal accuracy generally within .30-1 m. Post-processing concluded with exporting the corrected GPS files (.ssf format) into an ESRI shapefile (.shp) format using Trimble Pathfinder Office™ for interoperability with a geographic information system (GIS). Exported data was projected into Universal Transverse Mercator (UTM) with a World Geodetic System datum of 1984 (GCS_WGS 84).

ArcGIS Desktop™ was the GIS program suite used to create maps, manage geospatial data, conduct spatial analyses, and allowed data set manipulation by attribute and spatial relationships at various scales and object dimensions. Base maps consisting of an aerial photograph with the Project grid were produced in ArcMap™ and downloaded into the GPS-PDA's, as well as printed in a paper version for survey crews. Various exploratory spatial techniques such as those outlined by Connolly and Lake (2006) using ArcCatalog™ and ArcMap™ are used in this thesis to analyze architectural patterns, namely the geoprocessing tools such as *buffer, select, and clip* for delineating building group patterns.

Two geodatabases were created in ArcCatalog™ that allowed for the creation of different feature data sets with coordinated relationships among feature classes. Each layer organized in as GPS data was collected during the field season. One geodatabase

was designated for cultural features and a second geodatabase was designated for base maps that could be readily modified as new data became available. The cultural feature geodatabase consisted of several feature classes comprised of structure types (i.e. - platforms, terraces, walls) and artifacts (i.e. - ceramics and lithics), both of which are represented by points, lines, and polygons.

Classifying Architecture

Documentation of thousands of platforms, terraces, ground-level buildings, plazas, and other architectural features involved classification of into formal types based on morphological characteristics. The form and organization of the architecture, together with information from surface collections of ceramics and lithics were used to infer the function and use of architecture. A background of the classification procedure is presented here since it is referenced in the architectural analysis in the following chapter.

Classification of architecture by the LORE-LPB Project began during the 2009 field season and was further modified in 2010. Figure 4.4 is a schematic of the typology illustrating the classification of Angamuco architecture into seven major types and 25 sub-types representing provisional functional classes (Fisher 2009-2011).

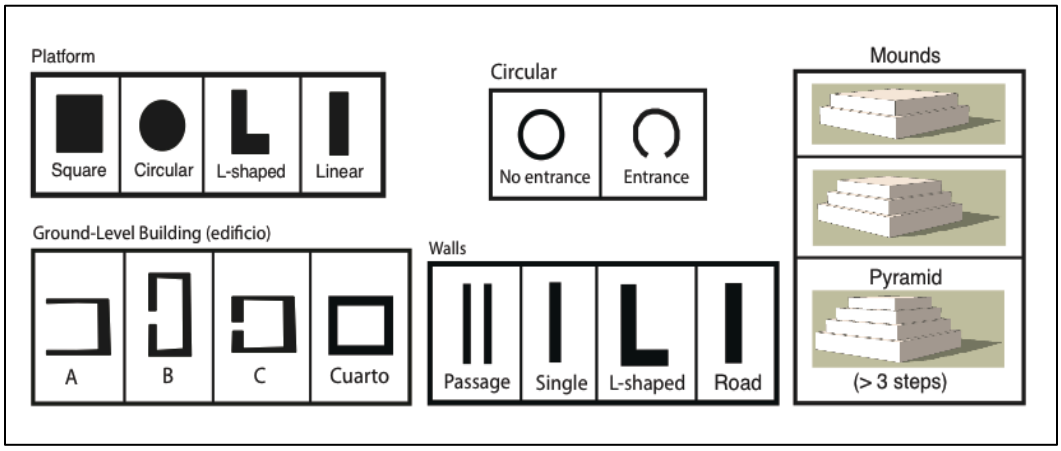

Fig. 4.4. Schematic of Angamuco building typology (© 2011 LORE-LPB Project).

The architectural typology is used in this thesis to develop a classification of Angamuco building groups in the 2010 study area. The flowchart in figure 4.5 illustrates the process used to analyze building groups. The first step involved 1) distinguishing between formal and informal building groups based on the presence or absence of a centralized open space. Step two 2) involved distinguishing formal building groups based on patterns between the central open spaces such as plazas and all surrounding structures regardless if they were domestic buildings (i.e.- house platforms) or non-architectural structures (i.e.-stairs and walls). This step involved using a geoprocessing function in ArcMap™ to create a 10 m buffer around each plaza, plazuela, and patios. The map in figure 4.6 illustrates how the buffer is used for identifying these spatial relationships.

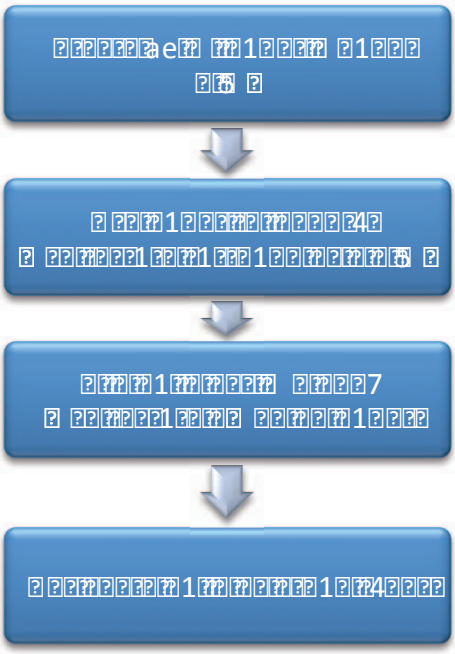

Figure 4.5. Flowchart of analytical process used to identify building groups at Angamuco.

The third step 3) involved using the clip geoprocessing function in ArcMap™ to identify how each types of buildings (i.e. – platform, mound, terrace) and non-architectural structures (i.e.- stairs, passages, and walls) relates to the buffer associated with each plaza, plazuela, and patio. Patterns identified in the previous three steps allowed for the final step 4), which involved creating provisional functional categories of building groups. Groups were identified and assigned a unique designation (BG-building group) and number. Throughout the study area is evidence of informal building groups consisting of residential structures such as platforms and ground-level buildings, however, more work is needed to better understand informal group patterns and is not within the scope of this thesis. The implications of this are discussed in the following chapter.

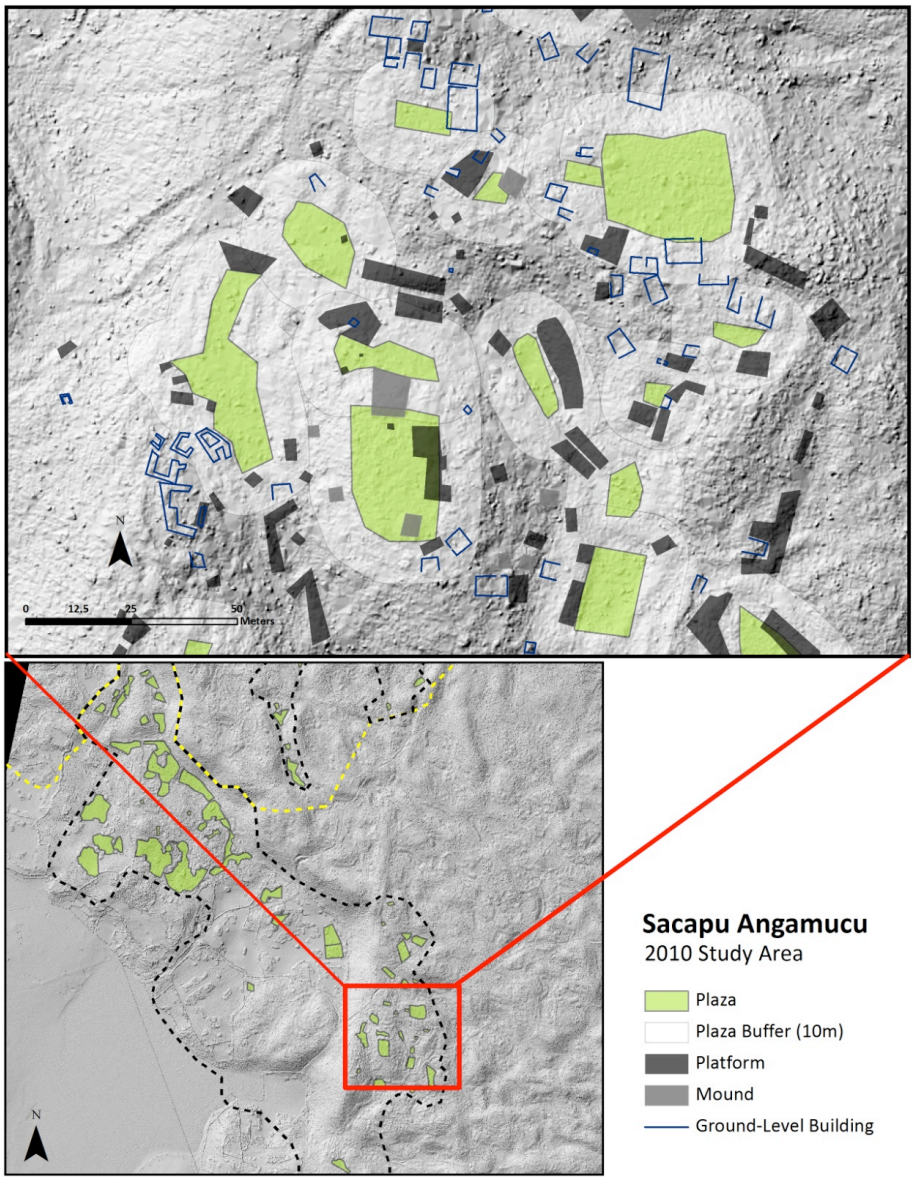

Figure 4.6. Map showing 10 m buffer around plazas in the zona alta (LiDAR data by Merrick & Company © 2011 LORE-LPB).

Discussion

This chapter has summarized the fieldwork methodology employed by the LORE-LPB Project to survey Angamuco and the analytical process used in this thesis to evaluate spatial patterning of architecture. Architecture documented by the LORE-LPB Project at

Angamuco exhibited different degrees of preservation and great effort was taken to systematically record information on architecture using recording techniques that are novel for the LPB region. The surface survey methodology and use of high-accuracy GPS technology and GIS analysis were advantageous for recording the complex and dense settlement amidst the rugged terrain and thick vegetation. In the following chapter, the analysis of architectural patterns at Angamuco is presented to address the questions proposed in the introduction.

.

CHAPTER 4

THE ARCHITECTURE OF SACAPU ANGAMUCO

Analysis of ancient architecture provides one of the best avenues for archaeologists to examine how prehispanic societies perceived and organized their communities (Smith 1992). Spatial relationships such as the form and layout of buildings convey information about a settlement's basic internal structure, which can in turn be used as evidence for interpreting different aspects of organization such as socioeconomic and political structure (Hirth 2000). For example, variation in the size and quality of houses can indicate differences in wealth and status, while variation in the quantity and types of nonresidential structures sheds insight on functional and social complexity of a settlement (Smith 1992; Johnston and Gonlin 1998). A common approach in Mesoamerican architectural studies involves two levels of analysis: 1) an examination of the form and function of structures at a settlement, or its architectural elements (i.e. – platforms, terraces, etc.), and 2) analysis of the arrangement of these structures into groups. Each of these perspectives contributes different types of information important in reconstructing settlement organization (Hirth 2000).

In this chapter, the architecture of Angamuco is examined using both of these approaches based on survey data from the 2010 field season. Architectural units are presented using a format that includes 1) description of the units form and materials and

2) functional interpretations. Results from this analysis are then synthesized in the following final chapter in light of the questions proposed in the introduction.

Individual Buildings

Residential

The map in figure 5 illustrates the overall layout of individual architectural features in the 2010 study area of Angamuco. The most common architectural remain at Angamuco are freestanding stone platforms (n=492), most of which are likely house foundations for perishable structures composed of wood, waddle and daub walls, and thatched roofs. Sizes range from 6 m² (~3m L x 3m W x .80m high) to over 250 m² (25 m L x 10m W x 2m high) and are generally 1-1.5 m high. Four sub-types of platforms identified include square, L-shaped (figure 5.1), linear (or rectangular), and a circular type. Ceramics found in association with platforms indicate a domestic commoner occupation with abundant plainware ollas, tecomates, and other domestic forms (Fisher 2011a).

Another type of stone platform documented at Angamuco includes over 100 stepped *mounds* (n=113), which presumably functioned similar to a platform in that they served as a foundation for a perishable superstructure that was likely domestic in nature. However, it is not well understood if mounds functioned specifically as residential buildings, ritual platforms, or perhaps a hybrid residential/elite function.

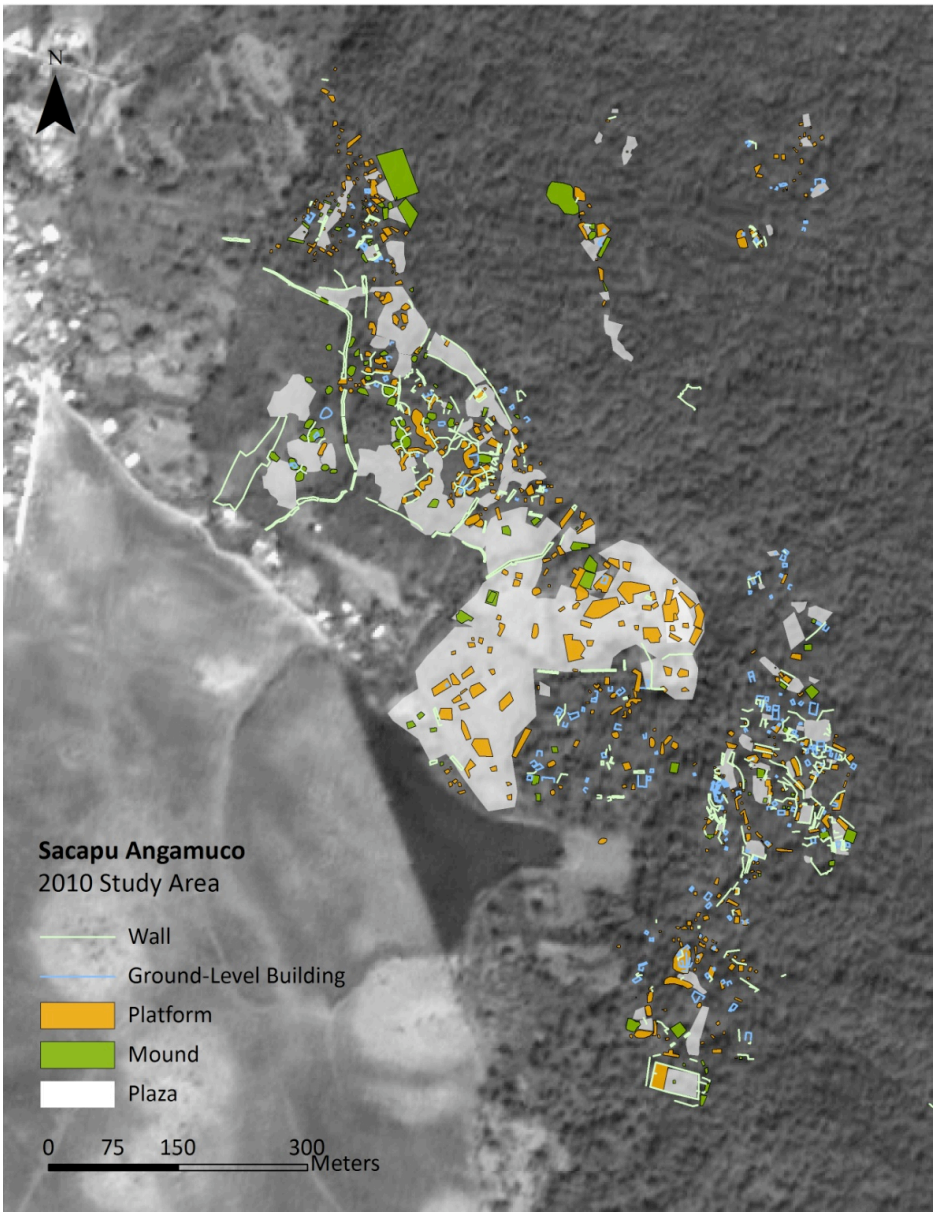

Fig. 5. Map of architectural features (n= ~1700) documented in the 2010 study area (imagery processed by the Alaska Satellite Facility [PRISM © JAXA 2010]).

Fig 5.1. Artist reconstruction of L-shaped residential house platform at Angamuco (© 2011 LORE-LPB Project).

Almost 200 *ground-level buildings* (GLB's) (n=193) were documented in the 2010 study area and are comprised of a low linear stone wall 30-80 cm above the ground surface that likely served as a base for a perishable superstructure consisting of wattle and daub walls and a thatched roof. Over half of the GLB's range from 4 m² to 30 m² in area and about ten percent of the total recorded range from 40 m²-150 m². The four sub-types documented include a 1) u-shaped (type A) type, which consists of three walls and one open side; 2) a rectangular type (type B) with four-side walls and an entrance 30-50 cm wide on one side; type C 3) ground-level buildings, which are similar to the type B forms, except they are square shaped with relatively equal dimensions; and 4) *cuartos*, which are enclosed four-sided stone walls with no entrance. Approximately fifty-eight percent of ground level buildings (n=112) recorded in 2010 occur in the zona alta. Variation in the size and form of GLB's suggests they served different functions ranging

from houses to ancillary structures such as kitchens and storage shed. Many ground level buildings resemble the verandas depicted in the plates of the Relación (Alacala 2008: 140).

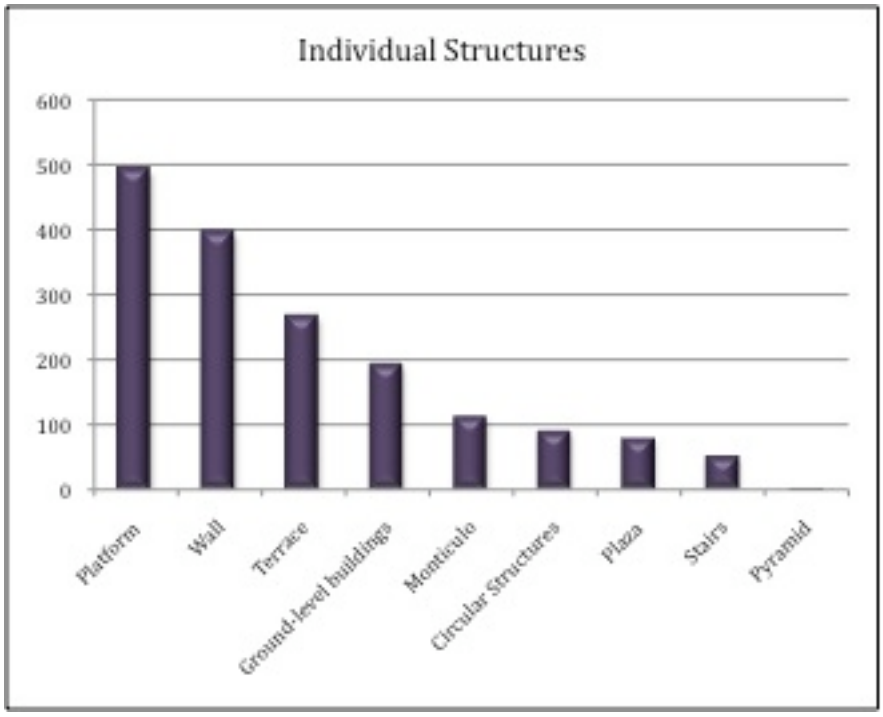

Fig. 5.2. Graph of individual structures documented at Sacapu Angamuco in 2010.

Habitation terraces are large three sided stone and/or earthen terraces built into a slope, with sizes ranging from 10-25 m long and 3-5 m wide. Many habitation terraces exhibit traits similar to *talud*-style platforms documented in central Mexico. The function of these structures is not well understood, but the scale of construction suggest they functioned as basal platforms for one or more perishable structures, as retaining walls for houselot garden plots, or for combined residential/agricultural activities.

Temples

Several temples were recorded during the 2009-2011 field seasons. These include a stepped rectangular type (2010), a keyhole-shaped yácata style similar to the massive pyramids at Tzintzuntzan (2011), and a square mound built on top of a low hill (2009). Pyramid-1, recorded in 2009, is built on the summit of a large natural hill (~40 m high and 60 m wide) that has been terraced to enhance its monumentality and borders a series of large plazas with several stone rubble piles that may have been smaller temples or elite compounds. Pyramid 2738, located in the southern part of the 2010 study area, is a large freestanding rectangular stepped mound approximately 15 m high (figure 5.3).

Fig.5.3. Photo of LORE-LPB Project crew members standing on top of pyramid 2738 (© 2011 LORE-LPB Project).

Agricultural Features

Several types of agricultural features were documented in 2010 including terraces and granaries. The scale of construction and layout of terraces suggest a diversity of agriculture was practiced and at different scales and intensity ranging from extensive terraces to small houselot gardens. Almost 300 terraces were documented in the 2010 study area and more likely occur, but due to preservation many terraced areas were documented as fragmented zones. Cultivation terraces are considerably more narrow (1-3 m wide) than habitation terraces (3-5 m wide) and most are supported against the slope by a stone wall or in some cases by a an earthen embankment.

Among the circular structures (n=90) documented is a type (type A) that likely functioned as a *cuexcomate* or granary. Type A circular features are comprised of a circular stone wall 30-50 cm high that is 1-1.5 m in diameter and likely served as a base for a superstructure consisting of a mix of perishable material such as adobe and stone. Cuexcomates are illustrated in the plates of the Relación de Michoacán (figure 5.4). Another type of circular structure (type B) documented is a stone-lined (2-2.5 m dia.) sunken wall with an entrance and likely functioned as a *temascal*, or sweat bath (figure 5.5).

Fig. 5.4. Granary depicted in the Relación de Michoacán (Alcala 2008: 148).

Fig. 5.5. Photo of temescal documented in the 2009 study area (© 2011 LORE-LPB Project).

Non-architectural Features

Non-architectural features refer to formalized spaces between buildings that served different functions such as providing privacy between residences or directing human traffic between buildings and groups of buildings. Several hundred walls (n=396) were documented in the 2010 study area including different forms such as small single walls, double walls for passages, and L-shaped walls. Single and L-shaped walls ranged from small 2 m^2 to (1 m x 2 m) to over 16 m^2 (1.5 m x 8 m+). The largest walls were documented in the zona baja, many of which enclosed a series of large plazas. These walls extend up to a 100 m or more in length, are up to 2 m thick, double-sided, and filled with a rubble core (figure 5.6).

Formal access between buildings and large portions of Angamuco are directed by stairs, passages, and roads. Among these are various types of stone walls to demarcate passages and stairs to provide access among the rugged topography. A fragmentary network of long, deeply incised roads and smaller, and ephemeral paths were documented. Remnants of formal raised roadways made of stone lead from the west edge of the settlement into the zona baja and leading up to the zona alta. In the zona alta, an extensive network of well worn paths cross the malpaís from west-east and north-south.

Fig. 5.6. Photo of author on a massive wall (2446) surrounding a large multi-plaza complex in zona baja (© 2011 LORE-LPB Project).

Plazas

Nearly 80 (n=79) *plazas, plazuelas, and patios* were documented in the 2010 study area (figure 5.7). Patios are small open areas less than 250 m^2 and served to embellish residential compounds as a private open space. Plazuelas, a term first coined by JES Thompson (Thompson 1931) in the Maya region, is used to describe small plazas that occur as either sunken or partially open spaces ranging from 250 m^2-1000 m^2. Sunken plazuelas occur in the narrow valleys of the zona alta and their sunken appearance is further enhanced by surrounding structures built adjacent to and above the floor level of the plazuela. In contrast, plazas occur as open leveled areas, with sizes ranging from 250 m^2 to over 6000 m^2. Partially open plazas and plazuelas occur at the base of gradually sloping hills that were leveled to construct flat open spaces.

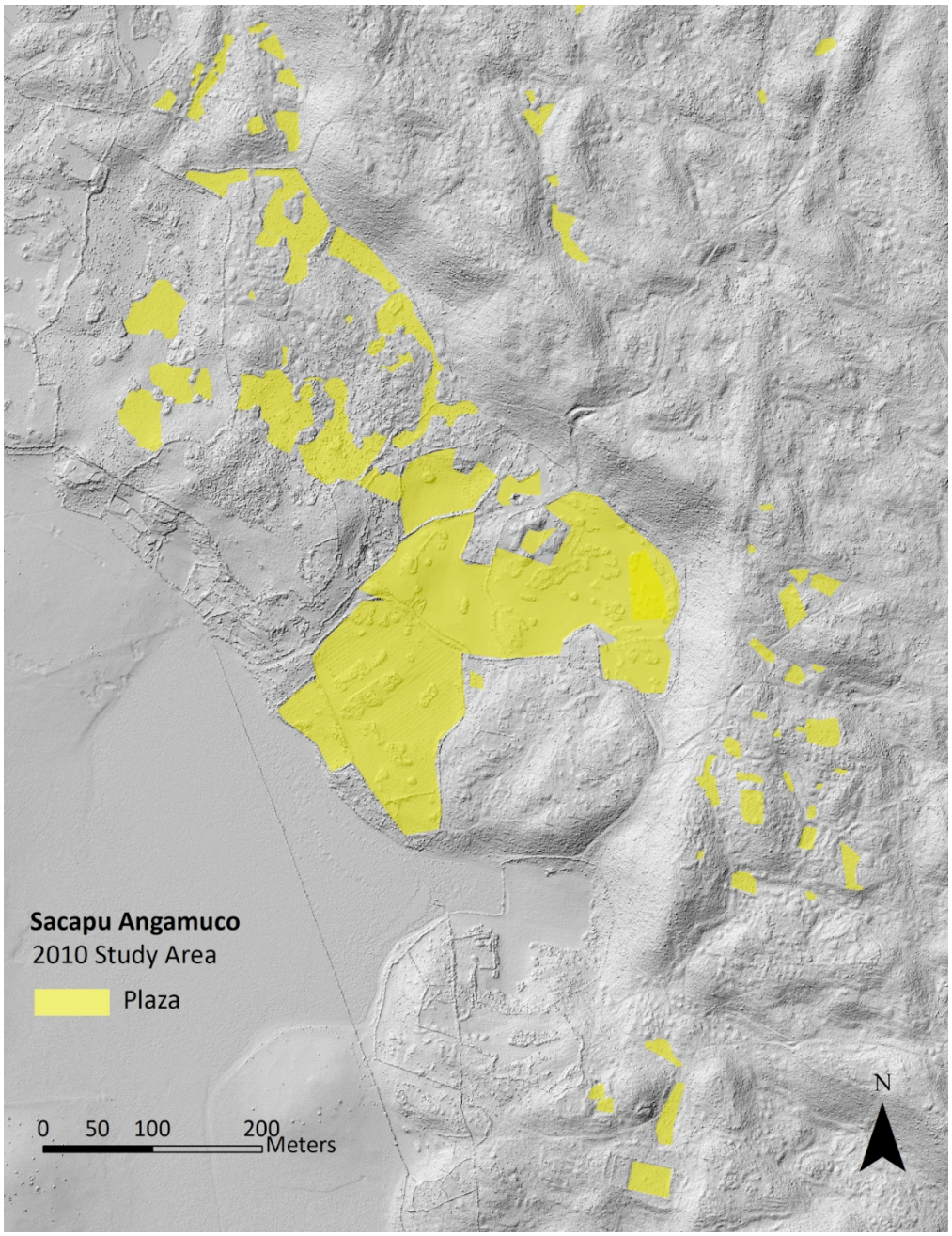

Fig.5.7. Map of plazas documented in the 2010 study area (LiDAR data by Merrick & Company © 2011 LORE-LPB).

Most platforms, mounds, terraces, and other non-architectural features usually occur in integrated groups with plazas, plazuelas, and patios rather than as isolated structures.

Surrounding buildings associated with open plazas were constructed at the open space level on low, lineal flanking platforms that defined one or more sides of the space. These platforms elevated the structure on them, emphasizing their importance with respect to other structures in the plaza. Plazas have the appearance of being slightly sunken even when they represent the original ground surface on which surrounding structures were constructed.

Building Groups

Few of the individual structures documented at Angamuco are spatially isolated. Most of the approximately 1700 individual buildings mapped during 2010 can be placed into 51 relatively discrete formal building groups comprised of a planned central open space (i.e. - patio, plazuelas, or plaza) and associated buildings (figure 5.8). Patterning in the spatial layout of plazas confirms these features were not only physically demarcated by the architecture on their edges, but that their relationship to specific building types provides clues to the function of building groups. On a more simple level the identification of building groups enables a basic understanding of how the site is organized. Table 5.9 outlines the basic characteristics of building groups.

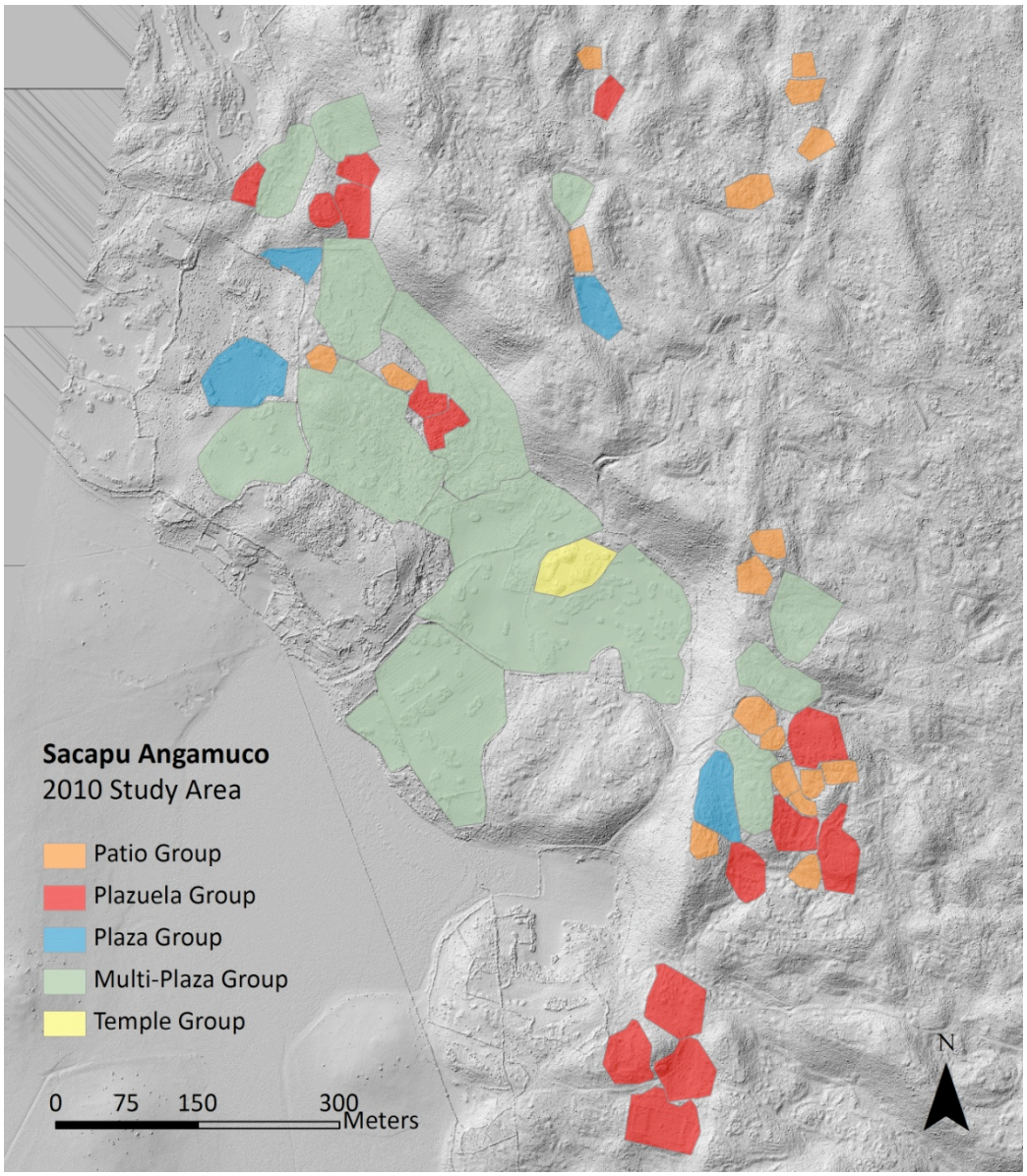

Fig. 5.8. Map of building groups at Angamuco (2010) (LiDAR data by Merrick & Company © 2011 LORE-LPB).

Several elements characterize Angamuco building groups including negative space and surrounding buildings. Negative space characterizes plazas, plazuelas, and patios that represent intentionally designed prepared areas for specific kinds of activity ranging from private, semi-private, and public functions. The form and scale of

construction of these spaces provide clues to the function of the group and reflects at least to some degree the amount of labor invested in their construction and the level of planning. These central spaces that characterize formal building groups served to unify surrounding buildings into a cohesive functional group, which leads to the next element to be considered.

Type	Building Group	Surrounding Buildings
I	Patio	- Patio (<250 m^2) - Platforms (6 -20 m^2) - Ground level buildings
II	Plazuela	- Plazuela (250 m^2 – 1000 m^2) - Platforms - Mounds - Habitation Terraces
III	Plaza	- Plaza (1000 m^2 – 3000 m^2) - Platforms - Mounds - Habitation Terraces
IV	Multi-Plaza	- Two plazas (1000 m^2 – 3000 m^2) - Large platforms (>100 m^2) - Large mounds (>100 m^2) - Large habitation terraces (>100 m^2)
V	Temple	- Pyramid - Large platforms (>100 m^2) - Stepped mounds (>100 m^2)

Table 5.9. Table of building groups documented in the 2010 study area.

The type of buildings, their quantity, scale of construction, and layout reflect how the group functioned. All of these provide clues about the function of building groups. The sequence of construction for building groups over time is an important consideration (i.e. - one building episode vs. accretion over time), but is beyond the scope of this thesis. The types of non-architectural structures, such as stairs, passages, and walls associated with a building group are also considered in this analysis, but not addressed in detail because we only have fragmentary evidence of these features.

An important factor to consider is the state of preservation of many of the buildings and plazas in the zona baja, which have been disturbed by milpa agriculture and cattle grazing. The general form of buildings such as platforms and mounds are identifiable, but the dimensions are exaggerated by the piling of stones for clearing from adjacent fields. Similarly, plaza boundaries were in some cases difficult to delineate because they had been recently plowed.

Patio Groups

Patio groups at Angamuco (n=18) consist of an arrangement of two or more buildings including platforms (5-30 m^2), ground-level buildings (3-54 m^2), and mounds (27-94m^2) arranged around a patio or courtyard (<250m^2) (figure 5.10). There is no patterned orientation of patio groups, nor are they consistent in size and layout. Other characteristics of patio groups include small terraced areas and granaries and/or temescales. In the zona alta, patio groups are comprised of a relatively diverse assemblage of residential buildings that include platforms and ground-level buildings. In the zona baja, patio groups are bordered mainly by platforms, and fewer ground level

buildings. Most patio groups are located in the zona alta (n=16) and are relatively spatially discrete from other adjacent buildings groups. Only two patio groups occur in the zona baja, both of which are located within a large complex of multi-plaza groups. The presence of domestic house platforms and their layout around a central patio suggests patio groups at Angamuco functioned as single-family households.

BG-36 is a good example of a zona baja patio group and is located between two large multi-plaza groups (BG-26) on the north and (BG-28) on the south. BG-36 consists of a small sunken patio (4172) covering 32 m^2. This patio is associated with six buildings that include three platforms ranging in size from 7-27 m^2. Other buildings include two mounds that cover 71 m^2 and 94 m^2 (4170 and 4176), as well as one ground level building (4160) covering 19 m^2. The west edge of the patio group is bordered by a massive wall (2871) that contains within it several large multi-plaza groups. There is an entrance on the west side of BG-36 that edges up against the wall and leads into a separate building group (BG-49) to the west.

BG-56 is a zona baja patio group consisting of a patio (2147) covering 42 m^2 and surrounded by low walls and two platforms (15 m^2 and 20 m^2) on the south end and a Type B ground-level building (11 m^2) to the east. Four outlier platforms (9-27 m^2), including two L-shaped platforms, and a ground level building (5 m^2) extend south of the main plaza and east of the patio. The north edge of the plaza group is adjacent to a modern trail leading from the zona baja into the zona alta and is likely a major prehispanic path.

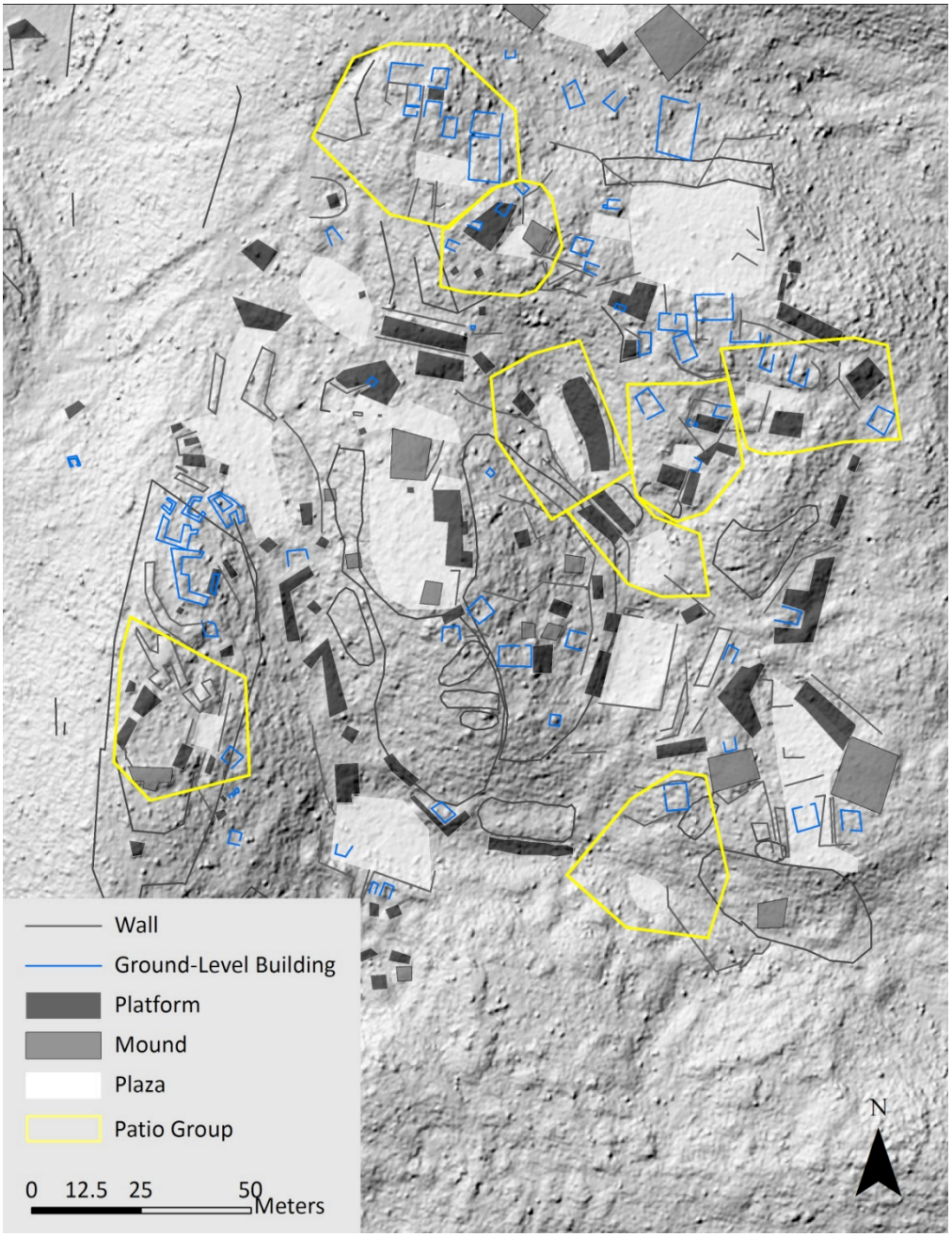

Fig. 5.10. Map of patio groups in zona alta (LiDAR data by Merrick & Company © 2011 LORE-LPB).

.

Plazuela Groups

Plazuela groups (n=15) consist of six or more buildings around a sunken or partially open plazuela (250-1000m^2) (figure 5.11). Surrounding buildings consist of platforms (13-46 m^2), mounds, habitation terraces, and ground level buildings (5-76 m^2). Plazuela groups consist of a diversity of building types including residential and agricultural structures. Large terraced areas are associated with many plazuelas groups. Most of the sunken plazuela groups occur in the zona alta and their orientation appears to be determined by the natural depressions or valleys between ridges, where they were constructed in the valley troughs to maximize precious open, leveled space. Presumably the stone was removed from clearing these spaces and then subsequently used to construct adjacent platforms and habitation terraces upslope to further enhance the sunken appearance of plazuelas. Several sunken plazuelas are fully enclosed by sloping and/or vertical stone walls and accessible via stairs descending into the plazuela floor. Partially open plazuelas with one open side were built into hillsides. The depth of open plazuelas was further enhanced by the construction of surrounding platforms and habitation terraces. Partially open plazuelas mainly occur in the zona baja. Plazuela groups presumably functioned as residential areas for extended households with the quantity of residential buildings presumably reflecting the number of occupants in a group.

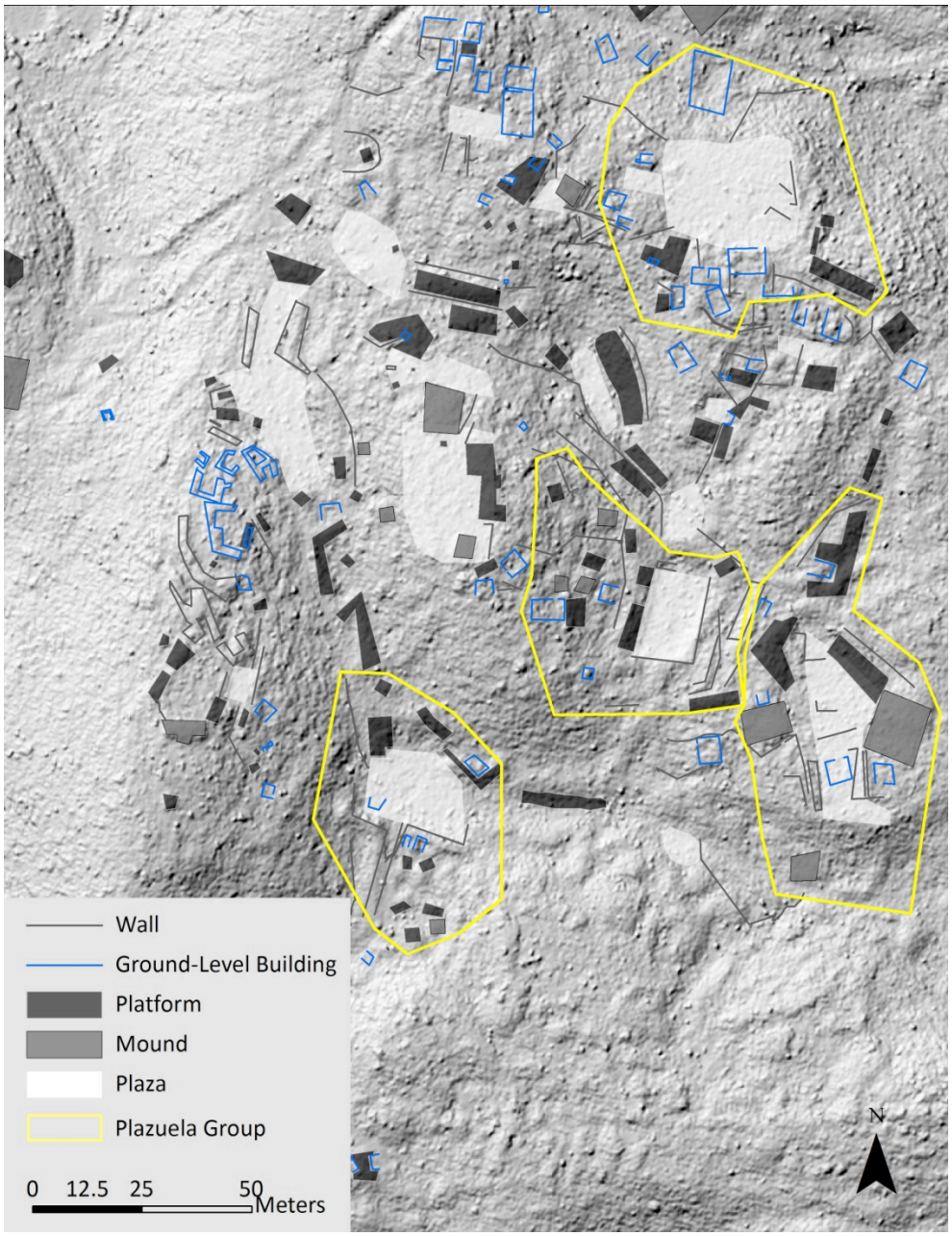

Fig. 5.11. Map of plazuela groups in the zona alta (LiDAR data by Merrick & Company © 2011 LORE-LPB).

.

BG-31 is an example of a plazuela group that is located on a low hill between the zona baja and alta. The top of the hill has a large sunken plazuela (3286) that covers an

area of 254 m^2. This landform was termed “El Palacio” because of its fortified appearance and layout, which consists of terraces on all sides and a prominent view of the zona alta and Lake Pátzcuaro to the west. The hill overlooks much of the zona baja and is adjacent to large multi-plaza groups along the north, west, and south. BG-31 is comprised of six buildings, including three mounds ranging from 38-68 m^2 (3274 and 3258) and three ground-level buildings ranging in size from 10-44 m^2. The scale of a buildings and location on a promontory location suggests it may have functioned as an elite household group.

Plaza Groups

Plaza groups (n=5) consist of a large open plaza (1000-3000 m^2) bordered by five or more buildings that include platforms (30-210 m^2), mounds, habitation terraces, and ground level buildings (5-42 m^2) (figure 5.12). Most plaza groups occur in the zona baja where the scale of construction is larger for both plazas and associated buildings. Ground-level buildings are more common in zona alta plaza groups. Historically and, no doubt before European contact, plazas were an important setting for the expression of Mesoamerican politics (Low 1995) and generally functioned as public spaces. Most plaza groups at Angamuco, however, do not appear to function as spaces for large public gatherings, but exhibit characteristics similar to an extended household residential group.

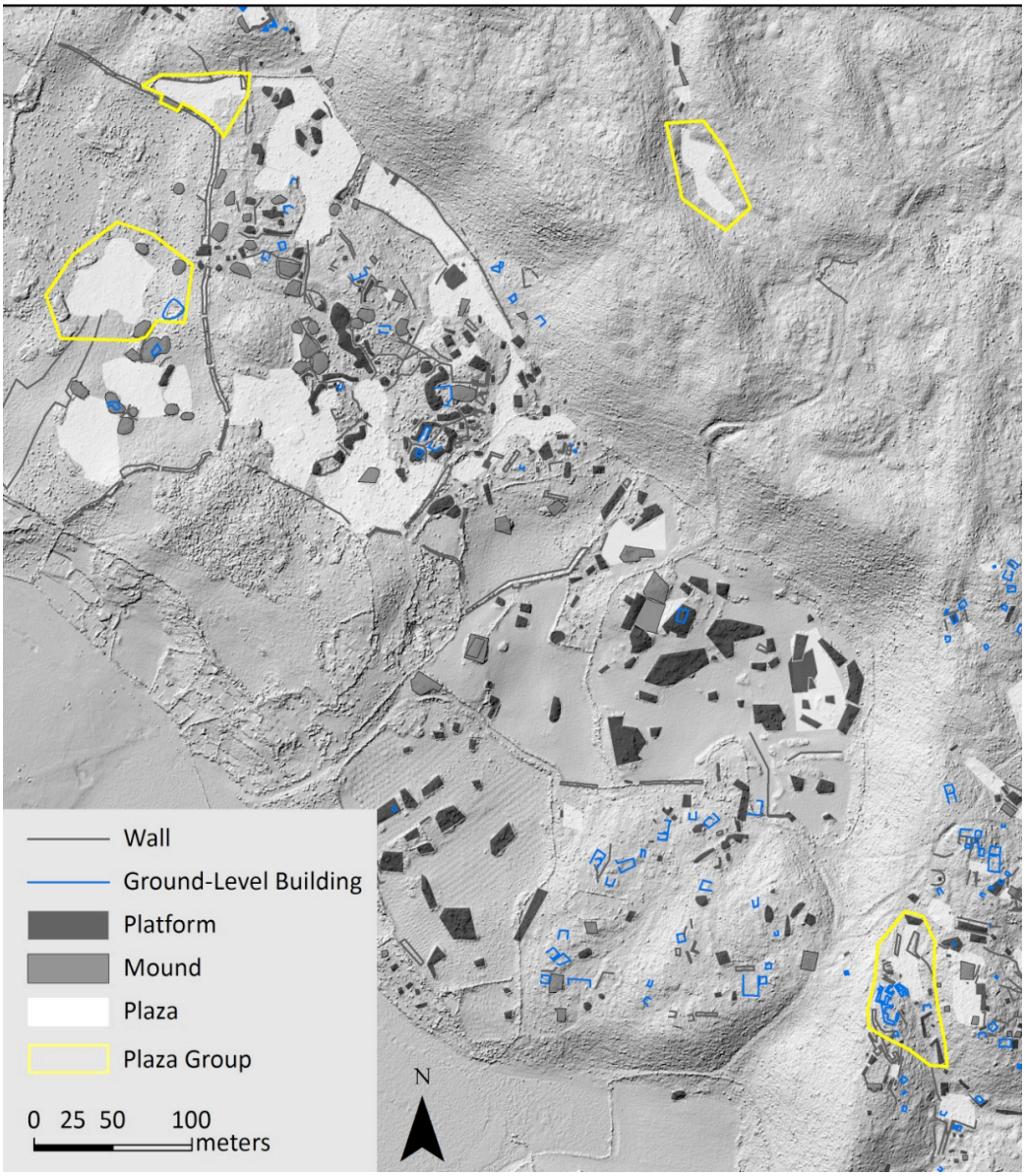

Fig. 5.12. Map of plaza groups in the 2010 study area (LiDAR data by Merrick & Company © 2011 LORE-LPB).

The best likely contender for public plaza groups is in the zona baja where plaza groups are larger and located near temple groups. For example, BG-21 is a zona baja plaza group whose proximity to a temple group (BG-57), scale of surrounding buildings, and overall

layout suggest it functioned as an elite and/or civic-ceremonial area.

BG-15 is a plaza group in the zona baja with a large open leveled type plaza (2534) covering 962 m^2. This group is comprised of eight buildings and an altar in the middle of the plaza. A large platform (2504) covers an area of 340 m^2 bordering the west edge of the plaza served as a base for ground level buildings on top. Another large platform (2524) extending 65 m^2 is located 15 m north of the plaza. The east side of the group is bordered by four mounds ranging in size from 19-94 m^2 and a small 12 m^2 mound (2548) on the north side. The plaza is surrounded by a 1 m thick wall that likely dates to the Colonial Period.

BG-10 is a large plaza group consisting of a plaza (2640) covering 1008 m^2 on the north end and 26 buildings extending south of the plaza. Nineteen platforms (3-64 m^2) were documented in the group ranging in size from. Several large sloping walls make up the north end of the plaza and were likely habitation terraces or degraded platforms. Between the main plaza and patio are five ground level buildings ranging in size from 10-120 m^2. Several large walls 1.5 m high and 2-9 m long are dispersed between the plaza and patio and may be building remnants.

Both examples mentioned above illustrate patterns in plaza group form between the zona alta and zona baja. For example, the number of structures are not necessarily related to the size of plaza. Some large plazas have fewer surrounding buildings than smaller plazas with a higher number of buildings. BG-10 exemplifies how zona alta plaza groups can have a relatively smaller plaza, but contain a high quantity of surrounding structures.

Multi-Plaza Groups

Multi-Plaza groups (n=12) consist of two or more plazas connected by wide passages (5-10 m) and bordered by a dozen or more platforms, mounds, habitation terraces, and ground-level buildings (figure 5.13). There are significant differences in the scale of construction between multi-plaza groups in the zona baja versus the zona alta. The largest multi-plaza groups occur in the zona baja. Plaza areas are larger (400-1800 m^2) and surrounding buildings are larger in volume. A network of several multi-plaza groups in the zona baja (BG-22, 26, 28) covering an area of 270 m x 280 m are located within a robust outer perimeter wall (2446) (2 m h x 2.5 m w) that is filled with a rubble core and entrances consisting of raised mounds. The wall is a clear division of space suggesting this area was purposely separated from other parts of the settlement. The scale and layout of multi-plaza groups in the zona baja make them the most likely candidates for public architecture, elite households, or as structures that served a combined residential, public, and administrative function.

In the zona alta, multi-plazas are smaller and their interconnectivity appears to result from the connection between valleys. Fewer buildings are associated with zona alta multi-plazas and the scale of construction is relatively smaller than the zona baja. Ground level buildings are more abundant and platform size on the average is smaller and there are more agricultural terrace zones. BG-7 is an example of a multi-plaza group in the zona alta that is comprised of three plazas connected by platforms and mounds, with several ground-level buildings are located on the south edge.

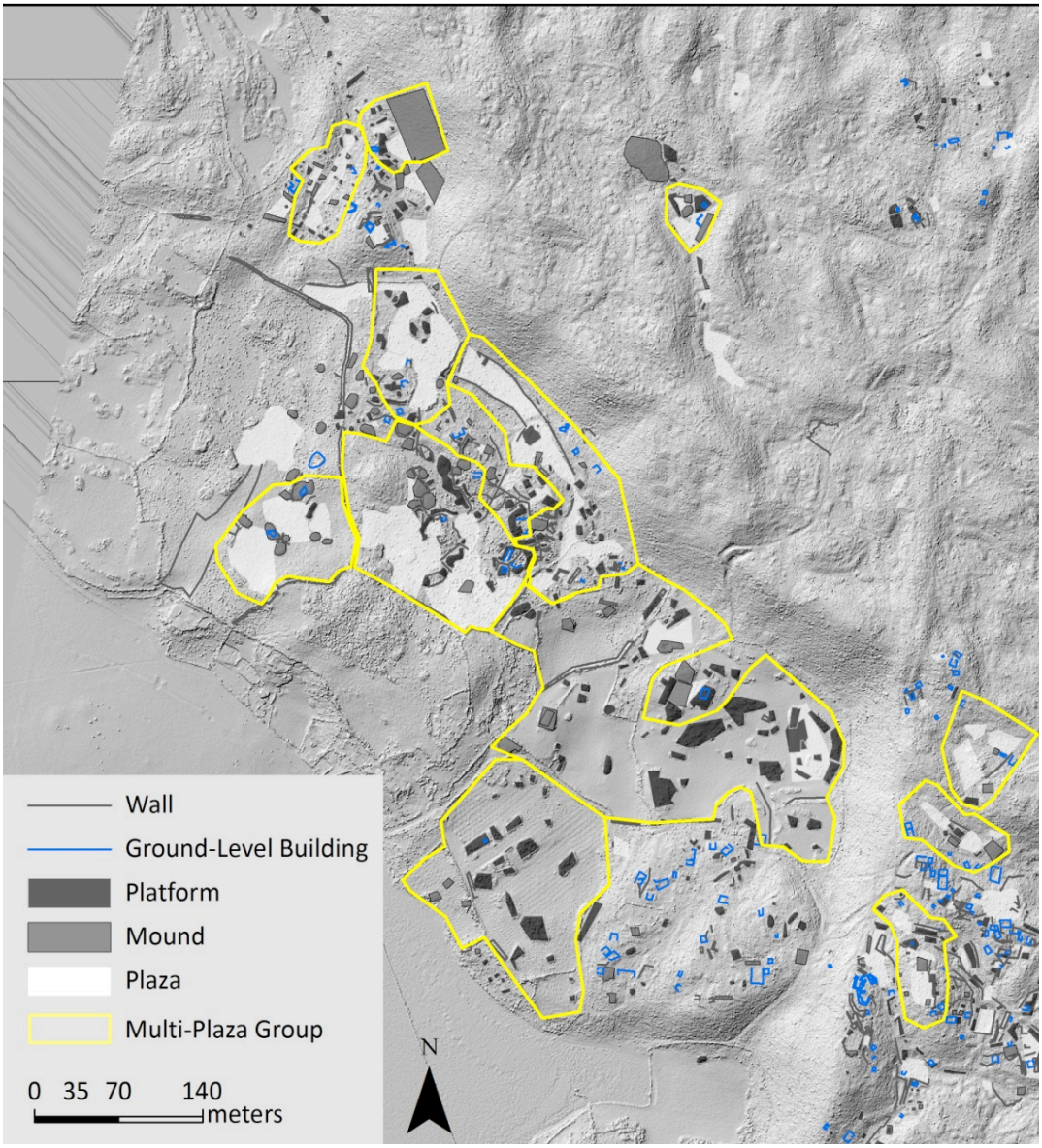

Fig. 5.13. Map of multi-plaza groups in the 2010 study area (LiDAR data by Merrick & Company © 2011 LORE-LPB).

.

BG-26 is one of the largest multi-plaza groups and consists of 22 buildings surrounding a large plaza (4120) and a side flanking plaza (4134) covering a total area of almost 6500 m^2. The main plaza (4120) measures roughly 60 x 65 m. Among these buildings most are large platforms (19-210 m^2) and mounds, and only three ground-level

buildings are present. A large, sloping talud-style terrace marks the east edge of the main plaza separating it from another multi-plaza group, BG-22. Many of the fifteen platforms are relatively tall (1.5-2 m) with intact multi-coursed stone walls marking their boundary. Four mounds (18-70 m^2) were documented and are considerably more robust compared to most mounds documented elsewhere in the study area. Three ground level buildings (12-27 m^2) are dispersed between a side plaza extending from the main plaza (4120) and a flanking plaza (4134), along the south edge of BG-26. The northeast side is of the group is bordered by a modern or colonial wall that borders the base of the heavily terraced slope ascending to the zone alta. A passage connects this plaza group with another plaza group, BG-27. The north side of BG-26 opens up to other plazas via several passages.

Multi-plaza groups are the largest building group, relatively limited in number, and display the most elaborate organizational plan at Angamuco. The scale of construction indicates high resource use in terms of building materials and the extent of modification suggests they functioned as elite residential complexes and/or civic-ceremonial areas.

Temple Groups

Temple groups at Angamuco vary in form and layout and they all occur in the zona baja. The primary elements of a temple group include a pyramid or yácata associated with a plaza and two or more large platforms and mounds. Three temples were identified in the 2009-2010 study areas and reconnaissance in the remaining portion of the southern malpaís confirms more temple groups exist. However, for the purpose of this

analysis, the single temple group documented in the 2010 study area is presented here because it is currently the best documented sample.

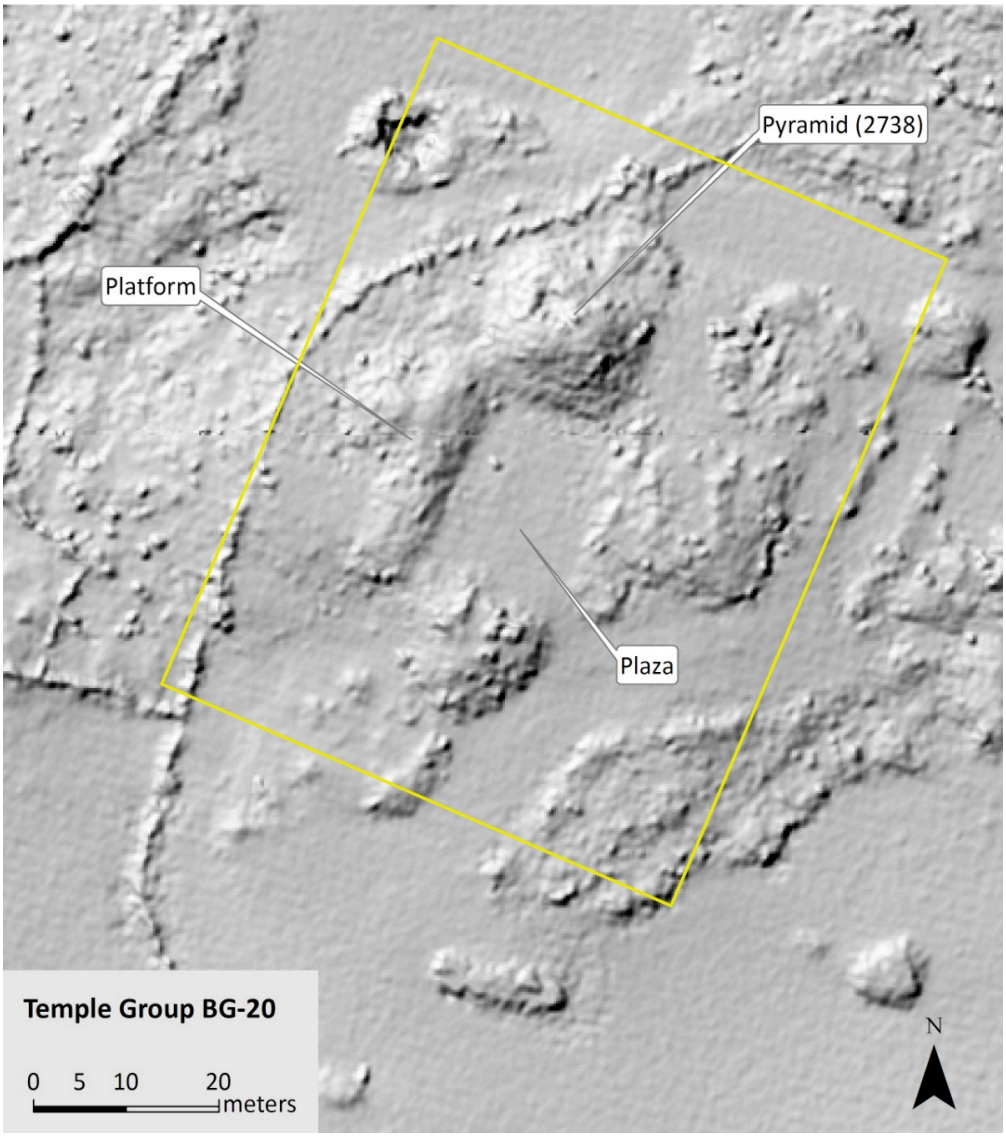

Fig. 5.14. Map of BG-20 temple group in zona baja (LiDAR data by Merrick & Company © 2011 LORE-LPB).

BG-20 is located in the zona alta approximately 50 m south of the steep hillside ascending to the zona alta. This group is comprised of four buildings including a central plaza (2738) (430 m^2), a large rectangular pyramid (2768), and three large side-flanking platforms (91-325 m^2). Together, these buildings form a roughly rectangular layout oriented northeast to southwest on its longest axis (figure 5.14). Pyramid 2768 is a square, four-stepped mound approximately 15 m high and marks the north edge of the building group. Semi-worked stones and remains of remains of an altar were documented. All of the structures in BG-20 have been impacted by agriculture and cattle grazing and a large looters pit cuts into a portion of pyramid 2738.

Settlement Chronology

Ceramics recovered in the 2010 study area suggest that most of Angamuco's architecture dates to Early and Mid-Postclassic periods (A.D. 900-1100) (Fisher 2011b), with a minor presence dating to the Epiclassic (AD 600-900). The Epiclassic material is mostly confined to a 15 ha location on the zona alta at the center of the settlement. This evidence includes triangular slab tripod supports similar to those found at Tingambato just west of the lake basin (Fisher 2011a). The paucity of Late Postclassic ceramics suggests there may have been a population decline during the peak of the Tarascan state (ca. A.D. 1350-1520). The fact that Angamuco is rarely mentioned in ethnohistoric documents further supports the hypothesis that the settlement was largely abandoned by the Spanish conquest (ca. A.D. 1530). Based on Fisher's (2011a) interpretation, it is reasonable to assume that the settlement of Angamuco is composed of multiple phases of occupation that lasted at least 400 years.

Late Postclassic material is found at several locations on the zona baja and associated with a few plaza groups on the zona alta. The density of this material and its frequency is very low, especially compared to other Late Postclassic centers within the LPB (see Pollard 2008). Of the approximately 7000 sherds collected in 2010, only about 300 can definitively be assigned to the Late Postclassic, though undoubtedly there are non-diagnostic plainware Late Postclassic sherds as well (Fisher 2011a). The bulk of the cultural material collected up to the 2010 season can be assigned to the Early-Middle Postclassic and much of this material is underwhelmingly domestic in nature (Fisher 2011a). This is consistent with the ethnohistoric evidence for the area that suggests at the time of European Contact the malpaís contained two small named occupations (Gorenstein and Pollard 1983). Few artifacts normally associated with elites (negative/resist, tripod bowls, pipes, etc.) are present in the assemblage (Fisher 2011a).

Angamuco Architectural Patterns: General Remarks

An inventory of buildings at Angamuco confirms different types of residential and public buildings, a variety of agricultural features, various types of open spaces for public and private activities, monumental architecture, and several types of non-architectural features.

It was suggested earlier that evidence of planning is provided when individual buildings share orientations and/or arrangements through common reference to features such as plazas, plazuelas, and patios, city walls, palaces, or other architecture characteristics of urbanism (Smith 2007). Patterns in the arrangement of buildings provide evidence for the coordinated arrangement of buildings and space at Angamuco.

Most of the approximately 1700 structures documented at Angamuco occur in relatively discreet groups characterized by a central plaza, plazuela, or patio associated with different types of residential and public buildings. The recurrence of these groups throughout the settlement demonstrates a larger pattern reflecting broader organizational processes at Angamuco and is an important characteristic for qualifying it as an urban settlement. It is clear from this analysis that there are some key differences between the zona alta and baja in terms of the recurrence of certain types of building groups and the presence or absence of certain types of buildings. Building group form appears to result largely from constraints imposed by the rugged terrain of the malpaís. The five building groups discussed above form a continuum of functions ranging from presumably small residential compounds, large extended family households, and public civic ceremonial areas. The implications of these patterns are considered in light of questions proposed in the introduction, as well as the definitions and concepts on urbanism and architectural analyses, in the next and final chapter.

.

CHAPTER 5

Conclusion

This is the first study to examine the architectural patterning of a malpaís settlement in the Lake Pátzcuaro Basin. In this thesis, I analyzed the form, function, and spatial patterning of the architecture of Sacapu Angamuco to understand the settlements intrasite organization and urban form. Returning to the questions proposed in the introduction concerning architectural patterning Angamuco, there are several lines of evidence provided by the analysis in this thesis that reveal the settlement's urban form and organization, as well as the sociocultural implications of the evidence.

In terms of the first question concerning how buildings are arranged at Angamuco and if these occur formally or informally, there is patterning and coordinated arrangement of buildings and use of space at Angamuco. Arrangements are standardized across the settlement in the manner of formal and informal building groups. Formal groups consist of two main elements that include 1) a central space (i.e. - plaza, plazuela) and 2) surrounding buildings (i.e. - platforms, mounds, and ground-level buildings). Informal building groups are not addressed in this thesis, but patterning is evident and future work should provide insight into how these groups functioned relative to formal building groups.

The second question deals with patterning of building groups, whether specific forms are identifiable, if they are spatially discreet, and what factors influence these

patterns. Five types of building groups were identified including patio, plazuela, plaza, multi-plaza, and temple groups. Building groups are relatively spatially discreet, though fine-scale boundaries are difficult to delineate due to limited our limited knowledge of building function, the density of architecture, and varying states of structure integrity. Outlier buildings occur that may be functionally related to specific building groups, but based on surface evidence alone the function of these buildings are not well understood. Work in the future such as excavation will shed light on the exact function of these structures. There appears to be a relationship between topography and the occurrence of specific building types and building groups between the zona alta and zona baja. The architecture of Angamuco was built to conform to the rugged topography of the zona alta. Hilltops were flattened and leveled throughout to construct plazas and plazuelas and portions of slopes leveled for plazas, plazuelas, and patios. There were abundant amounts of stone resulting from clearing for these central open spaces that could be used to build surrounding structures such as platforms, mounds, and shrines.

Although not considered in detail in this thesis, there is one observation about access and visibility worth mentioning. The zona baja is the first area of Angamuco that would be seen by people entering the malpaís area either from the lake basin or east of the malpaís. The zona baja is generally comprised of the largest architecture and most expansive built spaces in the settlement and the most densely populated residential areas occur in the zona alta. Thus, Angamuco can be characterized by two areas of occupation, one with a lesser range of social stratification, consisting of the smaller, plain dwellings of the commoners in the zona alta, and the other with large residential and public

buildings and civic-ceremonial centers in the zona baja. Whether similar patterns occur in unsurveyed portions of the malpaís remains to be seen.

The final question deals with building group patterning and how these patterns reflect intrasite, or community-level organizational planning. Angamuco exhibits planning at the level of the individual structure, with residential buildings making up the bulk of the architecture and several types recurring throughout the study area including stone platforms, mounds, and ground-level buildings. The zona baja presents the best evidence for both elite and public architecture based on the presence of large residential buildings, plazas, mounds, and the occurrence of temples.

Building groups are an important component of Angamuco and their recurrence indicate a degree of organization of the settlement. My analysis shows that Angamuco exhibits a degree of standardization and layout at the building group level. There is evidence that the construction of formal building groups represent a planned attempt at coordination of space through the formal use of plazas and plazuelas as central spaces to link surrounding buildings to serve a variety of functions. The irregular topography of Angamuco precluded strict adherence to any particular size of plaza or plazuela; however, the recurrence of plaza and plazuela-focused groups across study area demonstrates a preponderance of formal building arrangements. Variation exists in the size of building groups, namely the number of structures comprising a group. What little open space exists in the zona alta was exploited for construction of sunken plazuelas and partially open plazas, both of which functioned as central spaces linking domestic, ritual, and agricultural activities. The best evidence for public building groups is in the zona baja, where the presence of multi-plaza groups and temple groups suggests this part of

the malpaís may have been purposely designated as an area for public and elite activities, perhaps due largely to demands of topography.

In terms of what these forms tell us about the spatial organization in terms of planning of the settlement and if elements of urban planning and development are apparent at Angamuco, several patterns emerge. Angamuco does not exhibit a formal orthogonal layout like Teotihuacan, nor does it have traits like the Mayan civic-ceremonial centers. In terms of the urban planning, there is no evidence of orthogonality or a grid-like pattern at Angamuco. In general, plaza and plazuela groups conform to topography with no patterned orientation or evidence of extensive landscape modification suggesting alignment with specific structures. In the zona alta, building groups are more densely arranged and the terrain is considerably more rugged than the zona baja. In the zona baja, building groups are larger and more spread out and the terrain of the zona baja is more conducive to large architecture and open space.

As far as what architectural patterns reveal about urbanism at Angamuco and what these patterns tell us about the level of socio-political complexity, Angamuco provides insight into the nature of the form, function, and layout of a malpaís settlement and data from the site will improve regional settlement models in the LPB. In terms of development of the city, artifacts recovered from the site suggest there is a heavy presence of Late Postclassic material in zona baja and a high quantity of Early-Mid Postclassic material in zona alta, as well as some Epiclassic material (Fisher 2011a).

My analysis of individual buildings and building groups shows there is planning at each level. There is standardization of individual buildings such as platforms, ground-level buildings, and plazas, as well as standardization of building groups such as plaza,

plazuela, and multi-plaza groups. Beyond the scale of building groups, the distribution of building groups across the study area suggest more extensive levels of planning may exist at Angamuco, but is beyond the scope of this thesis. Namely, the walled complex of multi-plazas in the zona baja provides evidence that ward-level or neighborhood planning may have existed.

Although my analysis of variation in building size and form is mainly descriptive, evidence presented here concerning the range in building size suggests there is not a high degree of social stratification at Angamuco. Testing for the statistical significance of variation may provide more insight on the nature of relationships between building form, size, and social status, but better understanding of building function will be necessary to do this. Based on elements of ancient urban planning by Smith (2007), Angamuco's overall development can be characterized as organic, with little evidence of a high level of planning expected from a city with a centralized authority and complex urban functions. Angamuco clearly does not have a discreet orthogonal plan like a grid layout at Teotihuacan or Tenochtitlán. Unlike many Mayan urban settlements, which tend to have a defined epicenter with dispersed settlement (mainly residential groups), Angamuco does have a discreet boundary. The settlement boundary is isolated to the malpaís and there is no evidence of dispersed settlement beyond the edge of the landform.

Admittedly, there are a few shortcomings that come with relying exclusively on surface data to interpret architecture and use of space at Angamuco. The conditions of surface preservation limit interpretations about the form and function of residential and public buildings. Although the size and degree of landscape modification suggest Angamuco was a densely populated settlement, my analysis speaks little about the social

composition and rank of its occupants. In terms of the sequence of occupation of Angamuco, it is inferred in this thesis that building groups at Angamuco achieved form and size through accretion in a way that is similar to patterns of building group development observed in the Mayan region (Rice and Puleston 1981:140). Structures were likely added to the group through time, and associated structures were modified through time, thus demonstrating a diachronic element representing a succession of forms through which larger architectural patterns might evolve. In light of regional settlement patterns, it remains to be seen why there was a preference for occupying the rugged malpaís landscapes. For example, were malpaís settled in response to increased demand for productive agricultural lands in former lakebed areas and/or near the lake edge? Or did other factors influence the occupation of these rugged landforms?

Another aspect of organization not addressed in this thesis concerns the question of what cultural group (or groups) occupied Angamuco. The architectural study presented here provides many clues but few definitive answers. It can be said with relative certainty, however, that analysis of ceramics suggest that the main occupation of the site dates from the Early to Mid-Postclassic (AD 900-1350) and the paucity of Late Postclassic (AD 1350-1525) ceramics suggests the site was in decline by the peak time of Tarascan State consolidation. The fact that Angamuco is rarely mentioned in early Spanish accounts of the LPB supports the hypothesis that the settlement was largely, if not completely abandoned the time of Spanish intrusion into the LPB region in the 16th century.

Work at Angamuco also sheds new light on the context of urbanism in the LPB around the time of Tarascan state formation during the Postclassic period. The site also

provides crucial evidence of the role of architecture in urban settlements in the region and exemplifies how a seemingly inhospitable landscape was extensively and ingeniously modified to accommodate a large and dense population. Ultimately it is hoped that this work along with future work at Sacapu Angamuco will contribute to the limited but growing body of archaeological work aimed at understanding the range of urbanism present in the LPB and beyond.

REFERENCES CITED

Acosta, J.
1939 Exploraciones arqueol6gicas realizadas en el Estado de Michocan durante los anios de 1937 y 1938. *Revista Mexicana de Estudios Antropologicas* 3(2):85-99.

Andrade, M.A.H.
2011 El Colegio de Michoacán, A. C. Electronic document, http://etzakutarakua.colmich.edu.mx/proyectos/relaciondemichoacan/ mapas/ mapaCartas2.asp?id=E14A22, accessed September 11, 2011.

Arnauld, M.- C.
2008 Maya Urbanization: Agrarian Cities in a Preindustrial World. In *Urbanism in Mesoamerican/El Urbanismo en Mesoamerica Volumen 2*, edited by A. G. Mastache, Robert H. Cobean, Angel Garcia Cook, and Kenneth G. Hirth. v. 2. Pennsylvania State University, University Park, PA.

Ashmore, W.
1981 "Some Issues of Method and Theory in Lowland Maya Settlement Archaeology." In *Lowland Maya Settlement Patterns*, edited by Wendy Ashmore, pp. 37-69. Albuquerque: University of New Mexico Press.

2002 "Decisions and Dispositions": Socializing Spatial Archaeology. *American Anthropologist* 104 (1172-1183).

Balkansky, A.
2002 *The Sola Valley and the Monté Alban State: A Study of Zapotec Imperial Expansion*. Memoirs No. 36. Museum of Anthropology, University of Michigan, Ann Arbor.

Beekman, C. S.
2009 Recent Research in Western Mexican Archaeology. *Journal of Archaeological Research*.

Beaumont, Pablo
1932 Crónica de Michocán (1776-1780). Archivo General de la Nación: 17-19, México.

Billman, B. R. and G.M. Feinman (eds.)
1999 *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*. Smithsonian Institution, Smithsonian Series in Archaeological Inquiry, Washington DC.

Binford, L. R.
1982 The Archaeology of Place. *Journal of Anthropological Archaeology* 1:5-31.

Blanton, R.E.
1976 Anthropological Studies of Cities. *Annual Review of Anthropology*, 5:249-64

1989 Continuity and Change in Public Architecture: Periods I Through V of the Valley of Oaxaca, Mexico. In *Monte Alban's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlan, the Valley of Oaxaca, Mexico,* edited by Stephen A. Kowalewski, Gary M. Feinman, Laura Finsten, Richard E. Blanton, and Linda M. Nicholas, pp. 409-447. Memoirs, vol. 23. Ann Arbor: Univ. Mich. Mus. Anthropol.

Blanton RE, Kowalewski SA, Feinman GM, Finsten LM.
1993 *Ancient Mesoamerica: A Comparison of Change in Three Regions*. Cambridge: Cambridge Univ. Press. 2nd ed.

Blanton RE, G.M. Feinman, S.A. Kowalewski, L.M. Nicholas
1999 *Ancient Oaxaca: The Monte Alban State*. Cambridge: Cambridge Univ. Press.

Butzer, K.W.
1982 *Archaeology as Human Ecology: Method and Theory for a Contextual Approach*. Cambridge University Press, New York.

Chacon, A. T.
1993 El Lago de Pátzcuaro, Michoacán, Mexico, Bosque Limnológico de un Lago Amenazado. Universidad Michoacána, Morelia.

Chang, K.C. (ed.)
1968 *Settlement archaeology*. National Press Books, Palo Alto, California.

Chase, D., A.F. Chase and W. Haviland
1990 The Classic Maya City: Reconsidering "The Mesoamerican Urban Tradition". *American Anthropologist* 92:499-506.

Conolly, J. and M. Lake
2006 *Geographical information systems in archaeology*. Cambridge University Press, Cambridge, UK.

Cowgill, G.L.
1988 Onward and upward with collapse. In *The Collapse of Ancient States and Civilizations*, ed. N. Yoffee, G.L. Cowgill, pp. 244-76. Tucson: Univ. Ariz. Press

1997 State and society at Teotihuacan, Mexico. *Annual. Rev. Anthropol*. 26: 129-61

2004 Origins and Development of Urbanism: Archaeological Perspectives. *Annual Review of Anthropology*, Vol. 33: 525-549.

Fisher, C.T., H.P. Pollard, and C. Frederick
1999 Intensive Agriculture and Socio-Political Development in the Lake Pátzcuaro Basin, Michoacán, Mexico. *Antiquity* 73 (281): 642 – 649.

Fisher, C.T., H. Pollard, I. Israde-Alcantara, V.H. Garduño-Monroy, and S.K. Banerjee
2003 A reexamination of human-induced environmental change within the Lake Patzcuaro Basin, Michoacan, Mexico. *PNAS* 100(8): 4957– 4962.

Fisher, C.T., S. Leisz, and G. Outlaw
2011 Lidar: A Valuable Tool Uncovers an Ancient City in Mexico. *Photogrammetric Engineering and Remote Sensing*. 77(10): 962-966.

Fisher, C.T.
2005 Demographic and Landscape Change in the Lake Pátzcuaro Basin, Mexico: Abandoning the Garden. *American Anthropologist* 107(1):87-95.

2011a *Legados de la Resiliencia: La Cuenca del Lago de Pátzcuaro Proyecto Arqueologico (Proyecto LORE LPB)*. Informe Tecnico Parcial, Temporada 2010. Informe entregado al Consejo de Arqueología, Instituto Nacional de Antropología e Historia (INAH).

2011b *Beyond Thresholds and Tipping Points: New insights into the Origins of the Purépecha (Tarascan) Empire*. Paper presented at the 76th Annual Meeting of the Society for American Archaeology.

Gali, R.
1946 Arqueologia de Tzintzuntzan. *Anales del Museo Michoacano Epoca* 2(4):50-62.

Gorenstein, S., H. P Pollard
1983 *The Tarascan Civilization: A Late Prehispanic Cultural System*. Vanderbilt University Publications in Anthropology, Nashville, Tennessee.

Hirth, K.G.
2000 *Archaeological Research at Xochicalco, Volume 1, Ancient Urbanism at Xochicalco: The Evolution and Organization of a Pre-Hispanic Society*. University of Utah Press, Salt Lake City.

INEGI
2009 Instituto Nacional de Estadística Geografía (INEGI) Geospatial Data Gateway, Electronic document, http://www.inegi.org.mx/inegi/default.aspx?s=geo, accessed June 20, 2011.

Israde-Alcántara, I., V.H. Garduño-Monroy, C.T. Fisher, H.P. Pollard, and M.A. Rodríguez-Pascua
2005 Lake level change, climate, and the impact of natural events: the role of seismic and volcanic events in the formation of the Lake Patzcuaro Basin, Michoacan, Mexico. *Quaternary International* 135:35-46.

Johnston, K.J. and N. Gonlin
1998 What Do Houses Mean? Approaches to the Analysis of Classic Maya Commoner Residences. In *Function and Meaning in Classic Maya Architecture.* Houston, S.D. (Ed.), Dumbarton Oaks, Washington, D.C.

Lawrence, D.L. and S.M. Low
1990 The Built Environment and Spatial Form. *Annual Review of Anthropology*, Vol. 19, pp. 453-505.

Marcus, J.
1983 On the nature of the Mesoamerican city. In *Prehistoric Settlement Patterns: Essays in Honor of Gordon R. Willey*. Vogt, E.Z., Leventhal, R.M. (Eds.) University of New Mexico Press, Albuquerque, pp. 195–242.

Marcus J. and K.V. Flannery
1996 *Zapotec Civilization: How Urban Society Evolved in Mexico's Oaxaca Valley*. New York: Thames & Hudson.

Martin, S. and N. Grube
2000 *Chronicle of the Maya Kings and Queens: Deciphering the Dynasties of the Ancient Maya*. New York: Thames and Hudson.

Mastache, Alba, Robert Cobean, Angel Garcia Cook, Kenneth Hirth (eds.)
2008 *Urbanism in Mesoamerican/El Urbanismo en Mesoamerica Volumen 2*. Proyecto Urbanismo en Mesoamérica. Instituto Nacional de Antropología e Historia, Mexico City.

Michelet, D., A. Ichon and G. Migeon (ed.)
1988 Residencias, barrios y sitios postclásicos en el Malpaís de Zacapu. In *Primera reunion sobre las sociedades prehispanicas en el centro occidente de Mexico, Memoria*, pp. 177-191, Centro regional de Queretaro, Cuaderno de trabajo 1. Instituto Nacional de Antropología e Historia, Querétaro.

Michelet, D.
1992 El proyecto Michoacan 1983–1987. Medio ambiente e introducción a los trabajos arqueológicos. Collection Estudes Mésoamericains II-12, Cuadernos de Estudios Michoacános 4. Centre Français d'Etudes Mexicaines et Centre-Américaines, Mexico City.

1995 La zona occidental en el poscla´sico. In Historia antigua de Me´xico, Tomo III: El horizonte poscla´sico y algunos aspectos intelectuales de las culturas mesoamericanas, edited by Linda Manzanilla and Leonardo Lo´pez Luja´n, pp. 153–188. Instituto Nacional de Antropología e Historia, Universidad Nacional Autoónoma de México, and Grupo Editorial Miguel Angel Porruá, Mexico City.

1998 Topografia y Prospección Sistemática de Los Grandes Asentamientos del malpaís de Zacapu: Claves Para Un Acercamiento a Las Realidades Sociopoliticas. In *Genesis, culturas y espacios en Michoacan,* ed. Veronique Darras, pp 47-59, CEMCA, México.

2008 Living Differently. The sites of the Milpillas Phase (1250-1450 AD) in the Malpaís de Zacapu (Michoacán). In *Urbanism in Mesoamerican/El Urbanismo en Mesoamerica Volumen 2,* edited by A. G. Mastache, Robert H. Cobean, Angel Garcia Cook, and Kenneth G. Hirth. vol. 2. Pennsylvania State University, University Park, PA.

Migeon, G.
1990 *Archéologie en pays tarasque. Structure de l'habitat et ethnopréhistorie des habitations tarasques de la région de Zacapu (Michoacán, Mexique).* PhD. Dissertation, Universidad de París I, París, France.

2003 Abandonos planificados, rituales de vasijas matados o de clausura y ocupaciones posteriores: Los sitios del cerro Barajas, Guanajuato y de Milpillas, en el Malpaís de Zacapu, Michoacan. *Trace,* 43.

Nichols, D. L.
1996 An Overview of Regional Settlement Pattern Survey in Mesoamerica: 1960-1995. In *Arqueologiá Mesoamericana: Homenaje a William T. Sanders, Vol. 1*, edited by A. G. Mastache, Parsons, J. R., Santley, R. S., Serra-Puche, M. C., pp. 59-95. Instituto Nacional de Anthropologiá e Historia, Mexico City.

O'Hara, S. L.
1993 Historical Evidence of Fluctuations in the Level of Lake Pátzcuaro,Michoacán, Mexico over the Last 600 Years. *Geographical Journal* 159(1):51–62.

O'Hara, S. L., F. A. Street-Perrott, and T. P. Burt
1993 Accelerated Soil Erosion around a Mexican Highland Lake Caused by Prehispanic Agriculture. *Nature* 362:48–51.

Palerm, A. and E. R. Wolf
1957 Ecological Potential and Cultural Development in Mesoamerica. In *Studies in Human Ecology*, Monograph No. 3. pp. 1-37. Anthropological Society of Washington and Pan American Union of Social Sciences.

Parsons, J.
1972 Archaeological Settlement Patterns. *Annual Review of Anthropology*, 1: 127-150.

Pereira, Gregory
1996 Nuevos hallazgos funerarios en Loma Alta, Zacapu, Michoacan. En Las cuencas del occidente de México. Época prehispánica, edited by Eduardo Williams and Phil C. Weigand, pp. 105–129. Centre Français d'Etudes Mexicaines et Centre-Américaines, Instituto de Investigación Científica para el Desarrollo en Cooperación, El Colegio de Michoacán, Mexico.

Pollard, H. P.
1977 An Analysis of Urban Zoning and Planning in Prehispanic Tzintzuntzan. *Proceedings of the American Philosophical Society* 121:46–69.

1980 Central Places and Cities: A Consideration of the Protohistoric Tarascan State. *American Antiquity* 45:677–696.

1982 Water and politics: Paleoecology and the Centralization of the Tarascan State. Paper presented at the 44th International Congress of Americanists, Manchester.

1997 Recent research in west Mexican archaeology. *Journal of Archaeological Research* 5: 345–384.

2000 *Proyecto Desarrollo del Estado Tarasco: Los Señoríos Urichu, Xaracuaro, y Pareo (1990-1998)*. Informe Final al Consejo de Arqueología, Instituto Nacional de Antropología e Historia, Mexico. Tomo 1 y 2. Archivo Técnico, Coordinación Nacional de Arqueología, INAH, Mexico.

2001 *Informe Final al Consejo de Arqueología, INAH. Proyecto Desarrollo del Estado Tarasco: Los Señoríos Urichu, Xaracuaro, y Pareo (1990-1998)*. Tomo 3. La Cerámica. Archivo Técnico, Coordinación Nacional de Arqueología, INAH, Mexico.

2003a Central Places and Cities in the Core of the Tarascan State. In *Urbanization in Mesoamerica*, edited by William T. Sanders and Alba Guadalupe Mastache, pp. 345–390. Instituto Nacional de Antropologı´a e Historia and Pennsylvania University Press, University Park.

2003b Development of a Tarascan core: The Lake Pátzcuaro Basin. In *The Postclassic Mesoamerican World*, edited by F. Berdan and M. E. Smith, pp. 227-237. University of Utah Press, Salt Lake City.

2005 Michoacán en el Mundo Mesoamericano Prehispánico: Erongarícuaro, Michoacán y los Estados Teotihuacano y Tarasco. In *El Antiguo Occidente de México. Nuevas Perspectivas Sobre el Pasado Prehispánico*, edited by E. Williams, P. C. Weigand, L. L. Mestas and D. Grove, pp. 283-303. Instituto Nacional de Antropología e Historia, Mexico, El Colegio de Michoacán, Guadalajara.

2008 A Model of the Emergence of the Tarascan State. *Ancient Mesoamerica*,19 217–230

Pollard, H. P. and L. Cahue
1999 Mortuary Patterns of Regional Elites in the Lake Patzcuaro Basin of Western Mexico. *Latin American Antiquity* 10(3):259 - 280.

Pollard, H. P. and S. Gorenstein
1980 Agrarian Potential, Population, and the Tarascan State. *Science* 209 (4453): 274 - 277.

Pollard, H. P. and D. Haskell
2006 *Desarrollo del Estado Tarasco: Proyecto Erongarícuaro. In El Boletín del Consejo de Arqueología del INAH.* http://www.inah.gob.mx/index.html. vol. 1. Proyecto Erongaricuaro, Temporada II. Informe Técnico Parcial al Consejo de Arqueologia, Instituto Nacional de Antropología e Historia, Mexico.

Pereira, G.
1996 Nuevos hallazgos funerarios en Loma Alta, Zacapu, Michoaca´n. En Las cuencas del occidente de Me´xico. E´ poca prehispa´nica, edited by Eduardo Williams and Phil C. Weigand, pp. 105–129. Centre Français d'Etudes Mexicaines et Centre-Américaines, Instituto de Investigación Científica para el Desarrollo en operación, El Colegio de Michoacán, Mexico.

Puaux, O.
1989 *Les Pratiques Funeraires Tarasques (approche ethnohistorique et archeologique).* PhD. Dissertation, Universite de Paris I, Panthenon Sarbone, France.

Rapoport, A.
1988 Levels of Meaning in the Built Environment. In *Cross-Cultural Perspectives in Non Verbal Communication*, edited by F. Poyatos, pp.317-336. C.J. Hogrefe, Toronto.

1990 The Meaning of the Built Environment: A Nonverbal Communication Approach. Rev.ed. Sage, Beverly Hills.

1993 On the Nature of Capitals and Their Physical Expression. In Capital Cities, Les Capitales: Perspectives Internationales, International Perspectives, ed. by Tayor, J., J.G. Lengelle, and C. Andrew, pp-31-67. Carleton University Press, Ottawa.

Relación de Michoacán
1956 *Relación de las ceremonias y ritos y población y gobierno de Michoacán*. Reproducción facsimilar del Ms IV de El Escorial, Madrid, edited by Jose´ Tudela. Aguilar Publicistas, Madrid.

1980 *La Relación de Michoacán*. Versión paleográfica, edited by F. Miranda. Estudios Michoacanos V. Fimax, Morelia, Michoacan.

2000 *Relación de la ceremonias y rictos y población y gobernación de los indios de la provincia de Michoacan*. Edited by Moise´s Franco Mendoza Colegio de Michoacan, Gobierno del Estado de Michoacan, Zamora.

2001 *Relación de Michoacán*. Edited by Armando Mauricio Escobar Olmedo. Patrimonio Nacional, H. Ayuntamiento de Morelia, Testimonio Compan˜ı´a Editorial, Madrid.

2008 *Relacion de Michoacan*. Edited by Alcala, J. El Colegio de Michoacan, Zamora, Michoacan.

Sanders, W.T., Webster, D.,
1988 The Mesoamerican urban tradition. *American Anthropologist* 90, 521–546.

Sanders, W.T., Alba Guadalupe Mastache de Escobar, Robert H. Cobean (eds.)
2003 *El urbanismo en Mesoamérica, Volume 1*. Proyecto Urbanismo en Mesoamérica. Instituto Nacional de Antropología e Historia, Mexico City.

Smith, M.E.
1989 Cities, Towns, and Urbanism: Comment on Sanders and Webster, *American Anthropologist* 91 (1989):454-61.

1992 *Archaeological Research at Aztec-Period Rural Sites in Morelos, Mexico*. Excavations and Architecture/Investigaciones Arqueológicas en Sitios Rurales de la Época Azteca en Morelos, Tomo 1, Excavaciones y Arquitectura, vol. 1. University of Pittsburgh, Pittsburgh.

1993 Houses and the settlement hierarchy in late postclassic Morelos: a comparison of archaeology and ethnohistory. In *Prehispanic Domestic Units in Western Mesoamerica: Studies of the Household, Compound, and Residence*. Santley, R.S., Hirth, K.G. (Eds.) CRC Press, Boca Raton, pp. 191–206.

2007 Form and meaning in the earliest cities: A new approach to ancient urban planning. *Journal of Planning History*, 6, 3–47.

2008 The Archaeology of Aztec City-State Capitals: Four Views of Aztec Urbanism. In *Urbanism in Mesoamerican/El Urbanismo en Mesoamerica Volumen 2*, edited by A. G. Mastache, Robert H. Cobean, Angel Garcia Cook, and Kenneth G. Hirth. v. 2. Pennsylvania State University, University Park, PA.

2010 Empirical Urban Theory for Archaeologists. *Journal of Archaeological Method and Theory* 18, no.3: 167-192.

Steadman, S.R.
1996 Recent Research in the Archaeology of Architecture: Beyond the Foundations. *Journal of Archaeological Research*, 4:1.

Trigger, B.G.
1967 Settlement Archaeology: Its Goals and Promise. *American Antiquity* 32(2):149-160.

West, R.C.
1948 *Cultural Geography of the Modern Tarascan Area*. Smithsonian Institution, Institute of Social Anthropology Publication 7. Washington D.C.

Willey, G.
1953 Prehistoric settlement patterns in the Virù Valley, Peru. *Bureau of American Ethnology Bulletin,*155. Smithsonian Institution, Washington, DC.

1981 Maya Lowland Settlement Patterns: A Summary Review. In *Lowland Maya Settlement Patterns*, edited by Wendy Ashmore, pp. 385-415. Albuquerque: University of New Mexico Press.

Williams, E.
2005 *El antiguo occidente de México: nuevas perspectivas sobre el pasado prehispánico*. El Colegio de Michoacán, pp. 9-24.