POLITICAL CHANGE
IN AN ANCIENT MESOAMERICAN COMMUNITY:
KAMINALJUYU WITHIN THE VALLEY OF GUATEMALA
(500 B.C.- A.D.1000)

By

MICHAEL W. RYAN

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Department of Anthropology and Sociology

The University of British Columbia
Vancouver, Canada

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ABSTRACT

This thesis examines the causes and processes of culture change in complex society in ancient Mesoamerica. Facets of political and social change are attributed to the effects of competition for status, power and prestige. The position is taken that, although competition is not directly observable, it is visible in its patterned effects on the material record. Thus, the study examines the uses of material culture in socio-political terms, and then attempts to explain socio-political interaction and change using the archaeological remnants of material culture. The archaeological record for Kaminaljuyu and vicinity within the Valley of Guatemala is used as a test case.

Essentially, status competition, underwritten by material and consensual support, leads to efforts to promote economic production and population size. Responses to increases in polity scale and complexity lead to political adjustment and change. A processual model is proposed which focuses on change within and between two dominant economic and status support systems, the local subsistence system and the regional wealth trade system.

Relevant social variables are linked to archaeological materials to enable operationalization of the theory. Thus political support is represented by aspects of settlement (population size and distribution) and by economic production (land use, craft production). Status demonstration is represented by construction activity and political maintenance is represented

by the provision of administrative space.

The main findings for Kaminaljuyu are that:

1) Long-distance wealth trade in commodities and status goods was associated with maximization of all types of economic production, centralization of political power, rural population increase and population dispersal.

2) The local subsistence system was associated with decentralization of political power, localized economic productivity, centralization of population (crowding) and possible social conflict.

The method also led to the investigation of and insights into the record for Kaminaljuyu. The analysis demonstrated a two-period cycle of socio-political change, each cycle conforming to the sequence of change proposed in the model. This pattern conforms to well-known cycles of political centralization and decentralization. This approach was useful for investigating the archaeological record for this type of complex polity.

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CHAPTER 1. INTRODUCTION

This study addresses the problem of cultural change in prehispanic Mesoamerica. It is argued that aspects of change in ancient Mesoamerica may be explained by the effects of competition for status, power and prestige.

The main objective is to develop a theory of political and economic interaction and change and to generate and test a model of socio-political change. The theoretical focus on political activity and process implicates many aspects of socio-political and economic behavior, so an effort is made to develop an "interactive" approach. Due to the nature of the problem, testing required a site with a long chronological sequence which has a copious and diverse archaeological record. For these reasons, Kaminaljuyu, Guatemala and its immediate rural area within the Valley of Guatemala was chosen as the subject case (Figures 1, 2 and 3). Since much of the analysis depends on political and construction activity at the core site of Kaminaljuyu, the study focuses on the most active periods of mound building at the site from 500 B.C. to A.D.1000 (Table 1).

Chapter 2 (Theory), proposes alternatives to current explanations of change for Kaminaljuyu (Sanders and Murdy 1982; Murdy 1984; Michels 1979a), which focus primarily on 1) relations between cultural systems and agricultural regimes and 2) pre-defined (static) socio-political models of social organization.

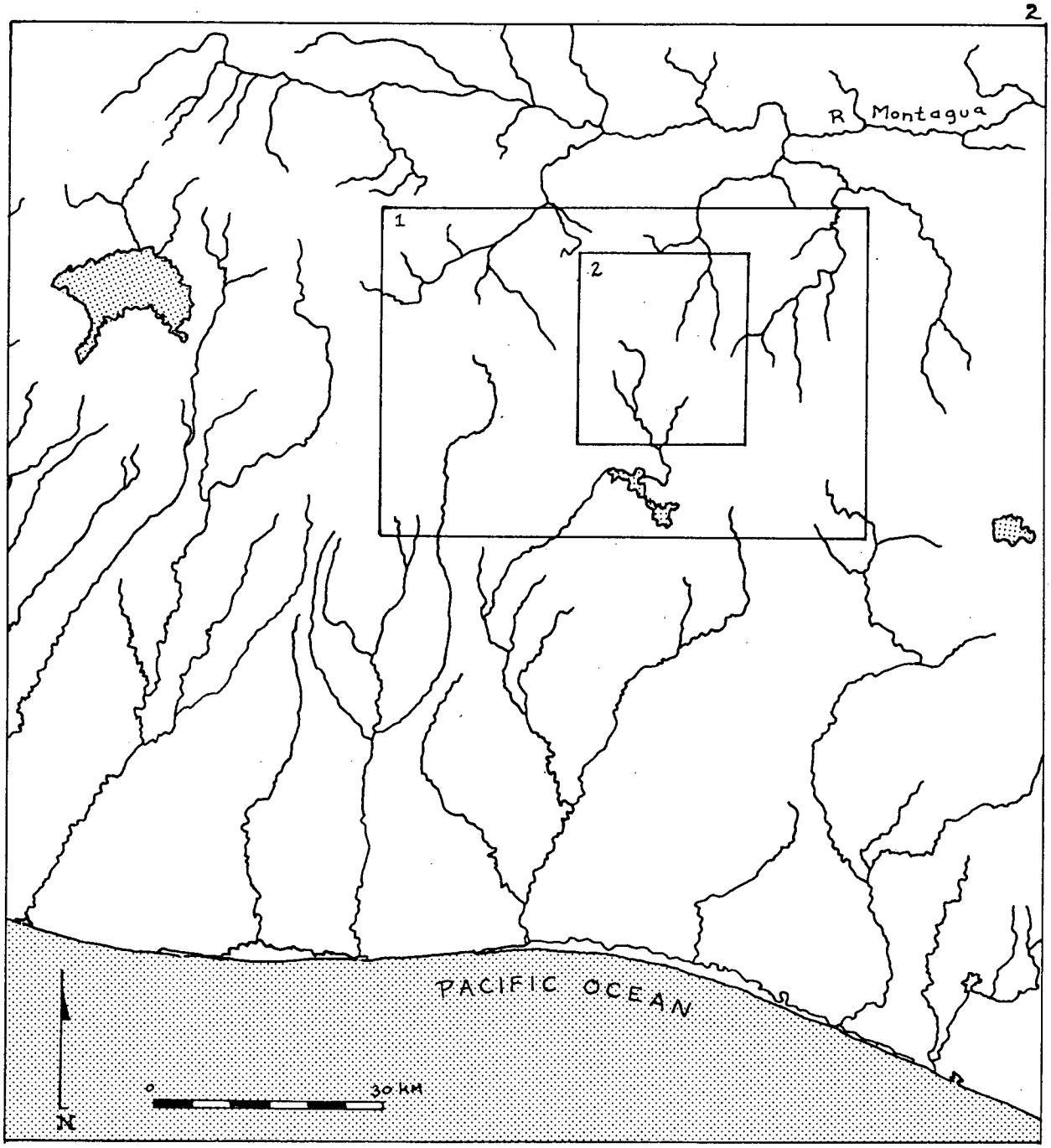


Figure 1. SOUTHERN GUATEMALA.
Inset 1: Kaminaljuyu: Valley Survey. Valley of Guatemala and Vicinity (See Figure 2).
Inset 2: Valley of Guatemala: Kaminaljuyu (See Figures 3,4).

Figure 2. KAMINALJUYU: VALLEY SURVEY. Valley of Guatemala and Vicinity.

Key: Aggregate Sites, All Periods.



= All zones (15 total) intensively surveyed by the University of Pennsylvania Kaminaljuyu Project (1968-1970).



= Archaeological site with existing mound architecture (1970).



= Archaeological site: mound architecture destroyed as of 1970.



or = Archaeological site without mound architecture.



Contour lines drawn at 100 m intervals: the center of zone 46 (central Kaminaljuyu) is 1500 m above sea level. Cool colors (blues, greens) and yellows indicate elevation descending from 1500 m. Warm colors, browns and greys indicate ascending elevation from 1500 m.

Source: Sanders and Murdy (1982:26-27, Figure 2).

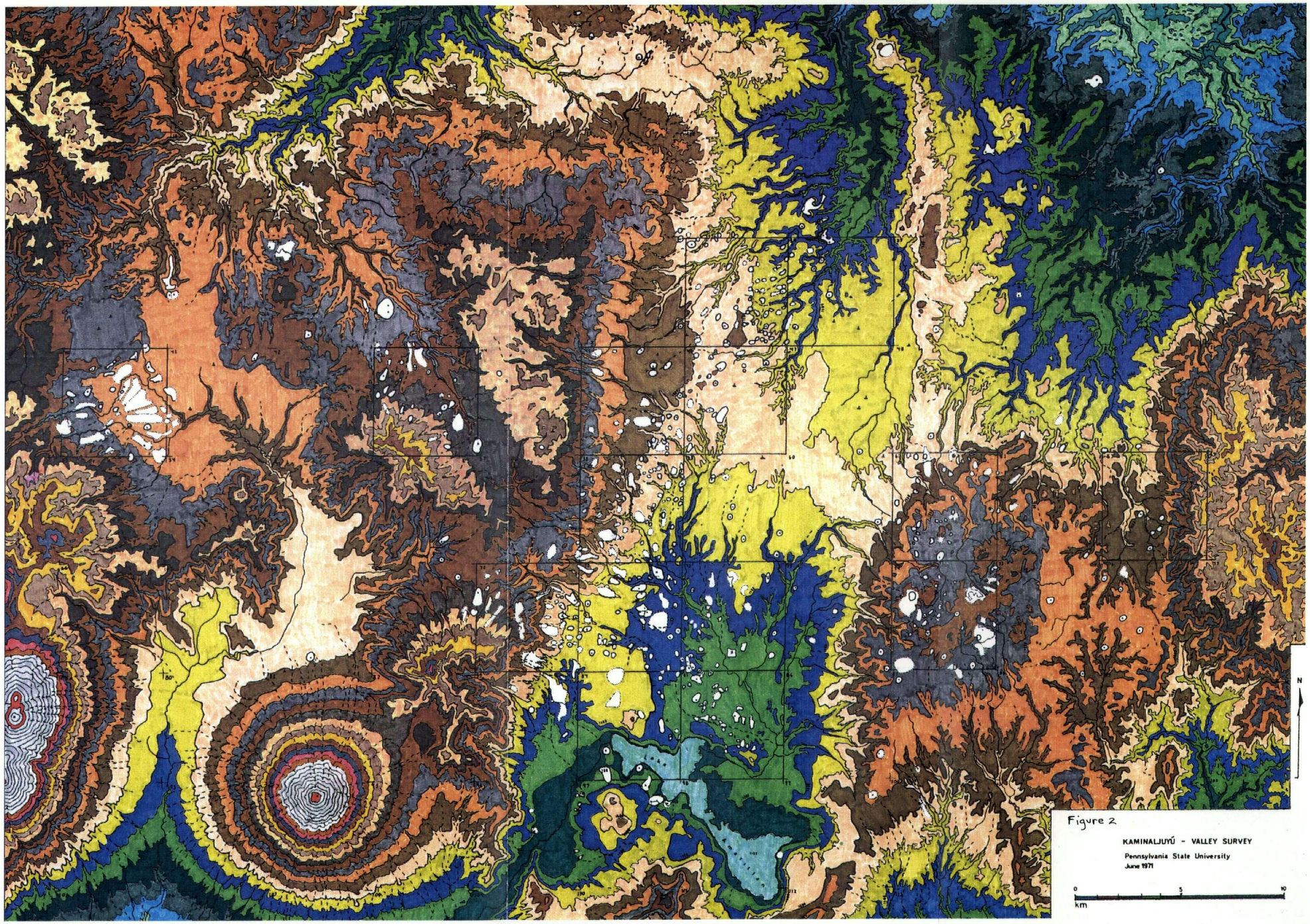


Figure 2

KAMINALJUYÚ - VALLEY SURVEY

Pennsylvania State University
June 1971

0 5 10
km

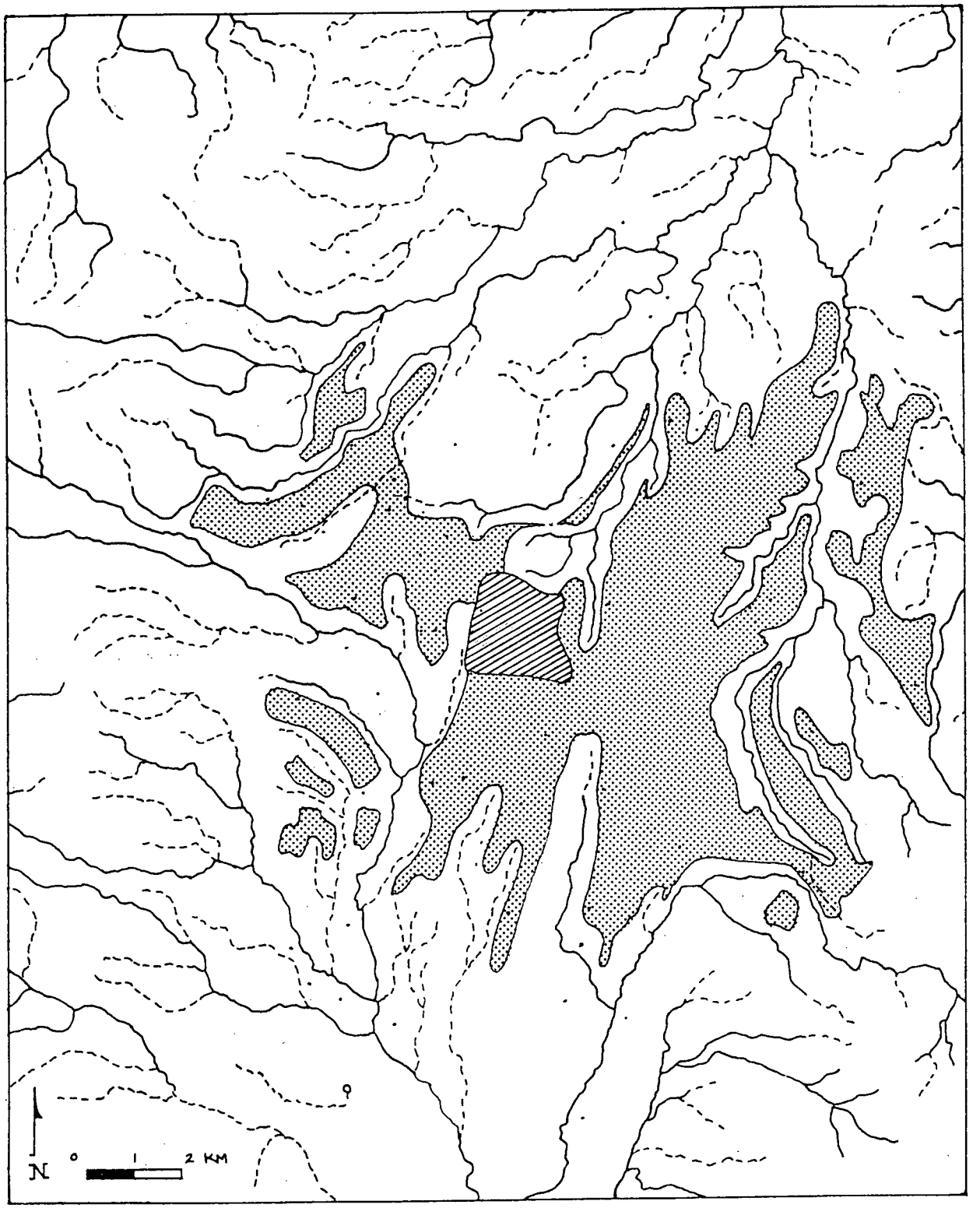


Figure 3. VALLEY OF GUATEMALA: KAMINALJUYU
The figure shows rivers (solid lines) and streams (broken lines) in the Valley. Approximate limits of modern Guatemala City (shaded area). Approximate limit of central Kaminaljuyu mound construction (hachured).

Table 1. PREHISPANIC CHRONOLOGY FOR KAMINALJUYU [1]

	Ceramic: Wetherington (1978)	Cultural: Michels (1979a)	Cultural: Murdy (1984)
	Colonial	Colonial	Colonial
1500			
	Chinaultа	Late Post-Classic	Late Post-Classic (LP)
1200			
	Ayampuc	Early Post-Classic	Early Post-Classic (EP)
1000			
	Pamplona	Late Late Classic	Terminal Classic (TC)
800			
	Amatle II	Early Late Classic	Late Classic (LC)
600			
	Amatle I Esperanza	Middle Classic	Middle Classic (MC)
400			
	Aurora	Early Classic	Early Classic (EC)
200			
	Arenal	L. Terminal Formative	Protoclassic (PC)
A.D.-B.C.			
	Verbena	E. Terminal Formative	Terminal Formative (TF)
200			
	Providencia	Late Formative	Late Formative (LF)
500			
	(Providencia) Majadas Las Charcas	Middle Formative	Middle Formative (MF)
1000			
	Arevalo	Early Formative	Early Formative (EF)
1500			
		Archaic	Archaic
7500			

1 After Murdy (1984:33).
Acronyms in brackets refer to designations in Tables and Figures.

In this study, an attempt is made to develop a model of change that attributes social and political change to the on-going inter-relations of political, economic, demographic and environmental variables.

It is argued that status competition, underwritten by access to and control of support (i.e., consensual, productive wealth, legitimacy, coercion), leads to efforts by political leaders/units to promote economic production and population size. For example, if political leaders follow a policy that encourages population growth as a means to increase labor and economic production (to increase political support), and so enhance their status through access to greater material and consensual support, they will, as a consequence, create a) administrative work associated with managing larger populations and greater economic production, b) more varied and complex administrative problems, c) conditions for social division due to effects of scale and d) additional demands on the environmental-subsistence system. Whatever new conditions arise will require (or create) a new set of strategies and policies, which require systemic responses. The archaeological record should retain traces of both the initial conditions and the responses.

According to this perspective, status competition implicates material culture and settlement patterns, both subject to archaeological investigation. Status competition is linked to archaeological data through three analytical divisions (taken mainly from the literature on political anthropology). These are:

1. political support, 2. status demonstration and 3. political maintenance. Support, a concept derived from political anthropology, refers to those factors which underwrite status position; for example; popular consensus, control of subsistence and wealth production, political legitimacy, coercion and ideology. Status demonstration refers to activities and material culture that indicate the current distribution of status within a community. Status is evident in the control and distribution of status goods, type and scale of construction activity, mortuary practice and ideological programs (such as sculptural records). Political maintenance is defined as routine, on-going administrative functions, such as dispute resolution, tribute management, organization of public ceremonies, regulation of external relations that the political establishment is required to carry out, which justify the existence of the political unit and enable it to monitor and control status relations and power. Political maintenance will be evident in construction activity and in the distribution and organization of archaeological (mound) sites.

It is argued that an interactive approach to explain culture change is possible using these divisions. Though representing different conceptual categories, these divisions are integrated when expressed as material culture. For example, earth mound architecture can represent aspects of support (labor tribute or access to material resources), demonstration (scale and volume of construction activity) and maintenance (summit area or the

provision and locus of administrative-ritual activity). Consequently, one can examine cultural changes along these divisions together, separately or contingently; either synchronically or diachronically.

In the final section of Chapter 2, theory and documentation taken from the anthropological literature (political and economic anthropology, demographic archaeology, systems theory, information theory and urban anthropology) are presented to support an understanding of analytical components such as economic organization, population dynamics, political units and political administration. These are explained, particularly as they refer to relations between political (status) competition and material culture.

In Chapter 3 (Processual Model of Change), a general model for the cultural evolution of a political community is proposed. This model attempts to integrate the diverse cultural processes and archaeological data, presented in Chapter 2, within a chronological context. A temporal sequence, based on a predominant local subsistence economy (and status system) is described. It is composed of three sequential cultural "formations" which are defined as configurations of social-political-economic relationships. A fourth socio-cultural pattern is proposed as an example of an "alternative" formation. Its political organization is based on a "wealth" goods economy (and status system) where trade in commercial and/or elite goods is predominant.

Chapter 4 (Methodology) presents a system for analyzing change. Categories of archaeological information, derived from the data on settlement (population) and land use patterns and construction activity are used to quantify and measure the analytical divisions (support, demonstration and maintenance). Synthetic measures, derived from these data, provide additional perspectives on each temporal phase to facilitate the analysis of change according to test implications drawn from the theory and model.

The main archaeological variables used are earth mound volume and summit area (or surface area of the top of mound architecture), population size and distribution, settlement patterns (especially site classification, size and spatial distribution), and land use data (soil classification). Additional data sets, such as burials, artifact assemblages and iconography are introduced to support the main points, but are not the main focus of analysis.

In order to direct attention to the activities within the local political unit, and to provide a basis for estimating population size by distance and distribution within the local area, a circular study area is defined, subdivided into concentric rings, with the site of Kaminaljuyu at the center.

A set of eight hypotheses are described according to expectations derived from the theoretical model, though the model itself may be considered a hypothesis.

Chapter 5 presents the analysis of the archaeological data

from Kaminaljuyu. A qualitative evaluation of periods likely associated with the wealth-based economy is provided as a basis for evaluating quantitative data. The analysis proceeds with an examination of settlement (population) and land use patterns for rural Kaminaljuyu. The focus is on examining features of social complexity (settlement data), centralization (power, status and administration) and scale (size and distribution of population and construction). With this information, the chronological periods are tested against the model of change, based on temporal expectations. Finally, a preliminary evaluation of the theory and model is given, based solely on settlement (population) and land use patterns.

Analysis of construction activity first examines the mounds in rural Kaminaljuyu, then those in central Kaminaljuyu. This involves the assembly of mound dimensions and distribution, and calculations of volume and various derivative values. Central and rural areas are then compared in conjunction with the data obtained from the previous analysis of settlement and land use. This provides the final basis on which to evaluate the theory and theory and make judgements about the process of political change in ancient Kaminaljuyu, particularly concerning change in the analytical divisions of support, demonstration and maintenance.

Finally, Chapter 6 presents the conclusions, including reviews and perspectives on the theory, model, methodology and analysis. The eight main hypotheses are evaluated. A processual synthesis of political-cultural history is provided for Kaminaljuyu based on the information contained in this study, supplemented by data from other areas (mortuary practice, stone sculpture, test trench analysis, inter-regional analysis) which demonstrates both the continuity of political activity and the dynamics of change within the study area. Comments on and revisions to this type of approach are proposed and perspectives on future research are given.

CHAPTER 2. THEORY

CURRENT EXPLANATIONS OF CHANGE FOR KAMINALJUYU

The theoretical and conceptual foundations for current explanations of cultural evolution in the Valley of Guatemala are found primarily in the literature associated with the Pennsylvania State University Kaminaljuyu Project (1967-1970), although the archaeological record dates to 1899 for surface maps (Maudslay 1899) and to 1925 for excavations (Gamio 1926,1927). Stenholm (1973:48-59) and Michels (1979a:3-14) review previous investigations and site reports.

Michels argues that the Kaminaljuyu polity was a representative of a "conical clan" chiefdom (1979a:261-264) similar to those in Polynesia described by Kirchoff (1955) and Firth (1957). The explanation, that I challenge in this study, is that cultural evolution proceeds within the structural limits of the social organization of the conical clan. Michels refers to this structure as an "equilibrium basin" (1979a:261) which allows for some diachronic variability, but which the conical clan "never really breaks out of "(1979a:275). This view uses a typological definition (i.e. the "conical clan") as a basis to examine archaeological data,so that interpretations about the nature of the society are already defined before any analysis begins. The idea of an equilibrium basin, which focuses on static functional integration, makes it difficult to explain social variability and the sources of cultural change and

disintegration. For example, Michels' argument for the disintegration of the chiefdom in the Late Classic (c.A.D.800) refers to the appearance of uncontrolled competition between traditional and insurgent lineages (1979a:238). This may be the case, but the approach does not lead to the examination of long-term processes that may be associated with this development; that is, of on-going, even normal, forces of "disruption" and integration. Consequently, change tends to be described rather than explained, and cultural evolution appears to be statically rather than dynamically phrased. In effect, theory is attached to a typological description rather than being integrated into an evolutionary framework that focuses on the processes and means of cultural change.

Another approach, represented by Sanders and Murdy (1982), attributes cultural change to the interaction of regional population dynamics and agricultural adaptations. Accordingly, archaeological patterns in the Valley of Guatemala "...suggested that social evolution was the product of a gradual per capita reduction of the agricultural land resource and, therefore, the product of intense competition over a basic resource" (1982:59). The assumption is that "population pressure" on agricultural resources motivates cultural evolution (c.f.Boserup 1965). A bias to resource-based explanations is further apparent as the authors contemplate what "...factors acted to produce social fissioning when political groupings reached the size of 20,000 to 30,000 people"(1982:59). They suggest that "...it probably has to do

with the nature of the agricultural system" (1982:60), although they do not specify the process(es) involved.

This approach is further developed by Murdy in a study of "man-land" relationships through time in the Valley of Guatemala (Murdy 1984). Although he attempts to integrate a wide variety of data "to elucidate the history of sociopolitical development" (Murdy 1984:219), he assumes the primacy and determinative effects of population growth. Consequently, "the prehistory of the Valley of Guatemala-Canchon Plateau can be seen as a series of stages of continued but irregular population growth" (Murdy 1984:236). With this perspective, population growth leads first to "intensification of the agricultural system" and then to "increases in the complexity of the sociopolitical system" (1984:236-237). Social development proceeds within this context from egalitatian to chiefdom society, then from stratified society and to centralized state, paralleled by progressive political decentralization, degradation of soil and agricultural production and sociocultural collapse (1984:237). The main problem with this procedure seems to be that processual explanation rests on the assumption of "natural" population growth. While population growth is an important factor, I argue that this view limits investigation of alternative causes of population growth (specifically, sociopolitical causes). The consequence of this view is that when certain population levels are reached (Murdy 1984:205-207), changes just "happen". Because of this restriction, conditions within and transitions between

his developmental stages are simply described as configurations of archaeological data (Murdy 1984:219-228), and not presented in an interactive way that involves other causative factors.

This perspective raises issues about phenomena associated with population change and size. For example, what forces cause population growth and decline? Is growth more than just natural growth followed by forced decline? What are the specific interrelationships among population levels, environment, subsistence practices, economic organization, political organization and social competition? Interactions must be far more complex and variable than simple one-way cause and effect relations that are driven by population growth and the "nature of the agricultural system. Useful knowledge can be gained from the study of changes in variables such as "...population growth, agricultural intensification, environmental deterioration and sociopolitical evolution" (Sanders and Murdy 1982:19), but to be really meaningful, they must be placed in reasonable juxtaposition, not only with each other, but with other variables as well.

In conclusion, an account of cultural evolution for the Valley of Guatemala requires a theoretically-based, processual explanation. In this study I will follow a procedure that:

1. Starts with theory, not data.
2. Avoids typological, normative arguments which exclude variability from analysis.
3. Incorporates multiple, reinforcing lines of evidence.

4. Demonstrates a cultural system evolving in dynamic tension instead of in dynamic equilibrium.

ALTERNATIVE EXPLANATIONS AND THEORITICAL APPROACH

The perspective presented here maintains that *competition* for status, power, prestige, honor etc, is central to social and political change. This view of the role of competition differs from those of Michels (1979a) and Sanders and Murdy (1982), who imply that competition is significant only as a factor in Late Classic (A.D.600-800) and Terminal Classic (A.D.800-1000) in the Valley of Guatemala, and is associated with population and land pressure. Michels, for example, proposed that the appearance of ball courts after A.D.400 indicates a shift from "cooperative" to "competitive" relations between lineage segments at Kaminaljuyu (1979a:231). Sanders and Murdy argue that intense competition over (agricultural) resources brought social change and collapse in the late stages (1982:59). In both cases, competition is not only characterized as destructive military conflict but also as an anomolous or intrusive event rather than an integral component of on-going competitive social relations.

The formation of competitive relations is not under study here, but they are assumed to be present as an integral part of the social constitution of the emergent chiefdom. Competition is often associated with contests among eligible, ranked heirs for access to the highest status positions. Goldman (1970:24), applying Polynesian ethnographic cases, argues that status

rivalry is "a necessary response to ambiguities of rank." For example, the absolute order of genealogical rank is compromised when a question of relative fitness for leadership arises. Status rivalry therefore, is concentrated in the highest ranks of the chiefdom, where chiefly competency and the right to rule (despite actual genealogical rank) are always open to challenge, especially from other high-ranking competitors. In other words, Goldman claims that, although genealogical rank determines inheritance absolutely, a designated individual may be unfit to hold a specific position, so (sanctioned) competition for that position follows. In this view, competition selects for competence and this invites confrontation and tests of political support.

However, Bailey (1969), with a wider view of competition, defines the political unit (or "political community" 1969:23) as the "widest group in which competition for valued ends is controlled" (1969:23). Competition is not restricted to issues of elite access to positions of high status, but is associated with the formation of or "teams" whose membership is variable; age, gender, class, kinship group, territory, achievement association, ascription etc. Groups compete using rules of "non-mathematical, game-politics": "A political structure, like a game, operates within limits set by agreed rules, which specify prizes, say how teams may be formed and led, lay down lawful and unlawful tactics, and sometimes appoint a referee with authority to see that the rules are observed" (1969:24-25). Bailey's view is more

useful than Goldman's because it allows competition to be seen as a generalized phenomenon which is organized within and between identifiable political groups, and he specifies the means by which competition can be resolved. In other words, Goldman's argument is a special case of competitive relations which concentrates on the resolution of elite access and succession to power.

These authors' perspectives introduce an important point. Competition is represented as a normal feature of social interaction in society. It is not necessarily associated with social disintegration or lack of cooperation, provided it is carried out within recognized "rules" of competitive behavior. In this respect, competition is seen as a process (or device) through which the most "worthy" groups and members in society are identified (which is a relative measure). With this view, competition, even intense or "destructive" competition, is not an anomolous or intrusive development in the Late Classic at Kaminaljuyu. Therefore, one can seek explanations of change which have their roots in on-going, historical and competitive social relations.

However, Goldman, and to a lesser extent Bailey (see also Swartz et al. 1966), have represented competition in a relatively static perspective. That is, though the competitive process has been introduced, there is little or no account of underlying gradual, long-term change; neither as a consequence of competition nor as a function of competition itself or of any

other social development. Due to the nature of political analysis, the focus is on confrontation and crisis during those times when competition is resolved. This tends to neglect any consideration of a gradual build-up of non-confrontational competition or conditions which should precede intense confrontation. We need to implement theory that can account for both long-term and short-term processes in social competition, rather than theory that just "explains" periods of crisis.

On the basis of the preceding discussion, I propose to address the following three questions:

1. How can competition for status, power and prestige explain political and cultural change?
2. How are competition and archaeological data linked?
3. What does the focus on competition and status rivalry imply for the treatment of archaeological data?

Competition and Political Change

How can competition for status, power and prestige explain socio-political change? In the theoretical perspective presented here, two pre-conditions are proposed:

1. There are political pressures for the growth, development, use, and control of important political support "resources".
2. There will be changes in relations between groups and/or individuals with changes in differential access to support resources (that is, between "normative" and "practical" relations; Bailey 1969).

First, material support is of immediate interest to those engaged in contests to obtain and maintain status and power since those who are able to assemble greater support are more likely to be successful in political competition (Bailey 1969:36). In effect, competition is mediated through access to labor (goods and services). Political units and leaders are expected to have a specific interest in advancing status by promoting expansion of the productive economic base and/or controlling status-marking resources (Sahlins 1972:82; Spencer 1990:10-11). Therefore, patterns of political and cultural change should clearly be associated with patterns of economic change and development. Also, material culture, as found in the archaeological record, should indicate prevailing (synchronic) status relations. The archaeological record can clarify economic and status relations by providing a basis for recording and evaluating changes in relevant material culture.

These premises explain the motivation for growth and development, but what about the process of change itself and what are its important features? Bailey has suggested a means to conceptualize this problem. I quote him at length here because he presents an overview of the relevant components, expressed within a competitive context.

> "Political change seems always to be a contest, although the cause of structural change is a maladjustment between that structure and its environment, the change is worked out through the actions of men and their failure to act. Perhaps one can imagine situations of total enlightenment in which wholly rational leaders, in response to environmental pressures of a non-human kind, dissolve the structure which has given them power and substitute another structure for

> it. But in life it seems that the environmental pressures making for change include usually other would-be leaders, whose ambitions and ideals are frustrated by the present structure. Therefore a contest arises: therefore we are able, to some extent, to understand change by using the categories of competition and contest." (Bailey 1969:217).

This perspective is useful because Bailey's purpose is to devise a methodology for the analysis of change. It is an "...attempt to discover some of the general principles in political manoeuvre which transcend cultures and which provide questions which could be the tools of research in a variety of different cultures" (Bailey 1969:xii).

Second, short-term political crises arise from and are the inevitable consequence of long-term processes, a theme which Bailey addresses in the case studies. I review the relevant arguments here (for a comprehensive summary, see Lewellen 1983:104-108). The potential for political change is likely when there is "a maladjustment between the normative structure [of society] and its environment" (Bailey 1969:189). Bailey means that "normative" social relations, explicitly understood in a written or unwritten social constitution, are recognized as legitimate. They are staked out by "normative rules"; that is, "Rules which express such ultimate and publically accepted values" (Bailey 1969:4). Then he distinguishes between politics with a "public face" (using normative rules) and "private wisdom" (using pragmatic rules) (Bailey 1969:5). The basis of (political) change is found in the differential between the two sets of rules: " The ratio of normative to pragmatic rules can be taken as an indicator of potential instability" (Bailey 1969:189). With

this, we have a basis for understanding long-term processes. For example, Bailey associates this "ratio" with an "environment". This environment

> "...is defined very widely: it may mean a new law, a new ideology, an increase or decrease in population, a plague, a new technique of cultivation, a tender-hearted or rigid administrator, or many other things...In effect, the environment is defined as everything which is not part of that particular political structure" (Bailey 1969:191).

Bailey argues, for example, that new resources may become available for use in political competition, and the normative rules may not give sufficient guidelines for their use. This leads to the political crisis. So, by means of two different theoretical perspectives (growth and control/use of new resources), we have defined the role of "resources" in political action, though Bailey defines resources more widely. In any case, theoretical links between political competition, the use of resources, political structure and crisis, and long-term and short-term change have been developed. But it is necessary to put them in context, to understand how they operate and vary together in time.

Bailey has argued that his theory of political change is valid regardless of political context, at least for any relatively complex society, and has presented several case studies from ethnography and recent history to demonstrate this (see above). But what about cases where the record is less immediate, which also show long-term temporal continuity, such as ancient historical or archaeological-prehistoric cases? Can analysis of such independent cases support Bailey's theory? To

answer this, I refer to Alfoldy's historiography, *The Social History of Rome* (1988 [1975]). I discuss this work in some detail because it is a detailed study of long-term competitive political processes, and it is a case which shows how social, political and economic interrelationships are "worked out." The author attempts to explain the course of ancient Roman social evolution by charting, from historical sources, the changing relationships of various status categories. He analyzes political interaction against the background of an (intensely) agrarian economy in a manner that recalls Bailey's game-theory approach. His view is distinctly structural-processual:

> "In order to counter the impression that Roman social history simply consists of a series of snapshots, stress has been laid, as far as possible, on the ways in which the social conditions of one stage grew out of those of an earlier period and on the extent to which they also paved the way for further social change." (Alfoldy 1988:xi).

He does, however, focus on periods of political crisis (for example: The "Struggle of the Orders": late 4th C.B.C., the Late Republic Civil Wars: after 201 B.C., the formation of the Empire: 27 B.C., the social breakdown of the Empire: 3rd C.A.D.) as particularly intense instances of rapid social or structural change. This procedure recalls Bailey's outline of the political process.

The contest for status, power and prestige, based on the ownership of productive farmland and access to (slave) labor, is central to Alfoldy's account. The contest is resolved within and between identifiable social categories and he indicates the factors and dynamics that are associated with change. To take one

example, in a discussion about social transformations in the Early Republic (1988:13-19), he notes that the early division of Roman society into two social groups, plebians and patricians, became untenable because:

1. The plebian class itself had become stratified as its membership increased. Some members had become wealthy, including a segment of warriors, craftsmen and traders (professions shunned by patrician landlords), who began to acquire (or purchase) agricultural land and surpass low-ranking patricians in wealth. Meanwhile, other plebians fell into debt, lost their land to patrician (or wealthy plebian) landholders or began to share small plots of land.

2. Many plebians were dissatisfied with conditions that allowed them to be exploited and politically dominated by the wealthy land-holding patricians while prevailing status regulations did not recognize wealthy plebians, or admit them to the noble class. Thus, wealthy plebians wanted political recognition and the poor ones wanted relief. In Bailey's terms, this situation represents a differential between normative and pragmatic rules (of status). The situation was resolved as follows (Bailey's key words appear in quotes, bracketed). Plebians, whose military importance (infantry) had increased due to the introduction of new tactical strategies, were able to challenge the patricians with demands ("confrontation"), particularly wealthy plebians who were able to make and supply military equipment. They formed a separate political unit ("team") and, in a crucial situation, threatened a

military strike unless political concessions were given by the patrician elites ("encounter"). Wealthy plebians also constructed their own temple (dedicated in 493 B.C.) in order to demonstrate their separate status ("symbolic display", "challenge"). According to Alfoldy, they had created a "state within a state" (Alfoldy 1988:75). Finally, with the codification of the Twelve Tables (c. 450 B.C.), the new status and rights of plebians were recognized ("relative credit verified"). However modest, these reforms did give some protection against excessive powers exercised by the patrician aristocrats. This entire episode is, in fact, almost an exact parallel to Bailey's account of the attempts of the farm laborers (Pans) to gain status recognition in Bisipara village (Bailey 1969:116-121). Alfoldy continues, in similar fashion, through over 1000 years of Roman history, so that we obtain a long-term processual account of Roman social and political development.

In answer to the question posed at the beginning of this section (How can competition for status explain political change and development?), it was first necessary to build a link between status competition and support resources. It is evident from Bailey's perspectives and from Alfoldy's historiography that competition for status, power and prestige are underwritten by support and resources, and that this interaction is central to political change, both in short-term and long-term situations. Status claims are based on development and control of economic/political "wealth", in particular wealth in new or key

resources such as productive land, livestock or trade goods and crafts. In some cases, especially in those where cumulative small changes in the distribution of wealth have occurred, wealth and status position may not coincide, and the resultant stress or potential for political challenge to the existing structure increases. This condition is represented in differences between normative and pragmatic rules, where only normative rules are encoded in a "social constitution", and status differentials are perceived as artificially wide. When such differences are opposed, that is, when normative status is wide but wealth status is narrow, reform or structural change is more likely to occur. Indications of these conditions would be apparent in the intensification of ideological programs to strengthen legitimacy, or coercive sanctions. Alternatively (or concurrently) one might also expect to encounter a period of social (civil) conflict, characterized by intense inter-elite conflict.

This process seems to be one of punctuated development in which apparently stable (structural) episodes of long-term gradual change are punctuated by short-term periods of instability and radical change, when normative rules are renegotiated to account for long-term changes in status and resource distribution.

Status Competition and Archaeological Data

How are intangibles such as status competition and political development manifested in material culture? Given the

theoretical links between status competition, resources and cultural change presented above, then one should expect patterns in allocations of resources. To address this, I would like to introduce three analytical divisions that will be used in this study: political support, status demonstration and political maintenance. They are useful divisions since they have an anthropological foundation, refer directly to political activity, and they have archaeological correlates. Political support has been defined as "anything that contributes to the formulation and/or implementation of political ends" (Swartz et al. 1966:10). In the abstract, political support varies on a continuum between two extremes; legitimacy and coercion. Legitimacy refers to the sanctioned legal process by which a group or person acquires and/or maintains political office. It is associated with the idea of consensual support. Coercion refers to the acquisition and maintenance, by intimidation and force, of political office in the absence of sanctioned legal processes. It is contrasted with legitimacy and consensual support (for selected cases see Alfoldy 1988:7,8,15,17,43,50,88,98,110; Bailey 1969:36,74,76,88,94,95, 117; Lewellen 1983:95-97; Swartz et al. 1966:30). Material culture is implicated in support because the politics of status, whether predominately legitimate or coercive, are underwritten by control of resources and economic production. As argued above, competing political units will attempt to gain control of, or access to, insofar as they are able, key productive resources. Therefore, this view argues that political activity dominates

material culture, and that material resources are used in the service of political activity and status determination. For similar views see de Montmollin on settlement (1989:50-52), Rowlands on the economy (1982:162-167) and Helms on trade (1988). Consequently, the concept of political support includes all aspects of material culture that contribute towards the allocation and maintenance of status position, particularly agricultural production, material resources and associated craft production, and access to external resources. The role of material culture in political activity is apparent simply by reference to ethnographic case studies in the general literature. Inevitably, as one might expect, reference is made to objects of material culture as something to be fought for and won, controlled or utilized in political competitions, such as status objects, economic resources or trade wealth (Bailey 1969:36-37; Lewellen 1983:93-97; Swartz et al. 1966:20-27). Without reference to further cases in the anthropological record (which are numerous), one may argue that political activity and status are closely linked to material culture and economic activity, and that the concept of political support must address the idea of access to and control of material resources.

Status demonstration refers to those activities and objects that indicate the current distribution of status. This will be evident in the quantity and quality of public (political) construction; the control of goods that mark status; the nature and quality of burial monuments and investment in ideological

programmes. Political maintenance refers to the administrative functions of the political unit that are associated with political integration. Any political unit is required to manage the routine, day-to-day affairs of its support group and institutions. Routine functions also enable political leaders to monitor and respond to situations that are likely to enhance or deplete status or threaten political integration. Maintenance will be evident in construction activity since built spaces are the locus of administrative functions (for further discussion see section below on political administration).

Implications for Treatment of Archaeological Data.

The emphasis on political behavior in society (e.g. support, demonstration, maintenance) leads away from analyses which conceive of society as a static, functionally-integrated, "equilibrium" system. In other words, while functionalist approaches can isolate and examine integrative devices as separate entities, political-processual approaches must attempt to identify and evaluate dynamic and changing interactions among several cultural components simultaneously along a temporal continuum. Analytical techniques must include both those which focus on cultural components that are seen to maintain structural integration (which implies stasis) and those which focus on situations or conditions that underlie change. Consequently, those who apply a political approach to cultural evolution tend to advocate an "interactive" approach. Goldman, for example, on

the basis of his analysis of Polynesian chiefdoms, comments :

> "We do need to consider the entire process of political and economic development less mechanically and more fully in the light of interactive processes. In Polynesia the process of status rivalry sets political evolution in motion and this, in turn draws heavily upon economic resources and means for its continual development." (Goldman 1970:486).

Swartz et al. in considering how to isolate a temporal "still point" to begin processual analysis, observed that investigators are "confronted by a set of co-existing parts that can be conceptualized as structured, or as having positions relative to each other" (1966:28). They go on to argue that, in order to introduce a temporal continuum to analysis, one should expect "instability and imbalance in power relations" originating in "ecological and demographic variations that affect the size and wealth of political units, psychological factors, such as differences in the need-dispositions regnant in various groups within the population at various times, and the effects of pressures and influences that originate outside the political field" (1966:28).

The analysis of change along multiple dimensions is supported by Feinman and Neitzel in their study of variability in New World chiefdoms (Feinman and Neitzel 1984). They show that, since there is considerable variability in the relationship of cultural components from one chiefdom to another, typological analysis, which lumps them together, introduces distortion. It assumes they are all the same. Only case by case, diachronic studies will "enable the archaeologist to understand the nature of the relationships among key variables" (Feinman and Neitzel

1984:77). They propose to concentrate analysis in each case on three sets of data, which will be of interest in this study:

1. Those between regional populations,
2. Those between social segments within a population and
3. Those between a population and its physical environment

(1984:78). We only need to introduce the dimension of time. The "interactive" approach is also advocated by Shanks and Tilley (1987). Offering critiques of theories of functionalism (1987:117-118), systems analysis (pp 118-119) and "essentialism", or deterministic effects of "pre-defined subsystems" (1987:120), they argue that one should study society as a "totality", which: "...is not some external structure or some essence, reference to which explains surface phenomena, concrete effects; structure is neither internally nor externally separate but is present in its effects." (Shanks and Tilley 1987:121).

I understand their view (1987:121-122) to mean that archaeological explanations must recognize that the *interrelationships* of cultural components form, and are identical with, social structure. I would include especially, the relations of support, demonstration and maintenance. Therefore, explanations of cultural change should examine these relationships as part of a "totality" from the very start of analysis.

As case studies of the interactive approach to culture change in ethnography and historiography, I refer to those presented in Bailey (1966) and Alfoldy (1988). Although neither

author is entirely explicit concerning the interactive approach presented here, this view is implicit in their commentaries (Bailey 1966:17, also chapter 1:1-17; Alfoldy 1988:x, also xi note 2). In archaeology, I refer to de Montmollin's analysis of the Rosario Valley, Chiapas, Mexico. According to de Montmollin, a monolithic or "totally" testable cultural model glosses over potentially interesting and informative data in order to test global theory (de Montmollin 1989:33-34, 37-39, 252-253). Consequently, we should not be overly concerned about incomplete or seemingly irrelevant data because they enable utilization of the requisite variety in the record and usefully point out areas for further investigation. The data, as de Montmollin argues, can be examined as an integrated, evolving whole: "The research process is broken down into steps or components, and the web-like linkages between them are appreciated and explored" (de Montmollin 1989:252). Here, the cultural system and the archaeological record are broken down into discrete analytical categories so that they can be examined separately, or in conjunction, in order to test whether their relationships reinforce explanatory arguments, and whether separate lines of evidence all "point" in the same direction. He applies a variety of tests from the settlement record in order to examine the political structure of the Classic Maya. Rejecting typological analysis and other pre-defined formulae, he carries out a series of tests which are intended to demonstrate where the polity fits on a scaled political continuum, from "segmentary" to "unitary"

structure (de Montmollin 1989:17, Table 1). This approach is interesting because it uses a detailed, exploratory and interactive perspective on political organization which can only be amplified with the application of additional classes of archaeological data. Unfortunately, the study is temporally restricted to to a single (Late Classic) phase, which precludes an interesting study of long-term change.

Processually, my view is that the various cultural components are never in completely stable equilibrium. Therefore, cultural change is presented here as a phenomenon associated with the "working out" of dynamic structural relations. This view is close to that held by Swartz et al. who state that "The closer we come to the political grass roots the closer we have to consider such 'motivations' as self-interest and ambition, and the more we are obliged to show in terms of detailed case histories, the working out of courses of action that are set in train by these and like impulsions" (1966:26). Bailey might agree: "Although the cause of structural change is a maladjustment between that structure and its environment, the change is worked out through the actions of men and their failure to act" (1969:216). Archaeological cases of an "interactive" approach to culture history, which complement Alfoldy's analysis, are available for the Western Roman Empire (27 B.C.- A.D.476) (Tainter 1988:128-152), although the author takes a more formalist approach, Mesopotamia (Wright and Johnson 1975) and Mesoamerica (Kowalewski et al. 1989; de Montmollin 1989).

Unfortunately, as Wright and Johnson point out (1975:283-285) most archaeological data lack the full breadth required for this type of interactive analysis. Neither is it feasible to define and analyse a "totality", even in cases where a substantial data base is available (de Montmollin 1989:37). Nevertheless, if the relationship of some dimensions of particular interest can be identified within the context of a holistic theory, it should not be necessary to describe all relations in the social "totality" because, if the theory is reasonable, the nature of the relations between the excluded (and included) dimensions is already implied, and therefore open to further archaeological testing.

In conclusion, the object of this study is to reduce data and theoretical formulation to manageable proportions while maintaining a holistic perspective. The following procedure will be used:

1. Present an interactive, processual theory of cultural change.
2. Define analytical components for study which are chosen as specific, interacting parts of the whole system.
3. Develop a processual model of cultural evolution in the (Kaminaljuyu) complex chiefdom, expressed primarily as dynamic relations of analytical divisions.
4. Propose specific test implications (hypotheses).
5. Evaluate archaeological data against the test implications and model.
6. Refine research questions.

In general, I intend to examine the political unit as changing configurations of defined analytical divisions (support, status demonstration and political maintenance) measured in terms of specific analytical classes (population and settlement patterns, construction activity and additional data as required).

ANALYTICAL CONCEPTS AND COMPONENTS

For the polity under consideration the components of interest are: economic organization, population characteristics and political units, and political-administrative organization. My understanding of these components as analytical units and their relevance to cultural change is presented below. First, it is neccessary to define some terms.

The political unit is a self-defined political entity that manages the political economy (the production, receipt and disposition of community resources and property). It is composed of institutionalized status/ social categories including lineage segments, political offices and titled positions, specialists, retainers and other dependants attached to elite houses, and supporting populations. The political unit has spatial, temporal and demographic dimensions which, if known, make it a suitable unit for archaeological analysis. Its existence as an independent or hierarchical unit in Mesoamerica is indicated by the presence of public-ceremonial mound architecture.

An identifiable political unit must be an emic unit, associated with the idea of political territory, tribute

obligations, political support and maintenance. It also forms the context for competitive status rivalry and the basis of political-economic support. Competition will be present within the unit as status and succession contests and as feuds between factional or lineage sub-divisions (Bailey 1969; Goldman 1970). The external dimension of competition involves rivalry between autonomous local units, and finally, rivalry between regional political units. Competition is mediated through access to support and resolved through confrontations with rivals in the form of feasting, contests of display or warfare (as raids of conquest and capture); all well-attested for Lowland Maya polities (see Culbert 1988 for a synthesis of Maya political history).

Finally, following Sahlins' arguments (1972:102-123), the "domestic unit" refers to the individual household or local kin residence group. Although it relies on the political unit for community coordination and services etc, it is opposed over the issue of the control of kin members, labor and production for tribute (see also Goldman 1970:542-549). It will particularly oppose political demands for tribute when these are perceived as burdensome, which may be the case when the political leaders are engaged in intense competitive rivalry. Essentially, the domestic unit is structurally opposed to, though not necessarily antagonistic to, political organization while the political unit is intent on maintaining and expanding political integration and status.

Economic Organization

"Economic organization" refers to the way in which a society patterns the flow of goods and services. It has two components:

1. The method or means of production, distribution, exchange and consumption (of material goods).
2. The articulations or regulations, by which component 1) is organized (i.e. market, tribute, redistribution systems).

With a focus on material goods, we have an analog for formalist theory in economic anthropology, to which standard rules of price-theory, market exchange, maximization and supply-demand theory may be applied. What if intangibles such as status, power, prestige are included as economic "goods"? Suppose "economic" organizing principles that regulate the flow of goods and services include those that are associated with social, political and ideological (as opposed to strictly materialist) organization? In short, what if economics and politics, for example, are treated as fully integrated systems, rather than as independant ones? This perspective is the basis for substantive theory in economic theory, which, supporters claim, is better able to analyze or describe conditions in pre-market societies (Polanyi 1968). The issue can be stated in reverse; should intangibles such as status, power and prestige be included in modern economic analysis?

Although the form in which the economic problem is presented above betrays a substantive bias towards ancient economies, I view the formalist-substantivist division as a false dichotomy

(Clammer 1985). There is nothing to be gained in attempting to validate one perspective at the expense of the other. They can operate together (Sahlins 1972:277-314). Social capital and political organization are congruent with materialist economic analysis. We know from the ethnographic record that political leaders, though interested in material production (in fact "wealth"), did not clearly separate, as formalist theory might argue, the material and social world, and in fact viewed them as interdependent.

This view of an integrated economy is consistent with the views presented above, where it was argued that the political unit, through its leaders, will attempt to control production, distribution (tribute) and consumption (status marking). Helms, referring to trade in valuable goods, has stated the point as follows:

> "...while the acquisition of shields or shells or stones or holy incense may require careful hard-headed trade and commerce between distinctly separate trading agents and polities, the ultimate goal of those seeking such goods may well be directed toward obtaining (maintaining) access to material manifestations of the power and potency that imbues the cosmos." (Helms 1988:130).

By its nature, however, archaeology concentrates on the recovery of and distributional/spatial relationships of material culture and thus favors formalist perspectives on ancient economic and social behavior. Yet, when this is done, one must address the question; What explains or motivates this distribution? Without an effort to understand these phenomena, we will not be addressing the most interesting and explanatory

part of the archaeological record. This perspective clearly involves social and political (not to mention economic) processes and we should be prepared to utilize distributional data in conjunction with constructive ideas about intangible goods and values (such as status, power and prestige) that affect material culture.

Judicious use of the anthropological record is called for, specifically for the purpose of building bridging arguments between the anthropological record and the archaeological record. The anthropological record recognizes two categories of economic activity; one associated with subsistence goods, the other with valuable goods (Brumfiel and Earle 1987:1-9; D'Altroy and Earle 1985; Douglas and Isherwood 1966:131-146; Goldman 1970:476-477). Subsistence goods include foods and utilitarian products which, because of bulk and low unit-value, are spatially restricted in their distribution (see also Drennan 1984).

The Subsistence Economy

The local economic system is underwritten by the total production of subsistence goods (foods and utilitarian products). Total economic wealth must be a function of total food (energy) production. For example, in terms of direct consumption, foods may be utilized for reinvestment in further food production, investment in family maintenance, payment to non-producing specialists such as healers, ritual sacrifice, affinal and marriage obligations and tribute obligations. Food consumption,

transformed into productive activity such as that found in craftwork, public labor and service committments should be accounted for as well. However, an "econometric" analysis of this sort is both questionable, because it does not investigate the political dynamics involved in the use of subsistence production, and, unfeasible, becuase we lack evidence of most perishable goods. Nevertheless, there are some features of subsistence production that would be useful in archaeological analysis. For example:

1. If political leaders emphasize the accumulation of wealth (through tributory relations), they can increase wealth by promoting expansion of the subsistence base (Blanton 1975; Sahlins 1972:82; Spencer 1990:10-11; Steponaitis 1978:428-430). In effect, wealth is "created", provided there is potential for increasing population, labor and productive output (Spencer 1982:44-48). Accumulated, it can later be utilized for activities directed towards enhancing status and power. This suggests that there should be meaningful relations between population size and settlement patterns, ratios of subsistence producers to non-producers and the activities of non-producers.

2. The extent to which a political unit relies upon subsistence goods for support will necessarily define the spatial range of its operations. This is due to logistical problems associated with the handling and transport of subsistence goods, which are usually bulky, perishable and have low unit-value. Unless subsistence goods are converted into more portable goods,

political and economic functions may be confined to the practical limit of food and utilitarian craft distribution. This condition suggests that there is a relationship between manufactured goods and the scale of political operations, not only in relation to long-distance trade, but also in relation to the size and nature of the local political territory.

3. In the form of tribute, subsistence goods, or their rough equivalent in service, labor and crafts, are converted into a variety of archaeological facilities or features where (inferred) functional activities occur. For example:

a) Residential complexes, workshops. Maintenance of local political authorities, their families, advisors, retainers and artisans.

b) Temples/ancestral mounds, monuments, walls, ditches, earthworks. Support for the construction of public facilities or personal monuments for local political leaders.

c) Temples, plazas, ceremonial platforms. Financing community festivals and ceremonies.

d) Dams, canals, terraces, ponds. Support for the development of (intensive) subsistence systems.

e) Fortifications, walls, ditches, ramparts. Construction of defensive works.

f) Workshops, storehouses, exchange spaces. Production of valuable goods for trade, status and ceremonial purposes.

In summary, subsistence goods contribute mainly to the support of the local economy, including, through tributory

mechanisms, the non-producing population. The position taken here is that the local subsistence economy, defined as a political financing entity (Brumfiel and Earle 1987), is differentially allocated by leaders of the political unit to a variety of public projects. The specific allocation depends on the scale and productivity of the subsistence system, the rate of tribute extraction as well as the distribution of political power and political priorities. Archaeological records of these allocations, such as distribution of construction activity, should indicate associated political conditions.

The Wealth Economy

The wealth or valuable goods economy is dominated by valuable portable goods and useful information (Helms 1979; 1988) which is associated primarily with long-distance, social-political relations between high-status members of different communities.

How do we explain long-distance trade in valuable goods? Perspectives on this question will help us to evaluate the distribution and context of such objects in the archaeological record and to understand political evolution through changes in these characteristics. Accounts such as resource equalization exchange, ideological trade, and interaction sphere exchange, are either non-explanatory, or unsupported by the ethnographic and historic record.

However, Helms (1979; 1988) has addressed this question with

specific reference to an extensive body of ethnographic and historical literature. She argues that there is local competition for access to external sources of power and knowledge, especially that which exists in distant places (real or mythical) inhabited by powerful, wealthy or supernatural beings (Helms 1988:131-137, Chapter 4). This contact is cultivated and monopolized by local elites (Helms 1988:148-163) whose practical "success" in such relations, verified by the possession of wealth associated symbolic (and valuable) objects, underwrites their status and gives evidence for knowledge of, or access to, useful (or harmful) powers and sanctions. These external relations can be reinforced through intermarriage, regular exchange, ceremonial visits and cooperation and alliance in warfare and trade. In effect, these relations, evident through the demonstration of special objects and information, are proof of efficacy (Helms 1988:132,151), which is a crucial component in gaining and holding political legitimacy and support in political competition. They demonstrate on-going political competition and interaction at the elite level in society. With this view, wealth valuables monitor, or "keep score" of current distributions of status and power on an inter- and intra-polity basis.

On the basis of the preceding, Helms has proposed some relationships between political organization and valuable goods that might be suitable for archaeological testing. There are three points.

1. Long-distance associations, measured in "sumptuary laws and elaborate regalia" (and valuable trade goods), will be more evident as the society becomes more politically centralized. That is, as political-religious status becomes "more focused, restricted, and publically enhanced" (Helms 1988:170), they are more circumscribed by status marking goods.
2. A more complex society derives a greater proportion of its legitimacy from long-distance associations (1988:170).
3. Polities that are more politically centralized place greater emphasis on tangible material goods as an indication of external contact and foreign knowledge. This is contrasted with more egalitarian communities which emphasize intangible forms of knowledge such as "songs, languages, curing skills" (1988:170).

Archaeologically, we are immediately faced with the methodological problem of defining and measuring political "centralization" and "complexity". However, this is a general theme of this study, so it should be possible to address some of the expectations for valuable goods trade and political ogranization suggested by Helms.

To respond to the question posed above, (why are valuable goods associated with social-political and long-distance relationships?), I make the following observations. Since valuable goods are associated with both (high) status and achievement, access to these goods is associated with competitive contests (compare Bailey's idea of political "prizes" 1969). Possession of such objects demonstrates competency and efficacy,

and thus the right to hold positions of power. Concurrently, valuables involved with long-distance trade are associated with access to external sources of wealth and useful power and knowledge (Helms 1979; 1988), which are often represented as powerful and dangerous and must be mediated through suitable local agents (Helms 1988:132). As political resources, these valuables also build confidence in the leader-mediator in the eyes of subjects and followers and give further substance to status claims.

The two classes of economic goods, subsistence and wealth goods, are usually opposed to one another in the literature on pre-market exchange. For example, there is normally no direct exchange between the two classes even though the production of valuables is underwritten by the subsistence system. Brumfiel and Earle have noted, in fact, that when subsistence and valuable goods are freely exchanged with one another, valuables become "true currency" (1987:4). To further define this opposition, they argue that centralized political control is associated with a shift in public financing (to pay administrators and craft specialists for example) from subsistence to valuable goods (compare with Helms' propositions above). It follows that if the economics of valuables do not fully depend on the productivity of the subsistence base, then increasing production and circulation of valuables should not necessarily correlate with the growth of agricultural populations or the development of intensive agricultural practices. In fact, if local political leaders, or

other individuals or groups, are able to obtain status and prestige by accumulating wealth through exclusive contact with foreign elites (while controlling the production and distribution of local and external valuables), then there may be a negative correlation (Wilk 1983:108-114). That is, a traditional subsistence-based status system may begin to weaken as elites depend more on external relations for purposes of determining status position. There will be less need to increase subsistence production or to promote population increase to provide additional agricultural production. This does not mean that agricultural production becomes unimportant, only that if status, power, prestige and wealth can be gained through contact with external sources of power, then some political maintenance problems are reduced, particularly those associated with managing increasing and productive subsistence systems. So, while the administrative workload is ameliorated, status values continue to escalate through exclusive (non-local) contacts. These arguments, developed further below, will be used to generate a set of testable hypotheses.

The distinction between the subsistence-based economy and the trade-based status economy is further defined by Fox in his discussion of the "Mercantile City" (Fox 1977:92-116), one of his four "primary" types of urban society. The lines of opposition are drawn between a "traditional" aristocracy whose status and power are based mainly on local agricultural production and a merchant aristocracy whose status and power are based primarily

on non-agricultural production, utilitarian and trade goods, and long-distance trade contacts (Fox 1977:95). He points out that mercantile centers "...arise where political hegemony over a region is weak or absent, as during the periodic decay of bureaucratic states, or when only weakly centralized segmentary states obtain, and where a source of urban wealth and economic autonomy exists other than control over peasant subsistence agriculture" (Fox 1977:95). This opposition is clear, not only from Fox's five case studies, but also from Alfoldy's study of Ancient Rome.

In the subsistence-based status system, elite links with the rural population and their productive activities are crucial. In a change to the trade-based status system, the ties with rural agriculturalists decline and the merchant elites maintain strong relations with craft producers and trade partners. Consequently, Fox expects an "urban" focus, or redefinition of, all or part of a pre-existing center. I expect this to be combined with a declining interest, by elites, in rural populations, settlement and subsistence production. Sanders and Webster, in an evaluation of Fox's urban typologies, applied to Mesoamerican urban centers, find his types useful for analytical purposes, but in need of some modification (Sanders and Webster 1988). But they specifically mention Kaminaljuyu as a candidate for mis-identification as a mercantile-type center. They argue that its small size and low level of social complexity preclude its function as a center of commercial production, and they are

convinced "...that the primary determinants of its growth were local, based largely upon the traditional Mesoamerican pattern of the domination of an agrarian farming population by local lords" (Sanders and Webster 1988:540). A contrary view is taken here. It is argued that there is political opposition between groups representing the two systems of political support, and that the archaeological record will demonstrate shifts from predominant reliance on one system to reliance on the other. This depends, of course, on inter-regional potentials for status-enhancing trade and exchange.

Finally, Hohenberg and Lees, working with preindustrial European urban sites, have identified two "urban" socioeconomic types, one based on a Central Place model, the other on a Network model. Cities in the Central Place model (Hohenberg and Lees 1985:47-59) are equivalent to those in the subsistence-based economic system described here. The urban center "...is rooted in the stability of the land and its tillers" (1985:69), but has the potential of "...draining the land of its material and human riches and imposing the norms of an official culture and a burdensome bureaucracy" (1985:69-70). Cities in the Network model are organized on trade-based economy (1985:59-69) similar to Fox's Mercantile city. Network cities (which are pre-capitalist) specialize in long-distance trade. A "wealthy oligarchy exercises quiet but tough rule over the city-state, tolerating much that territorial societies repress so long as the local order is not threatened." (1985:70). They note specifically that these types

of economic organizing principles are not mutually exclusive at a given site, but usually one type is dominant, and it is possible for a site to shift from one type to another (1985:70-72).

Having introduced this distinction, and the possibility of changes in the basis of status determination systems (subsistence-based versus trade-based systems), I refer again to typological definitions of social change, such as the conical clan model. Are they capable of incorporating an explanation of this type of change or economic shift? No, becuase the economic system of the conical clan model relies on the subsistence-based economic system of the Hawaiian type-case. Yet this shift is exactly what one would expect, given the discussion above. As an example of this process or economic shift, I refer to contact period Hawaii. Goldman observed that many Hawaiian chiefs neglected traditional agricultural practices when the sandalwood trade with Europeans began and when European products and styles appeared (Goldman 1970:222-223). This observation is supported by the historical archaeology project conducted in the Anahulu Valley, O'ahu (see Kirch 1985:309-314). For further examples see Hohenberg and Lees 1985:48-49. The evidence shows that intensification of agriculture and settlement precedes and follows the episode of sandalwood trade (c.1810-1829). I suspect that the contact-period shift in the economic basis of Hawaiian status would be regarded as an anomoly, as in the case for the proposed origin of competitive relations in Late Classic Kaminaljuyu. In conclusion, such a shift is expected for

Kaminaljuyu at the height of its relations with Teotihuacan and the Lowland Maya trade spheres.

Population and Political Units

Political factors are important determinants for population characteristics. What evidence supports this position? To answer this, the following issues are addressed. What causes population change? What social, political and economic forces determine population characteristics, such as size, distribution, division into social categories and economic roles, complexity, inequality, even age, gender and mortality?

The idea of politically-influenced population increase (or population regulation) is at once opposed to "population pressure" models of cultural change (Murdy 1984; Sanders 1972; Sanders et al. 1979) associated with the ideas of Boserup (1965) and Malthus (1798). These ideas argue that population growth, and thus its effects, such as population "pressure" on the subsistence and cultural systems, is an independent variable in cultural development. This model requires no explanation of population increase, nor of related social change. However, Hassan, using case studies, argues that methods of controlling population size are well-known and regularly practiced. Hunting and gathering communities deliberately practiced such methods in order to "dampen" natural growth (Hassan 1981). There is no reason to suppose that such methods were unknown or unused in agrarian communities, so it seems unreasonable to argue that

population increase is just caused by "natural" (or non-cultural) process. Instead, Hassan attributes population increase in agrarian communities to a number of practical economic factors, including:

1. High labor requirements in sedentary agricultural communities.
2. Relaxation of population/fertility controls prevalent in mobile hunting and gathering communities.
3. Development of labor-intensive agricultural systems.

(Hassan 1981:161-163).

Hassan questions many of the assumptions and implications of population pressure models and concludes that, with respect to variables that cause population increase, population growth is a dependant variable (Hassan 1981:162-163).

Although the potential for social and political determinants of population characteristics are strongly implied in Hassan's arguments, he does not examine this issue closely. However, a political view is taken by Cowgill, who argues that "powerful persons" in society will encourage high fertility in order to gain advantages from greater labor potential (1975:129). Furthermore, in political competition, greater populations not only provide more tribute and public labor to support status and self-aggrandizing display, but also more manpower in warfare. It is apparent that, among other things, one of the objectives of ancient warfare is to raise chiefly authority and prestige while reducing that of others (Freidel 1986; Cowgill 1975).

In addition to stress between political units represented in

Cowgill's view, there is also dynamic tension between political and domestic units. It is an issue over the control of labor, production and population. Sahlins states that agrarian commoners consistently work well below potential maximum productive capacity (Sahlins 1972:141-148). In fact, larger families, with greater labor potential, are especially "underproductive" (Sahlins 1972:102-123), which may be interpreted as an incentive to produce larger families. In any case, dispersed settlement, closely adjusted to subsistence-economic opportunities, is seen as a normal feature of the community of autonomous domestic units. However, the political unit opposes this arrangement (Sahlins 1972:130). It restricts the autonomy of the household, but it also integrates a community of domestic units into a political system. The relations are confirmed by the institution of tribute. Presumably, the domestic household resists the imposition of tribute since this requires either additional production (work or labor expenditure) and/or loss of customary living standards. Initially, there may be immediate benefits to the formation of the political unit, but as population grows, as the political system becomes entrenched and ossified, and competing political units arise, competition for power escalates. Consequently, the intensity of tribute demands should be proportional to the intensity of political competition for status, power and prestige. Population characteristics (such as size, distribution, division into social categories and economic roles etc.) are clearly implicated in political-domestic

relations and we should expect to find associated patterns in the archaeological data (see model). As examples which demonstrate that political leaders are very much involved in manipulating and controlling population characteristics in subject populations, I refer to three ethnographic studies of complex societies (Goodenough 1972; Toland 1987; Muller 1988), as well as to cases noted in previous references (Alfoldy 1988; Kirch 1985: 309-314). A number of archaeological tests have been devised to examine the relationships between political organization, population and settlement patterns (see de Montmollin 1989; Gorenflo and Gale 1986; McGuire 1983; Steponaitis 1981).

Nicholas has specifically tested Boserup's ideas using data obtained in an archaeology survey of the Valley of Oaxaca, Mexico for the period 1500 B.C.to A.D.1500 (Nicholas 1989). The results indicate that, contrary to the population pressure model, there was never any period when there was population pressure on productive land nor was there any statistically significant relationship between location of resources and population. Without evidence of population pressure (in spite of evidence for agricultural intensification), nor for a preference for settlement on optimal agricultural land, Nicholas concludes "Although the environment cannot be ignored in settlement decisions, it appears that social, political and economic considerations overrode exclusively environmental ones during much of the prehispanic era in the Valley of Oaxaca." (Nicholas 1989:505).

Under the circumstances, it is best to examine articulations between political organization, population, environment, economic organization, among other factors, but not look for primary, totally independent variables. For example, population growth can be seen as both a dependent and independent variable in political development. It is a dependent variable when efforts are made by the political unit to promote or regulate population for political purposes (depending on the ability to implement policies); such as increasing support or demonstrating status. On the other hand, it is an independent variable when increasing population size and specialization within the political unit require changes in administrative organization in order to maintain political integration, or lead to political fissioning where poorly serviced and disaffected groups attempt to separate from the unit. The basis is that all segments of the existing population seem to be deliberately engaged in population management, depending on different social objectives.

Political Administration

Any viable political unit is necessarily a managerial and administrative organization to the extent that it is interested in maintaining community integration. In effect, the political unit is equivalent to the nature and scale of its coordinating functions. The types of functions are evident in the literature of immediate interest in this study (Bailey 1969:59-72; Feinman and Neitzel 1984; Fortes and Evans-Pritchard 1940; Goldman 1970).

Political units and their administration have at least two functional objectives:

1. To mainten existing political integration.
2. To consolidate and expand political power and its basis of support.

Political leaders, because they are at the center of political administration (Wright 1977), are in an ideal position to monitor, manipulate and enforce community activities. This position enables them to direct production towards achieving political goals (increasing status, the laboring population and tribute) (Spencer 1990). What are the effects of such increases, and the associated specialization and complexity, on political administration? What effect will this have on the political unit itself? Johnson (1978; 1982) has argued that "scalar" (political or organizational) stress, defined as the limit of the ability to receive, process and dispense information necessary for managing and coordinating community activities, is primarily affected by population size. Responses to scalar stress, which occur either deliberately or spontaneously, are the means to maintain political integration and support political growth. Such responses lead to organizational or systemic change. Things change in order to remain the same. A dynamic component is thus introduced. One response, "simultaneous hierarchization" is associated with the spontaneous development of status ascription and social ranking (Johnson 1982:409-410). As the process continues, organizational scale, population and information flow

increase, and hierarchies composed of aggregate social units ("basal units") continue to precipitate out.

Information theory does address administrative/political problems associated with population size and increase, and even suggests links to resources such as land, labor and production (Johnson 1982:409,415). Since hierarchization depends on organizational scale (or information flow and population size), status, which is integral with hierarchization, necessarily depends on scale as well. Increasing competition is associated with larger scale. This perspective, though useful for linking population dynamics with political administration, does not help to explain the effects of competition and the use of resources for political ends. It does, however, address a processual component to the analysis of political administration, population increase and scalar stress.

The explanatory value of information theory is challenged by de Montmollin (1989). He argues that it is not a primary determinant for changes in political structure or the particular type of political regime (1989:23,154,160). His purpose is to demonstrate that such changes are "more political" and "less efficient-managerial" in nature (1989:23). He points out that, since information theory derives from analogies with modern economic, state-market systems, and is therefore "formalist" in its treatment of social systems, it is not appropriate to apply efficiency-managerial systems theory to pre-state political systems (de Montmollin 1989:36,221). He applies two

archaeological tests to evaluate information theory (1989:153-160). de Montmollin's view is that the test results, while somewhat inconclusive, generally contradict the view that information theory is predominant in explaining political organization (de Montmollin 1989:160).

Although I do not fully support the central role of information theory in political change, I think de Montmollin's views are overstated. For example, as argued above, the formalist-substantivist debate is founded on a false dichotomy (Clammer 1985). Efficiency-motivated principles operate, in one form or another, in all societies. It is a question, as in the economics of exchange discussed earlier, of the objectives of the participants. Also, de Montmollin's tests are compromised because we are not sure that he has examined the Rosario Valley at sufficient scale, both in terms of population size and territorial area. For example, according to Johnson, administrative efficiency factors are important within about 20 km or more of a high-order administrative center, or 40 kilometers in diameter and 1500 square kilometers and 20,000 individuals (Johnson 1982:415). Yet the area of the Rosario Valley, including the immediate peripheral areas, is only 100-150 square kilometers (de Montmollin 1989:40) with a maximum population of 20,000. Finally, the data from the Rosario Valley are synchronic, so we have no temporal conditions of change with which to evaluate the dynamics of the social system, nor changes in the administrative structure through time. Even so,

information processing efficiency is evident in the Valley, though the point is that it is not a "critically important factor" in the political system (de Montmollin 1989:160). For further discussion and examples in relation to "chiefdom" territorial size, see Spencer (1990:6-7).

I accept the views of both Johnson and de Montmollin because the immediate basis of causation is theoretically focused on the relations of competition for status, power and prestige. So, although information theory is a useful approach to the study of culture change (de Montmollin has devised ways to test this archaeologically), it is not viewed as a completely independant factor in cultural change.

Once again, the view of the chain of causation is important, that is, the relations of dependant and independant variables. For example, for purposes of examining changes in information flow, population size is an independant variable; but for purposes of political/status competition, population size is a dependant variable. So competition affects both information flow and population size. Yet the intensity of competition itself is subject to conditions of population size and the amount of information in the system. Given these views, a position is developing that approaches the conditions sought, a system that operates in dynamic rather than static equilibrium, in which the analytical variables exist in interdependant rather than fixed relationships.

Having addressed these issues, I make the following

assumptions about political administration. If population size increases under the influence of the political unit, associated administrative-managerial workloads must also increase and become more complex. However, political leaders and their immediate advisors may be reluctant to delegate or otherwise relinquish political powers, even in the face of an administrative overwork (Spencer 1990:6-7). A form of administration resembling a bureaucracy, organized around a class of professional administrators, is not necessarily an obvious or desireable solution. Since there must be a practical limit to the capacity of any administration to function efficiently, that is, to process/analyse/dispense information quickly enough to maintain political integration, there must be a point at which the political unit will experience ("scalar") stress.

At this point, stress-reducing responses are expected. For example, one might expect some local or peripheral political units to exploit "gaps" in administrative control and attempt to gain support for local political autonomy (Bailey 1969:78; Spencer 1990:6-7; Wright 1977:381). Presumably, if successful, they will form demographically smaller (but more manageable) political units, though physically and administratively modelled after the older units (Bailey 1969:80). In effect, there is no real structural administrative change, only political segmentation; accompanied by the creation of demographically and structurally similar political units. As an alternative (though perhaps more common) solution, the existing unit can negotiate a

political settlement with peripheral units, granting limited political autonomy in exchange for continued allegiance. In this case, there will be some degree of political delegation or decentralization, but unlike the previous case, the full duplication of administrative services and facilities is not found. Finally, there is complete structural change or transformation, such as implementation of effective state-like administration (Spencer 1990:8-15).

These explanations would account for Sanders and Murdy's observation that political fissioning in the Valley of Guatemala occurred when population segments reached 20,000 to 30,000 individuals. Coincidentally, the figure of 20,000 individuals is noted by Johnson to mark a demographic threshhold for administrative change ("simultaneous hierarchization") (Johnson 1982:407-410). However, these population sizes appear to represent an upper size-limit for a particular type of administrative system and do not inform us about administrative adjustments at lower population sizes. Consequently, this perspective tends to focus on fission dynamics, or typological boundaries between chiefdoms and states, when we want to examine the processes within the polity itself (perhaps ones leading up to chiefdom-state political transformations). We are inquiring about the types of solutions that were implemented in order to maintain political integration in a situation of administrative stress. We are interested in the types of remedies that were employed in order to deal with stress. For example, some

alternative remedies would include: intensification of coercive or ideological measures of support, deliberate political delegation, even technological improvements in information processing (writing, transport). Improbably, one might even expect efforts to reduce population size, since this will reduce associated administrative workloads. This solution implies that the economic base be reorganized in order to reduce reliance on population-intensive, status support systems, while at the same time maintaining current status levels. As argued above, this is a real possibility if political status begins to rely on trade-based relations, if the opportunity for such relations are available.

The archaeological record may indicate what types of solutions were attempted by chiefs to maintain political integration. Consequently, one of the objectives of this study is to test for expected changes in political administration, especially in relation to other analytical categories such as construction activity, population characteristics, settlement patterns and economic organization.

SUMMARY

It is argued that a central feature in the process of change is competition for status, power, prestige, honor. Though empirically invisible to direct observation and testing, it is nevertheless visible in its effects. Incorporated within a social constitution, competition drives a process in which various

components of the cultural system are implicated. Since competition for and control of (high) status position requires a support base, economic production, labor and population are subject to political manipulation. The main assumption is that political pressure is directed towards increasing support, in terms of production labor and population. Political legitimacy is further supported by ideological and coercive controls. Since the distribution of current status categories must be visible, demonstration of status position is an important part of social communication. Dress and adornment, rituals and ceremonies, display of political prizes and valuable goods, construction activity are drawn into the service of marking (or "keeping score" of) status. High status carries functional responsibilities which enable political leaders to maintain political integration and to monitor essential bases of support. This activity involves political-economic administration (for example; dispute resolution, tribute and trade management and other functions which require information processing and logistics skills). Finally, there is a tension between political groups associated with a subsistence-based economy and status system, and those associated with a trade-based economy and status system. Status in subsistence-based systems depends primarily on agricultural production and links political leaders with farming populations, rural settlement, local tribute systems and associated administration. Status in the trade-based system depends primarily on craft and valuable goods production (though

not necessarily through a market system) and links political leaders with manufacturing populations, urban settlement, regional exchange and trade administration. However, the two status systems are not mutually exclusive entities, so we would expect their relative importance to be measured along a continuous rather than a discrete scale, and this will change with time. Tension between the two systems is associated with opportunities for trade with external societies, especially with extraordinarily powerful and wealthy societies.

Given a disposition to political growth and its basis of support, political leaders are faced with problems of scale, and how to manage increasing workloads and organizational complexity while maintaining (centralized) political power. These problems, created through developmental growth, are a further source of adjustment and change.

The concept of dynamic tension is used to depict a cultural system that is subject to internal and external stresses and tensions which exert pressures for change. This process is carried out in time, but also creates historical precedent, so that the culture reacts to its own history. Cultural features are never in perfect equilibrium, but exist in interactive (dynamic) tension in time. Thus, these interrelationships are the structure. As they change, so does the structure, although there is resistance from the systems' own normative structure. From this point of view, static typological equilibrium models are seen as inadequate devices for explaining social development.

Given the theoretical orientation expressed above, I propose the following research objectives.

1. Research should begin with theory, not data. Theoretical perspectives, including views on economic organization, population characteristics and political administration, and related topics, precede analysis.

2. Research should avoid typological, normative arguments which exclude variability from analysis. These criteria are intended to minimize the interpretive restrictions built into pre-defined socio-cultural models (e.g. chiefdom, state, conical clan), which tend to favor temporally and structurally static interpretations. Allowance is made for changing configurations of analytical variables in time. Also, it has been suggested that changes in the type of status-support system are possible within the context of the model. Consequently, major changes in social relations are subject to contextual analysis.

3. The study recognizes the necessity for analysing multiple, reinforcing lines of evidence. One cannnot assume univariant relations among analytical variables (population, settlement, administration, production, exchange, construction etc.), nor that single variables are always in either dependant or independant relationships (for example, population size and administrative organization). It is necessary to anticipate variation in the relations of analytical variables through time so that expected variation can be used to construct and test a processual model. Thus, expected variation should assist in the

formation of testable hypotheses, expressed in the form of a processual model of long-term soco-political development.

4. The theory presents a cultural system that evolves in dynamic tension (rather than in dynamic equilibrium). This position avoids the use of restrictive typological models and *deus ex machina* explanations of change. A number of analytical categories relevant to the political change were introduced (economic organization, population characteristics, political administration) and three analytical divisions were defined (support, demonstration and maintenance). Some temporal links among them were identified so that a dynamic, evolving social system could be outlined from which a formalized sequential model can be derived. The system (or structure) is not conceived as one that maintains a typologically stable condition, though one might argue, from the point of view of the participants, that it changes in order to stay the same. Instead, its condition is viewed as relatively "open"; it is subject to change and/or development brought about by its own interactive momentum. It reacts to its own history and condition. Additionally, it can experience modification by contact with external polities, through trade, conquest, warfare and colonization for example (Blake 1985:62-126), which introduce new political resources (Alfoldy 1988; Bailey 1969; Fox 1977).

CHAPTER 3. A PROCESSUAL MODEL OF CHANGE

INTRODUCTION

One should question the utility of constructing cultural evolutionary models. They imply deterministic, unilinear schemes where one case stands for all cases. They risk confounding general with specific evolution. They also tend to create grand typological schemes (eg "stages" of evolution) which either exclude variability or use it to create typological sub-divisions. Finally, one may argue that it is simply impossible to construct adequate models of organizations as complex and variable as (prehistoric) cultural systems.

The model presented below is not meant to be a universal model of culture change. It is a heuristic device meant to be used for testing archaeological data in a specific case. Although the model approximates the archaic "aristocratic", "self-aggrandizing", Mesoamerican-Mayan culture system, it is not just "imagined", Evolutionist fashion, since it is based on theoretical positions derived from the anthropological record. The model, therefore, is a temporal sketch which incorporates analytical components and organizes them along an interactive, chronological framework. Hypotheses for archaeological testing are derived from the theory through the model, though the model itself may be considered a hypothesis. The tests should indicate whether the model is reasonable, where problems lie, provide insights for further testing, suggest areas for further discovery

and explanation, or simply indicate that the exercise be abandoned.

MODEL OF CHANGE

The model proposes generalized cultural "formations", understood in the theory as configurations of the analytical categories (population, settlement and land use, and construction activity). These formations do not necessarily correspond exactly to the defined chronological phases, but are described in relation to one another in a sequential fashion. Consequently, synchronic characteristics of the archaeological phases (for example, population size, construction volume, land use) can be considered independently of the formations. Afterwards, they can be compared with expectations these formations. This procedure avoids focusing attention on the explanation of short-term political crises, which are usually associated with typologically-defined phase boundaries in archaeological chronologies, and assists in the examinination of long-term processes. Finally, archaeological phases can be used as convenient "check points" in the processual continuum.

The model describes conditions in effect following the formation of the complex society. The assumption is that, since positions of high status, power and prestige depend on the ability to assemble political support (consensual and productive), rivalry within and between political units creates pressure to increase economic production, and by implication,

labor, population and tribute. The main sequence (Early, Intermediate and Late Formations) describes conditions expected for a predominantly local subsistence economy and status system.

Early Formation

In the Early Formation, a complex political community, such as Kaminaljuyu, the transition from a relatively egalitarian community to a ranked or stratified one would require social justification for the appropriation of communal powers (religious, supernatural, administrative, judicial, regulatory, etc.) by a specific lineage, and particularly by the lineage head. While there may be some resistance to this process of centralization from other lineages or political units, competing lineages will, among other things, attempt to "build up" their reputation by exalting their own ancestors. For example, they might construct conspicuous burial monuments with rich furnishings, placed on or near special or sacred geographical locations (McGuire 1983; O'Connor 1974). Meanwhile, since the objective is to centralize power, most, if not all, political functions will be carried by the emergent paramount lineage chief (Spencer 1990:8-9; Wright 1977:383). A well-developed paramount center will be present and secondary centers will be absent or weakly developed (Baines and Malek 1980; O'Connor 1974). Separate institutional facilities within the paramount center, which indicate delegation and specialization of political functions, will be absent (or present only in rudimentary form).

Consequently, the early ceremonial-paramount precinct will be dominated by personal and/or lineage monuments (McGuire 1983; Wright and Johnson 1975:272-274). Elite residences, as the physical locus of administrative government, may be prominent as well. The competitive quest for tribute (the agricultural basis of power) provides the impetus for promoting agricultural production, (Alfoldy 1988:5-13,43-44,52-53; Finley 1985:90-122; Hohenberg and Lees 1985:74-98; Tainter 1988:174-175), so I would expect to find evidence of strong population increase (Hassan 1978). There will be new settlement on or near preferred agricultural zones (Nicholas 1989), particularly where previous settlement was absent or very sparse.

Intermediate Formation

As population within the political unit increases, the following conditions are expected to develop.

1. A paramount or strong lineage will tend to generate relatively more members (both consanguines and affines) than weaker lineages, so there is more likelihood that legitimacy challenges for high status positions will be made through elite kinship relations (Goldman 1970; Hohenberg and Lees 1985:80).
2. Administrative functions, formally allocated to the political leader, may be delegated in response to the administrative workload generated by increasing population size, and to allay legitimacy challenges (Feinman and Neitzel 1984; Johnson 1982; Spencer 1990:9-15; Wright and Johnson 1975).

3. Challenges to central authority will be encouraged by perceived administrative weaknesses, especially in cases where subject-community administration is poorly serviced (Bailey 1969; Johnson 1982). Here is an opportunity for the development of alternative political units within the chiefdom.

Once elite status is entrenched, and population growth proceeds, a process of segmentation and decentralization of the political administration system begins (Alfoldy 1988; O'Connor 1974; Wright and Johnson 1975). This process is expected to accelerate as the system grows demographically and territorially. However, this should at first result in the proliferation of secondary administrative centers rather than a fundamental change in the methods of governing. Therefore, I would expect to find a continued construction focus on monumental construction (such as ancestral mounds) and elite residences, but there will be more such units, they will be distributed nearby within the region, and they will be smaller in scale. Population will continue to grow at moderate rates (Hassan 1981; Hohenberg and Lees 1985). New settlements in rural areas should continue to appear until most areas of preferred agricultural land are occupied, and possibly some marginal lands as well (Finley 1985; Nicholas 1989). Secondary communities larger than small villages or hamlets, possibly with evidence of mound architecture, should appear with greater frequency. These will likely be associated with some delegation of political power so we would expect duplication of some political functions and facilities.

Late Formation

If preferred agricultural zones are fully-developed at this time (Nicholas 1989), further expansion of settlements may be prohibited by political, geographical, or administrative boundaries. If so, evidence from settlement patterns may indicate a shift in which fewer new sites are founded, while more older sites are reoccupied (Blanton 1989). If not, new sites will continue to be founded and few older sites would be reoccupied. Settlement location should indicate a definite shift of settlement to marginal agricultural zones; Nicholas 1989; Wright and Johnson 1975). Agricultural intensification may begin, marked by landscape modification and production tools. Finally, I would expect some evidence of intensification of competition in the form of territorially-based conflict Michels 1979a; Murdy 1984; Sanders and Murdy 1982). Evidence would be found in settlement patterns (isolated zones, gaps or open spaces in otherwise fertile agricultural zones), site location (geographically defensible sites), artifacts (appearance or greater frequency of occurrence of weaponry) and features (defensive constructions such as ditches, walls and ramparts). Population growth will be high because agricultural productivity, based on marginal land use, is low but subsistence-based status rivalry (and warfare) and consequent demands for tribute are high (Tainter 1988:174-175). Administrative workloads will be escalating due to increasing population size and general intensification of activities such as status rivalry, subsistence production and

conflict-warfare Johnson 1982; Spencer 1990). At this point, some clear delegation of administrative functions and authority will be apparent in order to preserve the integration of the political unit. I would expect the appearance of more complex administrative facilities within the main ceremonial center (McGuire 1983; O'Connor 1974). They will be composed of specialized functional spaces that will serve as locations for formally recognized institutions. Elaborate residences, incorporated within the complex, will give it the appearance of a palace-complex. Monumental ancestral mounds, which demonstrate status and highly centralized power, will be reduced in relative scale and spatially separated from the administrative complex. However, lower-ranking secondary political units, located within or apart from the main center, are expected to attempt to raise their status as administrative decentralization progresses. They can be expected to demonstrate their rising status by constructing traditional, large-scale lineage monuments within their district. Political relations have, in this case, gone beyond delegation and proceeded to political segmentation. Under these conditions, one would expect the complex political facilities at the main ceremonial center to be rivaled in size and complexity by those in the peripheral zones. That is, there should be evidence of duplication of political functions and facilities in peripheral zones (Spencer 1990).

In summary, traditional political leadership will attempt to maintain political integration in a context of increasing

population size, relatively declining agricultural production (per unit of production), political segmentation, circumscribed territory, intensified local and external competition for resources and status, and escalating competition leading to general conflict or warfare. If these conditions are not stabilized, there is a real possibility that the subsistence system, the foundation of political status and power, and the main interest and ritual responsibility of political leadership, will fail under the intense pressure to produce support (Murdy 1984; Sanders and Murdy 1982), and the elite system will collapse with it. Alternatively, the political unit will simply disintegrate, as elites are abandoned both physically and morally by an overworked and exhausted productive population (Alfoldy 1988; Lewellen 1983; Tainter 1988:172-174).

Alternative Formations

Interaction between the local political system and external polities, by means of conquest, colonization or exchange relations, can cause internal changes (Blake 1985:62-126; Helms 1988; Wright and Johnson 1975). Also, changes in environmental conditions are capable of causing cultural change, although I would not assign primary causation here. For example, a shift in economic and political organization may follow deterioration or improvement of the subsistence environment (though this would have to be examined as part of interactive processes). Finally, one cannot ignore alternative internal sources of change

different from that (i.e. status competition) presented here. The argument here however is that these conditions are temporal interludes, incidental to the main sequence outlined in the model.

Kaminaljuyu was the contemporary of at least three influential Mesoamerican polities; Teotihuacan (A.D.1-750), Monte Alban (500 B.C.-A.D.500) and the Preclassic and Classic Lowland Maya (A.D.1-800). Furthermore, evidence at Kaminaljuyu from the Late Formative (500-200 B.C.) indicates contact with developed chiefdoms of the Pacific Coast and piedmont (Chiapa de Corzo, Izapa, Abaj Takalik, El Baul), which exhibit post-Olmec cultural features (Parsons 1986:27-44,91-93). The archaeological record at Kaminaljuyu demonstrates that the (elite) inhabitants were involved in long-distance trade throughout the history of the site, though more intensely in some periods. A strong committment to this trade is evident in two periods. The earlier is associated with the Terminal Formative (200-1 B.C.), and the development of elaborate mound complexes such as E-III-3 and D-IV-6. The latter occurs in the Middle Classic (A.D.200-400), beginning in the latter part of the Early Classic (just prior to A.D.400), when the gradual intrusion of Teotihuacan-style features and artifacts is evident in some elite contexts within the main ceremonial center (Mound A, Mound B, The Acropolis and Palangana complexes) (Sanders and Michels 1977).

I propose that these and similar developments indicate a shift in the status support system (and political competition)

from a primary focus on subsistence production to one based primarily on craft production (craft and valuable goods production and long-distance trade), and only secondarily on agricultural production (Alfoldy 1988:36-37,49-57,98; Helms 1988; Hohenberg and Lees 1985). This is analogous to the situation that developed between Hawaiians and Europeans described by Goldman (1970:222-223) and reported by Kirch (1985:309-314). This change represents a de-emphasis or reversal of trends evident in previous formations and parallels the development of the "mercantile" type urban complex described by Fox (1977) and the "Network" type complex described by Hohenberg and Lees (1985).

The political regime controlling trade production and distribution may attempt to reduce reliance on, and development of, the agricultural support system relative to the trade system. Consequently, population size in rural areas will remain constant, decline or increase very slowly. Population growth rates will accordingly be very low or negative relative to those in the preceding formations. Political leaders will take less interest in the organization of settlement and the control of domestic units other than that required to support the material production system (artisans) and local population. Therefore, I would expect the following changes.

1. Abandonment of some or all marginal agricultural lands with a rural settlement focus on optimal agricultural lands.
2. Abandonment or reduction of reliance on agricultural intensification systems and tools.

3. Greater rate of reoccupation of older settlements indicating a re-emphasis on non-intensive, swidden-type agricultural production.

The social and economic links which were important in previous social relations between political and domestic units will be reduced in importance, while differences will be emphasized. This change will be evident in elite-commoner artifactual assemblages, separation of elite-commoner settlement zones and clear differences in status-marking goods (Wilk 1983:108-114). Meanwhile, links with the craft-producing population will be strengthened. They will be located in strategic places, such as central production areas in the urban zone, resource sites and along communication routes.

Political administration will be reorganized. It may become less complex in relation to subsistence activities and farming populations. I expect some reduction in the amount of administrative space devoted to this type of management. Furthermore, political authority will become centralized as administrative workloads in this area have diminished, so there will be reduced stress for the creation or maintenance of secondary administrative sites in rural areas. On the other hand, administrative work related to management of trade, the craft-producing population and resource extraction will increase. However, associated administration facilities will likely be located in a central ("urban") zone where manufacture of goods and organization of trade takes place. In effect, political

administration is less focused on labor-intensive subsistence production and more focused on value-intensive craft production. Because activities are likely to be more varied in the craft-production system (this system manages the organization of various craft and agricultural activities), administrative spaces are expected to be more specialized and spatially centralized.

Fox's description and case studies of the "Mercantile" city-state suggest that it is a politically centralized, "urban" phenomenon characterized by social and architectural innovation, urban autonomy (in relation to the regional context), exaggerated social stratification combined with political dissention tending towards a solution of despotic autocracy (Hohenberg and Lees 1985:70). If this is the case in this formation, then we should expect to encounter archaeological characteristics such as a centralized "urban" zone complete with new architectural styles, spatially organized and clearly marked social segregation, clear differences in status-marking goods. Incidentally, this perspective addresses the expectations raised by Helms with regard to the relationship of political complexity and centralization and valuable goods (see section on valuable goods economy).

The most visible feature of this formation, of course, is the presence of valuable/craft/commercial goods, although archaeologically, we are handicapped by the absence of many perishable goods. In any case, we should discover certain facilities associated with this production: workshops, resource

and primary manufacture locations and specialized trading facilities such as storehouses, ports-of-trade.

As Fox notes, the key to the emergence of the merchant organization is found in a pre-existing condition of political segmentation (a "weak state"), such as one might find in situations described for earlier formations. However, the potential for its emergence, in terms of the opportunity for long-distance trade in valuables or commodities, must also be present. This condition implies the pre-existence of other complex communities in the region which have a similar interest in conducting a trade-based status system. The Alternative Formation must occur within this context.

A reverse, confirmatory test of this formation is possible. That is, what happens when the trade-based status system collapses? Presumably, political leaders would be replaced by those who follow the subsistence-based status system. However, conditions are likely to be much different than those in the earlier formations. Possibly, elite society is divided between a merchant and subsistence elite (Alfoldy 1988; Fox 1977; Hohenberg and Lees 1985). With the collapse of the trade wealth system, there must be an effort to regain or reassert control over agricultural production and re-establish close relations with the farming population. Perhaps relatively independent rural communities had developed in the interim and resistedf the new regime. Also, how are the political leaders to compensate for high levels of status lost with the collapse of the trade system?

Do they attempt to regain it through the subsistence system? In any case, we should expect the entire society to be more contentious and segmentary than before, and this will intensify since we expect the society to carry out its mandate under the terms of the Late formation, that is, intensification of agricultural production, high rates of population growth, escalating administrative workloads and political segmentation. This should constitute an important test for the model.

CHAPTER 4. METHODOLOGY

ARCHAEOLOGICAL IMPLICATIONS OF THE MODEL OF CHANGE

In the theoretical section, status competition in the complex chiefdom was analysed in terms of three analytical divisions; political support, political maintenance and status demonstration. The theory argues that, when the local subsistence economy is predominant, cultural change is motivated by relations of growth, the effects of growth on political administration and subsequent adjustments. The key point is that, given conditions of status competition, leaders of political units will attempt to increase and/or expand their support base, leading to increases in the scale and complexity of operations. In the process, two specific conditions will be encountered.

1. Conditions associated with the productivity of the subsistence support system. The productive subsistence (political support) system may be pushed beyond its "margin of safety", increasing the risk of agricultural failures (Nicholas 1989). This view is distinguished from "population pressure" models of change because population growth and pressure on resources is explained in competitive and political-economic terms.
2. Conditions associated with aspects of political maintenance. This limit is attributed to the effects of "scalar stress" as described above (Johnson 1982; Spencer 1990). A simple, unspecialized (centralized) administrative system is not equipped to service more complex management problems that result from

larger scale (population size, economic production).

These conditions work against the initial political objectives (increasing support, centralizing power) because they imply decision making (delegation) (Spencer 1990). Political responses are required, inaction will only invite change initiated by competing political units (Bailey 1970:73-85), or force contests between normative and pragmatic conditions (Bailey 1970).

According to the theoretical perspective, the following specific changes are expected.

1. Changes in the support system. There may be attempts to make the subsistence system more productive by organizing production to make it more efficient, or by implementing agricultural intensification systems. These changes are linked to political motivations, not population pressure alone. This will lead to increased administrative complexity.

2. Changes in the size of the productive land base (expansion). Conflicts between elites and commoners over control of and access to support may be solved by territorial expansion and/or wars of conquest, either to increase the support base (land) or to obtain more labor (Alfoldy 1988:20-29; Spencer 1990:11).

3. Changes in the maintenance system. I would expect some delegation of political authority. This will be evident in measures of regional hierarchization, that is, the development of secondary administrative sites. Otherwise, one would expect political segmentation where independent political units or

territories are formed within the original political territory. I would also expect the application of technological aids to improve information flow and administrative capabilities; such as recording-writing systems or transportation techniques (Johnson 1978, 1982; Wright and Johnson 1975). Finally, there could be a transition to state-like, bureaucratic political organization in which political authority is delegaled to administrative specialists, not necessarily political rivals (Spencer 1990).

4. Intensification of ideological (or coercive) means of control. These measures are supplement or replace consensual support, legitimacy and delegation. I would expect to find an emphasis on "religious" objects (such as sculptural programs), monumental construction, "closure" of ceremonial precincts.

Interaction with external political units or their agents does influence the process. The study of this interaction involves analysis archaeological materials on a regional scale, beyond the range of the present study (see Blake 1985:87-115 for discussions of the effects of conquest and colonization on the archaeological record). However, I believe that facets of inter-regional interaction are visible at Kaminaljuyu using local data (aside from the presence of trade goods), without undertaking a formal interregional study. For example, expectations of a model for a cultural shift to a wealth economy system are introduced (see Fox 1977; Hohenberg and Lees 1985; Cohen 1978). Two changes associated with such a transformation are suggested:

1. Reduction of a predominant reliance on the subsistence support

system as a basis for determining status. Consequently, there will be less effort directed towards increasing subsistence production (population and labor) or to focus competition and administration on the control and management of productive farmland. There will be simplification of the maintenance system (or de-hierarchization) in rural areas.

2. Economic activities will concentrated in centrally-located craft production areas (see Steponaitis 1978:430-437 for model and methods of locational analysis for political centers in complex chiefdoms). In spite of a decrease in rural administrative complexity and workload, overall administrative complexity may not change, but most activities will be efficiently concentrated in a central "urban" area. Thus, administrative work would not only apply to rural management, but also management of craft and wealth production, foreign relations, storage and transport and distribution of goods.

Analysis will focus on temporal changes according to archaeological implications of the theory and model, but will also indicate expected synchronic relations. I propose to carry out a series of tests and exploratory analyses using archaeological data for construction activity and settlement/population change.

QUANTIFICATION

Three classes, or analytical categories, of archaeological data are used in this study, population, settlement and land use,

and construction activity.

1. Population.

Population represents the basis and amount of support (labor available for economic-productive activities, service, war; consensual support). Population data include the estimated number and distribution of individuals by archaeological phase. Population size will indicate the potential amount of support available, particularly in the distributional relationships between elite, non-elite, and central and rural areas. Population growth rates will be important measures as they indicate changes in rural vs central relations and relative emphasis on productive activities (agricultural and craft production).

2. Settlement and Land Use Patterns.

Settlement refers to the spatial distribution of population by various categories (land-use classes, settlement size, settlement type, rural and non-rural) and represents potential levels of support in a given political formation. Settlement data, now substantially reported in the literature for the Valley of Guatemala (Murdy 1984), are crucial for estimating levels of rural, agricultural support, particularly for evaluating relations between subsistence versus trade wealth economies.

Settlement location by land use potential indicates the relative emphasis in the use of optimal and marginal agricultural land and the type of support associated with political formations.

3. Construction Activity.

Construction activity manifests aspects of status demonstration (building size and style, quality of materials and workmanship), maintenance (scale, complexity and distribution of secondary administrative facilities), and support (whether facilities were associated with subsistence and/or trade administration).

Analytical divisions evident in construction activity are measured with two variables, volume and summit area of mounds, platforms and ballcourt enclosures. Volume and derived measures generally indicate status demonstration. Summit area (upper floor surface) and derived measures are associated with day-to-day political maintenance (McGuire 1983; Tourtellot 1989).

For examining functional specialization in construction, Mesoamerican architecture does not always provide unequivocal categories. Researchers have begun to define site-development criteria as an alternative for functional identification. For example, development plans based on relative numbers of architectural types (plazas, ballcourts, pyramids) (de Montmollin 1989:78-82), or on site planning arrangements (Kowalewski 1989:410-411). However, as with architectural development in any era, facilities probably served multiple functions, or were later adapted to new functions. For this reason, I have placed summit area under the general heading of administration space in order to indicate generalized functional activities, whether for ritual/ceremonial, judicial, or miscellaneous other uses.

The Study Area

For purposes of analysis, a "study area" is defined as the total area within a circle of radius 9.5 km from the center point of zone 46, located about 500 meters southwest of the Acropolis complex at central Kaminaljuyu. Total area within this circle is approximately 284 km^2. This is not an attempt to identify the actual territorial boundaries of the political unit, which in any case, was probably variable in size and shape over time. It is an effort to define a territorial area large enough to obtain measureable changes in indices of centralization, complexity, and the distribution of archaeological materials, but small enough to exclude analysis of regional processes (though this does not mean they will be excluded from consideration).

Several factors were considered in choosing a radius of 9.5 km for the study area. Spencer (1990) argues that a (non-state) political territory of circular shape would have an estimated radius of about one-half day's walk (or 10/2 hours at 5.6 km/hr=28 km). This is determined as the maximum reasonable distance for traveling from the regional center to the edge of the territory and back in one day (Spencer 1982:6-7; 1987:375). Territories of larger size begin to tax the capabilities of the (non-state) administrative system. This is supported by a number of cases taken from the literature (Spencer 1990:7;1987:375). Culbert (1988:150) and Houston (1989:26) estimate that Classic period Lowland Maya political territories averaged about 15-25 km in radius. However, Kowalewski argues that highland communities

in Mesoamerica were usually quite small in size due to travel-time restrictions in mountainous terrain, and to greater cultural diversity relative to similar-sized regions elsewhere (Kowalewski et al.1989:8-12).

In the Valley of Guatemala, a radius of 9.5 km bisects an east-west corridor to the south of Kaminaljuyu which, during the Late and Terminal Classic, was a sparsely populated area without active mound sites which is interpreted as a "buffer zone" between two socio-political territories (Murdy 1984:180-181). Michels (1979a:53-55) argues that, on the basis of a study using location theory, and on the exclusive spatial distribution of specific types of obsidian within the Valley (Michels 1979a:57-59), the site of Solano, at 9.5 km from central Kaminaljuyu, was located near a long-standing, inter-polity boundary in the Valley. Brown describes the site of Solano as an "enclave" for foreign traders during the Middle Classic period in the Valley. Such sites are generally located in independent or marginal territory near political boundaries (Brown 1977:310; Chapman 1957; also Michels 1979a:51-53). Brown also identifies the Valley of Guatemala as a "port-of-trade" at this time. These areas are associated with geographical, ecological and cultural "transitional" zones (Brown 1977:305-306; Chapman 1957). Finally, the radius of 9.5 km incorporates most of the heavily populated, level terrain in the northern part of the Valley, but excludes much of the rugged piedmont and highlands to the west and north, which were generally sparsely populated, marginal areas of the

Valley.

The study area is subdivided into a core area (central Kaminaljuyu) surrounded by eight concentric rings (rural Kaminaljuyu). Specific data for the concentric configuration are provided in Table 2 (see Figure 4 for illustration). The core area (ring 1) is 1.5 km in diameter and is assigned to the site of Kaminaljuyu. This core is 7.07 km^2 in area, which approximates the 7.5 km^2 area of central Kaminaljuyu defined by the Kaminaljuyu Project (Michels 1979a:5). The site is actually located slightly off-center within ring 1. This area is referred to as the "core" area or "central Kaminaljuyu" (or just "Kaminaljuyu"). All areas outside central Kaminaljuyu are referred to as "rural" Kaminaljuyu. The remaining rings 2 to 9 (2.5 km to 9.5 km) are arbitrarily spaced at 1 km intervals.

The size and arbitrary spatial configuration of this area confers the following methodological benefits.

1. When superimposed on the survey grid zones (Figure 4), the ring structure permits population estimates to be calculated on the basis of distance from central Kaminaljuyu. The assumption is that population distribution will vary uniformly, by distance, in all directions from the center.

2. Because the intensively surveyed zones are concentrated in the study area (zones 33, 45, 46 including central Kaminaljuyu, 58, 61, 71, and 72), the eight outer concentric areas (rings 2-9) were sampled at rates between 25% and 50% (average=35.5%) of

their total area (see Table 2), while ring 1 (central Kaminaljuyu) was sampled at 100%.

3. Since the study area is relatively homogeneous in terms of the types of soils, terrain and environmental zones represented, total population estimates should be quite closely associated with the specific area under study.

4. Because of the core/periphery, concentric spatial perspective, measures relevant to centralization processes; such as distribution of population, settlement, mound sites, construction volume (status display) and summit area (administration), are facilitated.

Table 2. KAMINALJUYU STUDY AREA. Specifications for Concentric Ring Configuration.

RING NO.	DISTANCE RANGE from CENTER (km)	TOTAL RING AREA (km^2)	AREA SURVEYED (km^2)	SURVEY %	MULT. FACTOR 100%/ Survey%
1	0.0-1.5	7.07	7.07	100	1.00
2	1.5-2.5	12.56	5.60	44.5	2.24
3	2.5-3.5	18.87	9.40	50.0	2.00
4	3.5-4.5	25.12	11.90	46.7	2.14
5	4.5-5.5	31.41	13.10	41.7	2.40
6	5.5-6.5	37.70	14.60	38.7	2.58
7	6.5-7.5	43.98	16.10	36.6	2.73
8	7.5-8.5	50.27	13.30	26.4	3.79
9	8.5-9.5	56.55	14.10	25.0	4.00
SURVEY AREA TOTALS (Rings 1-9)		283.53	105.17	37.1	
RURAL KAMINALJUYU TOTALS (Rings 2-9)		276.46	98.10	35.5	

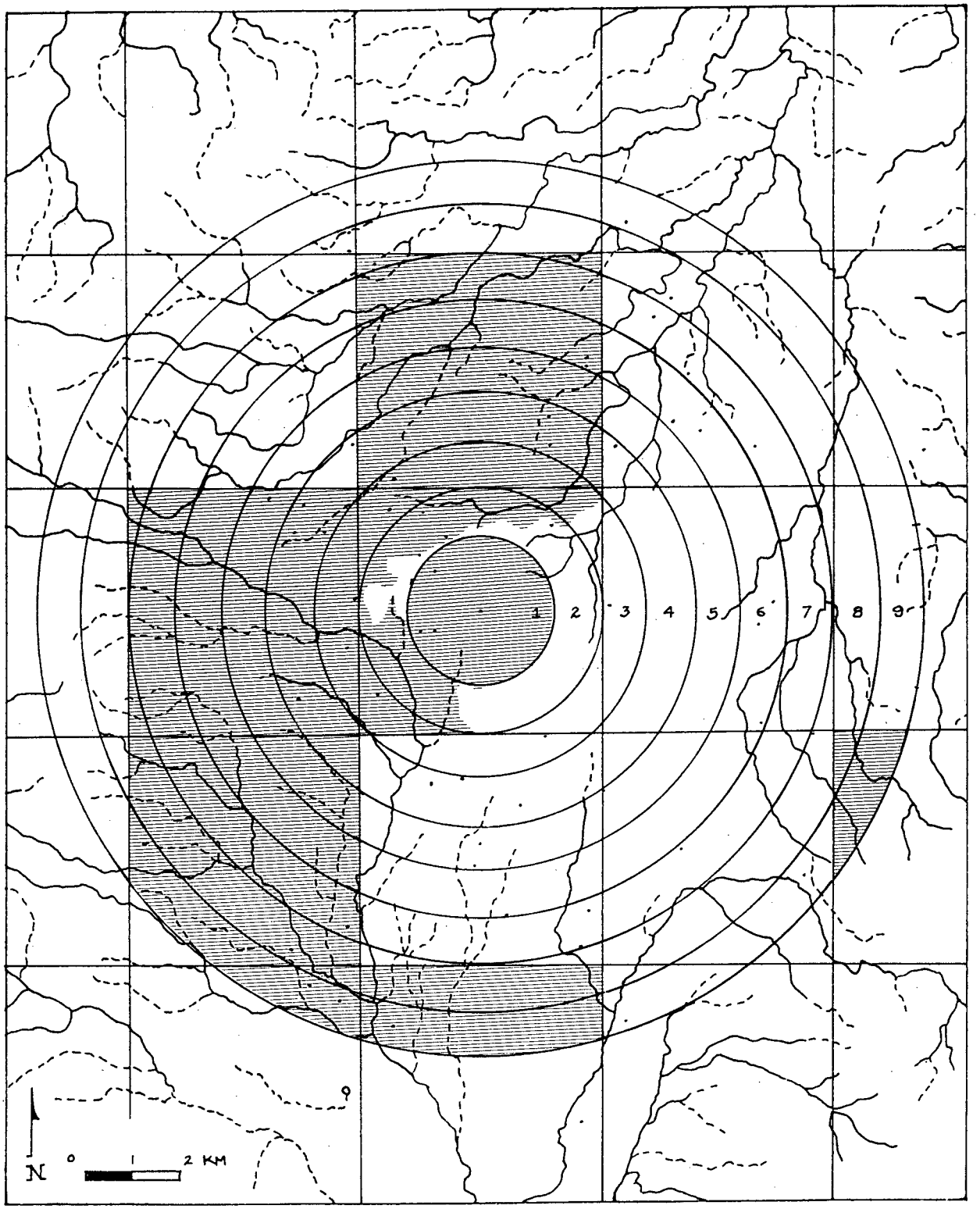


Figure 4. VALLEY OF GUATEMALA: KAMINALJUYU STUDY AREA
The circular study area is superimposed on the survey grid of numbered "zones". Concentric rings 2 to 9 refer to "rural" Kaminaljuyu. Area 1 refers to "central" Kaminaljuyu. Shading indicates the intensively surveyed zones which fall within the study area, which are used to estimate population size.

The following summary presents the three classes of archaeological data (population, settlement and land use, and construction activity) that are used to analyse the relevant analytical divisions (status support, status demonstration and political maintenance). The particular archaeological material to be examined is specified a); along with b) the derived measures and/or the relevant units of measurement.

1. Population
    i) Support-Population Size.
        a) site area, surface artifact density
        b) population size by settlement category, and spatial distribution by ring for central and rural Kaminaljuyu.
    ii) Centralization
        a) population size (central versus rural Kaminaljuyu).
        b) percent of total population in each area.
    iii) Distribution
        a) population in each concentric ring (1 to 9)
        b) density, size, percent of population in each ring.
    iv) Rate of Change (Increase/Decrease).
        a) population size (central and rural Kaminaljuyu).
        b) percent change per annum by phase.
2. Settlement and Land Use
    i) Maintenance-Hierarchy.
        a) rural sites with mound architecture ("mound sites").
        b) number of different sites, spatial distribution by ring.

ii) Maintenance-Complexity.

a) rural archaeological sites.

b) number of different site types.

percent of simple versus complex sites.

spatial distribution (number in each ring).

iii) Support-Subsistence Productivity.

a) sites, land-use class (agricultural) potential.

b) ratio of settlement on marginal versus optimal land.

3. Construction Activity

i) Status Demonstration.

a) mounds architecture (mounds, platforms, ballcourts).

b) total volume (m^3).

ii) Status-Ranking (V/A)

a) mounds architecture.

b) volume/summit area.

iii) Maintenance-Administration.

a) mounds architecture.

b) summit area (m^2).

iv) Maintenance; Administration Ratio (AR).

a) mound architecture, population.

b) population/summit area (persons served per unit summit area).

v) Maintenance-Support; Tribute Ratio.

a) mounds and and rural population (labor invested in construction by rural population).

b) construction volume/rural population (labor invested in

construction per person).

vi) Maintenance-Political Administrative Centralization.

a) mounds (central versus rural Kaminaljuyu).

b) percent of total volume and summit area located at central Kaminaljuyu.

ARCHAEOLOGICAL TESTING: HYPOTHESES

The three temporal formations (Early Formation, Intermediate Formation and Late Formation) are not required to correspond with the standard chronological sequence for Kaminaljuyu because the theory and model do not attempt to explain or justify these temporal divisions. However, they cannot be entirely ignored since the archaeological data are categorized by these divisions. Consequently, these divisions will be used as convenient test units or "checkpoints" for testing the model.

The key hypotheses for evaluating the thesis are as follows:

1. Identifying Features of the Wealth Based Economy.

Specific quantitative hypotheses for the wealth based economy are described below (hypotheses 2 to 8). However, these quantitative features (settlement, land use, construction), cannot stand alone as evidence for the presence of this system. They must occur in the context of characteristic (qualitative) features of wealth based (finance) systems as described by Brumfiel and Earle (1985), Fox (1977), Helms (1988), Hohenberg and Lees (1985). It is necessary to identify, on a qualitative basis, those periods for Kaminaljuyu which are candidates for the

wealth based system (Alternative Formation) so that quantitative and qualitative data may be compared. These hypotheses are necessarily qualitative and descriptive as no separate analysis is undertaken in this study. For Kaminaljuyu, these hypotheses depend on data and analysis found in Brown (1977), Michels (1979a), Michels and Wetherington (1979), Murdy (1984) and Parsons (1986).

For the wealth based economic system, relatively large quantities of long-distance elite trade and commercial goods will be present in elite contexts (burials, caches, residences/mounds, workshops). There will be (Mesoamerican) portable goods of two kinds, status marking goods (for example, fine ceramics, jade, hematite, shell, quartz, mica), and commercial goods (for example, coarse trade ceramics, obsidian). Craft production facilities (workshops) will be prevalent and found in proximity to elite habitation. In addition, the core site(s) will exhibit innovative and/or foreign styles in architecture, site planning, ceramics and other artifacts. There will be a focus on massive, monumental architecture. The distinction between "wealthy" elites and commoners will be clearly marked by differences in artifact assemblages and in architecture.

2. Status Demonstration (V/A=volume per unit summit area).

For the subsistence economy, there will be less emphasis on status (volume component) with time and more emphasis on administration (summit area component). Thus, the V/A ratio will decline with time. This indicates a shift from unspecialized

administration (associated with centralization of power and status) to complex and specialized (bureaucratic) administration.

For the wealth based economy, the emphasis will be on status (volume component) because administration and power will be centralized and simplified as rural population declines. Thus, the V/A ratio will emphasize the volume component.

3. Administration Ratio (AR=population per summit area).

For the subsistence economy, this ratio (persons served per unit summit area) should remain relatively constant with time (despite changes in population size) since population growth/decline will be directly associated with the provision of administration space. However I expect three main variations.

First, earlier periods (with lower population size) will have relatively less summit area (higher AR) because administration is centralized and undifferentiated from other functions, and administrative functions are not duplicated in secondary facilities.

Second, later periods (with greater population size) will have relatively more summit area (lower AR) because administration is decentralized, specialized and complex (bureaucratic), and functions will be duplicated at secondary sites.

Third, if there are periods when the polity is weakly integrated politically, that is, when local populations are independent of central administration, there will be relatively less summit area (higher AR). This should be associated with

diminished construction activity because this implies weak control over tribute labor of the support populations.

For a change to a wealth based economy, both (rural) population size and summit area will decline. However, centralization of administration should make it more efficient to deal with management of the trade economy, so summit area should decline relatively more (higher AR).

4. Tribute Ratio (mound volume per rural population).

For the subsistence system, this ratio should decline with time because there will be less emphasis on volume (status) as population increases and there is more emphasis on the summit area of construction. Thus, periods in which population is low, where power is centralized and status is emphasized, such as Early Formation, the tribute ratio should be greatest.

In more complex societies where population size and specialization are greater (Late Formation), the laboring population may be specialized class within the general population, so the tribute ratio should be smaller than for earlier periods.

In the change to a wealth economy, the tribute ratio should be higher than earlier periods because construction will emphasize status (volume) as rural population declines.

5. Centralization.

In the subsistence economy, the percentage of construction at the core (volume and summit area) should decline with time as secondary sites appear in the rural areas. Initial centralization

should approach 100%.

In the change to a wealth economy, construction will be more centralized than in the preceding period, and more centralized in general as population size and number of secondary mound sites declines.

6. Complexity/Hierarchy.

In the subsistence economy, a greater variety of site types will appear with time and there will be a greater percentage of complex sites (sites larger than hamlets). There will be greater variety in site size (volume) and features (architectural forms) with time in central and rural areas.

In the change to a wealth economy, there will be fewer site types than before (and generally), a lower percentage of complex sites and less variety in site size and features in the rural area.

7. Spatial Distribution of Settlement (population, sites).

In the subsistence economy, there will be greater spatial distribution of sites with time as population growth and demands for production bring settlement to more distant parts of the political territory. Consequently, there will be a more even distribution of population in the concentric rings with time (absolute size, density, percentage of total population in each ring).

This development also creates the potential for the appearance of secondary administrative sites. Thus, mound sites should appear in a more dispersed pattern in the rings as well,

and in proportion to population size. However, the pattern would be modified by lower densities towards the edges of the study area due to limits imposed by the subsistence financing system.

In the change to a wealth economy, since interest in subsistence production will decline, there may be little or no restrictions on settlement location. Furthermore, a wealth finance system will increase the effective range of political influence. For both these reasons, rural populations may be very dispersed and small in relation to the core site (since population will be centralized) and to the subsistence formations.

8. Land Use.

For the subsistence economy, optimal lands will be occupied first (Early Formation) and will always be preferred over less productive lands. However, there will be a gradual increase in the use of marginal agricultural lands as political pressure for tribute/production increases (indicated by more frequent settlement on marginal land).

In a change to a trade-based status system, the occupation of less desireable (marginal) lands will decline as rural population size declines, remains stable or increases more slowly than before. Rural population will decline sharply relative to center (urban) populations.

CHAPTER 5. ANALYSIS

IDENTIFYING FEATURES OF THE WEALTH BASED ECONOMY

What archaeological periods (see Table 1) at Kaminaljuyu may be identified with the Alternative Formation? This section describes the qualitative features of the wealth based economy in order to: 1) identify periods which are candidates for the Alternative Formation and 2) provide a basis for comparison with the quantitative analyses contained in this study. A qualitative, descriptive evaluation of each mound building phase (Late Formative to Terminal Classic) is provided according to criteria expected for the Alternative Formation (hypotheses, point 1).

Late Formative (1500 B.C.-200 B.C.)

Evidence for long-distance contact and exchange is present but sparse. There were general similarities with developed communities along the Pacific Coast (the "Post Olmec" period) and Gulf Coast (Olmec) in stone sculpture traditions and conventions (Parsons 1986:27-44, 91-94). The seven known burials at Kaminaljuyu were either unaccompanied by goods or contained mainly utilitarian goods (Ball 1973:181-182; Bebrich and Wynn 1973:79-82; Espinosa 1967; Fitting and Diehl 1979:384). However, jade beads and an Olmec style jade pendant were found in a ceremonial cache in Mound C-III-6 (Shook 1951). Outside the study area, a necklace of jade beads, part of the contents of a looted

grave, were reported for the site of Contreras (84-42-177) (Shook 1952:15,32). At central Kaminaljuyu, evidence of craft production, and typical wealth goods were absent from test pit assemblages (Michels 1979a:268-269). The Late Formative was an active mound building period, but there was little evidence of site hierarchization as the mound groups had similar site plans and were of about equal size (surface area and volume).

Consequently, the Late Formative is not a candidate for the wealth based economy (Alternative Formation), since it did not display the appropriate features.

Terminal Formative (200 B.C.- 1 B.C.)

Contents of elaborate, richly furnished tombs at Kaminaljuyu reveal that the political elites had access to a wide variety of exotic wealth goods representing the finest available craft production. Mound E-III-3 contained two of the most elabarate tombs known at the site (Shook and Kidder 1952). A similar elite tomb was found nearby in Mound D-IV-2 (Borhegyi 1956). A non-mound site, known as "Tumba Miraflores" also contained an elaborate Terminal Formative burial (Espinosa Aguilar 1960). Finely crafted artifacts found in these tombs were made of a wide variety of local and imported materials, including, jade, marble, flint, mica, quartz, basalt, pyrite/hematite, obsidian, various fine ceramics, shell, stingray spine.

The majority of habitation components found in the test pit excavations were classified as elite households (48-100% in the

ten divisions of the site) (Michels 1979a:151). Furthermore, all known households, regardless of status, were associated with wealth goods and debris from or artifacts used in their manufacture (Michels 1979a:99-131, 151-152). Apparently, Kaminaljuyu was an "enclave" for wealthy elite, their support population and craftworkers.

Regional ceramic traditions indicate close long-distance contacts, particularly within the "Miraflores sphere" of The Central Highlands and Pacific Coast of Guatemala and El Salvador (Demarest and Sharer 1986). Stone sculpture styles, featuring carved calendric inscriptions, indicate contact with distant sites such as Izapa, Abaj Takalik, Chocola, Bilbao, El Baul, Chalchuapa (Parsons 1986:53-60,63-70, 94-96). Parsons has observed that Miraflores stone sculptures of elaborately dressed, single figures depict "hierarchical real personages and even historical dynasties, perhaps including god impersonators with claims to divine descent" (Parsons 1986:90).

Mound building was carried out in massive scale at this time, and the largest mounds contained the most elaborate tombs (Mounds E-III-3 and D-IV-2). The Terminal Formative was by far the most active mound building period at the site, with the most (68) and largest mounds and the most ambitious building program.

Consequently, the Terminal Formative (Miraflores) is identified as an excellent representative for a wealth based economy (Alternative Formation).

Protoclassic (A.D.1 - A.D.200)

Although mound building was active during the Protoclassic, and single, large (lineage) pyramid mounds were present, elaborate tombs such as those for the Terminal Formative were not found in excavations. There is evidence of Protoclassic construction on Mound E-III-3, but no associated tomb. Only six burials are known from Kaminaljuyu, two in the Palangana (Cheek 1977:179-183), and four in Mound A-VI-6 (Kirsch 1973). Small quantities of grave goods were found and some non-local materials were present. Materials included, red beads, jade, hematite, mica, antler tine, human teeth. Ceramics included a figurine head, incensario fragments, utilitarian and fine wares. Usulutan wares indicate contact with Salvador and remnants of the Miraflores period.

The analysis of test pit assemblages reveals that, although non-local wealth materials were present, the workshop manufacture was no longer associated exclusively with elite households (Michels 1979a:160-167). Evidence of commoner specialization in craft production was found at two non-elite clusters at the site (Michels 1979a:165-166). Thus, it appears that 1. The flow of wealth goods had diminished from the Terminal Formative 2. The elites had lost their monopoly on wealth goods and 3. Elites were not able to deposit wealth goods in elaborate tombs.

The Protoclassic polity was active in producing stone sculpture, which seems to refer to "historical" events (Parsons 1986:60-63,71-73,95) and depicts captors and captives and

displays of military implements (Parsons 1986:104).

The Protoclassic is a problematic period for, although it was clearly unlike the monolithic Terminal Formative, there are indications of active external trade and contact, but not exclusively through the high elites. The sample of six burials at only two sites does not exclude the existence of elaborate interments were. Evidence of military themes in stone sculpture implies diminished trading activity.

Consequently, the Protoclassic is a possible, but weak, candidate for the wealth based economy (Alternative Formation).

Early Classic (A.D.200 - A.D.400)

Michels has argued that wealth goods production was even more decentralized than in the Protoclassic. Economic specialization in obsidian tool production (mostly blades) was confined to a "barrio" in the southwest part of the site. Lower elites and commoners at the site were definitely more involved in production. In fact, the majority of household components in the test trenches were non-elite (Michels 1979a:219).

Only five burials are known from Kaminaljuyu in the Early Classic. The most formal was found in Mound D-III-13, an interesting mound affixed with an adobe "mask" on its facade similar to ones found at Cerros, Uaxactun and Tikal about this time (and Mound D-III-1 nearby). The burial contained only a few artifacts including mostly ceramic vessels, and some greenstone beads. The mound itself was the second largest Early Classic

construction at the site (after mound C-III-1), though very small by Protoclassic and Terminal Formative standards.

Stone sculpture is represented by only one stela, and Parsons concludes this represents a hiatus in the production of monuments (Parsons 1986:79-81).

Though there is evidence of wealth trade and external contact in the early Classic, it was not extensive nor very active. This period stands in direct contrast to the Terminal Formative and is not a candidate for the wealth based economy (Alternative Formation).

Middle Classic (A.D.200 - A.D.400)

Kaminaljuyu's participation in a Mesoamerican commercial network dominated by Teotihuacan is well documented (Brown 1977:304-365; Cheek 1977:127-140; Michels 1979a). Kaminaljuyu appeared to occupy a strategic position in this network. Brown argues that it functioned as a port-of-trade, and that actual trading took place at the site of Solano, 9.5 km south east of Kaminaljuyu, where wealth goods were present in disproportionate quantity. He argues that the local elites were not directly involved in this trade (as they were in the Terminal Formative), but accepted fees from specialized traders. Some of these traders resided at Mounds F-VI-1 (Mound A) and F-VI-2 (Mound B), where wealth goods, often with Teotihuacan motifs, were abundant in a series of elaborate tombs (Kidder, Jennings and Shook 1946). Many additional burials have been recorded, usually containing a

variety of exotic wealth goods (for summary see Murdy 1884:148-156).

Monumental construction appeared at the Palangana and Acropolis complexes, Mounds A and B, and at Solano, and carried the distinctive Teotihuacan architectural features (for example, *talud-tablero* construction and stone facing). Formal ballcourts appeared at this time, and ballcourt markers displayed Coastal Cotzumalhuapan "Mexican" styles and themes (Parsons 1986:83-86).

As in the Terminal Formative and Protoclassic, Kaminaljuyu was again predominantly inhabited by elite class households (Michels 1979a:219). This marked a clear change from the Early Classic, as the site appeared to become an elite enclave.

Therefore, the Middle Classic does represent conditions expected for the wealth based economy (Alternative Formation).

Late Classic (A.D.600 - A.D.800)

Brown has proposed that the Middle Classic trade route through the Valley of Guatemala shifted west to the Antigua Valley as a consequence of competition from Pacific piedmont groups associated with the Cotzumalhuapan polity (Brown 1977:159-160). Parsons has noted that the Cotzumalhuapan tradition in sculpture was already present in Antigua and other "convenient" access routes to the highlands from the Pacific Coast (Parsons 1986:82). At Kaminaljuyu the style was already manifest in ballcourt markers ("tenoned heads") which appeared in Middle Classic components. This change was also associated with the

withdrawal of Teotihuacan from the Valley and the disappearance of Mexican motifs in architecture and artifacts.

Some Late Classic remains at Kaminaljuyu, such as isolated skulls at ballcourt sites (B-III-5) were in some cases sacrificial or dedicatory. The most elaborate of seven burials known is a group of five adults found near (not within) Mound B-V-11. This contained only a few ceramic vessels, three obsidian blades and a frog effigy. Meanwhile, the elite domination of Kaminaljuyu declined sharply, as did the number of households engaged in wealth goods production (Michels 1979a:219-220).

Construction was not undertaken on a massive scale (relative to population size), but was confined to renovating and enlarging and enclosing existing mounds and ballcourt centers at the core and constructing minor ballcourt sites at the site periphery (Mound groups B-IV-2, F-V-1, E-V-2).

Michels has argued that the increase of specialized stone tools in the test pits indicates that agricultural intensification was practiced in the Late Classic (Michels 1979a:210, Figure 58). This evidence could also be taken to indicate that subsistence agriculture was emphasized (to compensation for the loss of trade wealth) as outlying farming populations converged on the site.

Consequently, neither the Late Classic, nor the Terminal Classic, which carried through Late Classic developments, represent expectations for the wealth based economy (Alternative Formation).

In conclusion, there are two clearly defined periods which meet the criteria for the Alterative Formation, the Terminal Formative and the Middle Classic. Of these two, the Terminal Formative perhaps displayed the most definite signs including, massive construction, active trade and long-distance contact, elaborate burials, emphasis on craft production with control of status marking and commercial goods (especially obsidian). The Protoclassic period is problematic, but warfare, for which there is some evidence, generally works against the successful conduct of intensive, long-distance trade. The Late Formative, though demonstrating extensive long-distance contacts in architectural and stone sculpture traditions, had little evidence of a well developed trade system. The Early Classic presents the weakest case for the Alternative Formation.

POPULATION AND SETTLEMENT PATTERNS

Review of Research and Existing Published Data

Information on settlement and population history in the Valley of Guatemala and surrounding areas is derived from a surface survey carried out in three field seasons (1968-1970) under the Pennsylvania State University Kaminaljuyu Project. For this survey, the study area was divided into a survey grid of 100, 5 km by 5 km survey squares or "zones". However, the survey team concentrated the survey within only 40 zones. Of these, 24 zones near central Kaminaljuyu were to be intensively surveyed over 100% of their surface. A total of 12 of these 24 zones were actually surveyed intensively (zones 33, 34, 40, 43, 45, 46, 58, 61, 70, 71, 72 and 74). Three additional zones were surveyed at the rate of 50% (zones 63, 84 and 85). Figure 2 indicates the locations of these 15 zones. Preliminary, detailed reports for selected intensively surveyed zones have been published (Sanders and Murdy 1982, zones 33, 43 and 58; Michels 1979a:74-94, zone 58). A map noting the locations of all known sites, regardless of phase, has also been published (Sanders and Murdy 1982:26-27; see Figure 2). Murdy has provided descriptive settlement summaries for 13 of the 15 intensively surveyed zones (zones 40 and 63 were excluded). Accompanying figures show site locations by site type for each period (Murdy 1984, Appendix A:267-370). Regional maps indicate the locations of all known sites by period which fall within the survey grid (Murdy 1984:maps 3-14).

Descriptive data on rural sites with visible mound architecture were first assembled and published by Shook (1952). This study included information on many mound sites, some now destroyed, which fell outside the intensively surveyed zones. The Kaminaljuyu Project researchers visited most of the sites in order to verify data and record additional information. They also provided reports on newly discovered mound sites. Murdy (1984) has reported all these data. He has also published the scaled site plans originally prepared by Shook, supplemented by the Kaminaljuyu Project findings.

Settlement and demographic characteristics for central Kaminaljuyu, defined by the Kaminaljuyu Project as a 7.5 km^2 core area of monumental mound construction and associated habitation, were derived from various analyses of some 513, randomly-placed test tenches within this core area (Michels 1979a:100-131; Michels and Wetherington 1979:722-740). In spite of criticisms of this program (Webster and Freter 1990), and difficulties in applying the data to calculations of population size (Murdy 1984:302; see below), it provides the only available data base for evaluating population characteristics at central Kaminaljuyu. Nevertheless, I believe these data can be useful if they complement results of separate archaeological analyses.

In summary, for purposes of testing aspects of political support (population size, settlement size, type and distribution), as well as changes in centralization and hierarchical levels, we have a data base which includes:

1. Detailed reports on 13 intensively surveyed zones (each 25 km^2 in area) whose (uppermost) site components are recorded by artifactual (ceramic) surface scatter and density (Murdy 1984).
2. Regional surveys containing data on sites with visible mound architecture (Murdy 1984; Shook 1952).
3. A large data base for population characteristics at central Kaminaljuyu derived from the test trench excavations and derivative analyses (Michels 1979a, 1979b; Michels and Wetherington 1979; Murdy 1984:298-309).

Previous Population Size Estimates: Rural Kaminaljuyu

In the literature, there are three separate estimates of population size for "rural" Kaminaljuyu. All rely on the Kaminaljuyu Project settlement survey data. However, each estimate varies according to the size of the defined area of interest, the particular survey zones used as the base data, and the method of calculating unit population size.

In the first case, Michels defined the Kaminaljuyu "chiefdom" as a circular territory with a radius of 7.5 km (total area=150 km^2) around central Kaminaljuyu (Michels 1979a:53-56, Figure 24:63). Rural population estimates were based on preliminary survey data for zone 58 only, and a single ethnographic case yielding a ("conservative") value for population per rural household per hectare (Michels 1979a:70-74). This method ignores three factors:

1) variations in population density by site type. For example, the minimal estimate excludes a number of large, moderately- and densely-packed sites from consideration,
2) geographical unevenness in the distribution of sites within the study area. For example, in a given phase, sites tended to be more concentrated in certain parts of the Valley, and
3) differences in settlement density by type of terrain or land use potential. I consider this procedure unreliable for estimating population characteristics for the entire Valley.

The first study of population and settlement relying fully on empirical data from the surface survey was reported by Sanders and Murdy (1982). Estimates of population size for each site were derived by combining estimates of the areal extent of the ceramic surface scatter with an evaluation of the "density" (in sherds/m^2) of the material. For example, a larger, more-densely covered site was assumed to represent a larger, more densely-packed population. The criteria used for the relationship between artifact and population density are reported in Murdy (1984:78-83).

The population estimate for an area totalling 1000 km^2 around central Kaminaljuyu was based on survey data for only three zones (zones 33, 43 and 58, for a base area of 75 km^2). Yet, these three zones best represent the population of these areas only, not of the intervening, sparsely populated areas (such as barranca, piedmont and mountainous areas) which occur within the survey area. Thus, population density for the entire

1,000 km^2 area is treated as equivalent to that for the most heavily populated areas, so total population size tends to be overestimated. Also, this procedure treats the entire area as a single political unit throughout most of the history of the Valley. Yet this unit (its boundaries and political dynamics) is not clearly apparent. Thus, interpretations of change which rely on (overestimated) population size, combined with the concept of a (large) stable political territory, may be unreliable (Houston 1989:23-27). It would be appropriate to estimate population size in association with suitable ecological, cultural and geographical units.

In a third case, Murdy has presented data for 10 additional survey zones (zones 45, 61, 70, 71, 72 and 74 completely; zones 34, 84 and 85 partially; and the balance of zone 46 excluding central Kaminaljuyu). Murdy calculated population size for each site using the ceramic scatter-density method described above. However, population size for an area of 875 km^2 within the Valley was calculated by totalling site estimates in each of six defined ecological subregions (Murdy 1984:78, Table 8). He used survey data from zones actually located within these subregions as a basis for the estimates. While this is a reasonable procedure, I recognize two difficulties with the survey data. First, although a total of approximately 3,000 hydration dates were obtained from obsidian samples taken from the sites, "most were surface samples of dubious context" (Webster and Freter 1990:71). Without supporting evidence from excavation, we cannot

be certain that components corresponding to the hydration dates were actually present. Ceramic style dates do support the presence of some components, however (Murdy 1984:852-874, Appendix C). Second, for each site without architectural features (i.e. sites without visible mound architecture), only four obsidian samples were processed. Since there are eleven defined phases in Murdy's chronology (excluding the Archaic period), sites which actually had five or more components present (and some with only 2 to 4 components) must contain unrepresented components. Is it reasonable to expect to find 5 or more (superimposed) components? Settlement surveys elsewhere have shown that archaeological sites do show strong continuity from phase to phase (Webster and Freter 1990:74, Figure 8; Kowalewski 1989:792, Table A.III.38). Also, for rural Kaminaljuyu, sites with mound architecture, for which a minimum of twelve obsidian samples were processed (in addition to the ceramic style dates), were always represented by more components than non-mound sites (see Murdy 1984:852-874, Appendix C). Consequently, components and population at rural sites without mound architecture, especially those with early, deeply-buried deposits, are certainly underrepresented in the survey.

Despite these difficulties, Murdy presents the most complete and consistent information. Rather than attempting to redefine and calibrate the data, I will accept these as a "representative" sample of rural components and assume (synchronically) that site components are represented in adequate relative proportion, even

though (diachronically) non-mound sites and earlier components are probably underrepresented relative to mound sites and later components.

Study Area Population Estimates

In this study, separate methods are used to estimate population size for central and rural Kaminaljuyu. For analysis of rural Kaminaljuyu (rings 2 to 9), only sites located within the intensively surveyed zones, but lying within 9.5 km of the central point, were used. This included sites within only seven zones (zones 33, 45, 46, 58, 61, 71 and 72). Murdy provides maximum and minimum population estimates for each site (Murdy 1984:372-851). Population totals by chronological phase and by ecological region are given as ranges as well (Murdy 1984:79-83, Tables 7-9). Rather than using the range estimates, which requires duplicating analyses (one for minimum and one for maximum estimates), I have instead used the median estimate for each individual site in determining population size. In cases where range estimates for sites are not given, I have used the median of the population range given for that "type" of site as defined by Murdy (1984:42-43). Each site was then assigned to its appropriate concentric ring, preliminary population totals calculated and multiplied by a factor representing the expected contribution from the unsurveyed portion of the ring (for example, if 45% of the ring had been intensively surveyed, then the preliminary population total was multiplied by a factor of

100%/45%=2.2). Individual ring estimates were summed to obtain total population size within the study area for each phase. Table 3 presents the results of these procedures.

Table 3. KAMINALJUYU STUDY AREA. Estimated Population by Concentric Ring, Phase.

	ESTIMATED POPULATION									
	KJ	CONCENTRIC RING NUMBER								TOTAL
	1	2	3	4	5	6	7	8	9	POP.
EF	133	0	0	64	18	19	82	29	0	345
MF	815	34	0	134	390	117	0	28	230	1748
LF	1935	63	480	150	901	39	96	85	1020	4796
TF	2290	159	30	1685	1038	835	123	2520	936	9616
PC	3405	443	15	3189	294	136	915	114	1136	9647
EC	4468	539	105	490	702	130	648	171	1836	9089
MC	2965	783	585	904	1030	194	1133	1762	5858	15214
LC	4912	3343	4680	2836	4008	1548	839	853	4188	27207
TC	3273	3375	3440	2905	2616	1664	721	1260	10956	30210
EP	1115	2026	360	556	186	440	314	1109	720	6826
LP	948	136	270	2290	162	1515	218	114	1288	6941

Population estimates for central Kaminaljuyu are problematic because the remains at Kaminaljuyu were greatly disturbed by subsequent cultural activity, both ancient and modern (Michels 1979a:71; Webster and Freter 1990:70-71). Test trench excavators were often unable to find intact components representing single occupational episodes. The application of obsidian hydration

measurements for dating simply dated the obsidian, not the context. Ceramic style dating suffered from the same problem. Another problem is the assumption that core area household densities and household population were the same as calculated for rural areas (based on the ethnographic analogy). Some evidence indicates that core area occupational density was generally much greater than for rural sites, particularly within 100 meters of mound groups (Sanders and Hirning 1969:164). "Assemblage" and "trace" components within the trenches were used to derive measures of population size, distribution and relative social rank by phase (Michels 1979a:73, Table 3). Although a "correction factor" was applied in the calculation of population size, some doubt remains about the reliability of the estimates (Michels 1979a:72-73). Also, there are compounding errors caused by the use of problematic factors in equations used for calculating population size (i.e. correction factors for partial or "trace" components in test trenches) (Michels 1979a:71-72). Population estimates for central Kaminaljuyu (Table 3) are quoted as the median of the maximum-minimum ranges given by Murdy, which are based on "corrective" modifications to the procedure used by Michels (for discussion, see Murdy 1984:298-307). I suspect that the population for central Kaminaljuyu is underestimated, a lower population corresponding better with suspected low estimates for rural population. I will assume that the population estimates indicate proper relative values between the phases. However, the major difficulty remains unresolved. There was no common or

consistent methodology used to gather data or to calculate population size and characteristics for both central and rural Kaminaljuyu.

RURAL KAMINALJUYU: SITES AND SETTLEMENT

Population Change

Table 4 presents the calculated estimates of population size for central and rural Kaminaljuyu, and for the entire study area. It also provides calculations of population change in each phase, and a measure of population centralization (percent of total population residing at central Kaminaljuyu).

The rate of population change "I" is calculated using the criteria and formula provided in Hassan (1981:139):

$$I=\log_n (N1/N0)/T,$$

where N0 is population size at the beginning of the period, N1 is population size at the end of the period (or beginning of the following period), and T is the elapsed time (years) between N0 and N1. "I" represents the percent change (in population) per year for each period. Hassan (1981:234-235) has observed that growth rates of between 0.1 to 1.0 percent per annum are typical for agrarian populations, and rates of about 0.3% are common. The values in Table 4 do fall within this range.

Table 4. KAMINALJUYU STUDY AREA: POPULATION SUMMARY. Central and Rural Kaminaljuyu; Total Estimated Population, Population Change, and Population Centralization.

	CENTRAL KJ TOTAL POP.	CENTRAL KJ "I"	RURAL KJ TOTAL POP.	RURAL KJ "I"	STUDY AREA TOTAL POP.	STUDY AREA "I"	POP. CENT. % at KJ
EF	133	.	212	.	345	.	38.6
MF	815	0.36	933	0.30	1748	0.32	46.6
LF	1935	0.29	2834	0.37	4769	0.33	40.6
TF	2290	0.08	7326	0.47	9616	0.35	23.8
PC	3405	0.20	6242	-0.08	9647	0.00	35.3
EC	4468	0.14	4621	-0.15	9089	-0.30	49.2
MC	2965	-0.21	12249	0.49	15214	0.26	19.5
LC	4912	0.25	22295	0.30	27207	0.29	18.1
TC	3273	-0.20	26937	0.09	30210	0.05	10.8
EP	1115	-0.54	5711	-0.78	6826	-0.74	16.3
LP	948	-0.05	5993	0.20	6941	0.01	13.7

Examination of Table 4 and Figure 5 indicates that, although total population size did increase with time, the rate of change was variable from phase to phase. The main features of the sequence reveal the following patterns. In the study area, population growth during the Middle to Terminal Formative was relatively constant at 0.32% to 0.35% per annum, the two highest values in the sequence. However, population growth during the Terminal Formative occurred primarily in rural Kaminaljuyu while central Kaminaljuyu showed little increase. This pattern changed sharply in the Protoclassic. Although total population size remained stable, population at central Kaminaljuyu increased in both absolute and relative terms. This trend persisted in the Early Classic as population was more centralized at Kaminaljuyu than at any other time (49.2%).

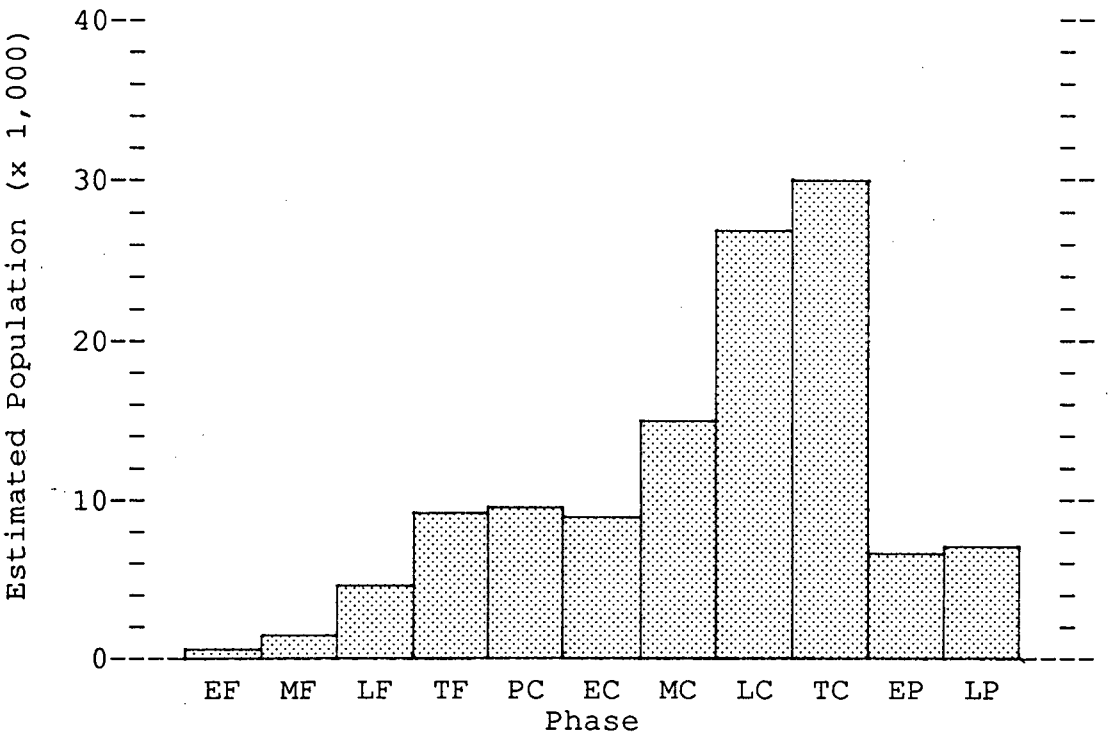


Figure 5. KAMINALJUYU STUDY AREA. Population Estimates by Phase.

Although total population size remained about the same from the Terminal Formative (9,616) to the Early Classic (9,089), rural population declined by 37% (7,326 to 4,621) while the core population increased by about 100% (2,290 to 4,468). In the subsequent Middle Classic the population balance between central and rural Kaminaljuyu changed to a pattern similar to that for the Terminal Formative. Particularly, both phases experienced sharp population decentralization. In both cases, this was associated with rapid rural population increase combined with very low or negative core population growth (during the Middle Classic, Kaminaljuyu's population was 34% less than it was in the Early Classic). Also, rural areas gained population at a rate similar to that experienced in the Terminal Formative (I=0.49% and 0.47% per annum respectively).

During the Late Classic, both central and rural populations demonstrated strong growth patterns. Population size within the study area increased to 27,207, yet it was less centralized (18.1%) than for any previous phase. The apparent population decentralization process continued in the Terminal Classic period, mainly due to population decline at central Kaminaljuyu. Rural population increased only slightly. Catastrophic population loss at the end of the Terminal Classic was most severe in rural areas. In the Early Postclassic, although a relatively greater proportion of the population resided at Kaminaljuyu (now classified as a large village), elite activity was dormant as Postclassic centers developed in different sub-regions of the

valley.

The overall pattern indicates this sequence of change.

1. Initial rapid population growth with population centralization (Middle and Late Formative).
2. Rapid population growth, especially in rural areas, and population decentralization (Terminal Formative).
3. Overall population decline combined with extreme population centralization (Protoclassic and Early Classic).
4. Same conditions as in point 2, but greater decentralization (Middle Classic).
5. Large absolute increases in both central and rural populations combined with population decentralization, followed by demographic collapse (Late and Terminal Classic).

Expectations for the Early Formation are approximated by conditions in the Middle and Late Formative. Starting with relatively low initial population, there were high values for population centralization (41%-47%) and steady population growth (0.33%-0.35% per annum). In the Late Formative, rural population increased at a rate faster than for central Kaminaljuyu.

How can the pattern in the Terminal Formative be explained? Were elites at central Kaminaljuyu promoting population growth in rural districts in order to benefit from favorable tribute ratios with the subsistence-producing support population? The evidence does support this proposition, but is inconclusive by itself. Further evaluation depends on closer analysis of conditions at central and rural Kaminaljuyu.

Population centralization in the subsequent Protoclassic and Early Classic suggests conditions expected for the Alternative Formation, yet these two periods were notable for relatively low levels of elite trade. Also, the Early Classic in particular, had very little construction activity (see section on construction activity) or investment in elaborate burials and other contexts of elite display. These conditions directly contradict the model for the Alternative Formation, and indicate complexities not anticipated in the model.

The Middle Classic marked a return to conditions similar to those of the Terminal Formative (strong rural population growth, population decentralization). These two periods were similar in other respects as well: they displayed intense involvement in long-distance elite trade, massive investment in construction projects and in richly-furnished elite burials. For the Alternative Formation, I expected population centralization, and decline of rural population growth. Wealth in valuables was evident, but rural population size increased at rates faster than for any other period. Thus, these conditions, according to expectations the model, are contradictory.

In summary, characteristics for two categories were similar in the Terminal Formative and Middle Classic: 1) population: overall population increase, rapid, rural population growth and population decentralization, and 2) emphasis on long-distance trade; a focus on construction activity at selected sites, and contexts for status display. Based on evidence for the Early

Classic, the converse seems to apply as well. The relationships among these variables requires closer examination, and some re-formulation of the model is anticipated (especially in relation to the proposed Alternative Formation).

Conditions in the Late Classic period suggests patterns expected for the Intermediate or Late Formation, including strong population growth (largest absolute population increases at both central and rural Kaminaljuyu), but also indications of population decentralization (relative to central Kaminaljuyu).

Evidence from both the Terminal Formative and the Middle Classic (representing features of the Alternative Formation) indicates that rural population growth may be associated with elite trade and wealth-based status. This was directly contradictory to expectations in the model. In the Late Classic, were elites also promoting rural population growth in a context of extensive trading activity? The available evidence indicates that the Late Classic polity was not dominated by a long-distance trading economy, or by the conspicuous display of wealth. In fact, the Late Classic succeeded the collapse of Middle Classic trade network associated with Teotihuacan and the (Early Classic) Lowland Maya. Spectacular burials and massive construction projects were not present. In terms of the model, one explanation is that political leaders were attempting to compensate for a reduction in the flow of wealth and status caused by the collapse of the long-distance trade network, and the subsistence system was bearing the burden. One possible way to test this would be to

look for evidence of population centralization because the effective distance range for financing in the subsistence-based economic system would be restricted (Brumfiel and Earle 1987). Analysis of the distribution of population in the concentric rings would assist in this evaluation. Again, population data alone are suggestive, but inconclusive.

The process of population decentralization continued in the Terminal Classic, although the rate of overall population increase was minimal (0.05% per annum). However, the Terminal Classic ended with an almost total collapse of the population structure. Apparently, political leaders were virtually inactive at central Kaminaljuyu during the Terminal Classic (Michels 1979a:234-238), so there is no reason to argue that rural populations were under centralized political control, or that core area tribute demands led to a failure of the support system. It is more likely that, if the support system failure occurred, it was a result of the activities of those stationed within the rural areas, perhaps those people associated with the many rural mound sites which appeared during the Late (and Terminal) Classic. The extreme loss of population in rural areas at the end of the Terminal Classic suggests that the rural area was most affected by the crisis.

The evidence for population change, while suggestive, is not in itself conclusive. Some association between the expectations and chronology of the model and the archaeological phases are tentatively indicated (Early Formation = Middle and Late

Formative; Intermediate Formation=Late Classic; Late Formation = Late and Terminal Classic). Some specific expectations are contradicted (Alternative Formation = Terminal Formative and Middle Classic). There was a positive relationship between intense involvement in long-distance trade activity and rural population growth (and population decentralization), which was opposite to that expected for the Alternative Formation, but was evident in both the Terminal Formative and Middle Classic. Considered together with additional evidence, this analysis suggests that the political disintegration of Kaminaljuyu was associated with activities of those (elites) located in rural areas, and that this may be related to economic adjustments following the collapse of the Middle Classic long-distance trade network. Finally, conditions in the Protoclassic and Early Classic (i.e. population stagnation and decline, centralization) require further explanation as they are not anticipated in the model of population change, which suggests that, except in the Alternative Formation, population increases steadily and uniformly. This analysis also suggests a possible cyclical pattern of political and economic change focused most clearly on the Terminal Formative and Middle Classic periods. These data and conclusions regarding population change, while interesting, are tentative and need supporting evidence and clarification.

Population Distribution

In this section, I will examine population distribution and change in the study area, within the context of the model, without attempting to specifically identify the distribution of political power or the existence of chiefdom or state political organizations, apart from making preliminary observations.

I understand "centralization" to mean the degree to which things or activities are concentrated in various categories or in space. Political centralization (i.e. the degree of concentration of judicial functions, policy making and implementation, and of tribute, matter and information) has often been associated with the size and distribution of population. That is, the degree of centralization of population attests to the degree of centralized authority (for discussion see de Montmollin 1989:87-96, see also the literature on Teotihuacan, Sanders et al. 1979; Millon 1981). Discussion of political centralization is also related to the study of organizational and administrative systems of chiefdoms and states (Johnson 1982; Spencer 1990, 1987; Wright 1977).

Associations between population and political centralization and organization are not assumed in this study. This approach will allow population centralization to be kept analytically separate from measures of political centralization and complexity until related analyses of political maintenance/centralization (construction summit area) and status demonstration (construction volume) are carried out in a subsequent section.

A two-part measure (rural versus central) of population

centralization was given above (Table 4). If one were to argue that population centralization indicates political centralization (or even state-level organization), then one might conclude that the Late Formative, Protoclassic and Early Classic were periods of centralized political power and state-level political organization, without considering alternative explanations (for example, defensive organization or remunerative economic association). Yet, at most, Kaminaljuyu contained about 50% (Early Classic) of the population in the study area, and an average of only about 28% from the Late Formative to the Terminal Classic. So, while interesting, these data do not inform us about the spatial distribution of the majority of the population located in the rural area. Tests of the model and theory of political change depend in part on measures of this distribution. For example, the model predicts that, as economic/productive demands and population increase, scalar stress will develop, and population and settlement will become more widely distributed in space, and there will be political development in secondary regions more distant from the core. This process will be most evident in the Intermediate and Late Formations. The decentralizing process will be associated with adjustments in political administration and control at distance from the core. Consequently, it would be useful to know whether populations were distributed differentially according to distance from the center. That is, was population most concentrated near the center of the study area and did it gradually thin out towards the edges? Was

there a more even distribution in space with time? Is there any indication of a demographic-territorial boundary? Was there a demographic-spatial structure in population distribution that reveals unanticipated patterns of political action and change?

In order to compare population distribution by distance from central Kaminaljuyu, population estimates for each concentric ring were standardized by conversion to population density. The results of this standardizing procedure are presented in Table 5 and are displayed graphically in Figure 6 a-k. However, even very low population densities within large areas (i.e. the outer rings) can represent a substantial population relative to smaller, more densely-packed areas (inner rings). These differences will have implications for administrative controls, especially if the larger proportions of the population are located at greater distances from the core area. Examination of population density does not address this aspect of demographic distribution. Therefore, the spatial distribution of population is also presented according to the percentage of total population located in each ring for each period (Figure 7 a-k).

Table 5. KAMINALJUYU STUDY AREA. Population Density by Concentric Ring, Phase.

	CONCENTRIC RING NO.								
	KJ1	2	3	4	5	6	7	8	9
EF	19	0	0	3	1	1	2	1	0
MF	115	3	0	5	13	3	0	1	4
LF	274	5	25	6	29	1	2	2	18
TF	324	13	2	67	33	22	3	50	17
PC	482	35	1	127	10	4	21	2	20
EC	632	43	6	20	23	4	15	4	33
MC	420	63	31	36	33	5	26	35	104
LC	695	266	248	113	128	41	19	17	74
TC	463	269	182	116	83	44	17	25	194
EP	158	161	19	22	6	12	7	22	13
LP	134	11	14	91	5	40	5	2	23

Values in the table indicate estimated population per km^2, and are calculated separately for each concentric ring (1 to 9).

Examination of Figures 6 and 7 shows that rural population density did not decline uniformly with increasing distance from central Kaminaljuyu. There was great variability in time and space. For example, population densities for concentric rings 2 and 3 were relatively low from the Late Formative to Early Classic phases. Their population represented only between 0.2%-10% of total population. Subsequently, these areas gradually "filled in" and reached a density peak in the Late and Terminal Classic periods. At this time, they accounted for much of the population surge in rural Kaminaljuyu as they represented relatively greater proportions of the total population (11%-17%). There was no apparent reason why these areas were not more densely settled prior to the Late Classic, for the agricultural land potential was equal to or better than other areas which

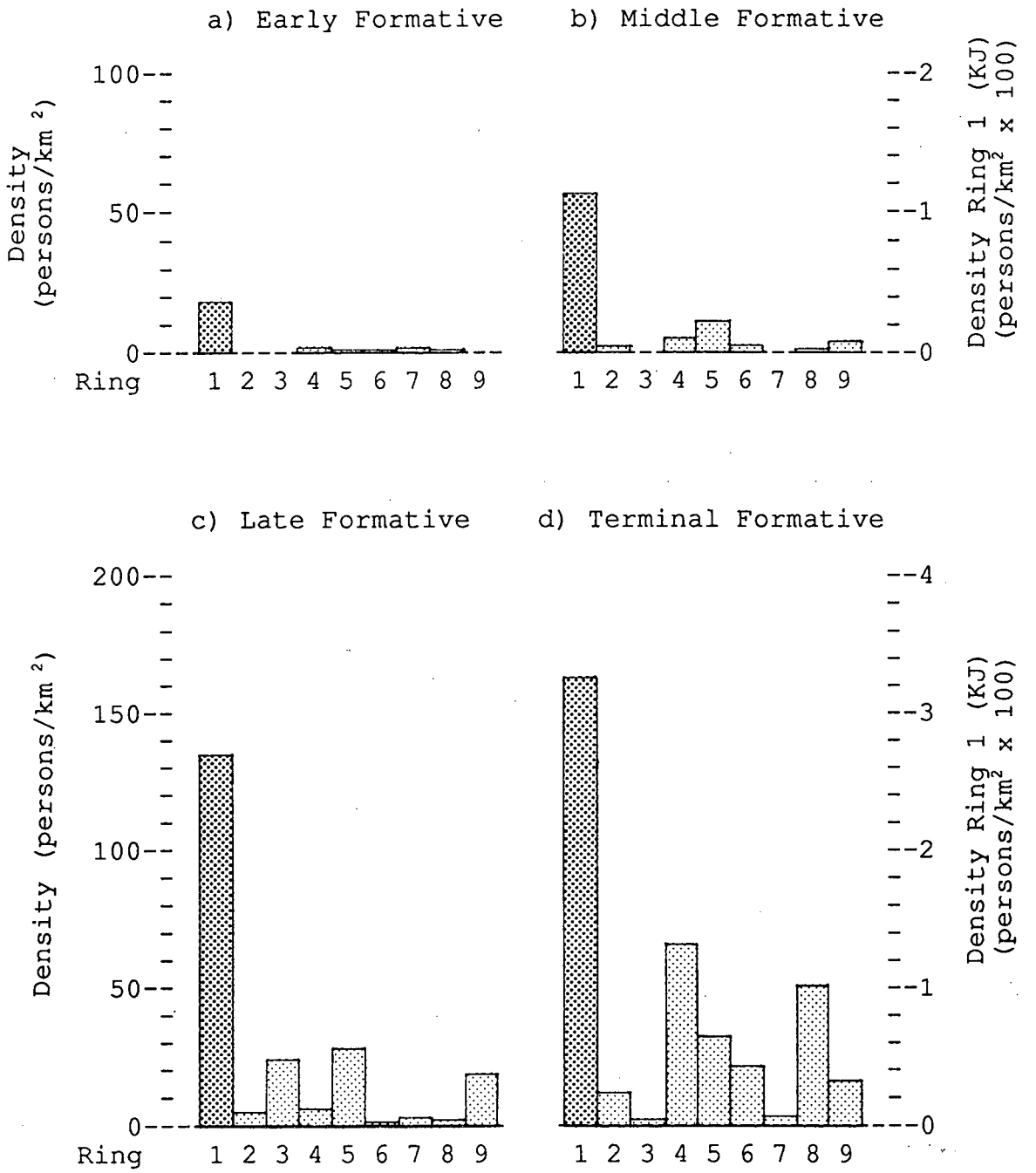


Figure 6. KAMINALJUYU STUDY AREA. Population Density by Ring, Phase.

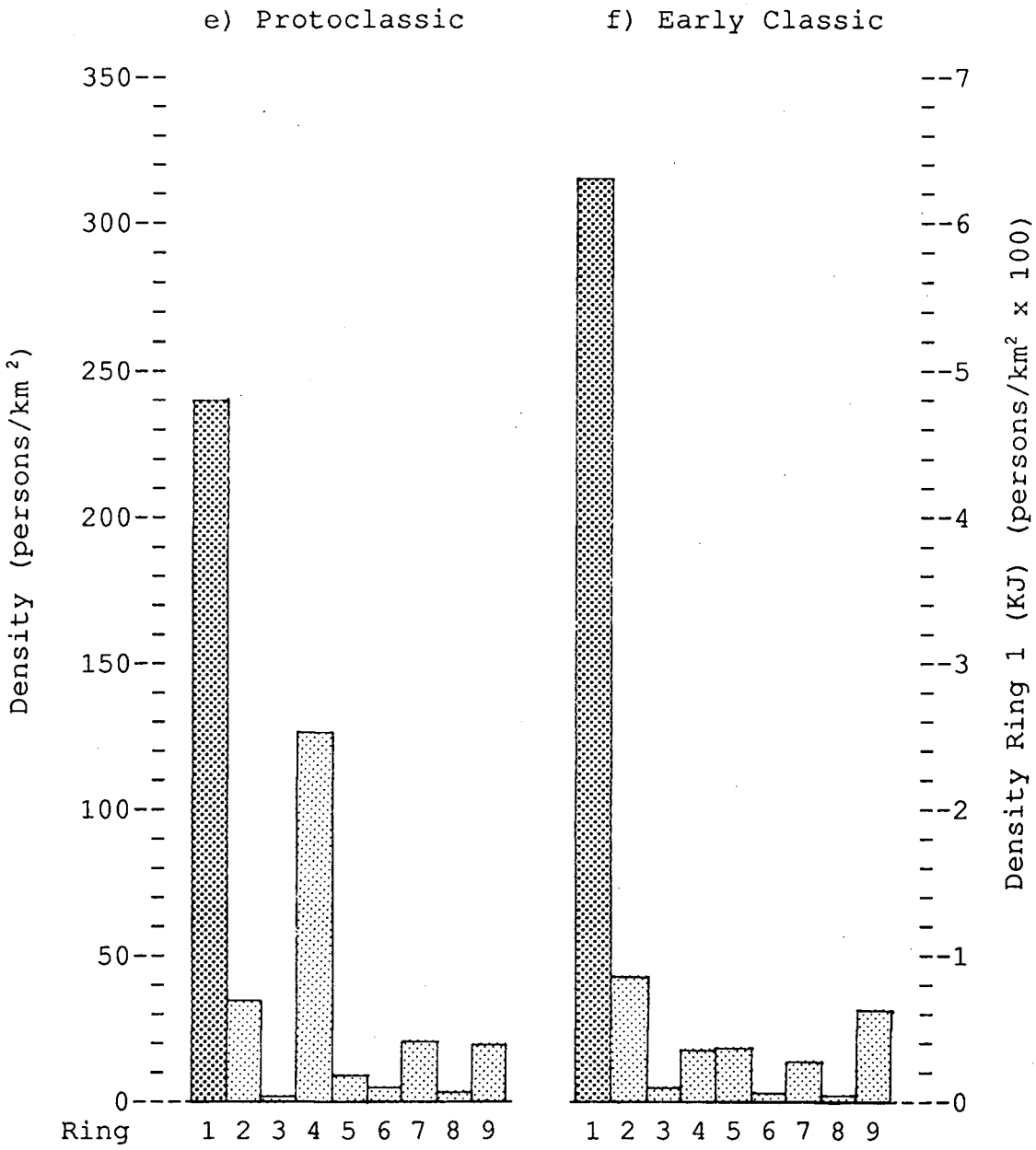


Figure 6. KAMINALJUYU STUDY AREA. Population Density by Ring, Phase.

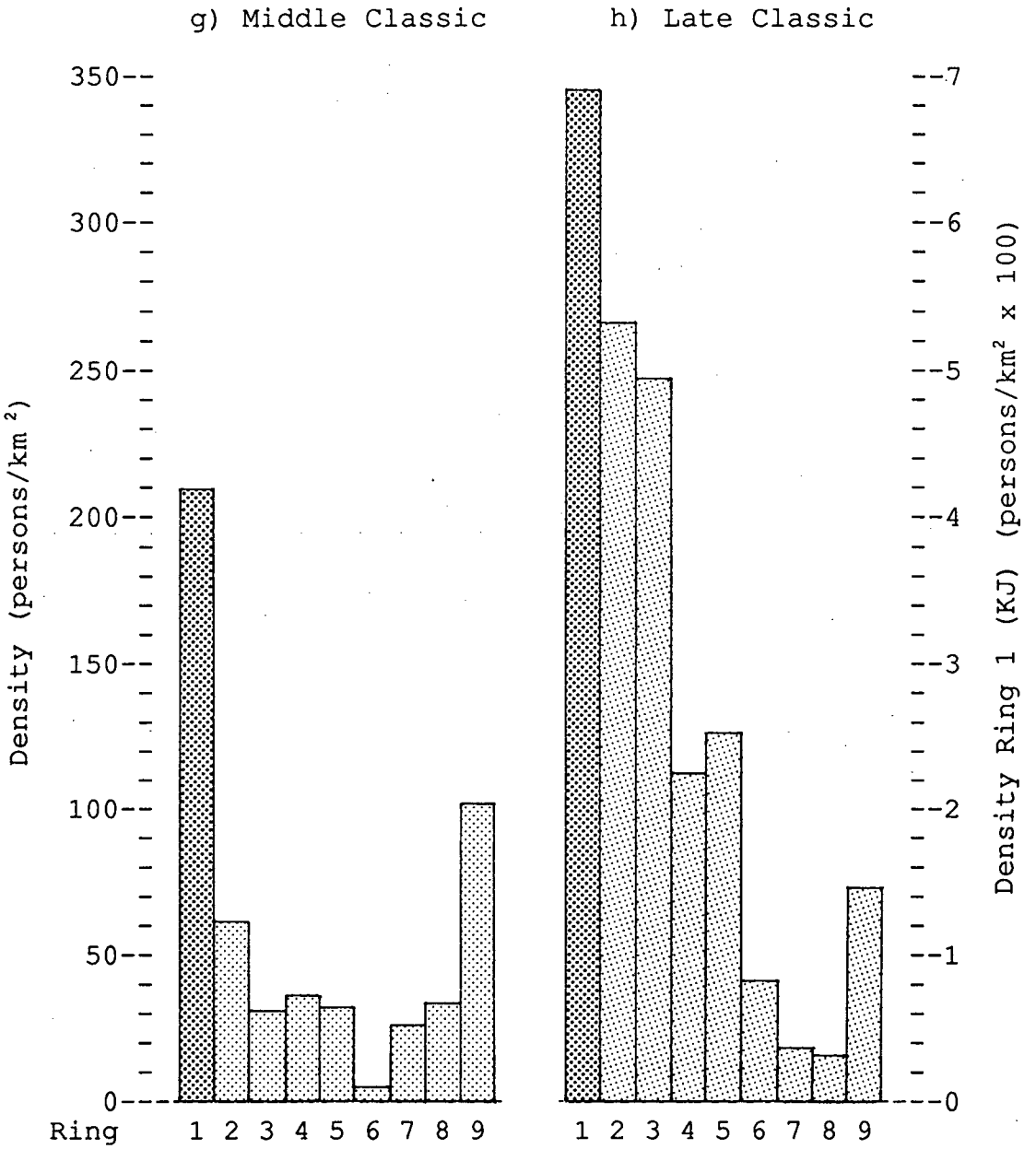


Figure 6. KAMINALJUYU STUDY AREA. Population Density by Ring, Phase.

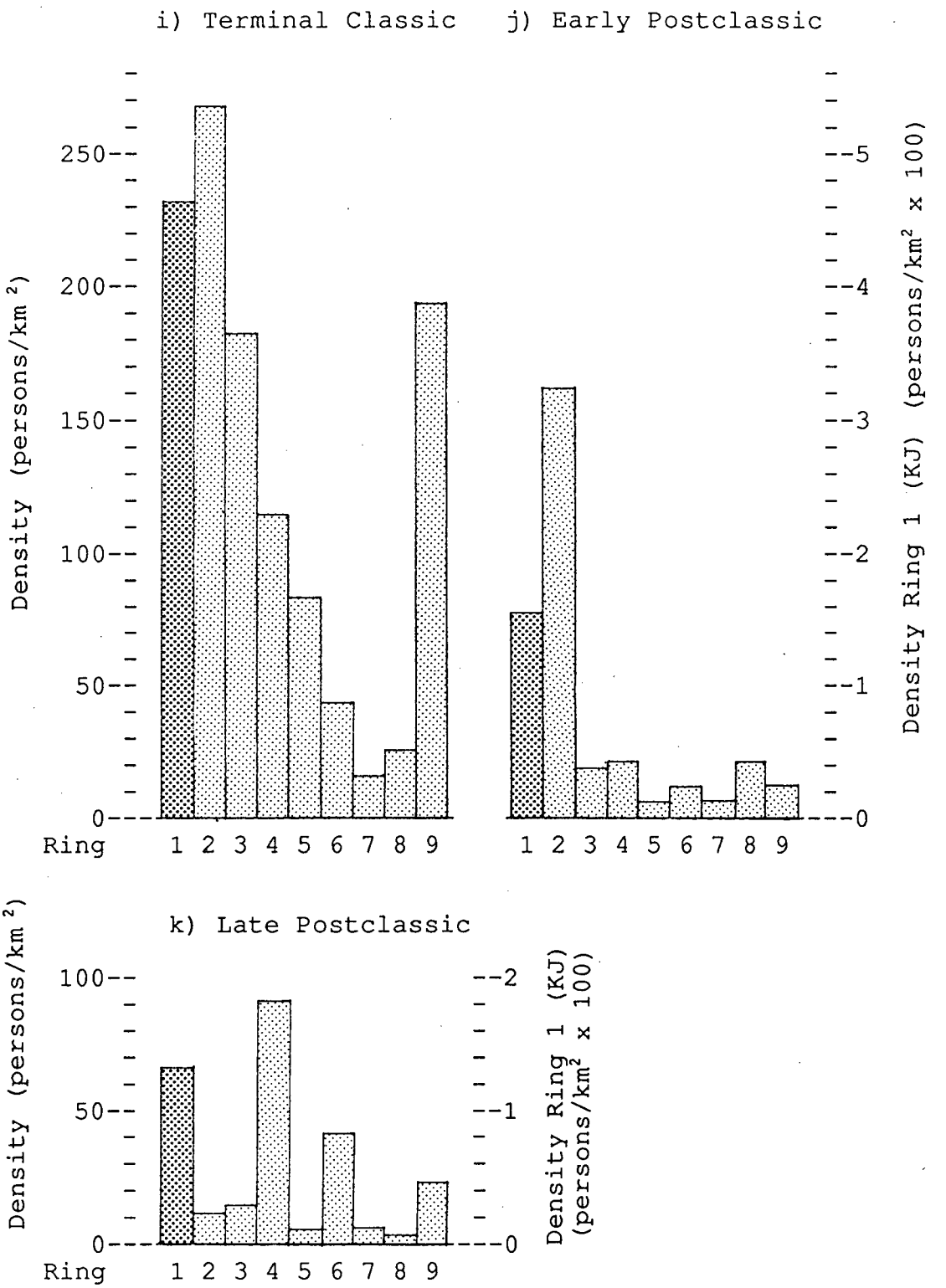


Figure 6. KAMINALJUYU STUDY AREA. Population Density by Ring, Phase.

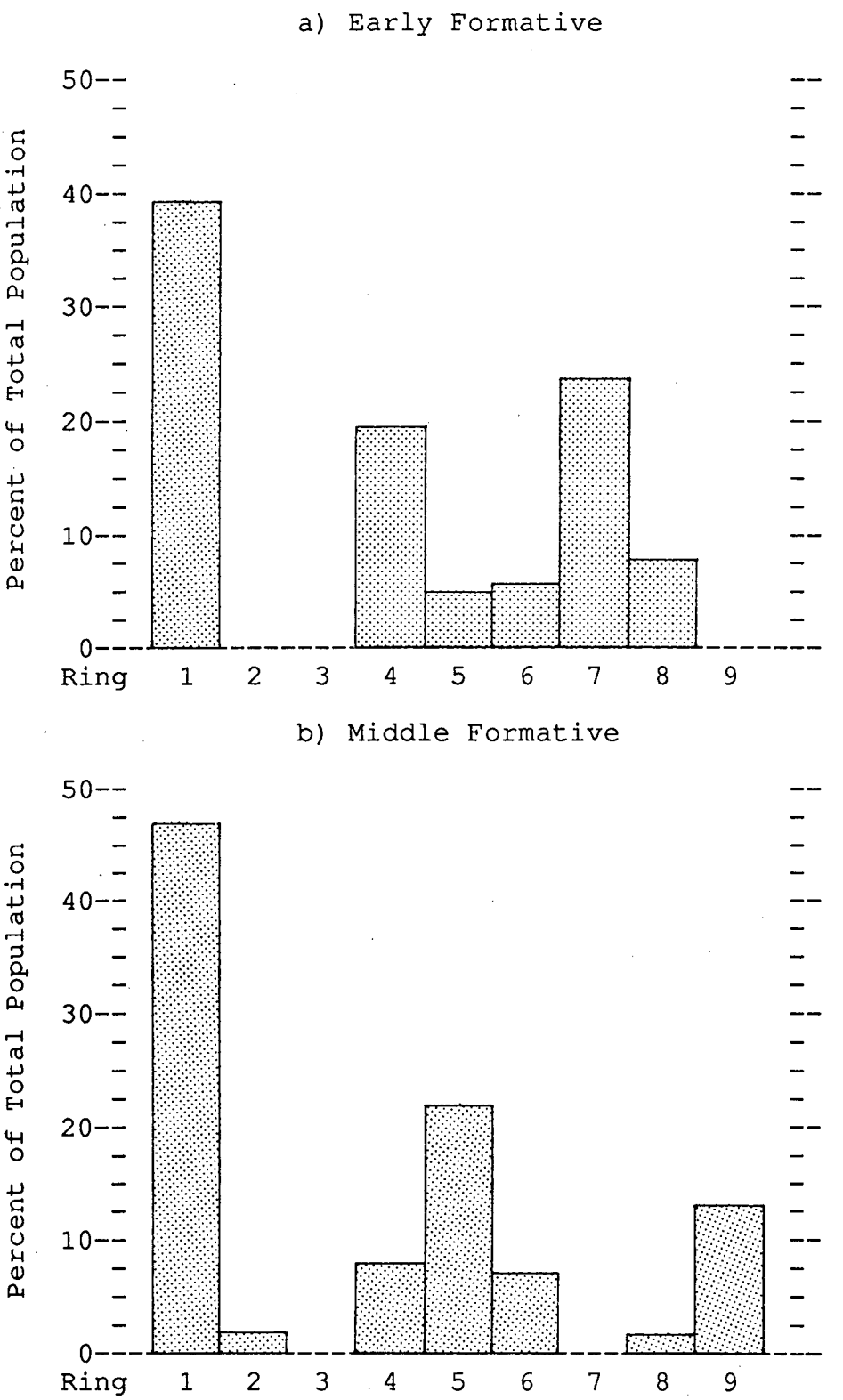


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase. .

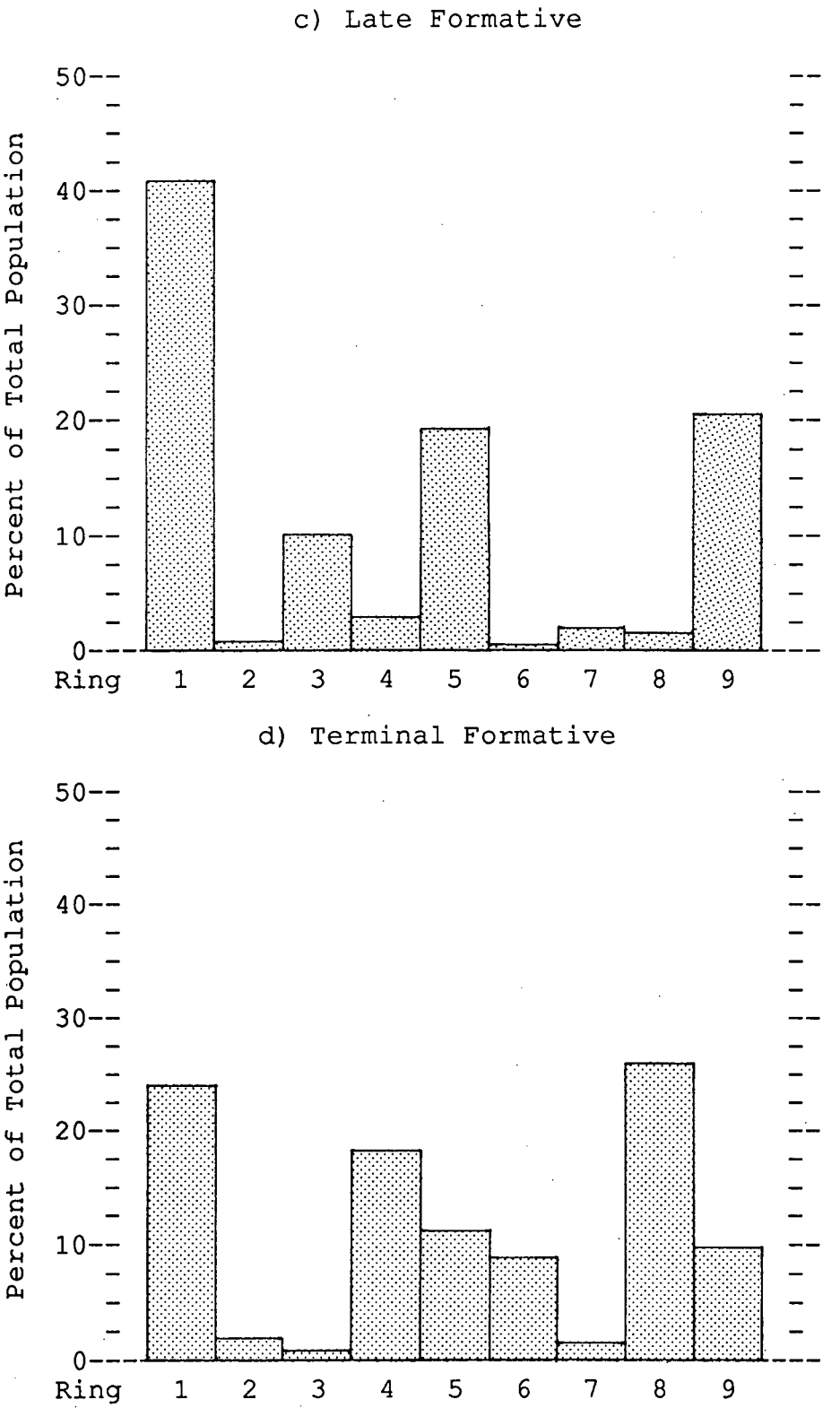


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase.

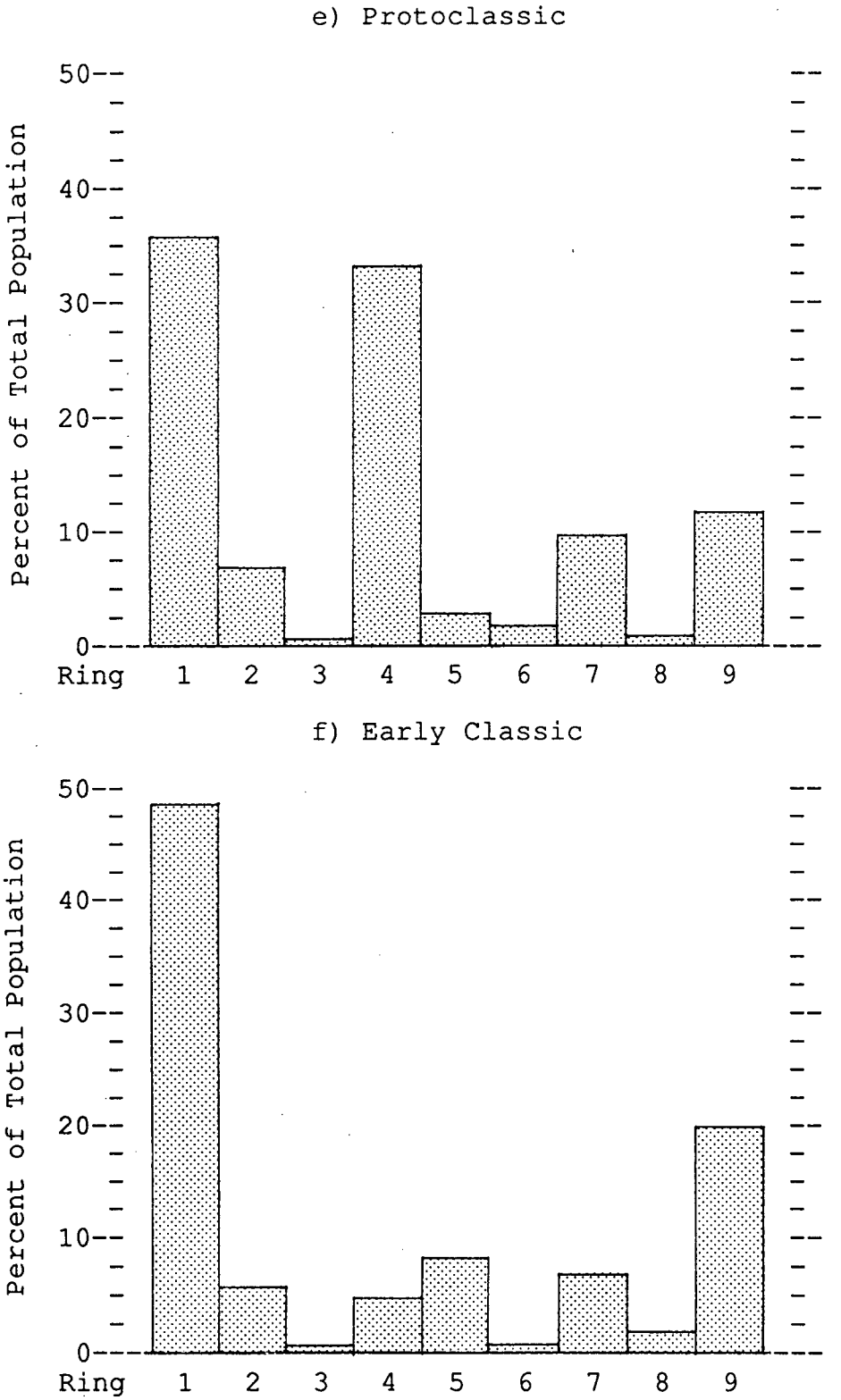


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase.

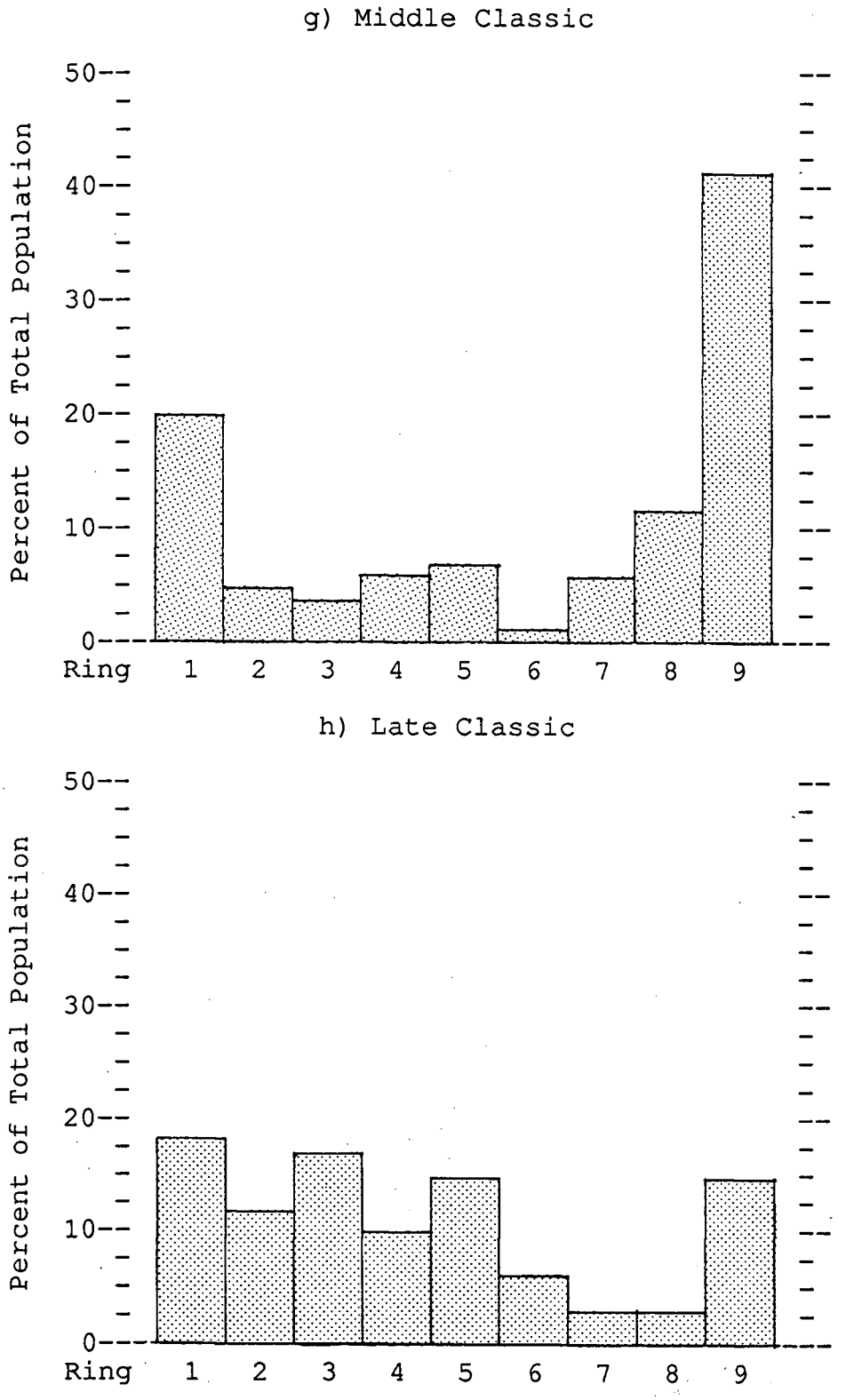


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase.

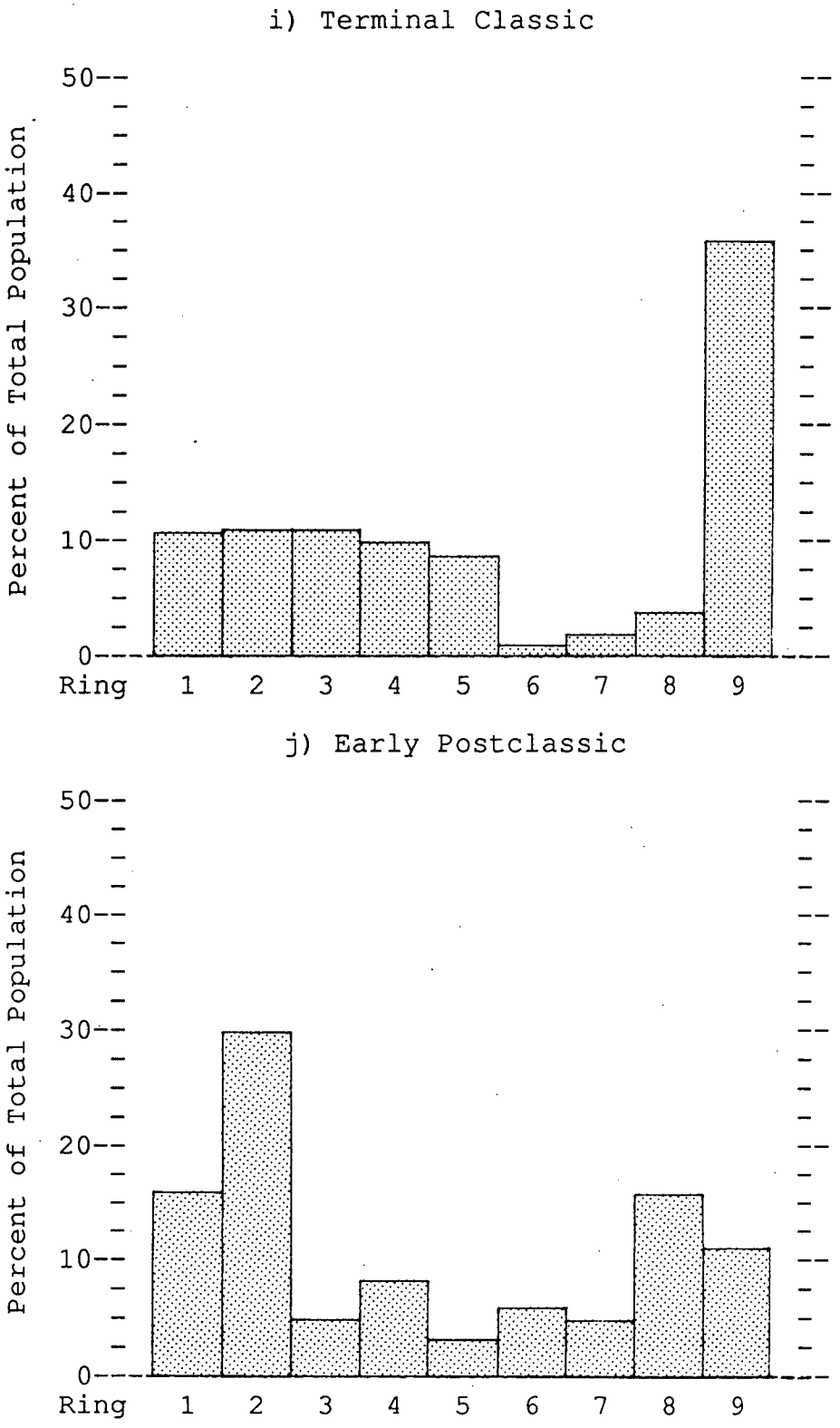


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase.

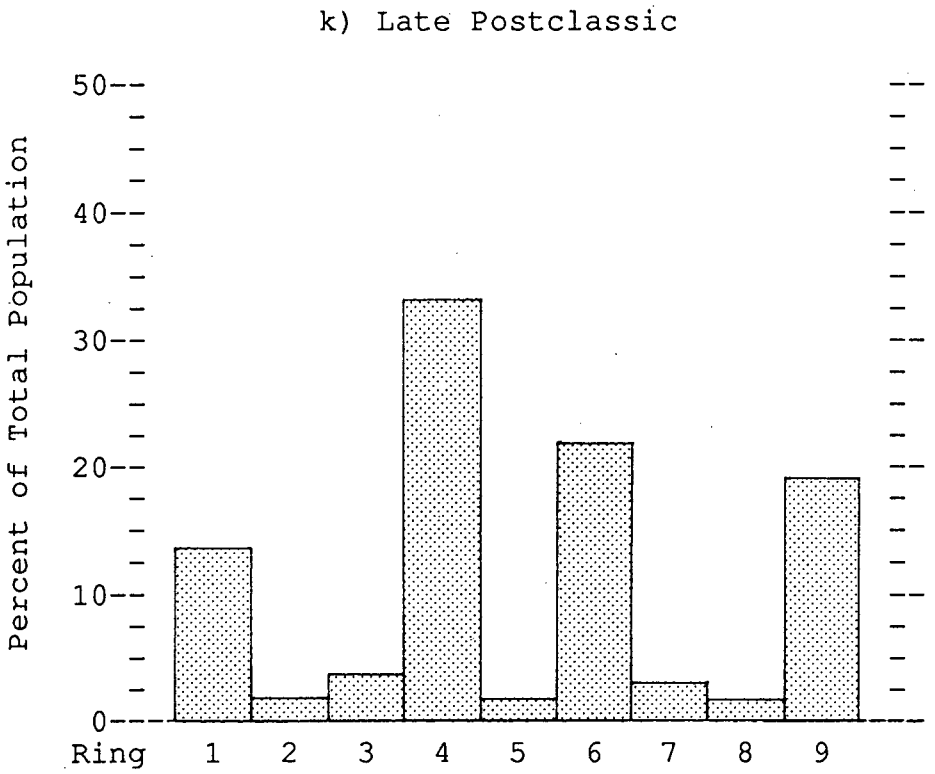


Figure 7. KAMINALJUYU STUDY AREA. Percent Population Distribution by Ring, Phase.

already had higher population densities (rings 4 and 5 for example). In contrast, rings 4 and 5 had relatively heavy population densities throughout the early phases, up to and including the Protoclassic, and represented substantial proportions of the rural population. In the Late and Terminal Classic however, these rings were surpassed by population growth in both the inner and outer rings (Figure 7 h-i).

With respect to population in the outer concentric rings, the sixth (5.5 km to 6.5 km) was generally sparsely populated. Population density in the seventh (6.5 km to 7.5 km) and eighth rings (7.5 km to 8.5 km) was variable but generally low, particularly for ring 7. Interestingly, there was a population surge in ring 8 during the Terminal Formative, when it represented about 27% of the total population (compared to about 24% for central Kaminaljuyu). There was also a peak during the Middle Classic when it contained more population than any ring (except ring 9).

Population densities in ring 9 were consistently high in contrast to low and very low densities in rings 7 and 8. Population size increased steadily in ring 9 after the Early Classic, until, during the Middle and Terminal Classic, it represented over 40% of the population in the study area (Figure 7 i). Is this a distortion created by the methodology (the concentric ring system)? For example, surveyed sites for ring 9 were concentrated in zones 58, 71 and 72, which were located within the generally heavily-populated central section of

the Valley of Guatemala (see Figure 2). Areas to the north and west, which lay outside the intensively surveyed zones, which were likely sparsely populated, were not represented in ring 9. Thus there may be a bias in the data for ring 9. Yet rings 7 and 8, which include adjacent areas in the same survey zones, did not show a similar pattern. In fact, the pattern generally indicates the opposite trend (i.e. low population densities). Furthermore, an examination of Murdy's survey reports indicates that parts of zones 71, 72, 84 and 85 lying beyond 9.5 km continued to show increasing population density with greater distance from central Kaminaljuyu. Therefore, it is probable that the values in Table 5 for population density in ring 9 are reliable, and possibly indicate the presence of populations associated with neighboring political units.

Interpreting these data reveals the following chronological patterns. During the Late Formative, rural population was relatively small (while increasing steadily), but was evenly distributed in groups located at various distances from central Kaminaljuyu (Figures 6 c and 7 c). Neither population density nor representative percentage declined uniformly with distance from the core. This pattern suggests political and demographic decentralization within rural areas, in spite of measures of overall population centralization at Kaminaljuyu evident in Table 4. These data suggest that the Early Formation is not well represented by the Late Formative, since, although population centralization was expected, rural population decentralization

was not. That is, there was no pattern of gradual expansion of population outwards from the core area, thinning out towards the edges of the study area. It is possible that central and rural populations were relatively independent at this time. Supporting analysis is required.

One explanation for "underdevelopment" in the area of rings 2 and 3 from the Late Formative to the Early Classic is that central Kaminaljuyu exerted direct political control over this area, immediately adjacent to the central core, and that the area was deliberately maintained as a dependent hinterland, quite possibly as a support zone for the core area inhabitants (or a sustaining area-agricultural zone). This explanation is supported by the recent discovery (1989) of an irrigation canal at central Kaminaljuyu, whose construction is dated to the Terminal Formative (M. Hatch, personal communication 1990). The canal, approximately 15 meters wide and 10 meters deep, led from the ancient lake within central Kaminaljuyu, near mound group A-V-8, to the southwest margin of central Kaminaljuyu and beyond. Hatch also states that food processing facilities have been identified in group A-V-8 near the canal. According to Hatch, this canal was used throughout the Terminal Formative and Protoclassic periods, but was filled in by Early Classic times. The existence of the canal also indicates that agricultural intensification and centralized political organization were present in the Terminal Formative. If so, then characteristics such as centralized power, agricultural intensification, long-distance wealth (elite) trade

and population decentralization are directly associated.

Population distribution in the Terminal Formative changed radically (Figure 7 f-g). Not only was total population decentralized relative to Kaminaljuyu, but rural population was distributed more towards the outer areas of the rural Kaminaljuyu (rings 4 to 9). In fact, the greatest concentration of total population was located in ring 8 (26%) (Figure 7 d). This distribution suggests conditions expected for the Intermediate Formation (population decentralization and rural population growth). Yet the Terminal Formative core population was actively involved in long-distance trade, and wealth based status systems, for which population centralization and rural population decline is expected in the model. Because of this contradiction between the model and the data, the model will require reformulation to account for trade in association with population decentralization and rural population growth. This analysis of the Terminal Formative shows that such decentralization was associated with both dispersed population distribution and the build up of population around the perimeter of the study area.

During the Protoclassic, while population unexpectedly became "re-centralized" at Kaminaljuyu (relative to the Terminal Formative), rural population became concentrated in the area of ring 4 (Figure 7 e), which accounted for about 33% of total population (compared to about 36% for central Kaminaljuyu). Interestingly, this area appears to have developed around the perimeter of the suggested reserve lands (rings 2 and 3), and

indicates that it was a zone of secondary political development. Meanwhile, populations in the outer rings (5 to 9) declined sharply, in particular ring 8 (from 26% to 1.2% of total population). Thus, about 70% of the total population was concentrated in two areas (central Kaminaljuyu and ring 4). This redistribution was not associated with population growth as total population size remained virtually unchanged from the Terminal Formative. Thus, I expect other factors (political and economic) to underlie these changes in population distribution. According to the model, the development of secondary political centers should be evident in the Terminal Formative or Protoclassic, following the period of population increase after the Late Formative. Therefore, I expect to find evidence of secondary (administrative) site development Intermediate Formation), especially in areas of concentrated population growth (ring 4; see section on construction activity).

Increased settlement density in ring 2 during the Early Classic coincided with population centralization processes at Kaminaljuyu. The canal mentioned above was filled in at this time. Early Classic population distribution was similar in profile to the Late Formative. For example, although population was concentrated at Kaminaljuyu, the rural population was dispersed in small, relatively equal-sized, groups, with secondary development in rings 5 and 9 (compare Figures 7 c, 7 f). However, rural population size had declined from the Protoclassic (6,242 to 4,621) and settlement had lost the focal

structure in ring 4. Because of this weak demographic development (implying an inability to realize population growth and increases in economic production), I suspect this indicates some degree of decentralization of political power. So, even though population was highly centralized at Kaminaljuyu, this was not necessarily due to the exercise of strong, centralized political power, but possibly due to a defensive posture. This idea will be tested using comparative (rural-central) construction activity in central and rural Kaminaljuyu.

The Early Classic pattern best fits expectations in the model for the Alternative Formation (population centralization, population decline in rural areas), but this period was not identified with active long-distance trade and contact, nor with elaborate contexts for elite display comparable to those of the Terminal Formative, or even of the Protoclassic. Some other explanation is required, possibly one that incorporates changes associated with conditions of conflict and warfare, or with the spatial restrictions of a local, subsistence-financed economy.

Slow population growth continued in rings 2 and 3 during the Middle Classic. Rural population distribution in the Middle Classic was similar to that of the Early Classic (dispersed), though population size was much greater in the Middle Classic (Figure 7 f-g). Interestingly, ring 9 was more densely populated than other rings at this time, and contained about 40% of total population Figure 7 g), compared to only 20% at Kaminaljuyu. The build-up of population in ring 9 continued a trend of population

concentration here, first evident during the Late Formative (compare the development of population in ring 8 during the Terminal Formative). These conditions in the Middle Classic correspond to those expected for the Late Formation (population decentralization and relatively even spatial distribution of a large population).

In the Late Classic, population distribution changed radically as density (Figure 6 h) and ring-percentage proportions (Figure 7 h) built up in the middle and inner rings, though ring 9 maintained its population size. Even though population at central Kaminaljuyu had increased dramatically (2,965 to 4,912), it represented only about 18-20% of total population, as it had in the Middle Classic. The dispersed settlement pattern of the Middle Classic was abandoned as rural populations built up right around the core, settling in the former "reserve" areas in rings 2 and 3. This reveals an interesting pattern of population decentralization combined with rural centralization around the core perimeter, which gives the pyramid-shaped population profile evident in Figure 7 h. Thus, amidst apparent decentralization, there is a pattern of centralization. In effect, this pattern is analagous to that which occurred during the Protoclassic, and particularly during the Early Classic, but on a larger scale (including rings 2 and 3), presumably to account for greater population size. Meanwhile, rings 4, 5, and 6 continued to develop, but rings 7, 8 and 9 actually lost population.

These changes raise some interesting questions. Was the core

area population expanding? Were rural populations closing in on the core? What occurred to change the settlement policy for rings 2 and 3? Were there similar political criteria involved in the change from the Terminal Formative to the Protoclassic, as from the Middle Classic to the Late Classic? Was political authority responsible for rural population growth and administrative centralization? To what extent was the pattern of population centralization due to conditions of conflict and warfare?

The conditions in the Late Classic suggest those expected for the Intermediate Formation (population decentralization, and development of population in areas near the core). However, the pattern of population centralization in the inner rings supports the hypothesis that the means of political financing had shifted towards the products of the local subsistence system, which were less portable and valuable (and spatially restricted) than those of a predominantly trade-based financing system. While suggestive, this situation is too complex to examine from the perspective of changes in population distribution alone.

During the Terminal Classic, for areas in rings 2 to 7, there was little change in the Late Classic settlement distribution (Figure 6 h,i). Populations densities declined uniformly with greater distance from the core (Figure 7 i), while the core area population declined to 10-11% of total population (from 18% in the Late Classic). However, this pattern was overwhelmed by a huge population increase in ring 9 (4,200 and

15% to 11,000 and 36% of the population in the study area). The result is clearly apparent in Figure 7 i. Clearly, there were administrative problems associated with scale (population size) and distance (from Kaminaljuyu), particularly if the population in ring 9 was incorporated in Kaminaljuyu's political unit. Thus patterns of political decentralization are expected (for the very late stages of the Late Formation (peak population and even distribution).

To conclude this section, the analyses show that the study area had a clear demographic-spatial structure, and that this structure changed with time. The structure suggests that the territory was spatially organized by distance from central Kaminaljuyu. I suggest the following spatial divisions and identify the associated concentric areas: core area (central Kaminaljuyu), support/reserve zone for the core area (rings 2 and 3), secondary zone (rings 4 and 5), peripheral territory (rings 6-8), and boundary zone (ring 9). There may have been additional structural divisions (quadrant divisions, pie-shaped divisions for example) (see Michels 1979a). Apparently, these divisions retained remnant meaning (if not functional meaning), even though the demographic-spatial structures changed. Population size and density did not always decline uniformly towards the edges of the study area. In fact, the outermost areas (rings 8 and 9) often showed a strong demographic presence. Areas near the perimeter of the study area which consistently had low population densities were likely close to a territorial boundary. There was almost

certainly a boundary zone associated with the areas in rings 8 and 9. This analysis supports previous estimates for the general location of such a boundary (see section defining the "study area"). Secondary areas in rings 4 and 5 also showed strong development, but inner areas (rings 2 and 3) did not develop until the Late Classic. Two-part measures of population centralization, as indicated in Table 4, do not reveal interesting or very useful demographic-spatial patterns. Population centralization with respect to Kaminaljuyu did not necessarily signify political centralization. For example, evidence from the Terminal Formative (the canal and implications of agricultural intensification) suggests that political centralization was associated with population decentralization and dispersal, and rural population growth. In contrast, while decentralization was apparent in the Late and Terminal Classic, populations were nevertheless concentrated at high densities immediately around the core periphery. This perspective suggests that some comparison is available between centralization processes in the Protoclassic and Early Classic and the Late and Terminal Classic, though at different scales as later populations were up to three times greater (9,647 in the Protoclassic and 27,207 in the Late Classic). Population was not distributed more evenly with greater population size. In fact, relatively equal population size in the Terminal Formative and Protoclassic/Early Classic periods, were associated with contrasting distribution patterns. There were other variables than population size

involved in these differences. This study shows that analysis of changes in population size and distribution, while informative, cannot be viewed in isolation. These were not independent variables in cultural change, nor indicators of the degree of political centralization.

Rural Sites and Complexity: Intensively Surveyed Areas

I understand "complexity" to refer to the number of different "parts" within a system. Greater size (or scale) and variability in the system are associated with greater complexity. The proportion of simpler discrete units within the whole system also indicates the degree of complexity. For example, a more complex system would have a relatively lower proportion of simpler parts. A less complex system would have a higher proportion of simpler parts, and there will be greater homogeneity among the parts. In cultural systems, greater population size is associated with greater complexity. Political complexity is measured by identifying the number of decision-making levels or hierarchical units, but can also be measured by the number of defined social or occupational classes present within the political unit.

For this study of sites and settlement, archaeological correlates of complexity include the number and variation of different types of sites (or "parts" of the settlement system). Social complexity is measured by analysis of the total number and mix of all site types in each phase. Only those sites lying

within the intensively surveyed areas (or 38.7% of the study area) were used in this analysis. In carrying out analysis of complexity, I have used Murdy's site classification system (for criteria see Murdy 1984:39-43,852-874). He identified 14 different site types, although one type (large elite center) did not occur within the survey area. This is not an ideal system since, because there was no comprehensive rural site-excavation program, it depends mainly on surface survey observations, not on assessments of site function.

Archaeological sites are sorted into one of the (13) categories defined by Murdy and the Kaminaljuyu project (surface area, ceramic sherd density, mound-non mound). The site hierarchy system and counts of site types within the hierarchy are presented in Table 6.

A simple count of different site types present (Table 6) reveals that the number of types did increase with time, though not uniformly. By these measures, the Late Classic was the most complex period with 10 of 13 (maximum) possible types represented, compared to 9 for the Terminal Classic and Early Postclassic, and 8 for the Middle Classic and Protoclassic. The least complex were the early phases from the Early Formative (2) to Late Formative (4), then the Early Classic (6) and Late Postclassic (6). In general, greater complexity (or number of different site types) was associated with greater population size (compare Table 4) and more total sites (Table 6).

Table 6. KAMINALJUYU SURVEY AREA. Site Classification: Number of Types by Phase.

	T 1	DH 2	H 3	SDV 4	SNV 5	LDV 6	LNV 7	ER 8	SEC 9	SCC 10	LCC 11	PC 12	RC 13	TYPES TOT	TYPES #
EF	11			1										12	2
MF	8	1	2		1	1								13	5
LF	20	4		3		1								28	4
TF	21		5		3	1	1		2				1	34	7
PC	29	2	10	1	2		1				1		1	47	8
EC	45	1	11	1	4								1	63	6
MC	44	3	21	2	5					2		1	1	79	8
LC	39	7	34	3	12		2	1	5			1	1	105	10
TC	41	7	31		11		5	5	5			1	1	107	9
EP	49	2	14	1	2	1	1	1	1					72	9
LP	43		16		2	1	1						1	63	6

KEY: Site classification names.
1(T)=Trace; 2(DH)=Dispersed Hamlet; 3(H)=Hamlet;
4(SDV)=Small Dispersed Village; 5(SNV)=Small Nucleated Village;
6(LDV)=Large Dispersed Village; 7(LNV)=Large Nucleated Village;
8(ER)=Elite Residence; 9(SEC)=Small Elite Center;
10(SCC)=Small Ceremonial Center; 11(LCC)=Large Ceremonial Center;
12(PC)=Provincial Center; 13(RC)=Regional Center.
TOT=Total number of sites recorded in the intensively surveyed zones within the study area.
TYPES=Total number of different types present (types 1 to 13).

While the preceding analysis indicates some associations and changes in complexity, it does not give a clear indication of the complexity structure within each phase (that is, of the variation in site-type distribution). Analysis of changes in this structure would facilitate examination of temporal change in the social/political organization. The following analysis examines the site type frequency by percentage composition in each period. Results are given in Table 7. Sites were then grouped into two categories, simple and complex. Simple sites include three types; trace (T), dispersed hamlet (DH) and hamlet (H) sites. Complex sites include all other types. A complexity ratio (C/S) was

calculated showing the relative proportion of simple to complex sites for each phase. The results are presented in Table 8.

These results show that the Late Classic (C/S=0.31) and Terminal Classic (0.35) periods were most complex, having lower proportions of simpler sites, combined with greater overall variability (Table 6). The Terminal Formative also had a low proportion of simpler sites, as its complexity rating (0.31) was comparable to that of the Late Classic. This is surprising, given its moderate site-type count (7 in Table 6). For its relatively small size (9,616 persons and 34 sites), the Terminal Formative had a very dispersed and diverse population. The next group had much lower C/S values. It includes the Middle Formative (0.18) and Late Formative (0.17), the Protoclassic (0.15) and Middle Classic (0.16) phases. The Early Classic (0.13) shows relatively weak complexity, and this is supported by evidence of a high percentage of trace sites (71.4% Table 7), comparable to that of the Late Formative (also 71.4%). This reinforces the parallel between these two periods, which was evident in the analysis of population distribution (concentrated at Kaminaljuyu, but with dispersed rural population). The Protoclassic was distinguished by the development of hamlet sites (21.3%), as the proportion of trace occupation remained constant from the Terminal Formative (62%). However, the Protoclassic lost overall complexity, relative to the Terminal Formative, and had a much lower proportion of complex sites (associated with rural population decrease).

Table 7. KAMINALJUYU SURVEY AREA. Percent Distribution of Site Types by Phase.

	SITE TYPE											
	T 1	DH 2	H 3	SDV 4	SNV 5	LDV 6	LNV 7	ER 8	SEC 9	SCC 10	LCC 11	PC 12	RC 13
EF	91.7			8.3									
MF	61.5	7.7	15.4		7.7	7.7							
LF	71.4		14.3		10.7		3.6						
TF	61.8		14.7		8.8	2.9	2.9			5.9			2.9
PC	61.7	4.3	21.3	2.1	4.2		2.1				2.1		1.0
EC	71.4	1.6	17.5	1.6	6.3								1.6
MC	55.7	3.8	26.6	2.5	6.3					2.5		1.2	1.3
LC	37.1	6.7	32.4	2.9	11.4		1.9	1.0	4.8			1.0	1.0
TC	38.3	6.5	29.0		10.3		4.7	4.7	4.7			1.0	1.0
EP	68.1	2.8	19.4	1.4	2.8	1.4	1.4	1.4	1.4				
LP	68.3		25.4		3.1	1.6	1.6						1.6

KEY: Site type names.
1(T)=Trace; 2(DH)=Dispersed Hamlet; 3(H)=Hamlet;
4(SDV)=Small Dispersed Village; 5(SNV)=Small Nucleated Village;
6(LDV)=Large Dispersed Village; 7(LNV)=Large Nucleated Village;
8(ER)=Elite Residence; 9(SEC)=Small Elite Center;
10(SCC)=Small Ceremonial Center; 11(LCC)=Large Ceremonial Center;
12(PC)=Provincial Center; 13(RC)=Regional Center.
Values refer to % by type (add horizontally for 100%). Sites sampled from intensively surveyed zones within the study area.

Table 8. KAMINALJUYU SURVEY AREA. Simple versus Complex Site Types by Phase.

PHASE	SIMPLE SITES	COMPLEX SITES	TOTAL SITES	C/S RATIO	RANK 1	RANK 2
EF	11	1	12	0.09	10	.
MF	11	2	13	0.18	4	.
LF	24	4	28	0.17	5	4
TF	26	8	34	0.31	3	3
PC	41	6	47	0.15	7	6
EC	56	7	63	0.13	8	7
MC	68	11	79	0.16	6	5
LC	80	25	105	0.31	3	3
TC	79	28	107	0.35	1	1
EP	65	7	72	0.11	9	.
LP	59	4	63	0.07	11	.

Simple sites include types T, DH, H; all others are complex.
Higher C/S ratios indicate greater social/political complexity.

The two Postclassic periods, though rated as relatively complex in Table 6, were nevertheless dominated by simple trace occupations (68% in Table 7), a sharp change from the Terminal Classic (38%). Due to the low site sample for the Early and Middle Formative (12 and 13 sites respectively), I consider the results for these periods to be unreliable.

These results again indicate that, although complexity tended to increase with time (Table 6), the progress was not uniform (Table 8). In general, a cyclical pattern is apparent. Complexity increased through the Terminal Formative, declined during the Protoclassic and Early Classic, increased again through the Middle Classic to a peak in the Late and Terminal Classic, then declined in the Postclassic. Though the complexity was associated with population size (Figure 8), it was also associated with the proportionate composition of site types (Table 8). The stongest relationship shows that, from the Late Formative to the Terminal Classic, the proportion of trace sites declined with time (except for the Early Classic). Peak complexity occurred in the Late and Terminal Classic phases, with maximum population size, and as population became concentrated around the core area. High complexity in the Terminal Formative is unexpected and unexplained. While interesting, these data need to be examined in the relation to other factors (mound sites and measures of centralization) as there is no clear resolution in terms of the model.

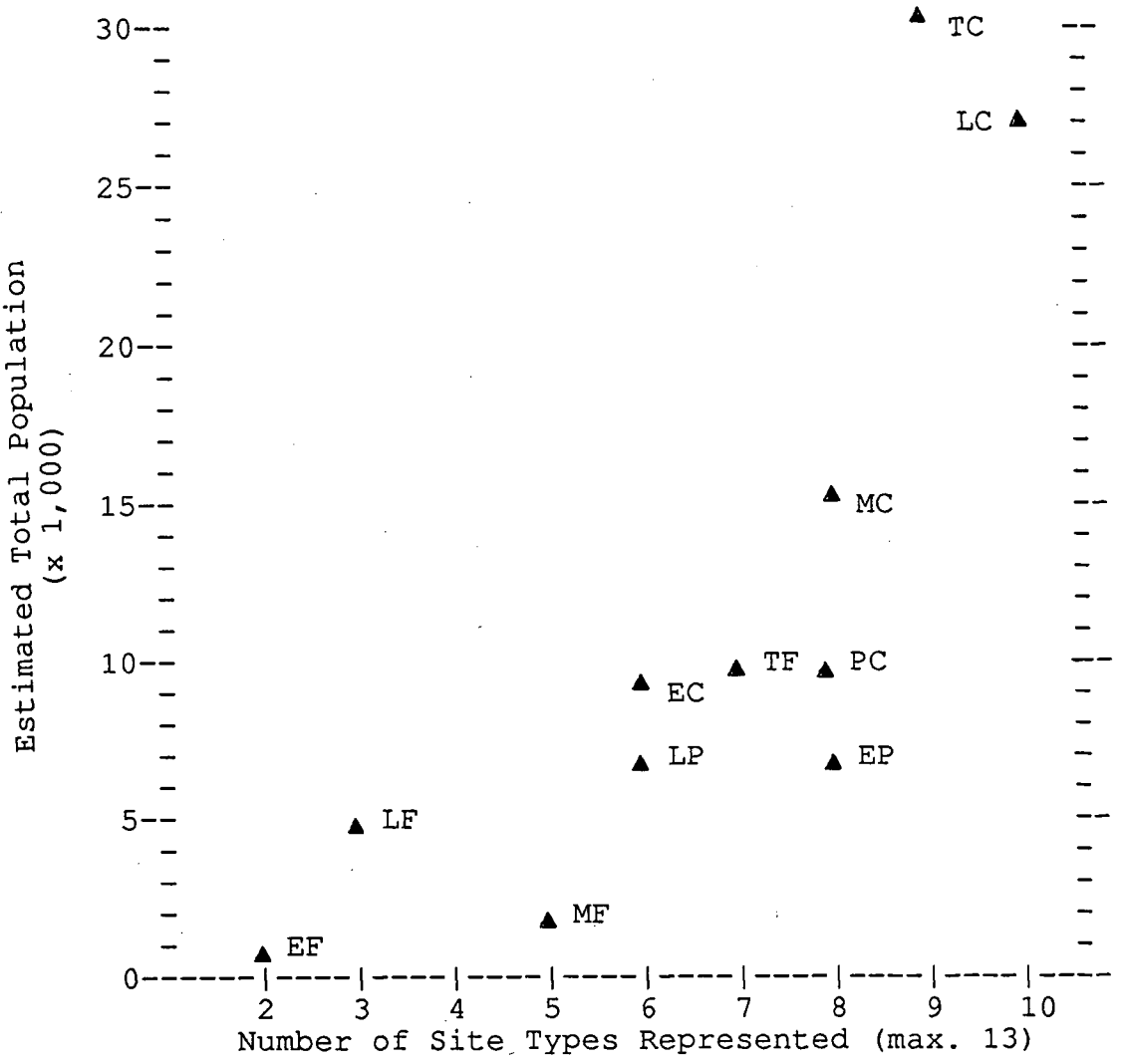


Figure 8. KAMINALJUYU SURVEY AREA. Complexity and Population.

RURAL KAMINALJUYU: MOUND SITE SETTLEMENTS

Rural sites containing earth mound architecture ("mound sites") represent the loci of (secondary) political, administrative and ceremonial activity. Thus, the number and spatial distribution of these sites is crucial for obtaining measures of change in political-administrative organization (such as centralization, complexity, scale). These data will be useful for comparison with similar data from central Kaminaljuyu.

The examination of mound sites is divided into three parts. The first part attempts to evaluate the reliability of the data base for mound sites found within the study area, specifically, whether we can be confident of the count of mound sites and of components within the mounds. Sufficiently reliability data would facilitate direct comparisons with estimated population and population distribution in the study area, and with construction activity (summit area and volume of mounds) at central Kaminaljuyu. This would also avoid the possibility of having to extrapolate data from the mound site sample of the intensively surveyed areas, which may not adequately represent the entire study area.

The second part addresses expectations in the model utilizing the data for the count and spatial distribution of secondary mound sites by phase. The examination provides a basis for comparison with population size and distribution. Measures of social complexity and hierarchy will be addressed as well.

The third part examines political-administrative centralization and change from the point of view of rural Kaminaljuyu. Rural administrative centralization is compared and contrasted with population size and mound site distribution and centralization. Comparison between central and rural Kaminaljuyu is carried out in a subsequent section.

Mound Site Data Base

Numerous mound sites are known throughout the Valley of Gautemala and nearby areas (Shook 1952). Table 9 (mound sites in the survey area) and Table 10 (mound sites in the study area) indicate the count of rural mound sites, ordered by distance for each phase. In preparing these tables, I relied on the site descriptions found in Murdy (1984:372-851, Appendix A). However, there are some problems with these data. For example, since few mounds have been excavated (and many are now destroyed), it is not known whether dated but unexcavated mounds contained earlier components. The only evidence of prior activity is indicated by the presence of earlier ceramics (or other artifacts, such as stone sculpture) on or near the mound, but we cannot be sure that this presence was associated with mound construction. Fortunately, there were only two cases where this occurred (Sanja and Cementerio - both large Late Classic centers), and the earlier components were excluded from the analysis. Only one site (Solano) has definite archaeological evidence of an earlier component (Brown 1977:211-246). It seems likely that most mounds

had only one period of construction, and do not contain earlier components. Periods of construction were assigned on the basis of style dates for construction, ceramics and associated artifacts, and by obsidian hydration measurements (Murdy 1984; Shook 1952). For post-construction periods, I have followed Murdy's site criteria and assumed that the presence of densely scattered, datable ceramics and other materials on or near the mound indicates that the mound was "in use" at that time.

Data for evaluating the reliability of mound site counts is provided in Table 11. Comparing expected and observed mound site counts (cols 4 and 5), it appears that a relatively larger proportion of sites were found within the intensively surveyed zones (most noticeable for the Classic periods). This discrepency is explained using three arguments.

1. There was better recovery of sites in the intensively surveyed areas. Some previously unknown mound sites were located in the Kaminaljuyu Project settlement survey, so it is possible that unknown mound sites are present outside the intensively surveyed areas.

2. Sites lying outside the surveyed areas were destroyed by modern urban development (especially at Guatemala City in zone 46, 47 and 60). Although sites were found in all parts of the study area, they were clearly absent in rings 3, 4 and 5 to the immediate east of Kaminaljuyu, even though mound sites were frequently found in these rings elsewhere. In fact, Shook's site survey (Shook 1952) and Kidder's site map (Kidder 1961:560)

Table 9. KAMINALJUYU SURVEY AREA. Rural Mound Sites Observed by Phase, Distance.

	CONCENTRIC RING NO.								
	2	3	4	5	6	7	8	9	TOTAL
EF									0
MF									0
LF		1						1	2
TF			1	1			1		3
PC	3		1			1			5
EC	2							1	3
MC	2			2		1		1	6
LC	1	4	4	1				3	13
TC	1	4	6	2				1	14
EP	1		1						2
LP				1				1	2
TOTAL	10	9	13	7	0	2	1	8	50

Table 10. KAMINALJUYU STUDY AREA. Rural Mound Sites Observed by Phase, Distance.

	CONCENTRIC RING NO.								
	2	3	4	5	6	7	8	9	TOTAL
EF									0
MF									0
LF		1		2		2		1	6
TF			1	1			1		3
PC	3	1	4		2	1		2	13
EC	2		1					1	4
MC	2		1	2		1		1	7
LC	2	6	4	1	3	1	2	5	24
TC	1	5	8	2	1	2	1	2	22
EP	1		2						3
LP				1			1	2	4
TOTAL	11	13	21	9	6	7	5	14	86

Table 11. RURAL KAMINALJUYU: CENTRALIZATION INDICES. Observed versus Expected Mound Sites.

	SURVEY AREA			STUDY AREA				
COL.	1	2	3	4	5	6	7	8
	NO. MOUND SITES	SURVEY AREA POP.	CENT. INDEX	NO. SITES EXP.	NO. SITES OBS.	STUDY AREA POP.	CENT. INDEX EXP.	CENT. INDEX OBS.
LF	2	1040	520	5.7	6	2834	472	472
TF	3	2572	827	8.6	3	7326	814	2442
PC	5	2517	503	14.3	13	6242	446	480
EC	3	1603	534	8.6	4	4621	513	1155
MC	6	3899	650	17.2	7	12249	712	1750
LC	13	8985	641	37.2	24	22295	602	929
TC	14	9633	688	40.0	22	26937	673	1224
EP	2	2168	1084	5.7	3	5711	952	1904
LP	2	1823	912	5.7	4	5993	999	1498

See Figure 11 for comparison of columns 3 and 8.

record no more than one or two sites here (within the contemporaneous city). Also, 8 to 10 additional sites were recorded on the immediate perimeter of the city, most of these now destroyed. I estimate that about 1/4 of the total area of rings 3, 4 and 5 (in the segment running to the east of central Kaminaljuyu) were covered by Guatemala City at the time of Shook's survey. However, even if mound sites occurred here at rates similar to those elsewhwere in rings 3, 4 and 5, the site count would still be lower than expected.

3. Spatially, mound sites were actually unevenly distributed in each period. The available information indicates that this was the case (Brown 1977:360-363; Murdy 1984: Maps 3-13; Shook 1952; see Figure 9 a-g). This suggests that sites located in the survey

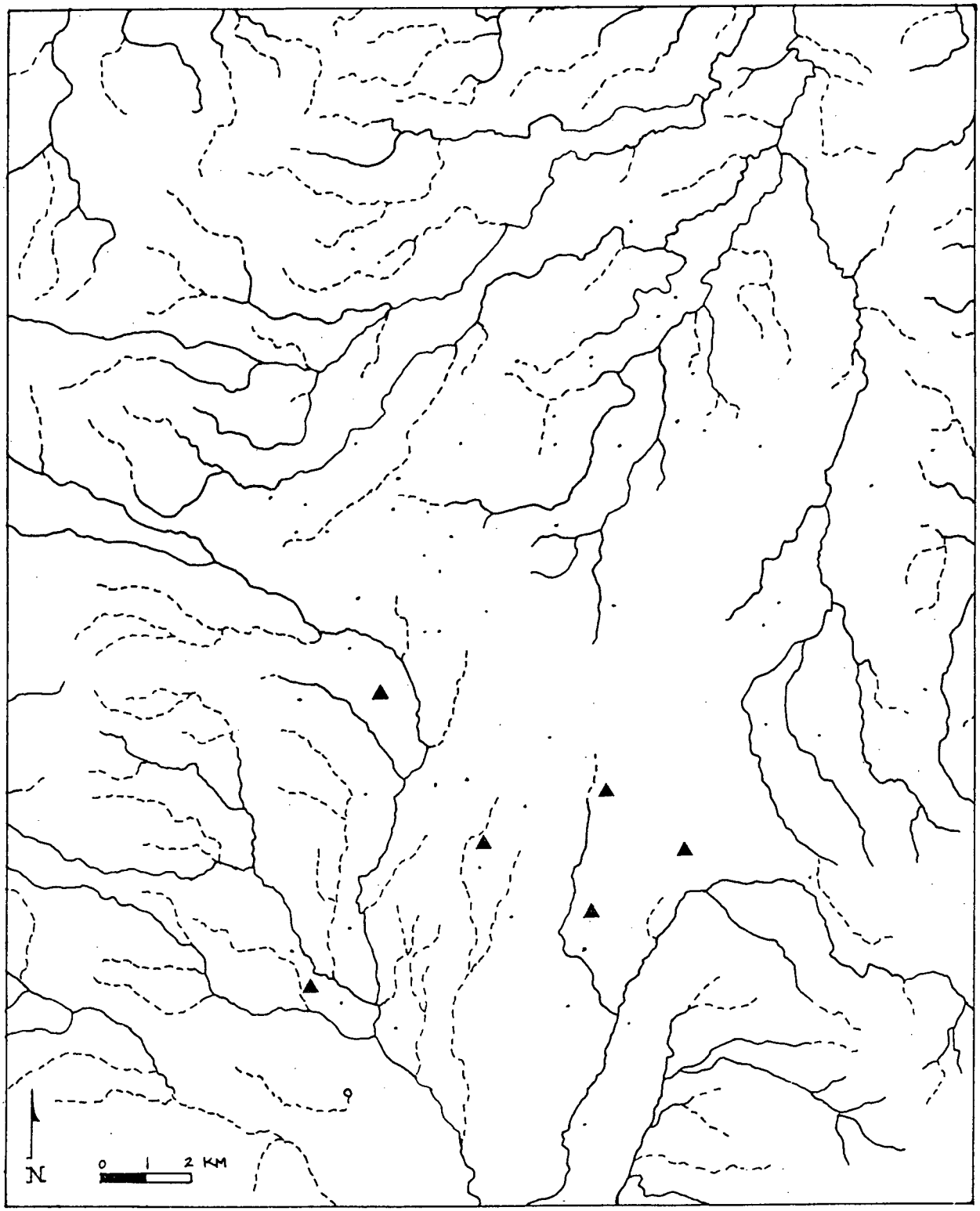


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

a) LATE FORMATIVE.
▲ = New Construction (6 Sites).

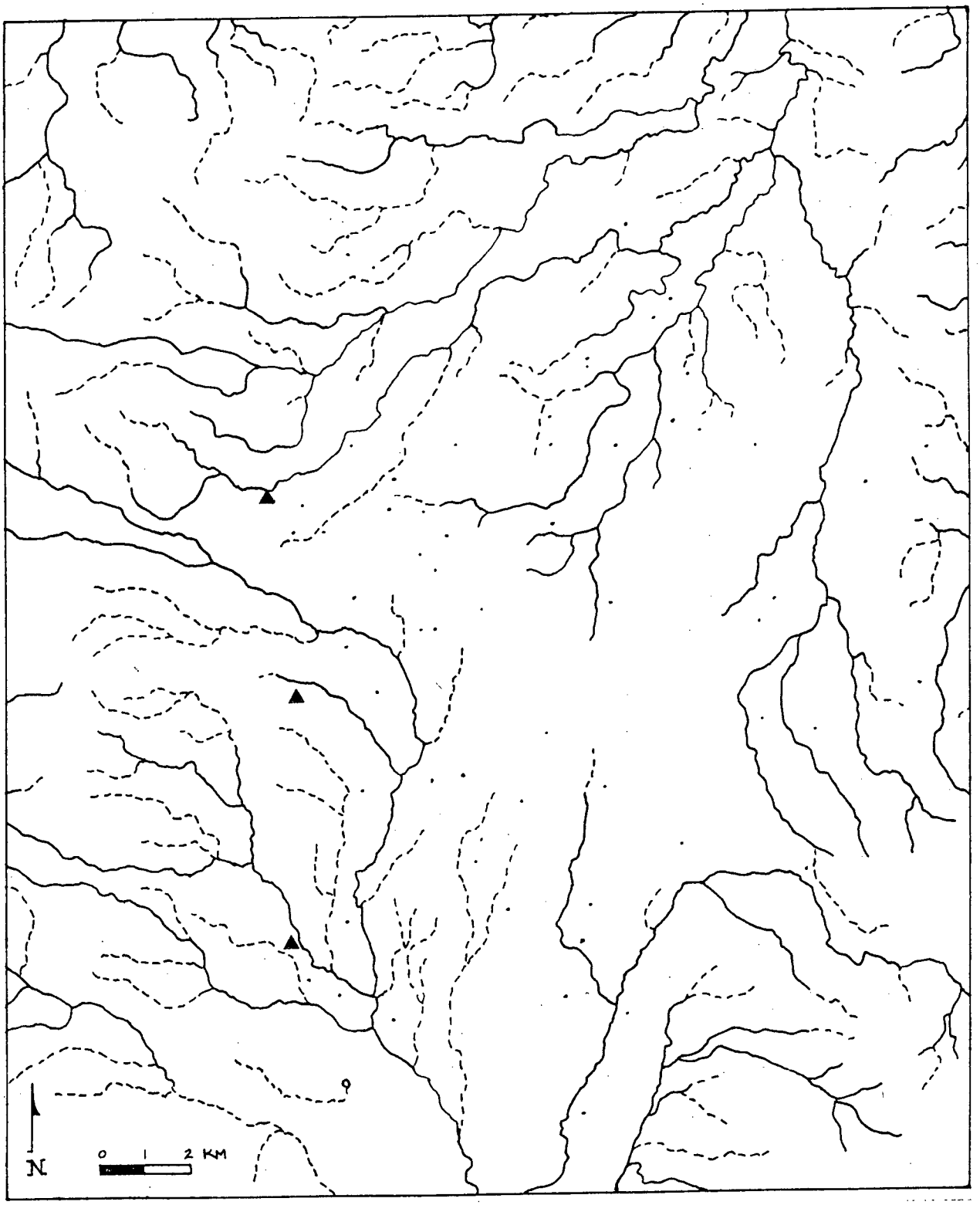


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

b) TERMINAL FORMATIVE.
▲ = New Construction (3 Sites).

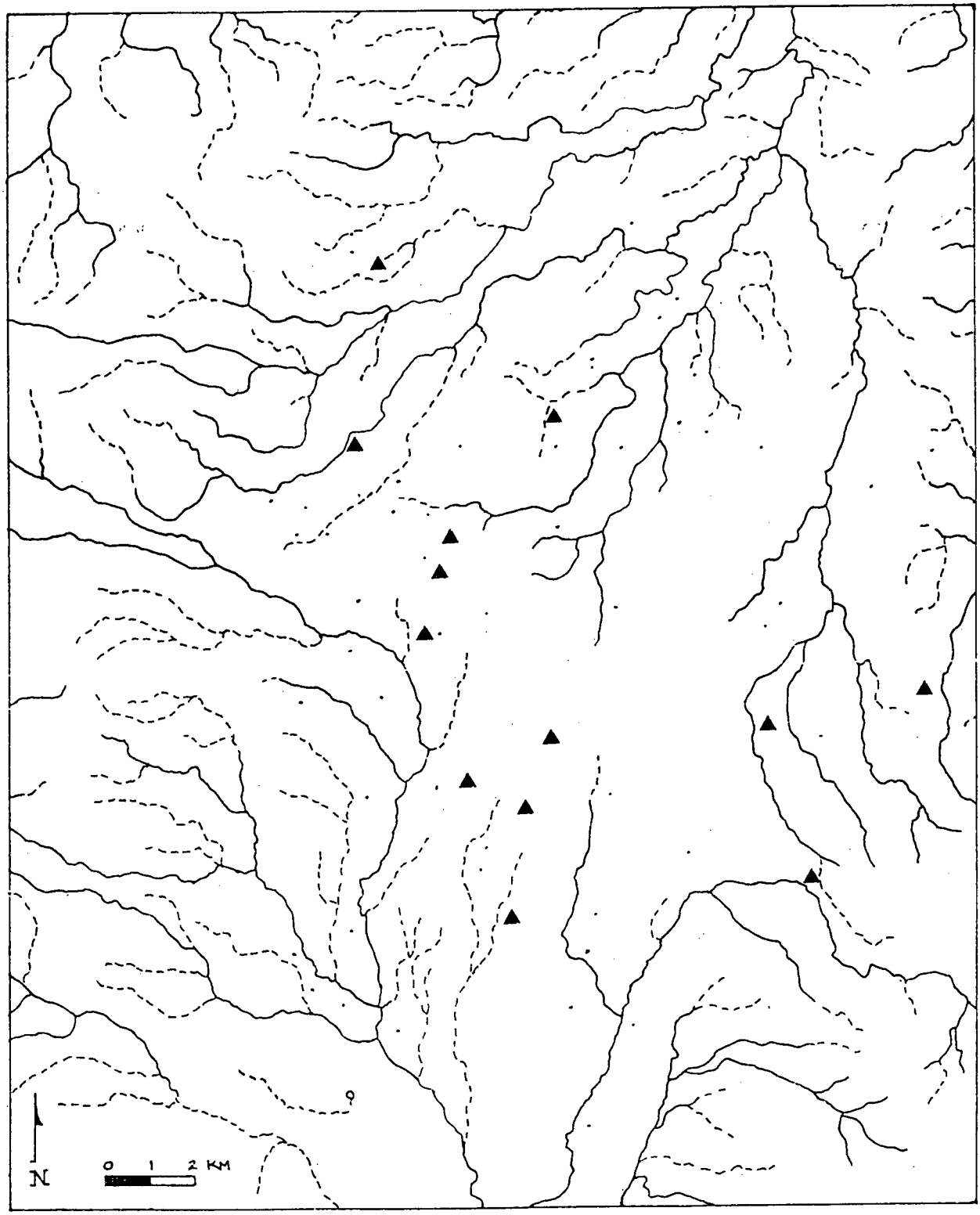


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

c) PROTOCLASSIC.
▲ = New Construction (13 Sites).

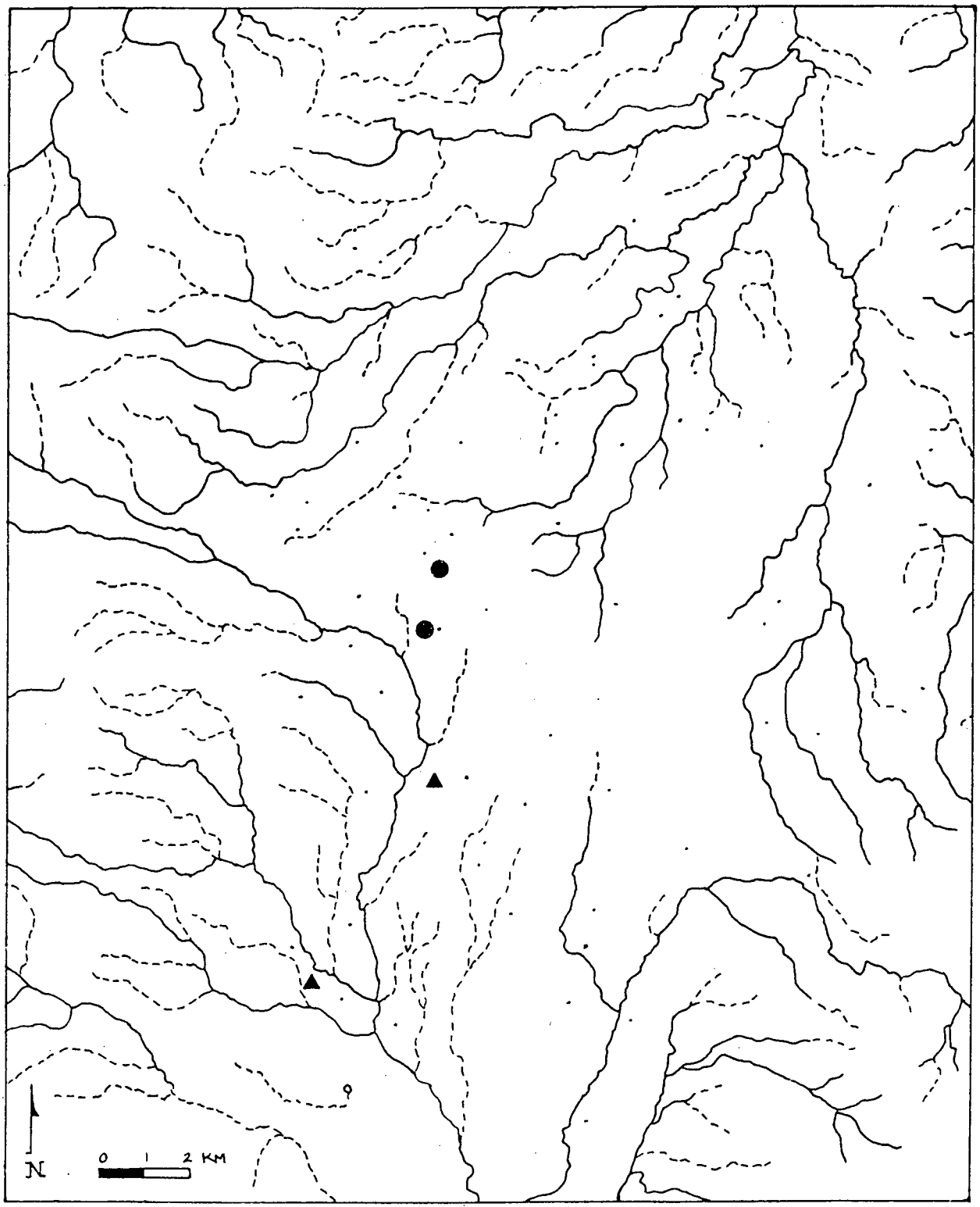


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

d) EARLY CLASSIC.
▲ = New Construction (2 Sites).
● = Old Construction (Reoccupied/Renovated) (2 Sites).

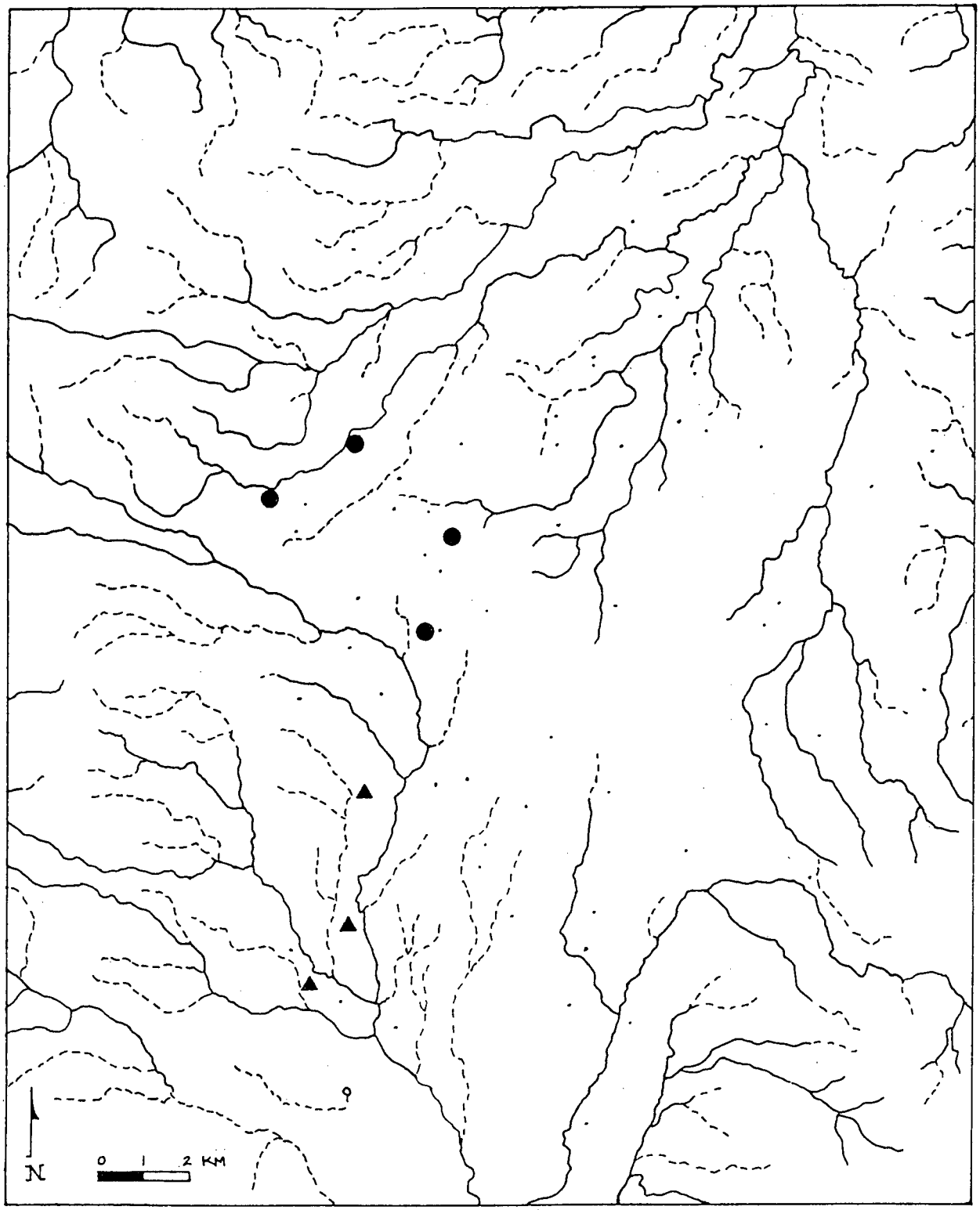


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

e) MIDDLE CLASSIC.
▲ = New Construction (3 Sites).
● = Old Construction (Reoccupied/Renovated) (4 Sites).

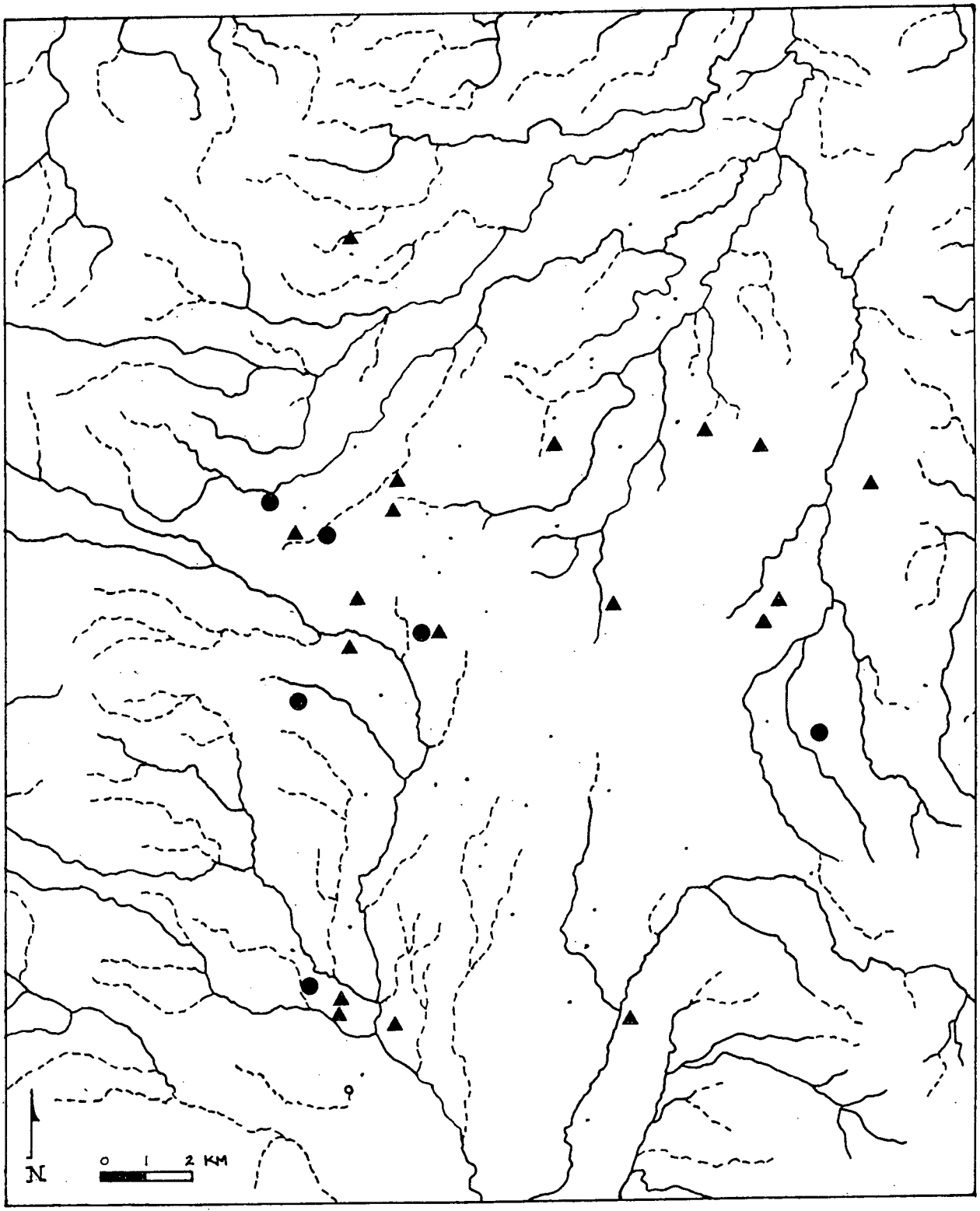


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

f) LATE CLASSIC.
▲ = New Construction (17 Sites).
● = Old Construction (Reoccupied/Renovated) (7 Sites).

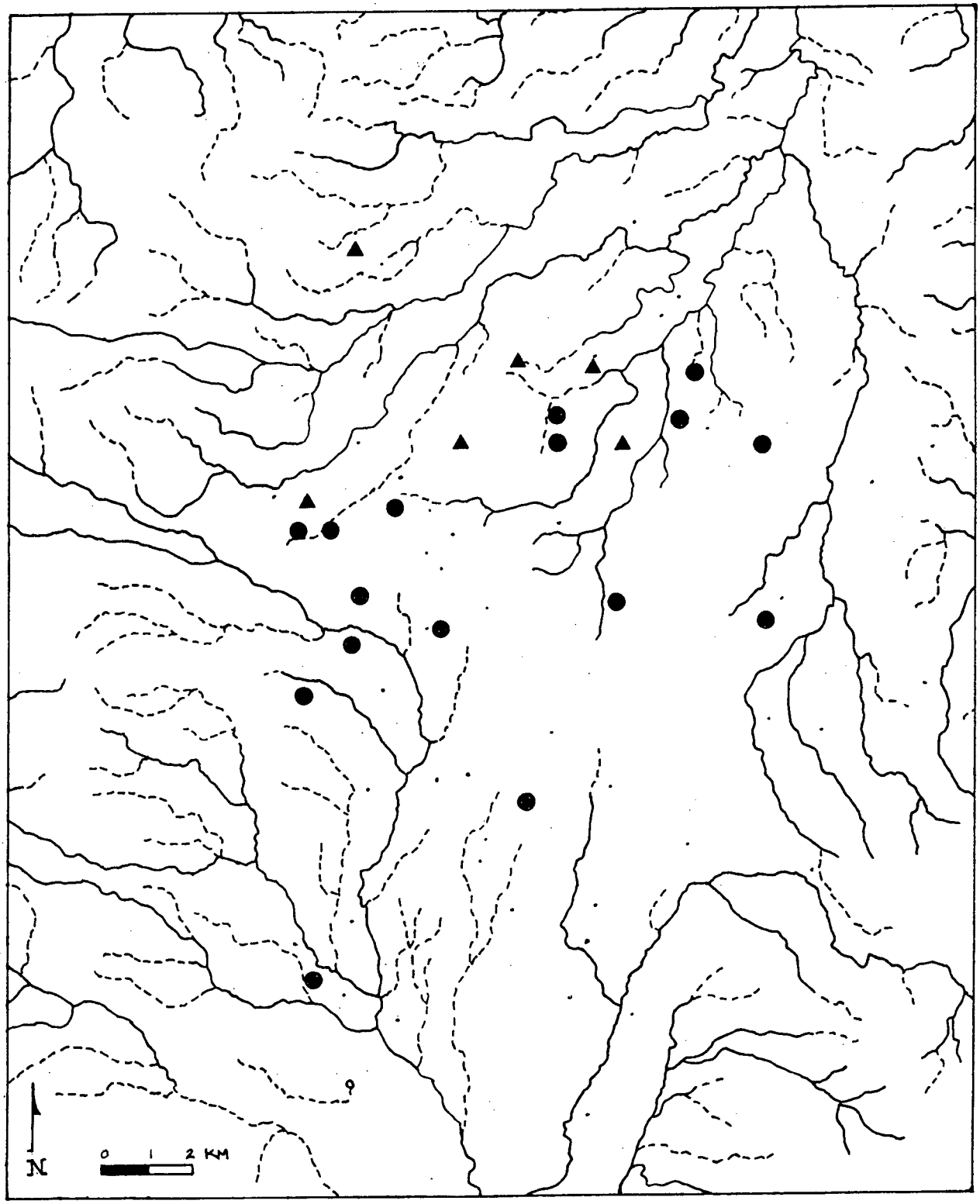


Figure 9. KAMINALJUYU STUDY AREA. Distribution of Mound Sites.

g) TERMINAL CLASSIC.
▲ = New Construction (6 Sites).
● = Old Construction (Reoccupied/Renovated) (16 Sites).

area were not representative of the true distribution of sites within the entire study area. For example, mound sites in the study area were apparently concentrated in the south during the Late Formative, in the center and north during the Late and Terminal Classic, and in the west during the Middle Classic, while the survey area sample was concentrated to the west and north of Kaminaljuyu, where most sites were likely to be found anyway. Was this uneven pattern "real" or was it created by factors described in points 1. and 2. above (mound destruction, missing data)? I think the pattern was real because mound sites (regardless of phase) were found in all parts of the study area, so there was no particular survey bias for any one area. Finally, similar "unbalanced" site distributions are known elsewhere in Mesoamerica, for example in the Valley of Oaxaca (Kowalewski et al. 1989: 270; 291-293, Figure 9.16; 199, ballcourt sites).

Thus, I would argue that the distribution of sites throughout the study area (as opposed to the survey area) are adequate indicators of the actual count and distribution of mound sites, even though (destroyed or unknown) sites (and their components) are certainly missing from the inventory. The alternative would be to rely on information from the surveyed areas, which would lead to inflated estimates. The study area data should be reliable enough to indicate the main features and establish a basis for relative changes in the count and spatial distribution of rural mound sites.

Mound Site Spatial Distribution

This analysis provides data with which to test the model for expected distribution of mound sites in rural Kaminaljuyu. Mound site locations are then compared with the distribution of population in order to test hypotheses about administrative-political centralization. According to the model, I expect to find: a) progressively more mound sites with time and, b) more different site types with time (delegation and segmentation processes). They will be more dispersed in space with time. Assuming mound site locations were linked to population distribution, I expect to find patterns of change in mound distribution that correspond to those for population distribution (ring density, Figure 6 c-i). Comparing results will provide a close view of relationships between population and mound site (administrative) locations and change.

The earliest dated mound centers (six) appeared in the Late Formative. Only two were found within the surveyed areas, one at Villalobos (zone 46), and the second, an early component at Solano. All mound sites were found in an area to the south of Kaminaljuyu. Only three mound sites are dated to the Terminal Formative. Two, classified as small ceremonial centers, appeared in zone 45 at distances between 3.5 km and 5.5 km west of central Kaminaljuyu (San Cristobal Mansilla and La Brigada). A third was located in zone 58 (Roldan II). Mound sites appeared in abundance during the Protoclassic. Thirteen sites were recorded, including the large ceremonial center at Naranjo (the only known

representative of this site type) at 3.5 km to 4.5 km north of Kaminaljuyu. For the first time, mound sites (three) appeared in the reserve area (ring 2), to the immediate west and northwest of central Kaminaljuyu (Rosario Naranjo, Garland and Cruz de Cotio). The remaining sites were dispersed throughout the study area (Figure 9 c). The Early Classic was represented by only three mound sites. One site (Solano), contained some new construction in the vicinity of the older Late Formative mounds. Two other sites were carried over from the Protoclassic (Garland and Cruz de Cotio). Although the Middle Classic experienced a substantial increase in rural population size (Table 4), it showed only limited development of secondary sites. Two new small ceremonial centers appeared in zone 58 to the south of Kaminaljuyu (Rancho Azul III and San Cristobal V). Ceramic and obsidian dating indicates that four older sites, all near Kaminaljuyu, were reoccupied. One of these (Rosario Naranjo), had new mounds constructed near older Protoclassic mounds. Solano, greatly enlarged with new construction covering the Late Formative mounds, became a provincial center. The Late Classic, as in the Protoclassic, experienced strong development of newly constructed mound sites. These were primarily small elite centers with ballcourts, and were located most often at 3.5 km to 4.5 km (rings 3 and 4) to the north of Kaminaljuyu. However, two large secondary centers (Sanja and Cementerio) appeared in rings 4 and 3 respectively. As in the Protoclassic, mound sites were scattered throughout the study area (compare Figure 9 c-g). This

was also a period of reduced construction activity at central Kaminaljuyu (see section on construction activity). During the Terminal Classic, 12 of 22 Terminal Classic mound sites were carried over from the Late Classic. Only 8 new mound sites were founded (all ballcourt sites). The sites were more closely grouped than in the Late Classic (compare Figures 9 f-g). The following Postclassic phases demonstrated a clear decline in construction activity and a regression of site organization. Although the area was occupied, spatial integration of the region had broken down (setting a limit on the methodology of using concentric rings to measure features of the political unit).

Figure 10 a-k shows the distribution of mound sites in relation to population estimates for each ring by phase. Visual inspection shows that the well-populated areas in rings 4 and 5 were also well-represented by mound sites. This was generally true for ring 9 as well. Following their initial appearance during the Protoclassic, the number of mound site decreased even though population in rings 2 and 3 increased with time. This was particularly evident in the Late Classic periods. Mound sites were only infrequently found in rings 6, 7 and 8 as population was generally low. During the Late and Terminal Classic, however, mound sites were more frequently found here, even though populations were building up near the core areas (rings 2 and 3).

Evaluating these data with respect to the model shows that the Early Formation (for which few secondary mounds sites were expected), might be represented by the Late Formative (the

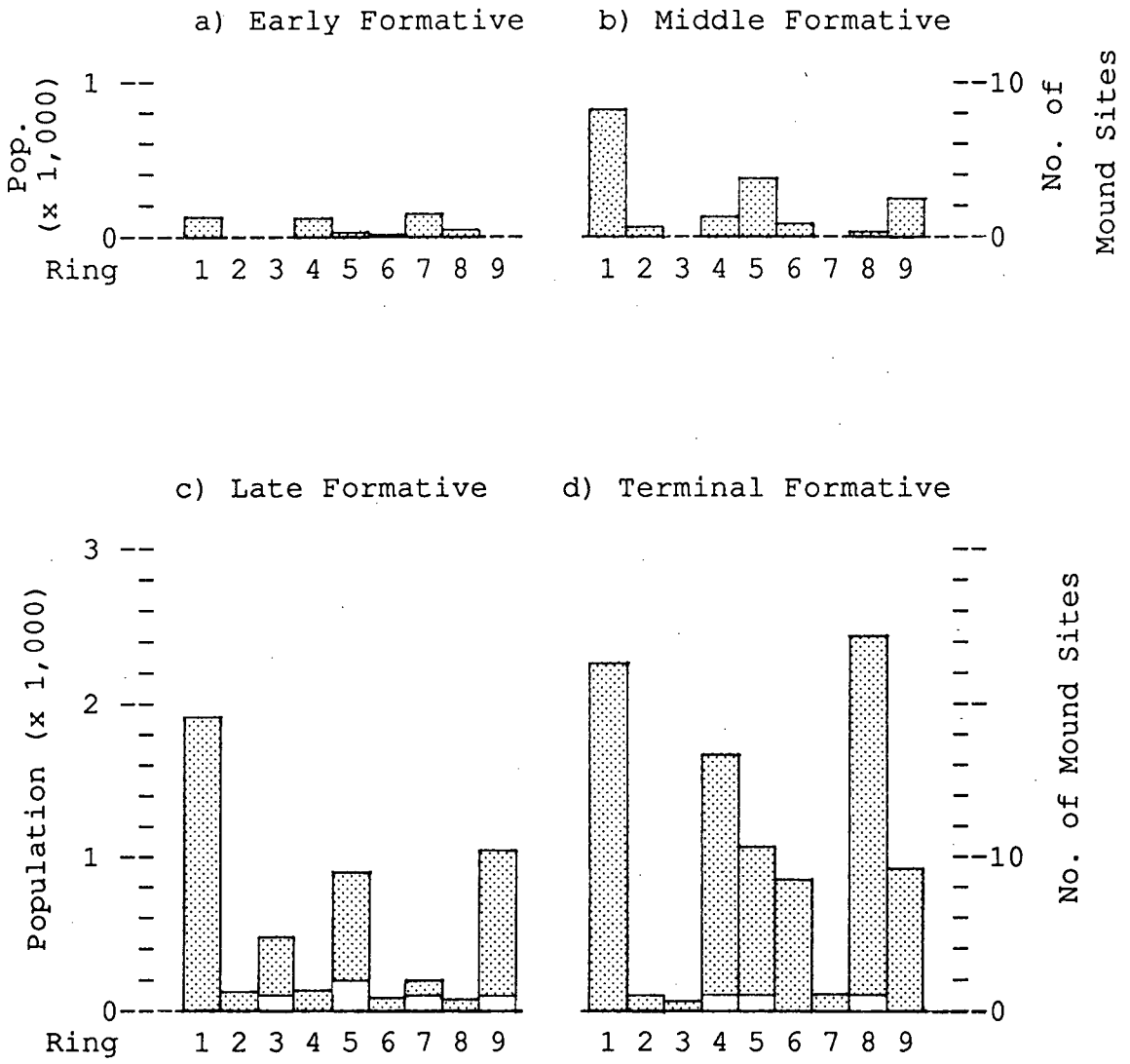


Figure 10. KAMINALJUYU STUDY AREA. Total Estimated Population (Table 3) and Number of Mound Sites by Ring, Phase.

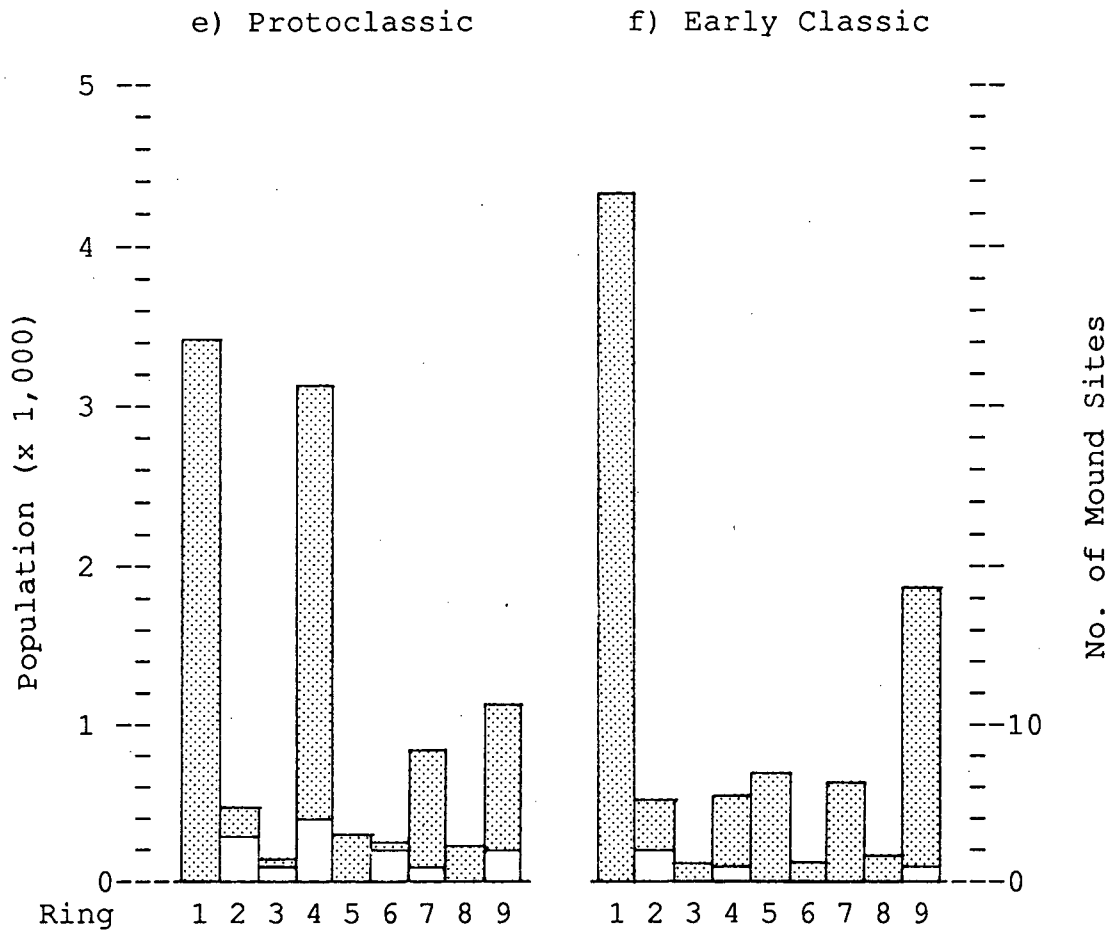


Figure 10. KAMINALJUYU STUDY AREA. Total Estimated Population (Table 3) and Number of Mound Sites by Ring, Phase.

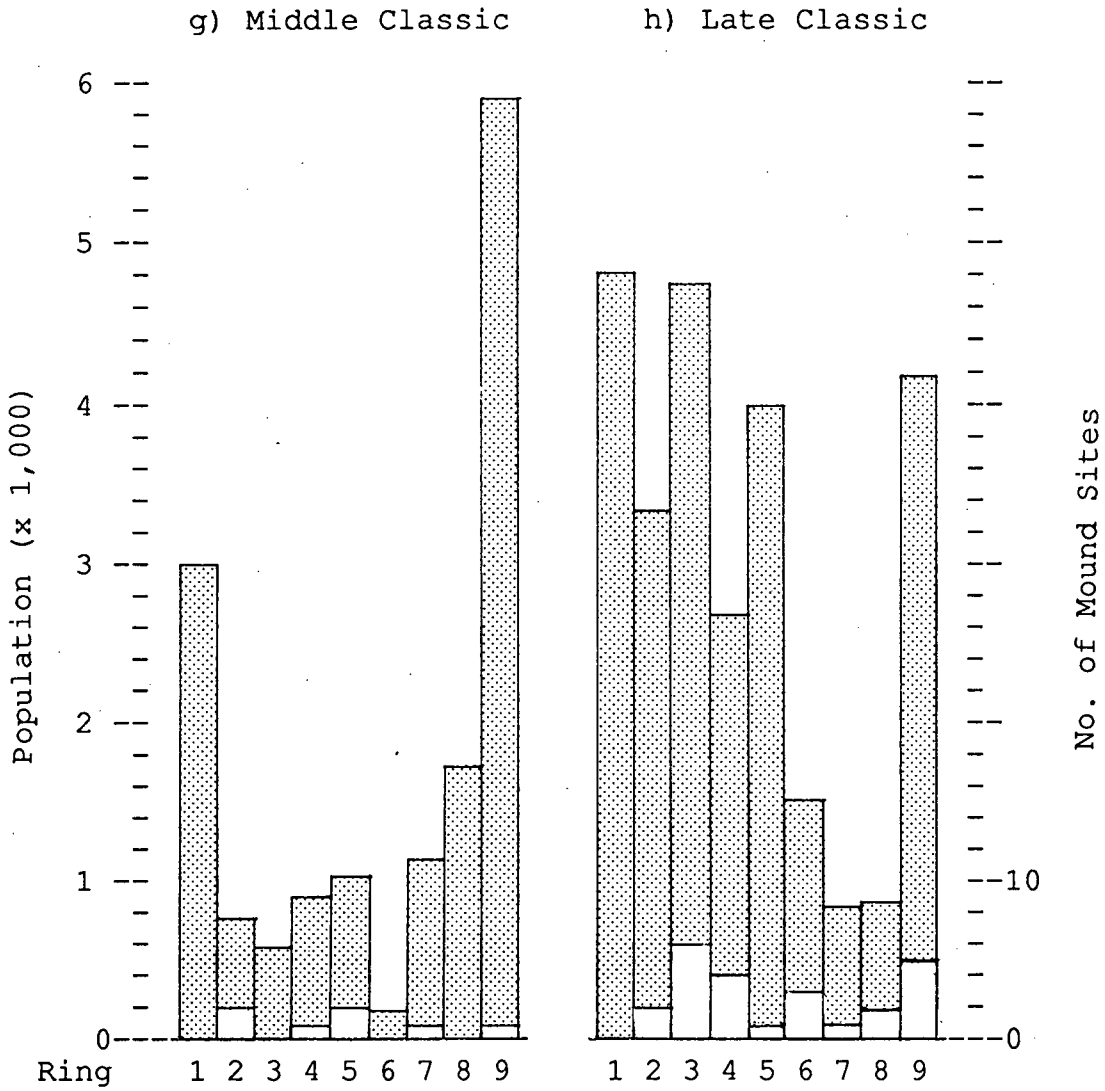


Figure 10. KAMINALJUYU STUDY AREA. Total Estimated Population (Table 3) and Number of Mound Sites by Ring, Phase.

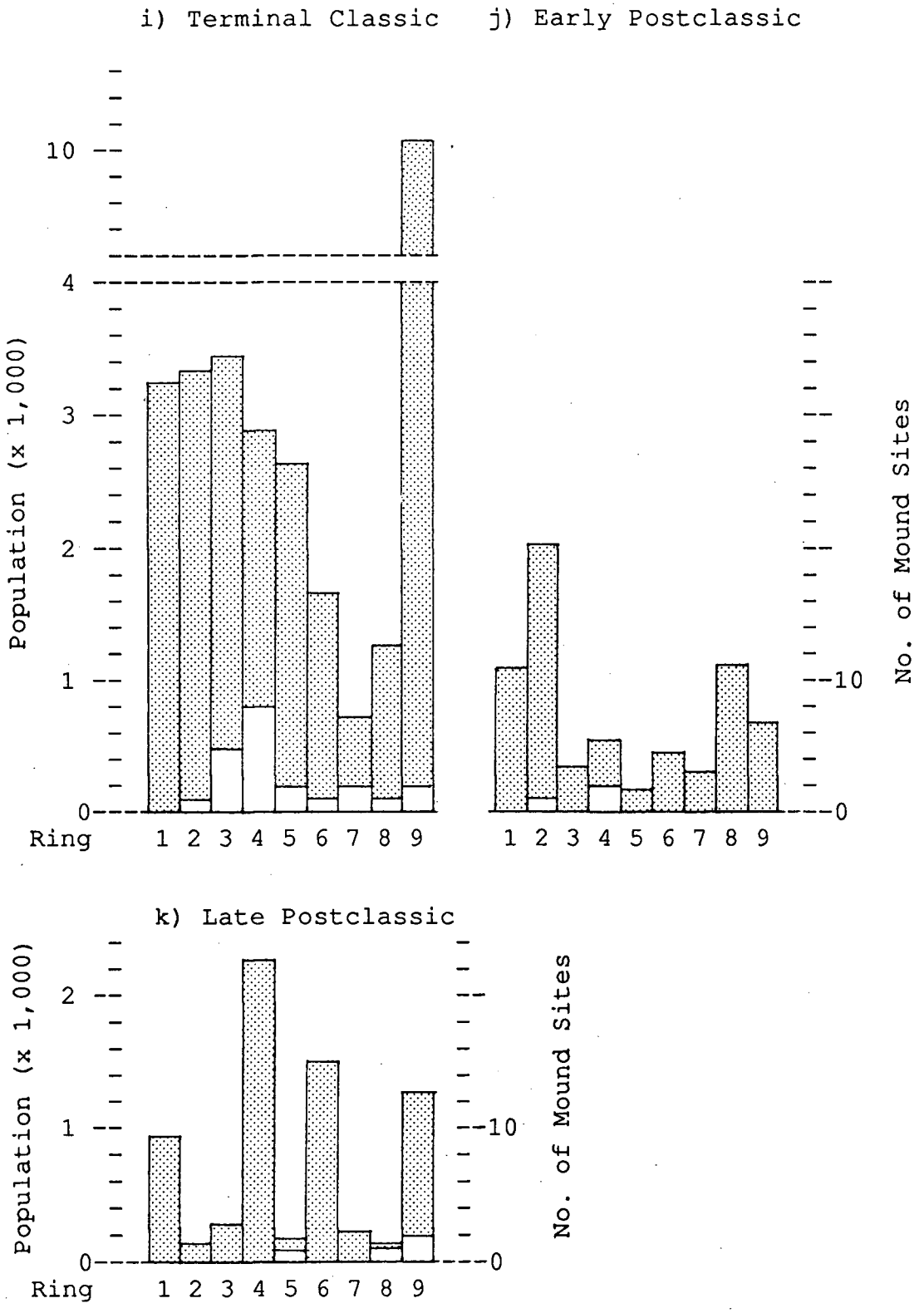


Figure 10. KAMINALJUYU STUDY AREA. Total Estimated Population (Table 3) and Number of Mound Sites by Ring, Phase.

earliest mound building phase), but this was not the case, as at least six mound sites were present. Instead, the Terminal Formative and Early Classic display the weakest development of rural mound sites, though both periods were dissimilar in other respects (e.g. population growth, population distribution and centralization, trade activity, core area construction activity). Thus, there is no reason to identify the Late Formative with the Early Formation. However, the Intermediate Formation is represented by conditions in the Protoclassic and Late Classic periods (proliferation of mound centers), though this was not accompanied by very rapid population growth, nor were sites necessarily located near the core site as expected in the model. Interestingly, both phases followed periods of rural population growth in dispersed settlements. This suggests that the source of these changes resided in preexisting conditions in the Terminal Formative and Middle Classic. The Late Formation is not clearly evident in the sequence of mound construction. However, the model anticipates that, as population approaches maximal size, territorial expansion would be restricted, and more sites would be carried over or reoccupied. This was the case in the Terminal Classic, but occurred on a lesser scale during the Early Classic and Middle Classic, when population size was much lower. With respect to the Alternative Formation, weakness in rural mound site development was expected in the Terminal Formative and Middle Classic, but not in a context of rural population growth. This further confirms that this part of the model must be

reevaluated.

This section shows that political change was not as gradual and uniform as expected in the model. For example, mound sites, though they were more numerous in the later periods, did not appear in steady increments with time. Nor were mound sites more evenly dispersed in space with time. In fact, the mound sites were distributed in various spatial patterns. For example, they appeared in sector (Late Formative), linear (Early Classic, Middle Classic), hemisphere patterns (Late and Terminal Classic). Finally, indices of site hierarchization changed from phase to phase. A two-part cyclical pattern is once again apparent, each cycle corresponding with the sequence in the model. For example, sharp increases in the number of mound sites occurred in two periods, the Protoclassic and Late Classic. The mound sites were dispersed more evenly throughout the study area than in other periods. Furthermore, both periods followed episodes of rapid rural population growth without corresponding development of rural mound sites (Terminal Formative and Middle Classic), and were followed by periods of relative developmental stagnation and decline (Early Classic and Terminal Classic). If the Kaminaljuyu cultural sequence is broken down in this way, the model does have some validity.

Mound Sites: Administration and Centralization

This analysis examines mound sites in the study area. The count of mound sites in this area is compared with those in the

intensively surveyed area in order to evaluate the representativeness of counts of mound sites in the study area. Having made an evaluation, the relative degree of rural administrative-political centralization is examined using an index of centralization ("I"= population "served" per mound site) for each period.

The centralization index is introduced to measure the degree of local political-administrative control in rural Kaminaljuyu. This is compared with measures of population centralization (usually associated with political "forced" settlement, de Montmollin 1989), to test whether there is an association between centralization of political administrative activity and population centralization. The centralization index is calculated by dividing rural population by the total number of rural mound sites. Since mound sites are defined as loci of administrative activity, with greater centralization of administrative-political activity at central Kaminaljuyu, there will be correspondingly less rural activity - thus relatively fewer active (secondary) mound sites and relatively more persons served per rural site. Conversely, with less centralized control at Kaminaljuyu, there will be relatively greater local control, and fewer persons served per rural site. Due to the effects of population growth explained above, I would expect segmentation of administrative control with population growth. This would mean, for example; a declining centralization index as the polity became decentralized and services were delegated or duplicated. There should be a

differential between periods that indicates a characteristic distribution of administrative centralization. For example, in the Early Formation, I expect high centralization indices as administrative functions are located at Kaminaljuyu and there is little delegation/duplication. Since administrative decentralization is expected for the Late Formation, mound sites for the later periods will appear to serve fewer people as more administrative services are located in the rural areas (lower centralization index). The indices for the Intermediate Formation should be similar to but higher than those for the Late Formation (indicating fewer persons served per site). For the Alternative Formation, I expect simplification of rural administration (or a higher centralization index) as population moves toward the core area and is serviced there.

In this analysis, I rely primarily on the survey area data for measures of centralization because there are consistent controls (i.e. the survey area) for the relationship between mound sites and population. Also, I cannot be certain that the mound site counts for the study area (outside the survey area) are reliable. On the other hand, data from the survey area may be unreliable because mound sites were probably unevenly distributed in the study area, and this may not be reflected sampled with survey coverage of only about 35 percent of the study area. Therefore, I will rely to some extent on centralization indices as calculated using mound sites within the entire study area.

Table 11 presents calculations of rural population to mound

site ratios (centralization index) for the surveyed areas and for the entire study area. In the following discussion, indices given in brackets quote the survey index first (Table 11 col.3), then the study area index (Table 11 col.8).

Examination of Tables 9, 10 and 11 (and Figure 11) reveals the following. If one argues that population centralization signified political centralization, then Kaminaljuyu maintained centralized political-administrative control during the Late Formative, as 40% of the population (see Table 4) was located at Kaminaljuyu. However, the centralization index (520-472) shows that population was relatively well-represented by rural sites. Also, mound sites were scattered at various distances from Kaminaljuyu in direct relation to population distribution (Figures 9 a and 10 c). Only three mound centers appeared during the Terminal Formative as rural population increased by a about 250% (from 2,834 to 7,326), giving a survey area index of approximately one mound site for every 827 persons. This is a very moderate index when compared to that for the entire study area (2,400), as no additional mound sites were recorded outside the survey area. Five elite centers were present within the survey area for the Protoclassic, and an additional 8 were found in the study area. This gives a low centralization index (503-480), and shows that administrative-political decentralization occurred with population centralization at Kaminaljuyu (Table 4). This index is comparable to that for the Late Formative, though the site distribution pattern was quite different (compare

Figures 9 a and 9 c). This development in the Protoclassic is interesting as it followed a period (the Terminal Formative) with a very high centralization index (827-2,442). The Early Classic also indicates a sharp contrast with the Protoclassic, as only four mound sites occurred in the study area, and three of these were in the survey area. Though rural population size had

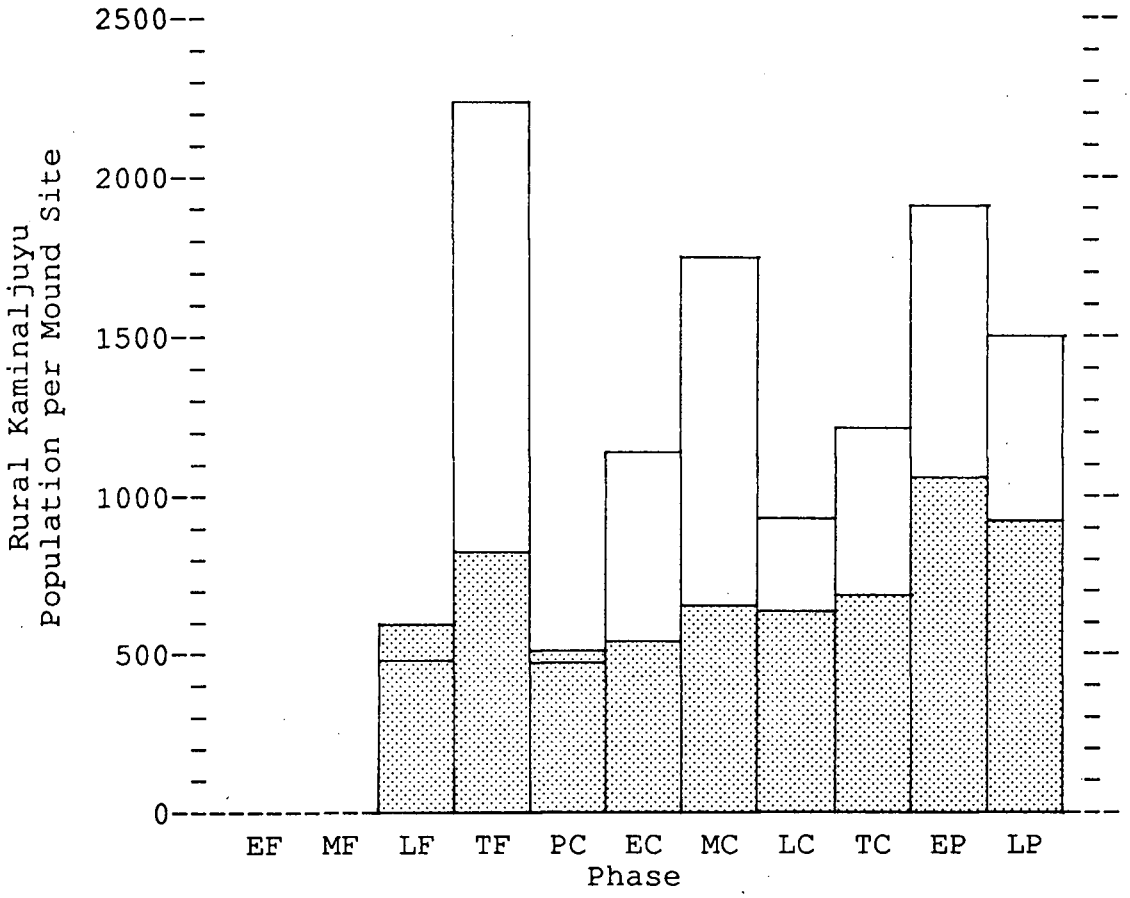


Figure 11. KAMINALJUYU: Centralization Indices. (See Table 11).

Key:

Observed Centralization Index, Study Area. (Table 11 col.8).

Observed Centralization Index, Survey Area. (Table 11 col.3).

declined from 6,242 to 4,621 in the study area, mound sites showed an even greater decline (from 13 to 4 sites). Consequently, the centralization index rose relative to the Protoclassic. However, this does not mean that Kaminaljuyu exerted centralized political control over the rural population, forcing people to settle nearer the site (see analysis of summit areas below). The final comparison between the Early Classic and the Terminal Formative (which had only 3 rural mound sites), will have to be made on the basis of conditions at Kaminaljuyu istelf. The Middle Classic experienced rural population growth, but, as in the Terminal Formative, relatively limited development of mound sites. A total of six sites were found in the survey area, including the large provincial center at Solano. Only one additional mound site was found outside the survey area; a reoccupied Protoclassic mound site in zone 32 (Bran). While rural population size increased greatly in the Middle Classic, settlement complexity increased only marginally (Tables 6, 7 and 8), and the mound site system showed weak development. The value for the centralization indices (650-1,750) again raises questions similar to those discussed for the Terminal Formative (what do higher indices mean?; greater or lesser administrative controls?). In the Late Classic, 24 mound sites appeared in the survey area, most of them new sites in rings 3 and 4, as rural population size continued to grow. While there were many mound sites present in the study area, expected totals are higher still. Thus, large differences between observed and expected

numbers of sites create uncertainties in this analysis. In any case, the centralization index for the survey area (641) indicates that larger populations were associated with new mound sites after the Early Classic (except for the Terminal Formative). Population growth in rural Kaminaljuyu continued at a slower pace in the Terminal Classic, and fewer new rural mound sites were founded. Most mound sites at this time were (as in the Late Classic) residential, ballcourt sites. They were small, compact units with population estimates of 10 to 100 persons. More sites were carried over from the Late Classic (see analysis of construction activity), indicating socio-political continuity in association with processes of administrative-political decentralization. However, even these local mound centers experienced greater administrative workloads (688-1,224) than before. Since central Kaminaljuyu was virtually politically dormant at this time, and there was strong rural continuity from the Late Classic, administrative functions were clearly shifting to rural areas. Finally, there was an almost complete collapse of mound centers in the Early Postclassic. Only one new center appeared (Betania), while two older sites had some evidence of continued occupation. The high indices at this time (1,084-1,904) show that there was relatively weak administrative control, a trend that is evident in the survey area since the Protoclassic (Table 11 col.3).

On the basis of this analysis, I conclude that there were two periods of strong administrative centralization at central

Kaminaljuyu (the Terminal Formative and Middle Classic). The other periods represented varying degrees of political-administrative decentralization. The centralization index tended to increase with time, even when more mound centers were present. This contradicts expectations (hypothesis 3) and indicates that populations were not better served by administration with time (or by delegation and duplication of service). It seems that, with the evidence of large Classic-period population size (over 30,000 for the study area alone during the Terminal Classic), centralized administrative mechanisms were experiencing scalar stress. I would argue that this stress on centralized administration in the Terminal Classic and Middle Classic led to political decentralization and the appearance of administrative mound site in local areas. Examination of central Kaminaljuyu and construction activity at rural and central Kaminaljuyu will provide a further perspective on this problem.

It is interesting to note that, from the Late Formative to the Terminal Classic periods, though the centralization index for the survey area tended to increase with time (Table 11 col.3), it falls within a relatively narrow range (827 to 503 persons per mound group, average=623). I believe this indicates an operational balance between population size and administration, or at least defines the size of a local "administrative" group represented by a mound site. Additional evidence from analysis of local settlement change in rural areas (not presented in this study), indicates that such local groups existed in rural

Kaminaljuyu. This is evident from coherent patterns in the location and occupation of sites in local areas. The size of the groups in centralization indices is coincident with Kosse's analysis of social group size and complexity (1990), in which evidence is presented that social groups between 400 to 600 individuals are the largest units for which effective social interaction is possible. All members know each other on a face-to-face basis, and information exchange and processing, and decision-making are facilitated. In larger groups, communication begins to fail, and the group will sub-divide and/or develop a hierarchical arrangement to govern itself (Kosse 1990:291-294). For the survey area at Kaminaljuyu, there were 5 groups of about 500 persons each in the Protoclassic, but 13 groups of about 650 persons each in the Middle and Late Classic. Thus, there is evidence of administrative (scalar) stress in a context of rapid population increase and physical crowding in the later periods.

For studying the distribution of administrative political activity, this examination of rural mound sites is contrasted with measures of population centralization. de Montmollin argues that population centralization reflects the ability of elites to enforce direct supervision of the subject population (1989:87-96). Thus, greater population centralization is a measure of greater administrative-political power. This analysis indicates that there are additional active variables, and that the situation is quite complex. For example, population *decentralization* in the Terminal Formative and Middle Classic

probably occurred in a context of administrative and political centralization of power. This occurred at the expense of local development and likely represents hierarchization of administration (Kosse 1990:284-288). In contrast, population *centralization*, as in the Late Formative and Protoclassic (and Late and Terminal Classic) occurred in a context of administrative-political delegation and/or segmentation, and relative rural autonomy. This is indicated by the proliferation of rural (secondary) mound sites. How would one interpret the Early Classic?, with its pattern of extreme population centralization and weak rural mound site development. Does this indicate the exercize of excessive political power to force people to locate near the core site?. To confound the issue further, the Late Classic also experienced population decentralization (relative to the core) amid rural population centralization, but in a context of dispersed rural mound site development and weakened core activity. In conclusion, these analyses indicate that it is not valid to argue, on the basis of similar values for single measures, such as (population) centralization, similar cultural processes were in operation. Various measures must be considered in relation to one another.

Evaluating this analysis of administration and centralization in terms of the model shows the following. Population centralization in the Early Formative (as well as low complexity) represents conditions expected for the Early Formation. Yet, an unexpectedly high mound site count (6)

indicates considerable rural development. Although population decentralization and rural population growth occurred in the Terminal Formative, mound site development did not. This pattern is not explained by the model because (rural) population increase always implies mound site development (as in the Intermediate and Late Formation), as well as political delegation and/or segmentation. The subsequent Protoclassic displayed a proliferation of mound centers, four sites were located near the paramount center in rings 2 and 3 (Table 10; Figure 9 c), which indicates expectations for the Intermediate Formation (development of mound sites near the core area). These conditions appeared in the Late Classic as well, though mound sites were generally located at greater distances from Kaminaljuyu (rings 3 and 4). Significantly however, both phases succeeded periods (Terminal Formative and Middle Classic) which experienced population decentralization associated with strong rural population growth. The Early Classic again indicates expectations for the Alternative Formation (rural population decline, decreased complexity, few mound sites), but this identification is probably due to shortcomings in the model.

The presence of mound sites in rings 3 and 4 in the Late and Terminal Classic is interpreted as an indication of political and administrative decentralization. This was associated with population increase in all ring areas. This agrees with expectations for the Late Formation. Comparison of Tables 9 and 10 with Figure 6 h-i reveals an interesting relationship. Though

population density increased to a peak in ring 2 in the Late and Terminal Classic, the number of secondary mound sites remained constant at one. In fact, there were fewer mound sites than for earlier phases. Presumably, this relates to the continued use of the proposed reserve areas near central Kaminaljuyu. The model argues that (forced) population growth (for example, in the Terminal Formative and Middle Classic periods) will lead to scalar stress and delegation or segmentation of political-administrative functions. Apparently, observing the increase in the number of rural mound sites, this was just what occurred in the Protoclassic and the Late Classic. However,the Late Classic is a better candidate for the Intermediate Formation because the sudden appearance of secondary centers occurred within a context of steady population increase (while Protoclassic population size remained stable). Trends evident in the Late Classic continued in the Terminal Classic, though the pace of development had slowed considerably (little increase in population size, number of secondary centers or amount of construction).

LAND USE

In this section, I will examine settlement patterns in relation to land use potential as part of the analysis of the support-subsistence system. To review the model, there are two hypotheses regarding changes in land use and economic productivity.

1. For the local economy (and status) based primarily on subsistence goods production, political competition will create pressure to increase production and tribute, and consequent pressure to increase the size of the (laboring) population. As available optimal land becomes fully utilized for settlement and production, more marginal land will be brought into use. Thus, settlement on marginal land will increase as population increases (or decline as population declines).

2. For an economy (and status) based primarily on trade-based wealth, political leaders will reduce demands for increased agricultural-subsistence production. Thus, settlement on marginal land and population size will decline as status depends less on subsistence production.

However, based on preceding analyses of population and settlement (change and distribution), a third hypothesis is indicated. Access to trade wealth may be used to enhance status and contribute to the political leader's ability to promote local production, possibly through a combined wealth-subsistence finance system. Alternatively, the two systems may operate independently, each managed by separate political organizations.

This analysis will address these hypotheses using the settlement and land use data prepared by Murdy (1984), who applied a soil classification system developed for the Valley of Guatemala (Simmons 1959) to derive a classification system for "agricultural use capability" (Murdy 1984:68). There are eight land use categories (or classes) in this system, ranging from most desireable (class 1) to least desireable (class 8) land (Murdy 1984:67-70). Reports on each intensively surveyed zone (Murdy 1984, Appendix A:266-371) are accompanied by a figure/map illustrating the "Land Use Capability" and areal extent of each land use class. Using these figures, I assigned each site in the survey area to a land use class according to my best evaluation of the class on which it was physically located. If there was any doubt, I chose the lower (or best) class. In the following analysis, the eight classes were divided into two groups. One group consists of land use classes 1 to 3, representing land with "optimal" agricultural potential, while the other group consists of classes 4 to 8 representing "marginal" potential. Class 1 does not occur within the survey area, while class 2 is present but has limited distribution. Class 3 is predominant and was the preferred land class for settlement. For example, an examination of zone 58 shows that, although only 33% of the total land area is class 3 land, about 75% of all site components (totaled for all phases) were located on this land.

The number of sites located on optimal land were totaled for each phase, then sites on marginal land. The ratio M÷0 (or M/O)

of sites located on marginal versus optimal land was calculated for each period, where higher M/O values indicate greater settlement on marginal land. The results are presented in Table 12 and Figure 12.

Table 12. KAMINALJUYU SURVEY AREA. Settlement Location: Optimal versus Marginal Land Use.

	NO. SITES Marginal Land Use Class 1-3	NO. SITES Optimal Land Use Class 4-8	TOTAL SITES	RATIO M/O
EF	4	8	12	.50
MF	3	10	13	.30
LF	6	22	28	.27
TF	6	28	34	.21
PC	10	37	47	.27
EC	15	48	63	.31
MC	17	62	79	.27
LC	25	79	104	.32
TC	25	82	107	.30
EP	19	53	72	.36
LP	18	45	63	.40

Higher M/O values indicate greater settlement on (use of) marginal agricultural land classes.

In the Early Formative, the sites were generally trace occupations (with population less than 10 persons per site) or hamlets located on agriculturally marginal land. Sites were often located at higher elevations in piedmont areas rather than on the valley floor. This evidence indicates that there was a greater emphasis on hunting and gathering than on agriculture at this time. In the Middle Formative site location shifted to more optimal agricultural land on the valley floor. During the Late

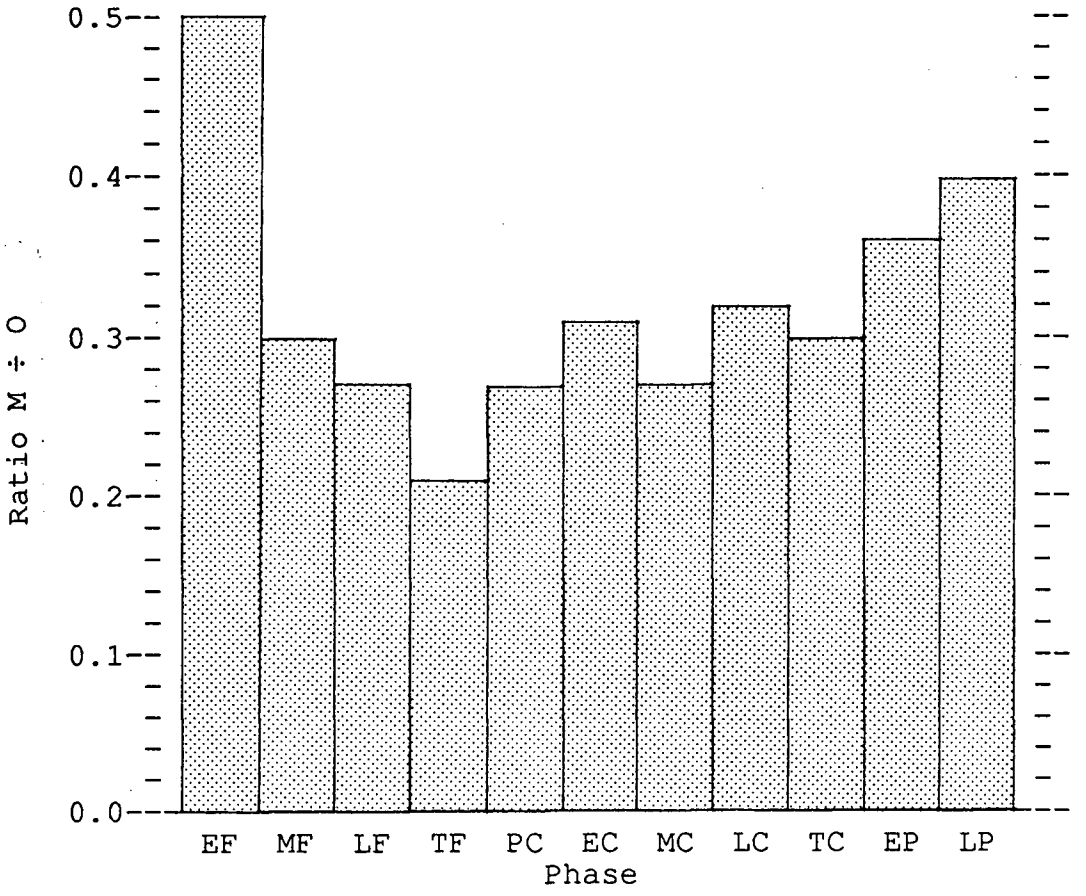


Figure 12. KAMINALJUYU SETTLEMENT: SURVEY AREA. Marginal ("M") versus Optimal ("O") Land Use. (See Table 12).

Formative, when massive mound construction began at Kaminaljuyu (though Middle Formative mound construction cannot be dismissed), the shift to optimal land persisted.

During the Terminal Formative, settlement was clearly focused on optimal land. This was an interesting development as it accompanied a sharp increase in rural population (with population decentralization and dispersed settlement). Under these conditions (that is, rural population growth), I expected greater use of marginal land, not less. The construction of the canal system discussed above further indicated a definite interest in agricultural production, not, as expected, a declining interest. In this context, this development suggests that elites were promoting production. It also appears that this use of optimal, not marginal, land was associated with wealth-based status. Thus, the record shows that changes in the Terminal Formative, such as increased settlement on optimal land, rural population growth, dispersed settlement, increased social complexity, agricultural intensification and participation in elite trade, were directly associated. In this context, it appears that access to trade wealth did not diminish interest in subsistence production, and in fact was associated with increases in production and labor potential.

In the subsequent Protoclassic and Early Classic phases, the proportionate use of marginal land increased, but rural population size declined (from 7,326 in the Terminal Formative to 4,621 in the Early Classic). This is directly contrary to

expectations (the model assumes steady increase). In a reversal of conditions found in the Terminal Formative, population became spatially centralized at Kaminaljuyu (Figure 7 e-f) and rural complexity declined (Tables 7 and 8). This was a direct reversal of conditions found in the Terminal Formative. Significantly, the Protoclassic, and especially the Early Classic, were distinguished by a clear decline in involvement in long-distance trade relative to the Terminal Formative. This evidence also suggests that total subsistence production declined in rural areas with declining rural population and increased use of marginal land. That is, little economic wealth was generated in either system, particularly in the Early Classic. As is already apparent from previous analyses, alternative explanations are required to account for developments in the Protoclassic and Early Classic. The land use and settlement data affirm this assessment as they do not conform to the expectations of uniform evolution outlined in the model.

During the Middle Classic settlement patterns changed again as site location became more focused on preferred agricultural land. This trend, and general patterns of demographic change, reinforce the overall similarity of relationships in the data for these two phases. These similarities in characteristics and change include: population decentralization and dispersal in the region, increased complexity, limited rural mound site development, massive construction projects at central Kaminaljuyu (see section on construction activity), renewed investment in

elaborate burials, and involvement in elite trade. It is also possible that settlement on preferred land was associated with intensified subsistence production (Michels 1979a; Murdy 1984), which includes evidence of terrace agriculture and the use of digging tools.

In the subsequent Late and Terminal Classic phases, as trade wealth declined and population became centralized around Kaminaljuyu, so did the use of marginal land. This was analogous to the change from the Terminal Formative to the Protoclassic and Early Classic. However, some conditions were different from those in the Early Classic. For example, there was increased use of marginal land occurred in the context of increasing (not decreasing) population size and complexity. This trend may be explained in part by reduced settlement choices in a context of intense political competition. For example, the Late and Terminal Classic periods were characterized by the political decline of central Kaminaljuyu amidst the development of rural mound centers (in rings 3 and 4) and rural population growth (especially in rings 2, 3 and 4), where a high proportion of sites were located on marginal land. Finally the Postclassic pattern may be explained by a tendency to locate settlements in defensible positions on hills and terraces, which contain most of the marginal land in the survey area.

This examination does show that, when predominantly agricultural subsistence began, optimal lands were occupied first (Early Formation). Afterwards, as population increased, there was

a shift to greater use of marginal land. However, exceptions occurred in the Terminal Formative and Middle Classic, which experienced declines in the proportion of marginal land use, even though rural population increased. In both periods, settlement on marginal land did decline when a trade-based wealth was emphasized, but (rural) population size increased at the same time. It was suggested that some population was employed in intensive production of optimal lands and that the rural population increase was associated with greater demands for subsistence production. Apparently, wealth and local production were associated. This suggests that access to trade wealth and external contacts, not only enhanced local prestige and power, but also reinforced control over population and production which helped to underwrite the status system. Thus, all forms of production were maximized. The pattern in the Protoclassic and Early Classic was exceptional. Rural population declined, but occurred in a context of increased use of marginal land, was, as with some other measures presented above, unexplained by the model. Thus, this leaves only the Late and Terminal Classic as periods which best fit the model.

In conclusion, the pattern of periodic change is again evident. After a period of initial adjustment to and development of the optimal agricultural regime (Middle and Late Formative), the first cycle appeared as a system of maximal production of subsistence goods began. This was concentrated on optimal land, enhanced (in at least one area) by intensive agricultural

practices, and associated with trade wealth concentrated in the core area (Terminal Formative). This was followed by a collapse of the productive system and trade network and increasing use of marginal land (Protoclassic and Early Classic). The second cycle began with a new system of maximal production and increased proportions of settlement on optimal land (Middle Classic), and continued until the collapse of the trade network and extreme settlement on marginal land (Late Classic) to economic and social collapse (Terminal Classic). Though the model for land use is flawed, analyses carried out in conjunction with other data lead to useful perspectives on political organization and change.

PRELIMINARY EVALUATION

Before proceeding with the analysis of construction activity (political maintenance and status demonstration), I would like to integrate the analyses of population, settlement and land use patterns (the support and maintenance systems) in order to make a preliminary evaluation of the theory and model, as well as to review findings about the processes of political change at Kaminaljuyu.

Evaluation of Theory

1. Economic Organization and Land Use

Relationships between the two economic systems (the subsistence and valuable goods systems)were found. The evidence shows that they were integrated and complementary systems, not independent and opposed. For example, in the Terminal Formative (and Middle Classic), increases in rural population size and in agricultural production (especially with evidence of agricultural intensification), occurred in a context of intense involvement in wealth trade and of centralization of political power. Thus, economic production in the subsistence and wealth trade systems reinforced one another, and both were maximized in periods associated with centralized political power (Helms 1988:170). Conversely, periods of negative rural (productive) population growth (Protoclassic and Early Classic) occurred in a context of declining subsistence production (abandonment of intensification systems and increased use of marginal land), reduced wealth

trade, population centralization and decentralized (diffuse) political power. This shows that access to and control of wealth goods by centralized power was instrumental in promoting the development of the support base (population growth, subsistence production). This is directly contrary to the model for the Alternative Formation, for which I expected diminished interest in the subsistence system.

The findings for changes in population distribution suggest that population centralization was associated with conditions where wealth goods were not available in adequate quantities to finance political administrative and economic operations in areas more distant from the core. Alternatively (or concurrently), population centralization may be a defensive posture assumed during periods warfare with external polities (Protoclassic, Early Classic, Late and Terminal Classic).

Finally, these analyses show that cultural change (or growth) at Kaminaljuyu was not based solely on the local agrarian system (contra Sanders and Murdy 1988:580), but there was a definite "mercantile" component to this system (Fox 1977:92-116; Hohenberg and Lees 1885:59-69), and that there were shifts in the organization of the local system associated with the degree of participation in wealth-based status and trade (Hohenberg and Lees 1985:70-72).

The use of marginal land did increase with time, but the change was not gradual or uniform. Greater utilization of optimal land, relative to the preceding period, was observed for the

Terminal Formative and Middle Classic periods, and was linked to rural population growth and population decentralization and dispersal, agricultural intensification and participation in a wealth economy.

2. Population (support system)

It was argued that status competition would lead to demands to increase material production (the basis of political support), and thus population growth. The best evidence for "forced" population growth was found in the Terminal Formative and the Middle Classic periods, where population growth was associated with these conditions:

a) Rapid rural population increase.

b) Dispersed population distribution.

c) Elite involvement in wealth trade.

d) Agricultural intensification, which occurred (in the Terminal Formative) at population levels below any indication of population pressure on available resources.

e) Minimal rural mound site development.

f) Increased social complexity.

g) Exploitation of optimal agricultural land.

h) Centralization of political power (construction activity, administrative centralization) by minority elite groups in the core area.

Thus, population growth (and population pressure) was clearly associated with centralization of political power and status, and with very active participation in wealth trade.

These conditions for the Terminal Formative (or the Alternative Formation) are contrasted with conditions in the Protoclassic when "forced" population growth was not apparent, particularly in the rural areas. In this context, a negative rate of rural population growth were associated with population centralization, the diffusion of political power, active rural mound site development, increased use of marginal agricultural land, declining social-political complexity, and collapse of the Formative wealth trade network. What limited or prevented the earlier trend of population growth? From the perspective of the model, some explanation could be found in the lack of centralized political authority (perhaps undermined by the decline of the wealth-based status and finance system) and consequent demands for increased production. Perhaps, warfare and emigration affected population growth as well.

Population growth in the Late Classic, associated with rural mound site development, supports expectations for the Intermediate Formation. Apparently, as in the Protoclassic, these condition were also associated with population centralization, though for the Late Classic, the scale of centralization encompassed a wider area than central Kaminaljuyu.

The analyses demonstrate that increased economic production (subsistence and wealth trade) and population growth were associated in a context of centralized political power (based on wealth trade). Contrary to the model for the Alternative Formation, political leaders did not show diminished interest in

subsistence production when wealth trade was dominant, in fact they displayed greater interest, as they were able to promote operations over greater distances, and on the most favorable agricultural land.

3. Administration (maintenance)

Analysis shows that, although hierarchical (site) complexity did increase with population size and with time, the change was not gradual or uniform. Periods of apparent political-administrative centralization (Terminal Formative, Middle Classic) were immediately followed by periods of decentralization (Protoclassic, Late Classic) and then by periods of social and political stagnation (Early Classic, Terminal Classic). Although Johnson (1982) and Sanders and Murdy (1982) expect scalar stress and political transformations at about 20,000 to 30,000 individuals, social and political changes (at least within the study area) were evident at much lower population levels (about 10,000 persons in the Terminal Formative and 15,000 in the Middle Classic). The adjustments in the Protoclassic and Late Classic appear to be associated with attempts to compensate for periods of unstable power centralization, not necessarily with absolute population size. These conclusions about the distribution of administration of political power will be tested more rigoursly with analysis of construction activity.

Evaluation of the Model.

The Early Formation, defined primarily as the period of

earliest mound construction, is not well represented by the Late Formative phase. This phase was unexpectedly complex and politically decentralized. Although trace occupations accounted for 20 of 28 sites (or 71%) in the survey area at this time, rural Kaminaljuyu (within the study area) contained 6 known mound centers. It is possible, as Murdy suggests, that the Valley was territorially divided among a number small, relatively independent polities (Murdy 1984:119), each with its own ceremonial center, and that political power was not regionally centralized. Burial evidence from the Valley indicates that social statuses were present but not strongly differentiated (Murdy 1984:118-119). Even at Kaminaljuyu, the largest center in the Valley, burials, though present in large mounds, were not richly furnished nor very elaborate. The mounds (as centers of community, lineage and ceremonial power) were apparently in the process of becoming appropriated by individual lineage heads, but this would not be fully complete until the Terminal Formative. Consequently, the Late Formative was probably organized as a series of autonomous, loosely integrated political units, of which Kaminaljuyu was the largest, amidst a sparse, relatively egalitarian, rural population.

The Intermediate Formation is best represented by the Late Classic. In agreement with the model, there was moderate population growth, greater social complexity, evidence of administrative decentralization, the appearance of numerous mound sites in rural areas near the core area (rings 3, 4 and 5) and

greater use of marginal land. However, though population decentralization was evident with respect to Kaminaljuyu, population was nevertheless centralized in the inner rings, not, as expected, dispersed in the study area.

The Protoclassic fits expectations for the Intermediate Formation criteria, except there was evidence of overall population stability (not growth) associated with population centralization at Kaminaljuyu.

The Late Formation is best represented by the Terminal Classic. There was greater complexity in rural areas in association with a population maximum. A settlement "gap" was evident to the south of Kaminaljuyu in otherwise fertile agricultural land (rings 7 and 8). Political activity in the core area was reduced, as secondary mound sites, representing political segmentation, were active in rural areas (rings 3, 4 and 5). There was greater use of marginal land for settlement. Expected rapid population increase was not evident, even though the relative proportion of marginal land use had increased. As in the Late Classic, population was spatially decentralized in relation to central Kaminaljuyu, but was nevertheless concentrated in the inner rings (rather than dispersed as expected in the model). Expected evidence of agricultural intensification (such as canal or terrace systems or the production of specialized farming tools) was not definitely present. Taken together, the current evidence, in spite of some contrary data, does meet conditions expectated to precede the

collapse of the political system of the Late Formation (Terminal Classic).

The Early Classic displays some features of the Late Formation (Terminal Classic) as well. These include: population centralization with low (negative) population growth, increased use of marginal land, reduced core area activity, minimal participation in the wealth trade economy. In this period however, rural mound sites did not develop, and the core area survived as a political entity. In some ways, the Early Classic resembles expectations for the Alternative Formation (rural population and mound site decline), though, without evidence of features associated with involvement in wealth trade (massive construction projects, elaborate mortuary practice, presence of many long-distance trade goods, settlement on optimal land), this period should not be included in this Formation. Thus, in terms of the model, the Early Classic (though similar to the Terminal Classic-Late Formation) is a unique period which may require a separate description (Formation) to account for the cultural hiatus in both central and rural Kaminaljuyu.

Conditions expected for the Alternative Formation were not entirely consistent with those found in the Terminal Formative and Middle Classic. The primary criteria, such as intense involvement in wealth trade and status, contact with external polities, and concentration of administrative and political power at the core, were present. However, observed rural development, such as rapid population growth and population decentralization

(especially in rings 4, 5 and 8), was contrary expectations. The utilization (or settlement) of optimal land was expected, but not in a context of population growth or agricultural intensification (the A-V-8 group canal). Given the evidence for active wealth trade, the accumulation of wealth by the core area elite, the presence of elaborate burials in large mounds, massive construction activity, it is appropriate to redefine the model with respect to the relations between the core area elites and the rural population (see below).

Conclusions

A comparison of conditions at the beginning (Late Formative) and end (Terminal Classic) of the temporal sequence generally support the model. For example, the analyses show that political complexity did generally increase with time and with greater population size (Figure 8). Complexity was directly associated with the degree of political centralization (compare Tables 6 and 11) and did increase with time. Figure 8 demonstrates a similarly low social complexity in the Formative and Early Classic phases (with population centralization at Kaminaljuyu and relatively low rural population size), and high social complexity in the Late Classic phases (with population decentralization and relatively high rural population size). There was proliferation and decentralization of mound sites with time. The use of marginal land did increase with time and with population size (Figure 12).

Problems with the theory and model are already apparent.

1. The analyses reveal that change over the 1500 year period did not progress in the uniform way described in the model. Some conditions contradict expectations. For example, population growth did not follow a continuous pattern from smaller to larger size. Population did not gradually decentralize with time. Secondary mound sites did not appear in ever-increasing numbers nor did complexity increase uniformly. These discontinuities were not fully explained by reference to the Alternative Formation (Terminal Formative and Middle Classic), because subsequent responses (in the Protoclassic and Late Classic) though similar, were not identical, nor did they take up the pattern in effect (Late Formative and Early Classic) prior to their emergence.

2. The proposed Alternative Formations (Terminal Formative and Middle Classic), contradicted expectations for population centralization and devolution of rural Kaminaljuyu. Given current evidence, except for scale and complexity, these phases best represent conditions described for the Intermediate Formation.

3. Specific changes in the Protoclassic and Early Classic periods were not consistent with expectations of uniform population growth and population decentralization. I attribute these conditions to changes involving conflict and warfare (Brown 1977; Hatch 1987; Parsons 1986), and/or to the collapse of the wealth-based economic financing system.

4. The Early Formation was not fully apparent in the Late Formative (see explanation above). It may be necessary to propose a less centralized, more egalitarian political system (such as a

simple chiefdom or Big Man system).

The observations and difficulties presented above require that the model be revised. An explanation for these difficulties is already apparent. The model has some meaning if the 1500 year period is divided into a two-period, cyclical pattern of development. As a preliminary alignment, beginning with the Late Formative (Early Formation), I propose the following sequence:

CYCLE	PERIOD	FORMATION
-	Late Formative	Early Formation?
	Terminal Formative	Alternative Formation
1	Protoclassic	Intermediate Formation
	Early Classic	Late Formation?
	Middle Classic	Alternative Formation
2	Late Classic	Intermediate Formation
	Terminal Classic	Late Formation

This sequence as proposed has the following properties. The Formations and Periods are not defined on the basis of single variables (such as population size) or on monocausal criteria (such as population pressure), but on complex relations among a series of variables, such as population size, distribution and change; social complexity; administrative centralization (mound site distribution); economic organization and other variables. It leaves open the possibility of historical contingency, such as the access to available wealth trade networks, or the effects of warfare, because it focuses on patterns of change among a number

of variables. Thus, different sites should produce different orderings of the Formations depending on local historical contingency. The pattern of change from phase to phase also shows that the potential for local change was also present in the nature of these relations, and this was apparent in the specific changes that occurred. For example, the Terminal Formative and the Middle Classic (Alternative Formations) developed in the context of social and political decentralization, or within a politically "weak" regional system (Fox 1977:95). Subsequently, the Protoclassic and Late Classic (Intermediate Formations) developed in the context of hypercoherent, monolithic and centralized political organizations. Finally, the Formations and changes from period to period are independent of political categories, such as chiefdom or state, as the active variables and political processes are the same in all cases. Thus, evaluations about the types of political organization in effect (and conditions that give rise to them) can be made in retrospect (without reference to pre-defined models), not in advance. Further testing (construction activity) will indicate whether these preliminary conclusions are warranted.

CONSTRUCTION ACTIVITY

Objectives

This section examines the analytical category of construction activity as a means to address questions about status demonstration (volume of construction) and political maintenance-administration (summit area of construction). The primary task involves the assembly of data on mound architecture within the study area in order to identify building dimensions, dates of construction and periods of utilization. These data are integrated with population and settlement data to test hypotheses about changes in political administration and status relations. There are three parts in this section. The first part examines construction activity in rural Kaminaljuyu. The second part examines construction activity in central Kaminaljuyu. The third part integrates the two.

MOUND CONSTRUCTION IN RURAL KAMINALJUYU

Data Sources

A substantial data base describes mound architecture for the Valley of Guatemala and adjacent regions. My main source for rural architecture is Murdy (1984:372-851, Appendix B, Site Descriptions), who compiled a variety of reports (including some previously unpublished reports), and assembled these together with scale drawings of site plans and the site descriptions. The

majority of the information comes from the work of Shook (1952) and the Pennsylvania State Kaminaljuyu Project survey (1968-1970). This is supplemented by information I collected on two sites during a visit in April 1990 (Rosario Naranjo 46-110-054 and Cemetenterio 47-20-185).

The Data Base

Undoubtedly, mounds were destroyed in the past, often to facilitate modern urban development. Additional mounds, though known from early reports, were destroyed before researchers were able to examine them. Many extant mounds, while placed in the chronological sequence, remain unexcavated.

Dating mounds on the basis of surface surveys creates problems in analysis. For example, ceramics and obsidian samples associated with the mound may date to two or more periods, leading to difficulties in assigning construction dates. This problem is not too serious in the Valley of Guatemala because mound sites are also dated by attributes such as scale, style or site plan, special features (such as ballcourts), and associated datable artifacts (such as stone sculpture). Consequently, the periods of construction are assigned for 53 of the 55 rural mound sites found in the study area. However, we cannot be certain in some cases whether there were interior construction components associated with surface finds dated to periods earlier than the outer mound. Fortunately, there were only two cases where this occurred (Sanja 45-03-389 and Cementerio 47-20-185). I have

excluded these two early components from this study. Meanwhile, I assumed that mounds were utilized for political-administrative purposes during post-construction phases which are represented by datable artifacts.

Procedures for Quantifying Mound Data

Assigning functional use to Mesoamerican mounds is a problematic exercise (Kowalewski 1989:412). Structures likely served several functions, and these changed with time, especially as mounds were re-used after a period of dormancy. Fortunately, there is no urgent need to define functional uses for the mounds, since only aggregate total (not functional) space is under examination. Total summit area simply represents the locus of generalized political-administrative (maintenance) activities. Ideally, the floor area of plazas and low-lying (buried) mounds and platforms should be included, but sufficient, reliable data are not available. Consequently, mound summit area is treated as a representative sample of total administrative space "in use". Ballcourt summit area, that is, the summit area of the walls enclosing the playing surface, is included in the analysis since ballcourt activity, as with many of the mounds, is considered to support administrative and ritual functions. Mound volume is also treated as aggregate effort, even though a mound may consist of several successive sub-stages within the same phase.

Mound dimensions (length and width of base and summit, and height) are taken from Murdy's Site Descriptions (1984:372-851).

Dimensions not quoted in the text were measured from the scaled, site-plan drawings. For two additional sites, Rosario Naranjo and Cementerio, previously unrecorded dimensions were obtained directly (using tape measure and pacing). Estimates for missing parameters were derived from relevant information in Murdy's reports. The two undated sites, Rodeo (46-11-143) and San Carlos (59-22-367), are not included in this analysis. Postclassic sites were not included as it became apparent that the spatial integration in the study area had broken down, making the analysis based on concentric rings meaningless. The total sample consists of 53 sites, 172 separate mounds, a number of mounds incorporated in and atop platforms at large sites, 21 ballcourts and a number of platforms.

Excavation shows that mound architecture in the Valley of Guatemala and at Kaminaljuyu was constructed in the form of terraced platforms with vertical or sloping sides (Michels and Sanders 1973; Sanders and Michels 1969; Kidder, Jennings and Shook 1946). The occasional mound is hemispherical in form (probably only Late Formative mounds such as B-V-6). No known mounds are cone-shaped, that is with a pointed top and straight sides sloping from base to pinnacle. The form visible today, a rounded or hemispherical mound, is a product of erosion and humus deposition, and presents a misleading shape. However, with so few mounds excavated, less than 25% within the study area, including Kaminaljuyu, this is usually the only evidence for mound dimensions. In choosing a formula for estimating volume, I tested

a number of formulae on a variety of excavated mounds and a selection of arbitrarily designed terraced platforms. The formulae used included those for calculating the volume of a cone, pyramid, spherical slice, spherical cap and frustrum of a pyramid. The best aggregate results were obtained using the formula for the spherical slice (98% of actual aggregate volume), but the volume of high pyramids, a common type in the mound sample, was greatly overestimated. The worst results were obtained using the formula for the volume of a cone (51% of actual aggregate volume), and the volume of high pyramids was greatly underestimated. The cone-volume formula was used by Michels to calculate mound volume at Kaminaljuyu (Michels 1979: Table 24,147; Table 34,199). Consequently, I will not rely on the volumes as calculated by this method, mainly because periods with a higher proportion of high pyramid mounds will be relatively underestimated by volume, and overall volumes between periods will be artificially minimized.

The best overall results were obtained with the formula for calculating the volume of a truncated pyramid (or frustrum of a pyramid) (91% of actual aggregate volume), but closer overall agreement with more common types of mounds, such as high pyramids and low platforms with relatively equal terrace heights. This formula is:

$$V=1/3\ H\ (B+S+\sqrt{B}xS),$$

where B is the basal area of the mound, S is the summit area of the mound and H is the mound height between the base and the

summit. This is the same formula used by Blanton for calculating mound volume in the Valley of Oaxaca (Blanton 1989:416-422). This formula is also convenient since a measure of summit area is required for the analysis of political administration (maintenance). Calculations of total volume and summit area, by phase, are presented in Table 13, and by individual mound site in Appendix A.

Table 13. RURAL KAMINALJUYU: CONSTRUCTION SUMMARY. Construction Volume and Summit Area within the Study Area including Mounds, Platforms and Ballcourt Enclosures.

	NO. SITES	VOLUME (m^3) NEW	(NS)	OLD	TOTAL	SUMMIT AREA (m^2) TOTAL	(TS)
MF	0	.	.	.	.	.	.
LF	6	16856	.	.	16856	1887	.
TF	3	7133	.	.	7133	2723	.
PC	13	71604	.	.	71604	13162	.
EC	4	5313	.	3428	8743	2056	.
MC	7	95192	6064	31749	126941	21463	4668
LC	24	63809	.	95226	159035	32676	15881
TC	22	6721	.	156032	162753	35567	18772
EP	3	1347	.	5556	6903	1259	.

NEW indicates the volume contributed by new construction in the current phase.
OLD refers to the volume contributed by mound sites constructed in earlier phases.
(NS) = New volume excluding construction at Solano.
(TS) = Total summit area excluding construction at Solano.

Construction Volume: Rural Kaminaljuyu

In this section, I will focus on construction activity in rural Kaminaljuyu as a separate analytical unit. Construction volume is here associated with status demonstration, the ability to assemble labor to construct a permanent, visible symbol of

power and status. However, it is appropriate to minimize emphasis on short-term labor investment in mound construction (which leads to formalist interpretations of construction activity), and focus on the mounds' long-term, day to day significance. From this perspective, the presence and utilization of older mounds is recognized and included in these analyses.

Figure 13 shows that the stock of total construction volume in use increased with time, although declines occurred in two periods, the Terminal Formative and the Early Classic. The nature of this increase is revealed in Figure 14, which indicates the total volume contributed by new construction in each phase (Table 13). The Protoclassic and the Middle Classic stand out as particularly active periods of construction, followed by the Late Classic. Although total volume in use increased with time (Figure 13), Figure 14 shows that the amount of new construction was variable from phase to phase. This relation is further defined in Figure 15, which indicates the percentage of total volume represented by new construction in each period. The Late Formative, Terminal Formative and Protoclassic building stock was composed of totally new construction (that is, there was no reuse of earlier construction). In the Early Classic, however, only about 60% of mound volume was new construction. The balance was retained from two Protoclassic sites out of a total of only four Early Classic rural mound sites. In the Middle Classic, about 75% of the building stock was new, but this is somewhat misleading, as 70% was contributed by activity at one site, Solano.

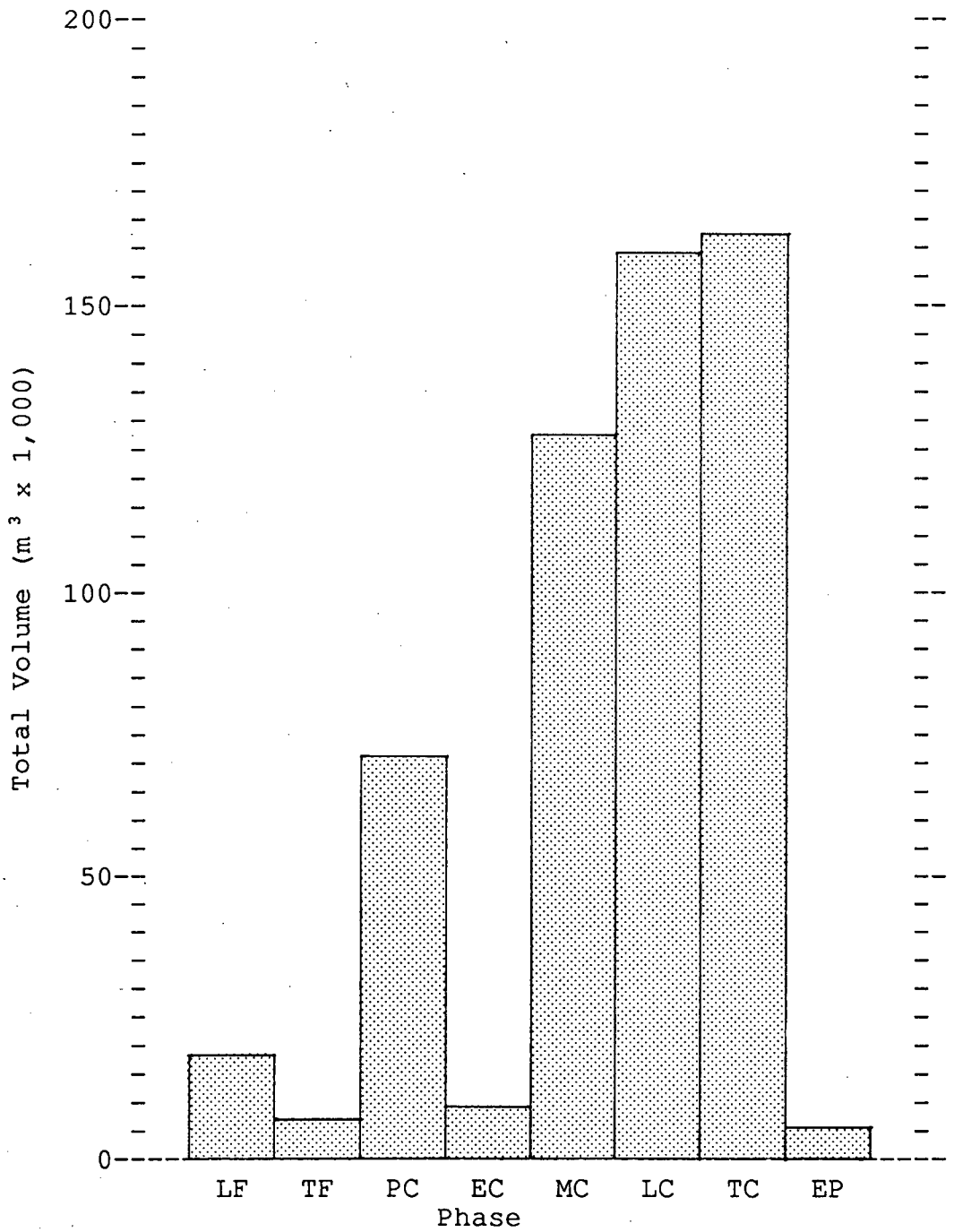


Figure 13. RURAL KAMINALJUYU. Total Construction Volume in Use by Phase. (See Table 13).

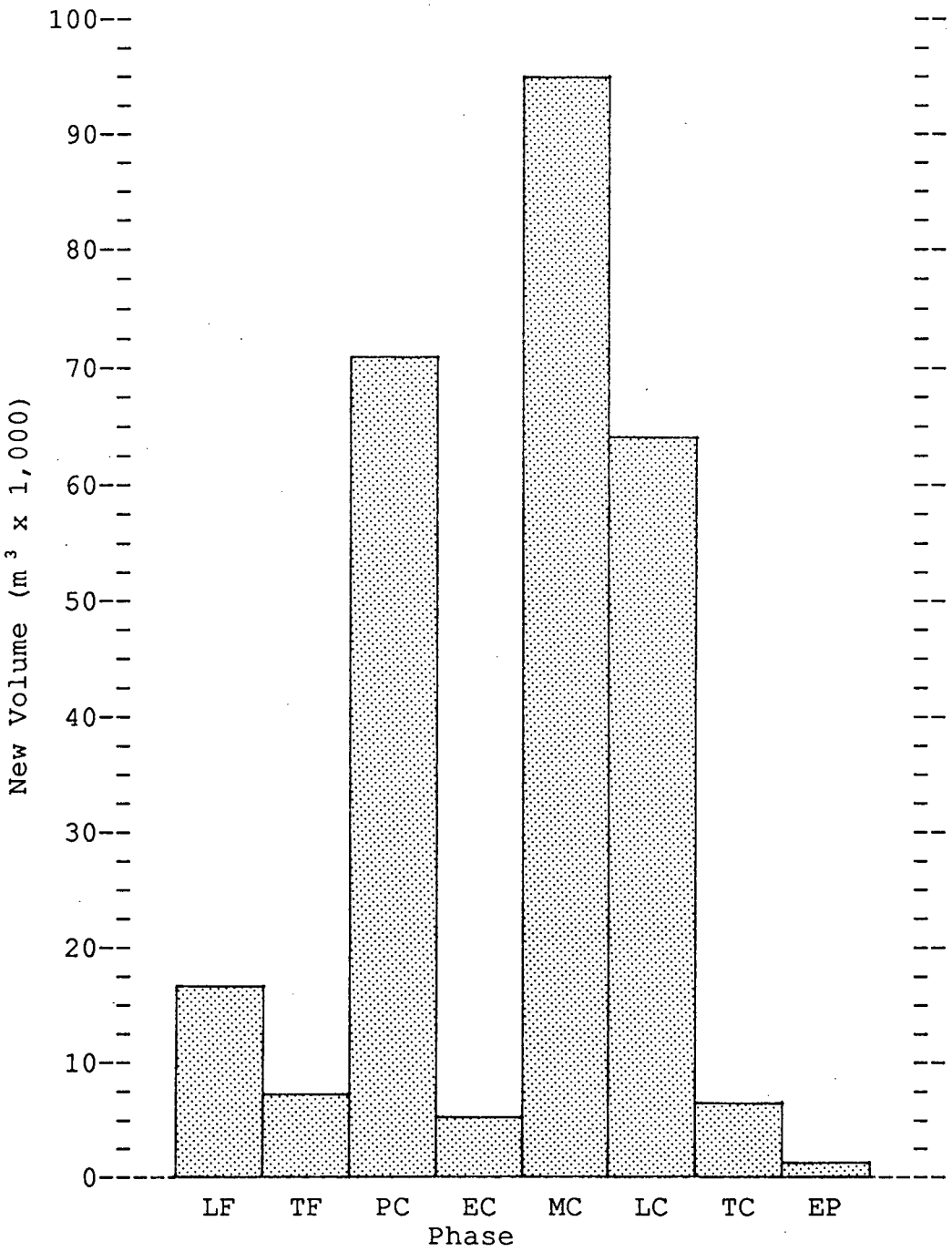


Figure 14. RURAL KAMINALJUYU. New Construction Volume by Phase. (See Table 13).

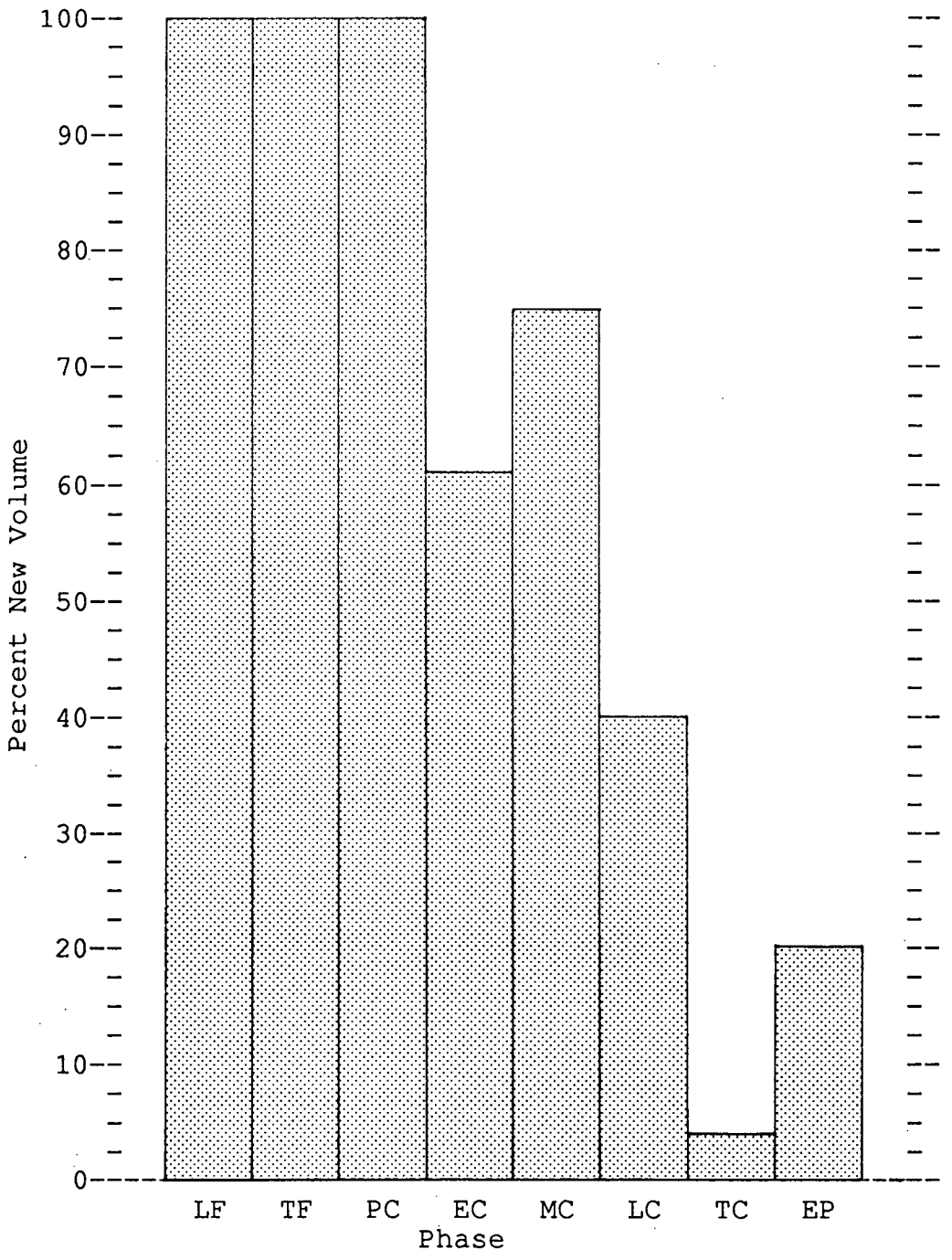


Figure 15. RURAL KAMINALJUYU. Percent of Total Volume Contributed by New Volume.

Thereafter, the proportion of new construction declined steadily as older sites were either carried over from the preceding phase, or dormant ones were reoccupied. In the Terminal Classic, only about 4% of volume was new construction, even though this period displayed the greatest volume in use for any phase.

In general, there was very little rural mound construction in the Terminal Formative and Early Classic, and considerable construction in the Protoclassic and Late Classic. New mound construction in the Middle Classic, though substantial, was concentrated at one site (Solano), rather than at a number of sites (13 in the Protoclassic and 21 in the Late Classic). Excluding Solano, total new construction volume was comparable to that in the Terminal Formative and Early Classic (see Table 13). From the Middle Classic, as the total amount of volume in use increased, the amount of new construction decreased, and this was coincident with large absolute population increases in the Middle and Late Classic.

Tribute Ratio: New Construction

In order to examine these patterns of construction more closely, calculations of rural labor demands per capita were calculated (new volume/rural population="tribute ratio"; Table 14 col.5). This is a somewhat arbitrary measure as it does not account for population variation within a given period, or for the size of the available labor force. Ideally, it should include demands for labor at central Kaminaljuyu. I have

temporarily ignored this fact as I wanted to provide a basis for comparing "push and pull" centralization effects of political power on the rural population.

Table 14. RURAL KAMINALJUYU: CONSTRUCTION ACTIVITY. Table of Derivative Measures.

	COLUMN 1	2	3	4	5	6	7	8	9
	V/A NEW VOL m	V/A NEW VOL (-S)	V/A TOT VOL m	V/A TOT VOL (-S)	TRIB. RATIO	AVG. SITE VOL m^3	AVG. SITE VOL (-S)	AR ADMIN RATIO	AR ADMIN RATIO (-S)
LF	8.93		8.93		5.95	2809		1.50	
TF	2.62		2.62		0.97	2378		2.69	
PC	5.44		5.44		11.47	5508		0.47	
EC	3.67		4.25		1.15	2186		2.25	
MC	5.57	7.31	5.92	7.27	7.77	18134	5213	0.57	2.62
LC	4.31		4.87	4.32	2.86	6626	2296	0.68	1.40
TC	2.55		4.58	3.85	0.25	7398	2858	0.76	1.43

KEY:
Col.1 V/A ratio; calculated as: aggregate mound volume/summit area for all new construction, by phase.
Col.2 Same as col.1, excluding volume and summit area of Solano (-S).
Col.3 V/A ratio; calculated as: total aggregate mound volume/summit area, by phase.
Col.4 Same as col.3, excluding volume and summit area of Solano (-S).
Col.5 Tribute Ratio; calculated as: new volume/rural population, higher values indicate greater labor investment.
Col.6 Average Site Volume; calculated as: total volume/no.of sites.
Col.7 Same as col.6, excluding volume of Solano (-S).
Col.8 AR (Administration Ratio); calculated as: rural population/summit area (persons per m^2), lower values indicate greater availability of administrative space (services) per person.
Col.9 Same as col.8, excluding summit area of Solano (-S).

Higher tribute ratios indicate greater effective demands for labor, though one could argue they also represent a general

ability to control labor in all forms, such as craft production, agricultural labor and personal service. Interestingly, and perhaps unexpectedly, the Protoclassic period had the greatest emphasis on labor for mound construction (11.47 m^3 per person). A relatively low rural population made a substantial labor investment, scattered over a number of rural mound sites. The Middle Classic also indicates a high rural tribute ratio (7.77). However, as noted above, construction effort was concentrated at the site of Solano. Excluding Solano, the tribute ratio was only to 0.37, demonstrating that extraordinary construction effort was undertaken at Solano. The Late Formative also indicates a relatively high tribute ratio (5.95), which supports the hypothesis that the early phases (Early Formation) will emphasize status demonstration in construction activity. The low ratio for the Terminal Formative (0.97) shows that the rural population was not expected to provide much labor for local building projects, even though rural population size had increased substantially. Possibly, community labor (or tribute) was allocated to the manufacture of craft goods for the wealth trade economy, or to projects at central Kaminaljuyu (such as mound building, canal construction and maintenance, craft production). The Late Classic had relatively little emphasis on mound construction, even though a substantial population-labor base was available. Appendix A shows that most new mound sites in the Late Classic were relatively small ballcourt centers. As in the Middle Classic, available labor may have been applied to other types of

production. The population maximum in the Terminal Classic was accompanied by the lowest tribute ratio of any period (0.25). Perhaps at this time, there was more emphasis on the administrative aspects of managing a large population than on expressing status in mound construction. Given evidence of population centralization at this time, it is possible that there were also problems with financing construction projects based predominantly on a subsistence economy. Alternatively, assuming that the centralization process was part of a defensive posture, production and labor potential may have been devoted to less visible activities associated with warfare.

Mound Site Volume: Rural Kaminaljuyu

I have used another measure, the ratio of total (as opposed to new) volume "in use" per site, as an indicator of the degree to which construction (or status) was concentrated at rural mound sites (Table 14 cols 6,7). Numerically, this ratio is simply the average volume per site for each period. It is analagous to the centralization index used earlier (total rural population/number of mound sites, see Table 11), but total volume of construction in use is substituted for total rural population. New volume alone is not used because the objective is to test the relative emphasis on total volume demonstrating status. Higher values indicate that, for a particular period, individual sites placed a greater emphasis on status display. This exercise is clearly contrasted with the tribute ratio (new volume/rural population),

which represents demands for new construction, not current, ongoing status of all sites.

Table 14 col.6 shows that, as with the centralization index (Table 11), the average site volume (excluding Solano) falls within a relatively narrow range between 2,000 m^3 and 3,000 m^3 per site, except for the Protoclassic and Middle Classic phases.

Although there was emphasis on status display in the Late Formative, average total volume at each mound site (2,809 $m^{3)}$ was not much greater than for most other periods. In contrast, mounds sites in the Terminal Formative, slightly smaller at 2,378 m^3 per site, had a much greater emphasis on functional aspects (Table 14 col.3; see analysis of volume and summit area below).

Protoclassic mound sites were twice as large by volume than earlier sites (Table 14 col.6). Furthermore, the volume in use was all new construction at 13 sites in the study area. The focus was clearly on displaying status in the local territory. The Early Classic showed a decline in rural mound development (relative to the Protoclassic), with an average site volume lower than that for any period. Not only were sites smaller, but there were only four of them, and two of these were carried over from the Protoclassic. This period once again displays very weak rural development.

Extreme rural concentration of rural volume was apparent in the Middle Classic. However, the value in Table 14 col.6 (18,134 m^3 per site) is misleading because Solano, one of seven active rural sites, accounted for over 71% of this volume. Solano

was clearly a focus of status and construction activity during the Middle Classic, and its classification as a provincial center is justified. Excluding Solano, however, the average for the remaining six sites (four of them reoccupied sites) was only 5,213 m^3 (Table 14 col.7), though still substantial relative to other periods. Nevertheless, the underlying weak development of rural sites at this time (as given by the tribute ratio excluding Solano, 0.37; and by the total of new construction, Table 13 (NS)), was comparable to conditions in the Terminal Formative (Table 14 col.5).

During the Late and Terminal Classic, rural mound sites were, on average, larger by total volume (and more numerous) than earlier periods, except the Middle Classic. By this time, ballcourt enclosures were present, and these are included in volume totals, where they account for about 20% of new construction volume. I have differentiated Late Classic sites into three main classes (see Appendix A); large regional or provincial centers with 6 or more mounds plus a ballcourt (Cementerio, Guacamaya I), medium sized elite centers with 2 to 5 mounds plus a ballcourt, and smaller mound sites (usually villages) without ballcourts. Only 40% of total volume in use was represented by new construction, represented by a number of newly-founded sites (20 of 24 in the phase). About 40% of this was contributed by one site (Cementerio). The site of Solano continued in use, and again accounted for a substantial proportion of volume in use (57%). Without Solano, the average

volume in use drops sharply (from 6,626 m^3 to 2,296 m^3). This pattern, the proliferation and scattered distribution of new sites founded on standardized site plans, was similar to the pattern observed for the Protoclassic, though the variability of the Late Classic mound sites was greater. In both cases, they followed a period with rapid rural population growth, without accompanying development of secondary centers. However, a major difference is that there was little emphasis on volume of construction (2,296 m^3 per site in the Late Classic compared to 5,508 m^3 in the Protoclassic). So while Late Classic sites were more numerous, they were also much smaller. Finally, some settlement continuity is evident in changes from the Late to Terminal Classic. There was little new construction, though average site size was comparable to that in the Late Classic. This is explained as older, large sites continued in use (including Solano, Cementerio, Sanja).

To conclude, the preceding analyses (total construction volume, tribute ratio and mound site volume) show that the Protoclassic polity (political elites) placed great emphasis on developing rural mound sites. Not only were the sites numerous and large, but relative to the population, there was much labor devoted to their construction. Finally, all sites were classified as new sites. Apparently, many local political leaders placed considerable emphasis on displaying status. No other period compares with this record. The Middle Classic construction effort at Solano, though massive, was a single effort on which less

effort (per unit population) was spent. Other rural Middle Classic sites, though large, were often carried over from earlier periods (in fact, three of seven sites in use were constructed in the Protoclassic). Excluding Solano, Middle Classic rural mound sites were comparable to those of the Terminal Formative (few sites relative to population and low tribute ratios). The smallest sites, by volume and labor investment, occurred in the Early Classic, reinforcing earlier conclusions about the deterioration of rural districts at this time. The Late and Terminal Classic were comparable to the Protoclassic with a pattern of numerous mound sites scattered in the rural area, but there was much less emphasis on status display, less new volume of construction, and more emphasis on site hierarchy in the context of a large rural population.

In summary, though the sequence of mound construction was variable (cyclical) from phase to phase, there was generally less emphasis on status display, site size (volume) and on labor investment with time. There was also more emphasis site differentiation, implying that there was greater concern with the administrative aspects of managing a large population.

Mound Site Volume and Summit Area: Rural Kaminaljuyu

The volume to summit area value/ratio (V/A) is useful because it describes the amount of effort used to create functional (administrative) space. It represents the relative balance between the creation and use of space for status

demonstration (volume) versus administrative space (summit area). For example, high mounds with broad bases and small summit areas, usually regarded as lineage and mortuary structures with primary ritual functions, are interpreted as status monuments with both administrative and/or ritual functions. Thus, a higher V/A ratio indicates greater emphasis on status demonstration. Low mounds or platforms with broad bases and summit areas are regarded as residential, administrative or cermonial facilities. They will have a relatively low V/A ratio, indicating a greater emphasis on functional or administrative uses and less relative emphasis on status display. Tourtellot has used such a measure to rank individual housemounds at the Classic period Maya site at Seibal, Guatemala where he obtained clear resolution for housegroup hierarchical rank (Tourtellot 1989:Figure 3).

For each phase, I have calculated the aggregate V/A ratio for both total construction and new construction (Table 14 cols 1,3). Since the massive site of Solano overwhelmed the V/A ratio from the Middle Classic, I have also calculated V/A ratios excluding this site (Table 14 cols 2,4). As noted above, higher values represent relatively greater emphasis on using construction to display status, while lower values indicate relatively more emphasis on functional and administrative aspects.

For the Late and Terminal Formative and the Protoclassic periods, the V/A values for both total and new construction were identical as all construction in use was new construction (no

older mound sites were re-used). Subsequent phases have different total and new V/A values as older mound sites were re-occupied with little or no modification.

Results show that the six Late Formative mound sites had the highest V/A value (8.93) by a considerable margin. This supports the hypothesis that mound construction in the early phases (Early Formation) will place greater emphasis on status demonstration. However, this was expected to occur within the core area, not in the rural area, where few, if any, mound sites were anticipated. This supports the thesis for the relative political/ritual importance of Late Formative rural mound sites.

The very low V/A value for the three Terminal Formative sites (2.62), demonstrates that there was minimal emphasis on status display. This occurred in spite of significant rural population growth, and shows that there was more emphasis on functional uses in the mound groups. Thus, not only were there few sites, they were small, involved little labor investment, and their status component was minimized.

The change in the V/A value for the thirteen Protoclassic sites (5.44) demonstrates a much greater emphasis on status demonstration. This change occurred in a context of general political decentralization/delegation following the very weak development of rural mound sites in the Terminal Formative. Based on previous evidence for the Protoclassic (large volume per site, high labor input, emphasis on status), I suspect that a series of loosely integrated, secondary political units were engaged in

(status) competition.

The four Early Classic sites had a moderate to low V/A ratio (4.25) which is attributed in part to the continued occupation of two Protoclassic sites (Garland and Cruz de Cotio). The V/A ratio for new construction, and the associated tribute ratio were considerably lower than in the Protocalssic. Thus, in the Early Classic, there were only a few small mound sites with little emphasis on status display and little labor investment. The pattern developed in a context of rural population decrease and low social complexity. The rural area in the Early Classic was likely experiencing cultural hiatus.

The Early Classic pattern changed in the Middle Classic, though there were still fewer mound sites than one would expect given the large rural population increase. Nevertheless, there was renewed interest in status display in both total (V/A=5.92) and new (V/A=5.59) construction. The focus on status was most apparent when Solano was excluded from V/A calculations (V/A=5.92 including and 7.27 excluding Solano). As in the Early Classic, some high status Protoclassic mounds were reoccupied (Bran, Rosario Naranjo and Garland). Thus, Solano, with a V/A value itself of 5.39, was part of a rural mound system that placed emphasis on high status and ritual functions. In relative terms, Solano appears as a center which focused more on administrative functions, and shows that political-administrative power and resources were organized on a scale much larger than before.

Late Classic mound site organization, as noted previously,

was similar to that for the Protoclassic, in particular the appearance of many new sites scattered in the rural area. Because of this development, Solano contributed less to the total volume than it did in the Middle Classic, so V/A ratios excluding and including Solano were relatively equal. Since total rural population was about 3.5 times greater than in the Protoclassic, there was certainly a potential to assemble labor for massive construction projects. Apparently though, the Late Classic polity made little use of this potential for construction (tribute ratio=2.86). Instead, new construction was directed to more functional purposes than in the Middle Classic (Table 14 cols.1,3). Also, sites were much more varied by type, plan and scale (see Appendix A). They ranged from large centers (Cementerio, 33,477 m^3) to small hamlets (Los Guajitos, 63 m^3), indicating a concern for hierarchy in the administrative system.

During the Terminal Classic, new mound construction was confined mainly to small-scale sites with ballcourts. Labor was not invested in large construction projects (Guacamaya II was the largest new mound site at only 2,200 m^3), though site variety was retained from the Late Classic. In fact, it is apparent from the tribute ratio (0.25 m^3) that political leaders made even less use of the labor potential for construction than in the Late Classic, even though rural population had peaked in the study area.

This analysis of volume and summit area, in conjunction with evidence from previous analyses, demonstrates that each period

had a distinctive rural mound site organization and character including; ritualism in the Late Formative, weakness in the Terminal Formative and Early Classic, status display and functionalism in the Protoclassic, centralization amid status display in the Middle Classic, and functional variety in the Late and Terminal Classic. However, there seemed to be a general trend from an emphasis on the ritual-status component to an emphasis on functional variety (bureaucratic component). I think the distinctiveness was due to the effects of the relative emphasis in labor investment (tribute) on construction activity versus other activities such as craft production, personal or military service, subsistence production (canals, terraces, field labor), or general core area demands. To complete this analysis will require examination of activities at central Kaminaljuyu.

Mound Site Summit Area and Political Maintenance

This section examines aspects of political maintenance (administration) as evident from the analysis of the summit area of earth mound construction in rural Kaminaljuyu. Summit area, the surface area of the top of mound construction, represents space formally assigned to administrative-political functions including; judicial hearings, decision and policy making activities, ritual procedures, economic and military planning and management. The summit areas of mounds, platforms and ballcourt enclosures are included in this category. Summit area "in use", defined using the same criteria as for construction volume, is

the primary measure. It measures the total of new plus old mound architecture "in use" in a particular period. There are three parts to the analysis. The first examines change in the amount of available summit area, the second examines the relations of summit area and population size and the third examines the distribution in space (in the concentric rings).

1) Period totals for rural summit area, presented in Table 13, are shown graphically in Figure 16. These data show that there was a net increase in the total amount of space available with time. Each period, except for the Early Classic, had successively greater amounts of summit area available, although the rate of increase was variable from phase to phase. This growth pattern, of course, generally agrees with that for construction volume (Table 13, Figure 13), except that the Late Formative had a greater total mound volume (or status display) than the Terminal Formative. As noted above, the early phases, except the Protoclassic, provided little summit area (administrative space) relative to volume (status display). The Protoclassic provided well for both components. The Classic period (Middle to Terminal Classic phases) demonstrated a relatively steeper increase in administrative space.

The nature of these changes is evident in Figure 17, which illustrates the amount of new summit area provided in each phase. This again shows that the Protoclassic polity placed great emphasis on the provision of summit area, as the amount of new space approached that provided in the Late Classic.

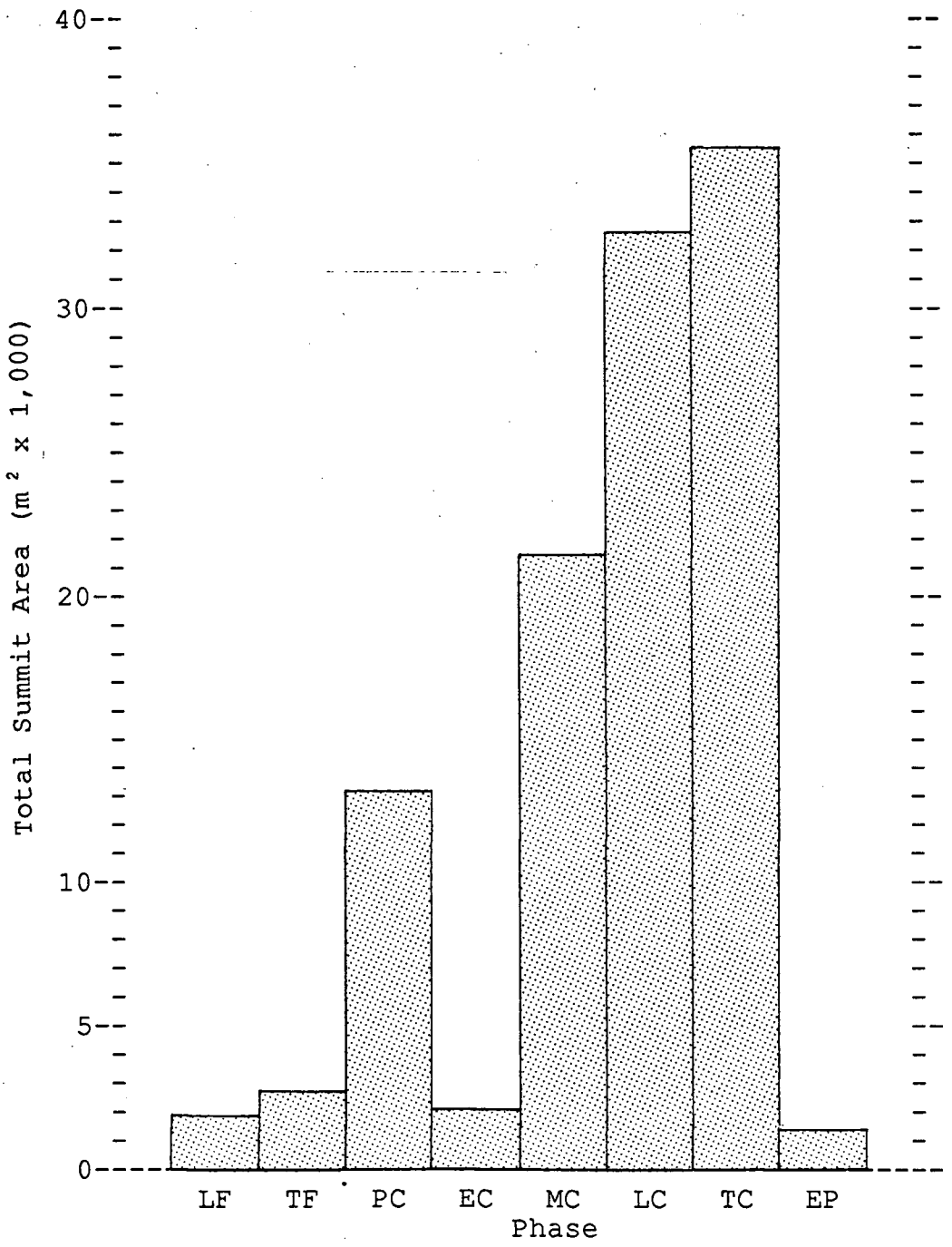


Figure 16. RURAL KAMINALJUYU. Total Summit Area in Use by Phase. (See Table 13).

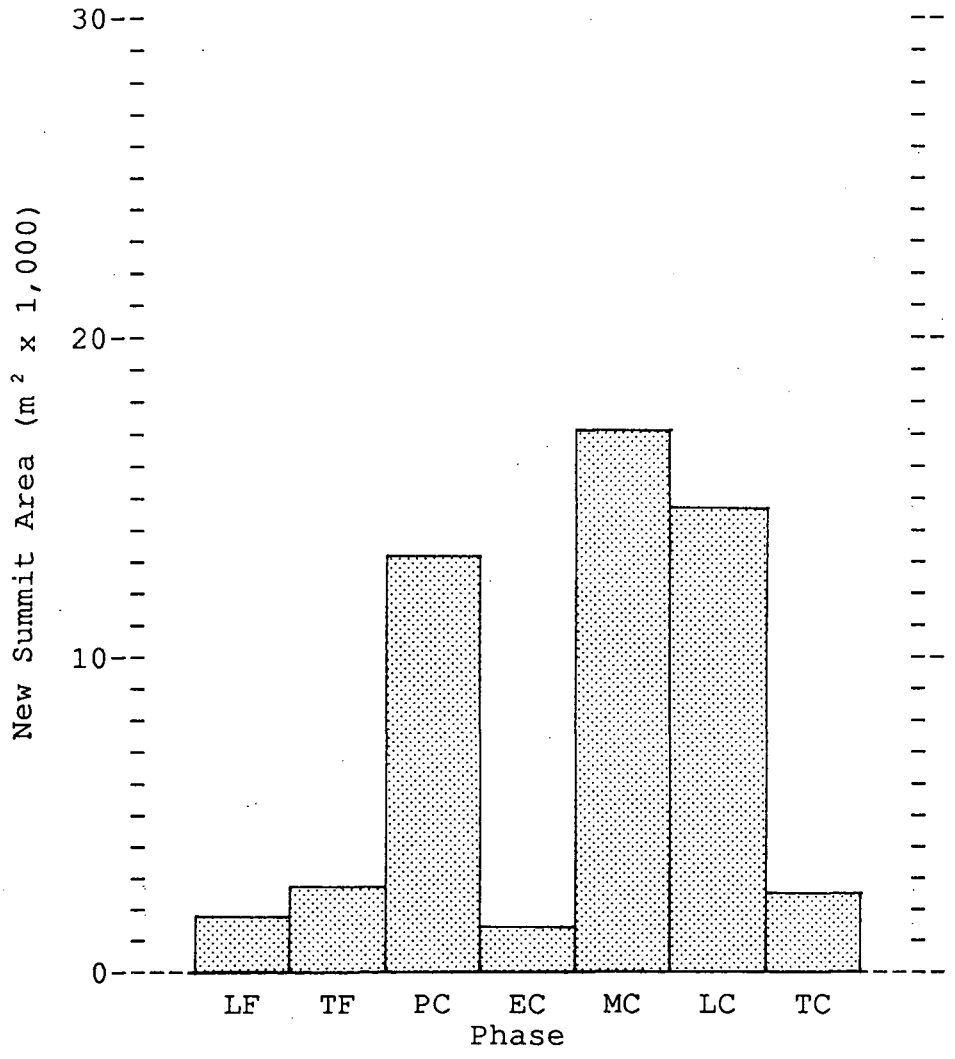


Figure 17. RURAL KAMINALJUYU. New Summit Area by Phase.

It is also evident that in the Late and Terminal Classic an effort was made to provide large amounts of space for administration, even though less floor area was supplied by new construction (that is, older mound sites were used more frequently). Thus there was more emphasis on management activities in the rural area than on status display in the later periods.

Plotting summit area in use against rural population for each phase yields Figure 18. There are two groups in the plot. One consists of a general cluster with summit area less than 3,000 m^2 and population less than 10,000 persons (Late and Terminal Formative, Early Classic). The second group shows a clear positive relation between population size and summit area. For rural Kaminaljuyu, this shows that, regardless of other factors (such as number of mound sites, emphasis on status display, position in the socio-political cycle), there was an emphasis on administrative (bureaucratic) functions after the Protoclassic which was clearly evident from the Middle Classic through the Terminal Classic. The structure of this organization changed as well. For example, though rural administrative space was clearly centralized at Solano in the Middle Classic, this changed to a more decentralized and efficient system in the Late Classic, as political maintenance became more hierarchical and segmented, and central Kaminaljuyu became relatively less active politically. These conditions imply that a state-like (bureaucratic) political organization was present in the Late and

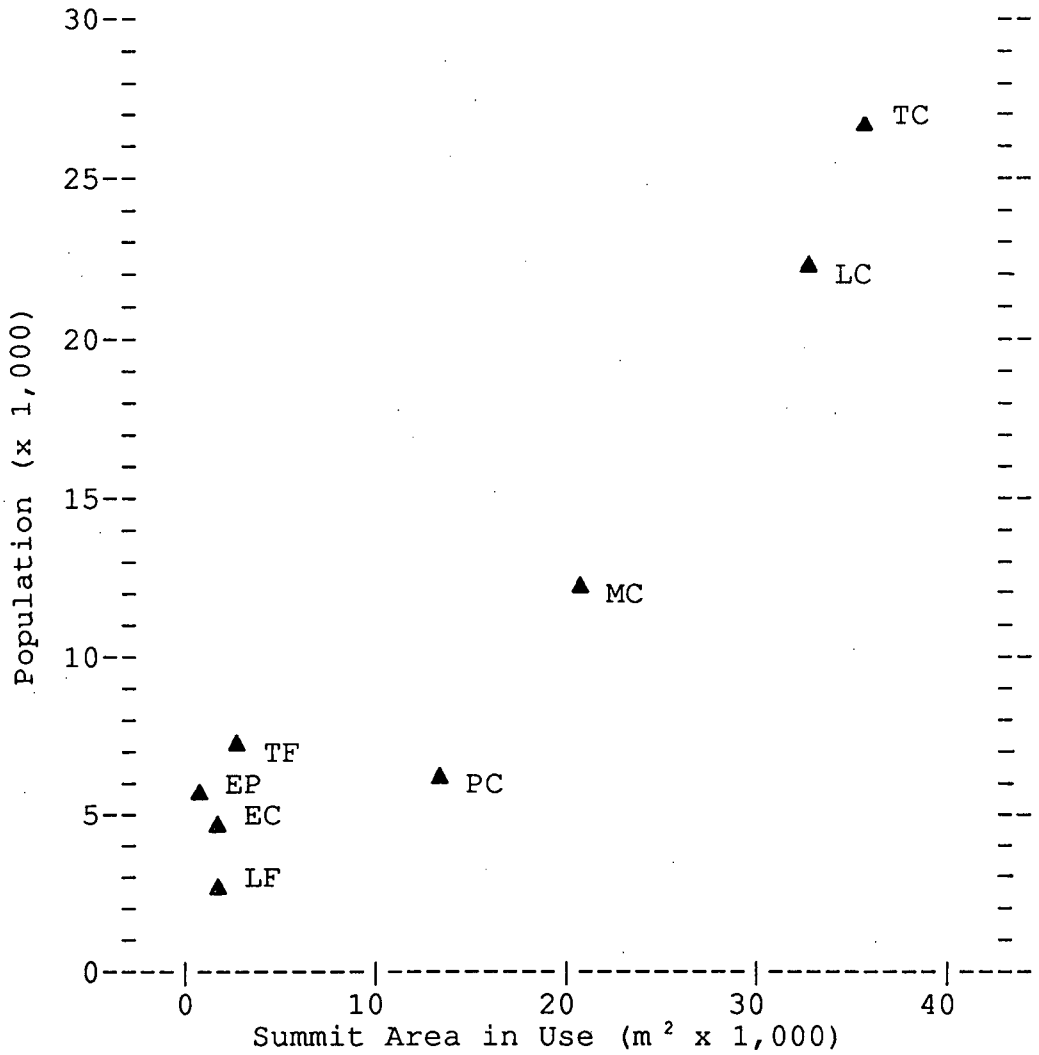


Figure 18. RURAL KAMINALJUYU. Summit Area in Use by Population. (See Tables 4 and 13).

Terminal Classic, possibly as early as the Terminal Formative or Protoclassic. As with other analyses, a full explication will become evident with examination of construction activity at central Kaminaljuyu.

2) A crucial aspect to this analysis of summit area concerns its relation to changes in rural population size. For example, the model proposes that increases in rural population size (without adequate political-administrative adjustment) will lead political delegation and comparable increases in the amount of space (summit area) devoted to rural administration. This relation was demonstrated in Figure 18. However, it would be useful to know how close this relation was. Thus, Table 19 col.8 compares rural population size with the "administration ratio" (AR). This ratio evaluates the estimated number of persons served for each square meter of summit area. For example, lower values indicate that the population was served by relatively greater amounts of summit area. Thus, lower ratios (or relatively more summit area) imply closer supervision of the population, more attention to administrative functions or the application of more complex management systems.

Table 14 col.8 shows that, except for the Late and Terminal Formative and the Early Classic, The AR ratio (as illustrated in Figure 19) remained quite constant, though it tended to increase slightly with time. This pattern held in spite of variations in rural population size, amount of summit area or the number of mound sites. This demonstrates that political and space or

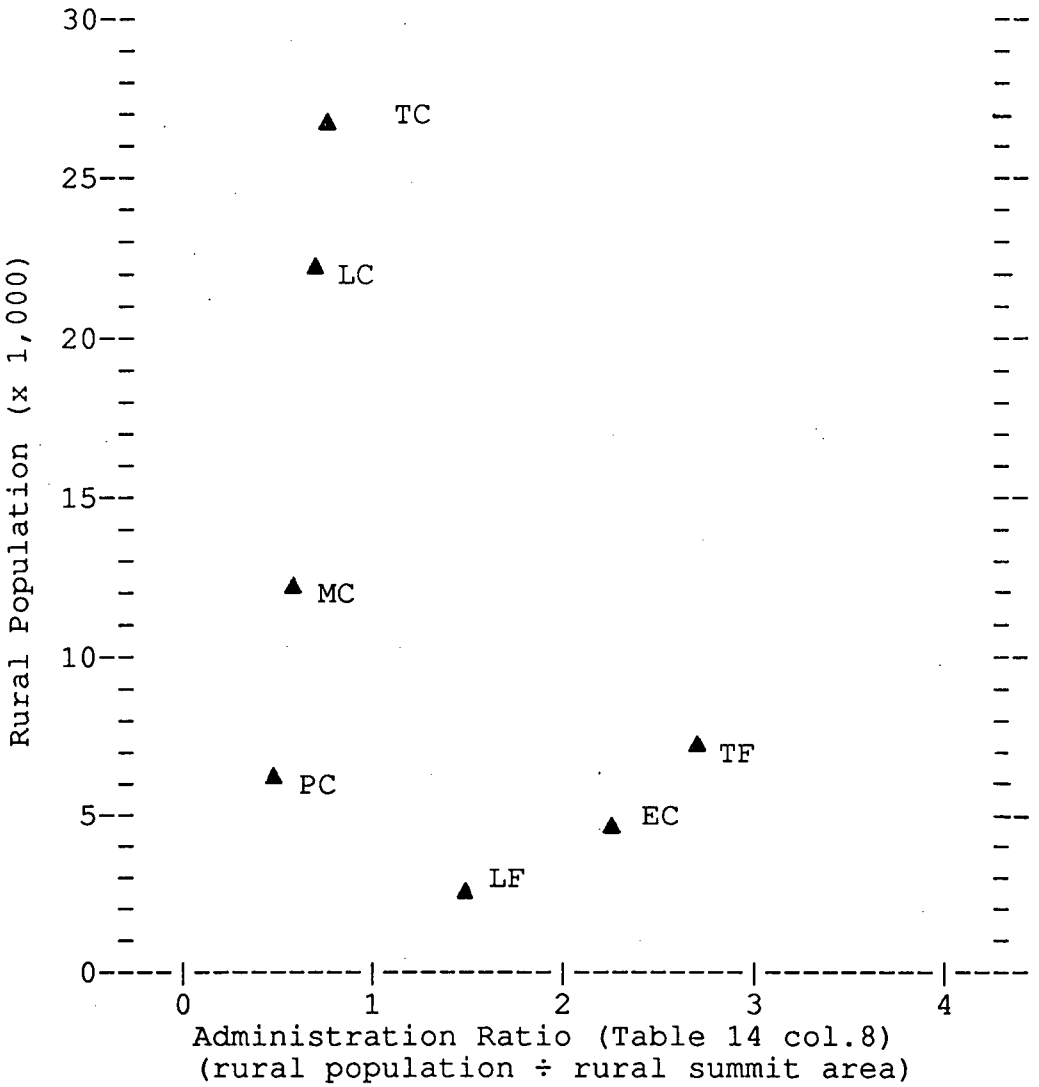


Figure 19. RURAL KAMINALJUYU. Administration Ratio by Rural Population.

programs were closely associated with population size and change, although there was greater variability at lower population size. It seems that there was an effort made to maintain a relative balance between population size and administration space (or service). Nevertheless, there was evidence of administrative or scalar stress in the Late and Terminal Classic (with parallel greater population size and AR ratios), and this was accompanied by political decentralization and rural site hierarchization. These changes follow from Middle Classic population increase.

The AR ratio also indicates that periods of steep rural population increase (Terminal Formative and Middle Classic) were followed by periods with greater attention to administrative functions. The effect of Solano is clearly apparent (Table 4.13 cols.8 and 9). Though its role in rural administration is somewhat ambiguous (it may have been part of a separate political system), the consistent value for the AR ratio is evident in either case.

3) The spatial distribution of summit area is presented in Figure 20 a-g. This exercize assists in evaluating processes of administrative centralization in rural Kaminaljuyu. Figure 20 is best compared with Figure 6 a-k, which shows the distribution of mound sites (by number of sites) in the concentric rings, but demonstrates the specific allocation of summit area (by amount of space) in each ring and so gives a better indication of the distribution of administrative activity in space with time.

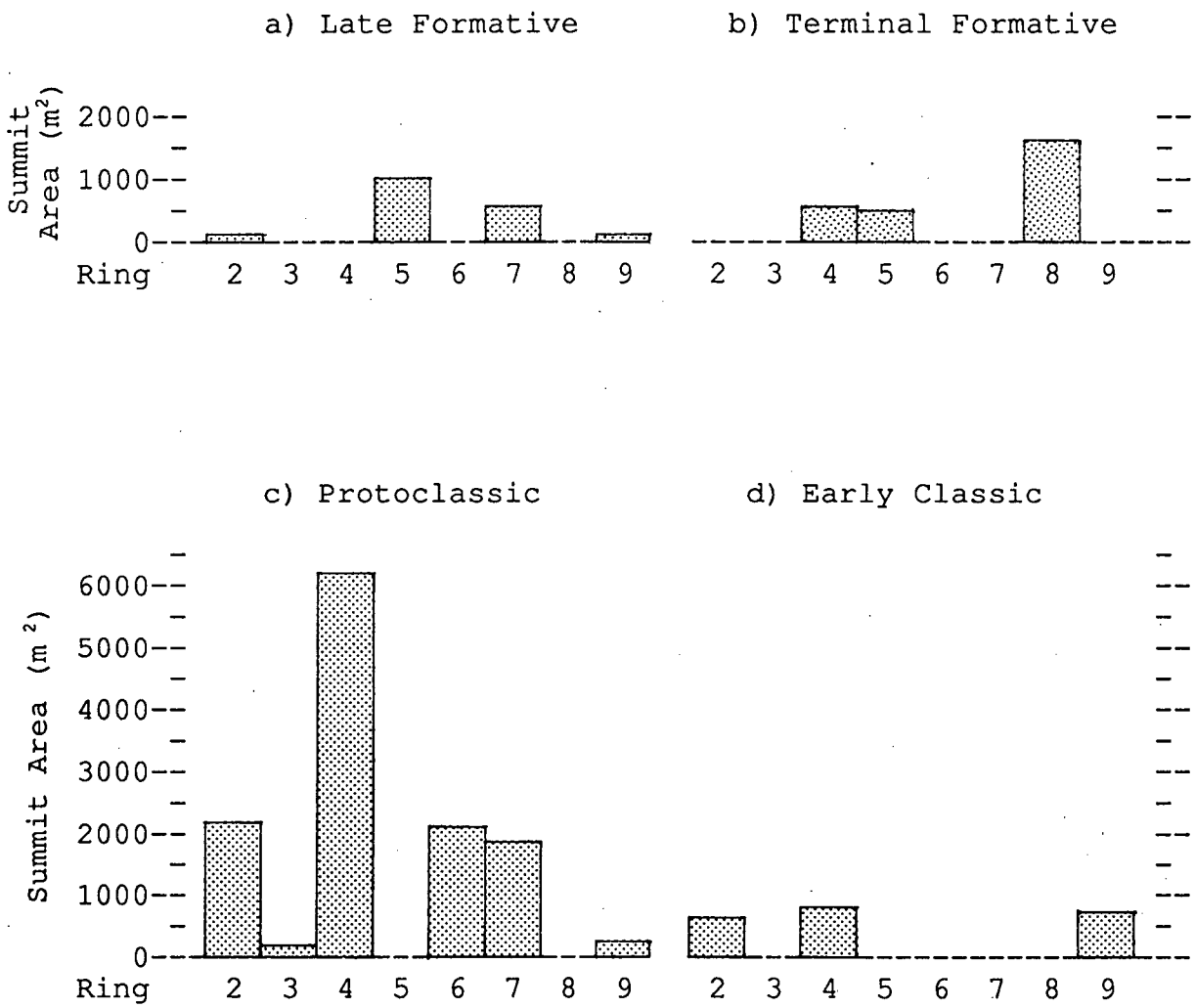


Figure 20. RURAL KAMINALJUYU. Mound Site Summit Area within the Study Area by Ring, Phase.

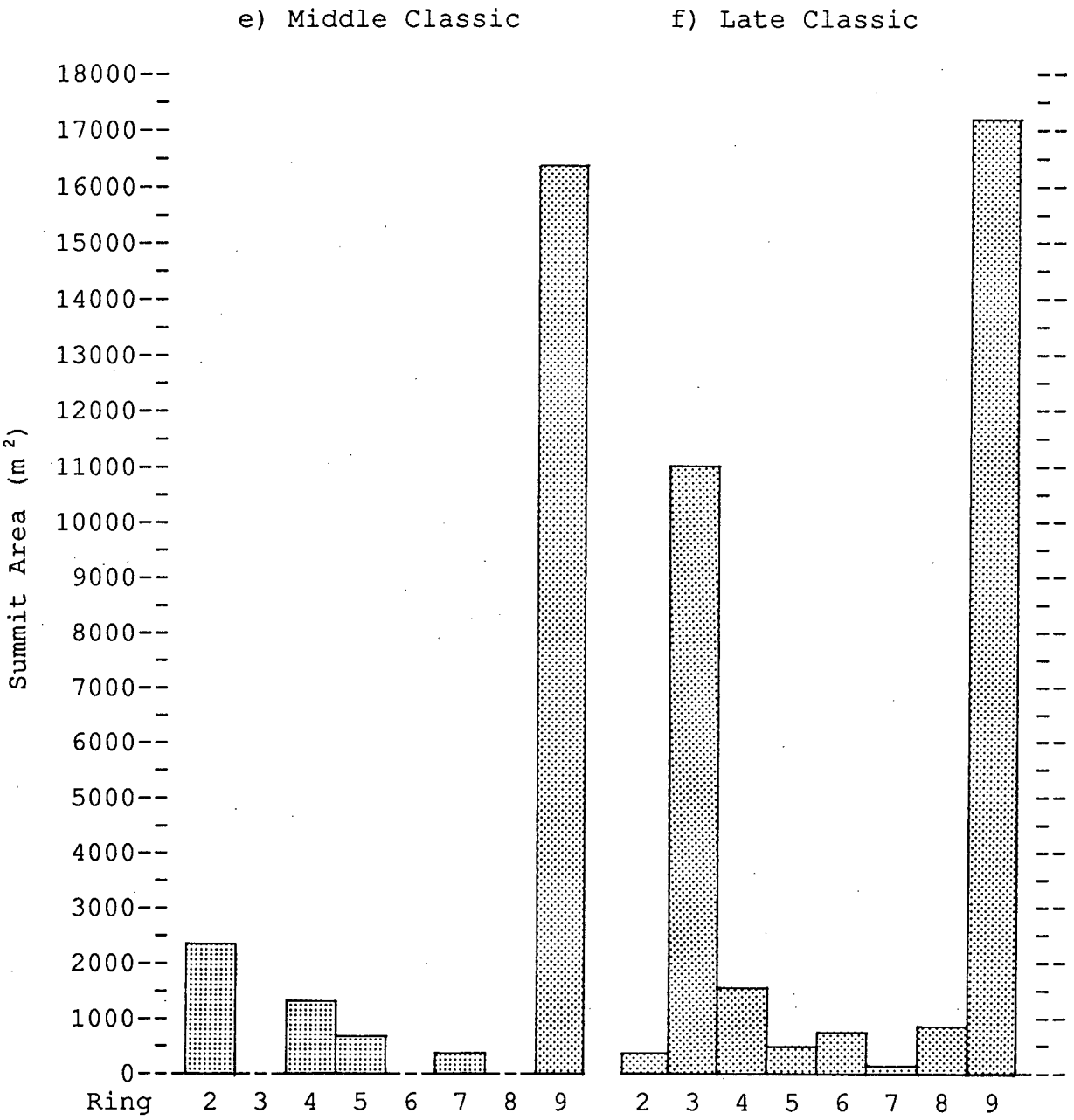


Figure 20. RURAL KAMINALJUYU. Mound Site Summit Area within the Study Area by Ring, Phase.

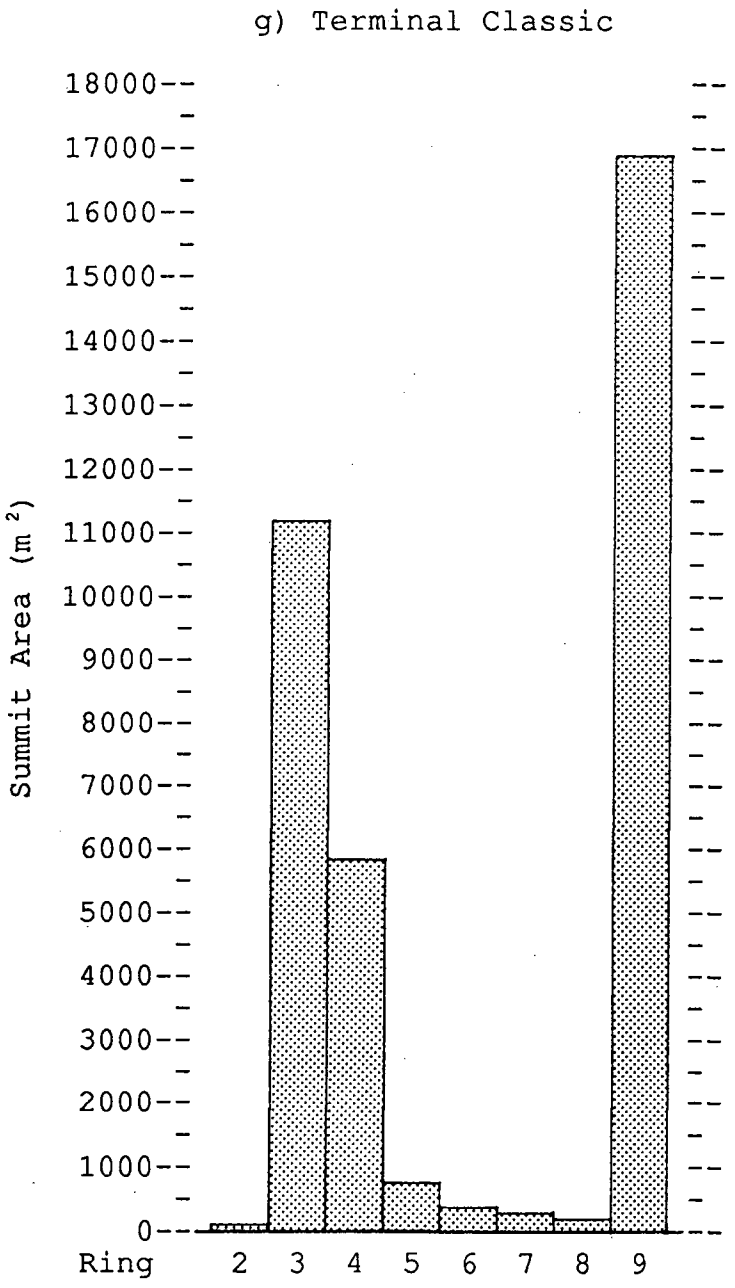


Figure 20. RURAL KAMINALJUYU. Mound Site Summit Area within the Study Area by Ring, Phase.

The Late Formative had a dispersed site (and population) distribution pattern, but Figure 20 reveals that one site in ring 5 (Mulato) contributed nearly one-half of the summit area (see Appendix A). This was an unusual site featuring an octagonally shaped platform enclosure which may have been associated with ritual functions. The balance of the summit area was distributed in the outer rings. This evidence confirms the decentralized pattern of the Late Formative, in contrast to expectations in the model. The Terminal Formative, with only three mound sites, had one site with a large summit area located in ring 8 (Roldan II). Interestingly, this site is comparable to the Middle Classic site of Solano, though on a smaller scale). It contained the majority of administrative space in the rural area, it was located in one of the outer rings, in the same general area as Solano, and appeared in a context of developed wealth trade (Alternative Formation). The generally weak and dispersed pattern of rural mound site development and the provision of administration space was sharply contrasted with the strong development of rural settlement. Protoclassic summit area distribution was very dispersed as indicated in Figure 6 e, though a large proportion of the summit area was contributed by a large platform at Naranjo. This site, as indicated by the presence of at least 33 stelae and an unusual site plan, was likely a ceremonial center (compare the Late Formative site of Mulato). Comparison with the Terminal Formative shows that the proliferation of summit area was associated with a clear pattern of administrative

decentralization. A dispersed, very weak development of summit area in the Early Classic was consistent with the distribution of sites apparent in Figure 6 f. Summit area was concentrated towards the inner rings (2 and 4), population size was low and fairly evenly distributed (Figure 7 g). As in the Terminal Formative the majority of Middle Classic summit area was provided by a single site (Solano) located in an outer ring. Otherwise, summit area was concentrated towards the inner rings, although population was fairly evenly distributed within the study area (Figure 7 g). Thus the Middle Classic had begun to display a spatial-administrative centralization pattern between two poles (Kaminaljuyu and Solano) that contrasted with population size and distribution, and that became more evident in the following periods. The Late and Terminal Classic were alike in demonstrating centralization of summit area in association with population centralization. In both cases, ring two contained very little summit area in spite of the extreme concentration of population. The pattern simply intensified in the Terminal Classic, as summit area increased in rings 4 and 5, but not in ring 2. Another pattern is clear; the summit area contributed by ballcourt enclosures increased towards the inner rings. They were clearly associated with population centralization and the development of secondary mound sites in rings 3 and 4 (but not ring 2). Meanwhile, the development in ring 9 continued, in population size, number of mound sites and summit area. The concentration of summit area is even more apparent in

Figure 20 f,g than for the concentration of mound sites and population (except in ring 2) in Figure 6 h,i.

This analysis of mound site summit area distribution reveals that there was a tendency to dispersed distribution of summit area in all periods except the Late and Terminal Classic. Of particular interest is the extraordinary amount of summit area (and population) consistently located in ring 9 (or ring 8 in the Terminal Formative), indicating either a bi-polar political organization or the encroachment of independent peripheral political units. In the Late and Terminal Classic, population increase and centralization was associated with summit area centralization and the construction of ballcourts, demonstrating further relationships between crowding, and increases in social complexity, political hierarchization and management workloads.

The examination of political-administrative activity (political maintenance) has contributed to the evaluation of the theory and model. For example, there was a general temporal trend in mound construction from an emphasis on large volume with small summit area to large or small volume with relatively large summit area. In the Terminal Classic the process was associated with minimal new mound construction and continued occupation, or reoccupation, of older mound sites. This was interpreted as indicating a shift from expressing status in construction (Late Formative) to expressing administrative-functional (bureaucratic, state-like) aspects of construction (most evident in the Late and Terminal Classic). This shift was also associated with rural

population size exceeding about 9,000 to 10,000 persons in the Terminal Formative-Protoclassic periods. The AR ratio indicated that there was an attempt made to maintain a scalar balance between population size and summit area. Increased social complexity, political hierarchization (from mound site classification), political delegation-decentralization (from prevalence of mound sites and summit area), was associated with summit area and population centralization (crowding) in the Late and Terminal Classic.

Nevertheless, the two-period cycle was apparent where political centralization amid rural population growth in the Terminal Formative and Middle Classic (Alternative Formation) was succeeded by political decentralization amid rural mound site development in the Protoclassic and Late Classic (Intermediate Formation). This was then followed by periods of political decline in the Early Classic and Terminal Classic (Late Formation), although these phases were not as close analogically as the other two sets. For example, the Early Classic lost rural complexity, population declined and most mound sites were abandoned. On the other hand both, experienced population centralization, increased use of marginal land, minimal core area elite and construction activity and indications of active warfare.

Finally, the analysis of summit area distribution shows that population centralization was not associated with political centralization (or by exercizing a monopoly on status and power),

but rather with political decentralization, as well as, in the Late and Terminal Classic, with social complexity and political hierarchization or delegation.

Discussion: Construction Activity in Rural Kaminaljuyu

This examination of construction activity in rural Kaminaljuyu supports some aspects of the model. For example, conspicuous monuments constructed to display status were present in the Late Formative, and were relatively more important for status display or ritual use than for functional or secular use. However, mound sites (six) occurred more frequently than expected in the rural areas (and much labor was expended on them), indicating that political power and status was not monopolized by central Kaminaljuyu. Construction activity associated with the Terminal Formative does support expectations for the Alternative Formation, but for different reasons. It was argued that elites engaged in long-distance wealth trade would have diminished interest in rural subsistence production, and this would lead to a de-emphasis on efforts to promote population growth. In fact, the opposite was the case. Rural population increased while settling on optimal agricultural lands and participated in at least one intensification project (the canal at mound group A-V-8). On the other hand, summit area devoted to administrative functions did not keep pace with population growth. Administrative and political control was definitely centralized at Kaminaljuyu. The alternative arguments are that local

administration was carried out at inconspicuous (non-mound) sites, or that the rural population in minor sites (e.g. hamlets), were relatively independent of central Kaminaljuyu. However, this contradicts the evidence that rural production was organized and directed towards supporting paramount center construction. The massive amount of construction, presence of richly-furnished tombs and elite trade goods, internal hierarchization at central Kaminaljuyu must have depended on the control rural productive support.

The balance of evidence supports the view that rural population growth occurred in a context of highly centralized political power. These argument is summarized as follows:

1. Subsistence and trade wealth appear to have reinfored one another to maximize production. Thus there was a likely a substantial productive (support) surplus.
2. Relatively little productive effort was invested by large rural populations in local development. There were few mounds sites, they had low status and required little labor input.
3. The low proportion of summit area relative to population size (AR ratio), indicates that administrative functions for the rural population were managed from a remote location.
4. The core area inhabitants, who represented a relatively low proportion of total population, enjoyed spectacular wealth evident in mound construction, elaborate burials and possession of imported and local wealth objects.

Consider also that the florescence of Terminal Formative

Kaminaljuyu was coincident with the decline of other Late Formative ceremonial centers in the Valley of Guatemala.

Thus, I think it reasonable to conclude that the surplus production appeared at central Kaminaljuyu, and that the elites at the site had a monopoly on status and power and supported it by organizing and controlling economic production and labor. Furthermore, the extent of Kaminaljuyu's political power at this time certainly extended throughout and beyond the Valley of Guatemala, and the elites likely received benefits from more distant places.

A scalar threshhold seems to have developed when rural population approached 10,000 persons at the end of the Terminal Formative, without any change in the administrative system, creating the potential for change as described in the model. The Protoclassic pattern with numerous rural centers with similar site plans was expected for the Intermediate Formation. Interestingly, Protoclassic site plans were similar to older Late Formative site plans (Murdy 1984:131-132), and unlike Terminal Formative patterns. As if to emphasize the change, Protoclassic sites were intent on displaying status as both labor demands and V/A ratios were high (Table 14 cols.1,3 and 5). However, mound sites were almost certainly dedicated to individual rulers. This is evident from a tradition of stone and relief sculpture, which recorded dynastic sequences with inscriptions in "Arenal" (Protoclassic) style and revealed a political focus on leadership associated with military themes (Parsons 1986:60-63). The

Protoclassic pattern of relatively independent, small- to medium-scale rural political units, with a strong a administrative component, themes of conflict, emphasis on status demonstration, decentralization of political-administrative power, lead to the interpretation that the polity was composed of a series of loosely integrated, highly competitive units.

The Protoclassic eventually gave way to the Early Classic "hiatus". While the dynamics of this change are not explicitly explained by the model, a period of conflict is proposed. As noted above, the population was even more centralized at Kaminaljuyu than in the Protoclassic, presumably in a defensive posture. There was little active trade, minimal construction activity and encroachment of commoner households on the core site (Michels 1979a). In rural Kaminaljuyu construction activity was also minimal, and administrative activity (summit area) and labor demands were minimal. In other periods, stagnancy in the polity was apparent at the core, or in the rural area, but not in both areas. Severe disturbances are evident in the Early Classic.

In the Middle Classic (closely aligned with the Terminal Formative,and the Alternative Formation), most of the rural support potential was concentrated at Kaminaljuyu and Solano, which represented two nodes of administrative and political centralization (though the question of Solano's political affiliation remains open). For the Middle Classic, which experienced another rural population surge, without equivalent rural development (with the exception of Solano), there was great

potential for change, as there had been under similar conditions in the Terminal Formative. Thus the transition from the Middle Classic to Late Classic is analogous to the transition from the Terminal Formative to the Protoclassic.

The Late Classic pattern agrees with expectations for the Intermediate Formation. New rural centers appeared, and they were hierarchically organized in at least three levels. Some were complex, multi-purpose sites (Cementerio), others were mid-sized less complex sites (Cotio, Colonia Abril), while others were small-scale with one or two mounds (Belen II, Garland). However, administrative workloads, increasing with population size, were not centralized at one or two primary sites. New facilities were created, and a balance between population size and administrative space was maintained. There was a certain emphasis on status demonstration in new construction (Table 14 col.1), but because population size was large (about 23,000 in rural Kaminaljuyu) and much older construction was "re-used", there was less demand for labor in construction, and more emphasis on providing space for (secular) administrative functions.

As in the Protoclassic, there was great emphasis on constructing new mound sites to mark the new distribution of administrative organization within the rural areas. As Figure 20 f shows, this distribution was dispersed in all rings, but most of the summit area was located in ring 3, particularly at sites with large platform enclosures (Cementerio, La Comunidad IA, Sanja, Guacamaya I).

The Late Classic pattern continued in the Terminal Classic, but all construction activity had declined. The relation between population size and administrative space was maintained, but few new sites appeared. The focus of construction activity had shifted from an emphasis on status to an emphasis on functional space.

In conclusion, this section shows that the study of rural construction activity does yield information about the centralization of administration which was not apparent from the examination of population and settlement patterns alone. For rural Kaminaljuyu, I was able to determine patterns of change in status demonstration and political maintenance; in most cases, explain these changes from phase to phase in terms of the model; and confirm areas where the model is weak.

To review an earlier discussion, centralization of status and political power (Terminal Formative) was supported by the monopolization of long-distance contact and trade wealth, by the control and promotion of local subsistence production and by agricultural intensification and population growth. This condition deteriorated with time and continued population growth and created the potential for change (scalar stress), even though the agents of change may have appeared from elsewhere.

Political segmentation and delegation followed, where rural populations were served more adequately by local sites (Protoclassic). However, political conditions were contentious, though the polity did maintain political-spatial integration.

This continued until the reappearance of an Alternative Formation in the Middle Classic, amid the politically weak Early Classic polity, possibly associated with the development of the Middle Classic trade network. The process was repeated through the Late and Terminal Classic, though the scale of the polity and its activities was much greater than in the Protoclassic and Early Classic.

CENTRAL KAMINALJUYU: MOUND CONSTRUCTION

The period of mound construction at central Kaminaljuyu is definitely known for six of the eleven defined phases, from the Late Formative (500 B.C.-200 B.C.) to the Late Classic (A.D. 600-800). Over 200 mounds have been recorded within central Kaminaljuyu. About 50 mounds have been investigated by archaeological excavation (for summaries, see Murdy 1984:300-301;529-570). Other mounds, many now destroyed, are known from a surface contour map prepared at 1 meter intervals (Shook 1952; reprinted in Michels 1979a:5).

Problems with this data base are similar to but more acute than those outlined above for rural mound architecture, including; uncertain dating, hidden components and mound destruction. Mound construction and periods of use were assigned according to criteria used by Michels (1979a:22-23) and Wetherington (1978:187-220). Mound dimensions were taken from available excavation reports. Remaining dimensions were estimated using the scaled surface contour map, including base and summit dimensions, and mound height. I am prepared to accept the limits imposed by these data as I require sufficient information to establish relative differences in construction activity between phases. In estimating volume, I applied the same procedures and formula used to calculate the volume of mounds in rural Kaminaljuyu. Results of the procedures are given in Table 15 B., which also presents summary data for mound construction at rural

Kaminaljuyu and for the entire study area. These data are shown graphically in Figures 21 to 26. Derivative values are found in Table 16.

Table 15. SUMMARY of CONSTRUCTION ACTIVITY: KAMINALJUYU.

	NEW VOLUME m^3	OLD VOLUME m^3	TOTAL VOLUME m^3	SUMMIT AREA m^2
A. Rural Kaminaljuyu				
LF	16856	0	16856	1887
TF	7133	0	7133	2723
PC	71604	0	71604	13162
EC	5315	3428	8743	2056
MC	95192	31749	126941	21463
LC	63809	95226	159035	32676
TC	6721	156032	162753	35567
	Fig.14		Fig.13	Fig.16
B. Central Kaminaljuyu				
LF	119295	0	119295	7797
TF	280498	74484	354982	18600
PC	129439	18413	147852	5868
EC	50834	42920	93754	4462
MC	110337	32814	143151	14353
LC	74201	102882	177083	17536
TC	0	0	0	0
	Fig.22		Fig.24	Fig.26
C. Kaminaljuyu Study Area (Rural + Central Kaminaljuyu)				
LF	136151	0	136151	9684
TF	287631	74484	362115	21323
PC	201043	18413	219456	19030
EC	56149	46348	102497	6518
MC	205529	64563	270092	35816
LC	138010	198108	336118	47029
TC	6721	156033	162755	35567
	Fig.21		Fig.23	Fig.25

Table 16. KAMINALJUYU CONSTRUCTION ACTIVITY. Table of Derivative Measures.

	CENTRAL KAMINALJUYU			KAMINALJUYU STUDY AREA			
	COLUMN						
	1	2	3	4	5	6	7
	V/A NEW VOL m	V/A TOT VOL m	TRIB. RATIO	TRIB. RATIO	AR ADMIN RATIO	ADMIN. CENT. %	CONSTR. CENT. %
LF	15.37	15.30	14.09	48.04	0.49	81	88
TF	15.08	19.08	38.29	39.26	0.45	87	98
PC	22.13	25.20	20.74	32.43	0.51	31	64
EC	11.46	21.12	11.00	12.15	1.40	69	91
MC	7.73	9.97	9.01	16.73	0.42	40	53
LC	4.21	10.10	3.33	6.19	0.58	37	54
TC	-	-	0.0	0.25	0.85	0	0

KEY:

Col.1 V/A ratio, central Kaminaljuyu; calculated as: aggregate mound volume/summit area for all new construction.

Col.2 V/A ratio, central Kaminaljuyu; calculated as: aggregate mound volume/summit area for total construction (in use).

Col.3 Tribute Ratio, central Kaminaljuyu; calculated as: new volume/rural population. Higher values indicate greater labor investment.

Col.4 Tribute Ratio, Kaminaljuyu study area; calculated as: total new construction/rural population.

Col.5 AR (Administration Ratio), Kaminaljuyu study area; calculated as: total population/total summit area. Lower values indicate greater availability of administrative space (services) per person.

Col.6 Administrative Centralization: percentage of total summit area located at central Kaminaljuyu.

Col.7 Construction Centralization: percentage of new volume located at central Kaminaljuyu.

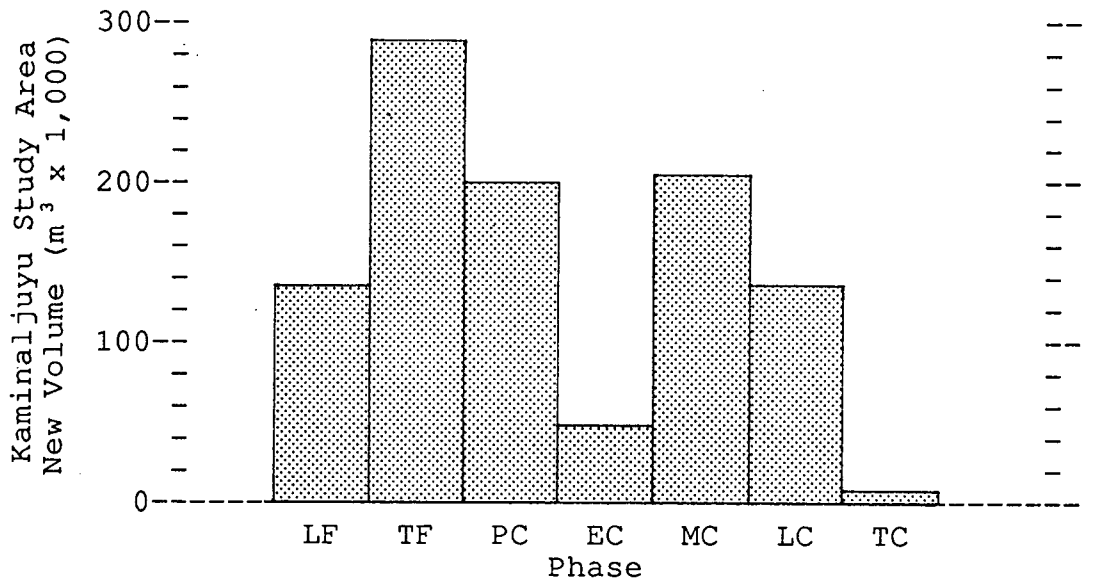


Figure 21. KAMINALJUYU STUDY AREA. New Construction Volume by Phase. (See Table 15).

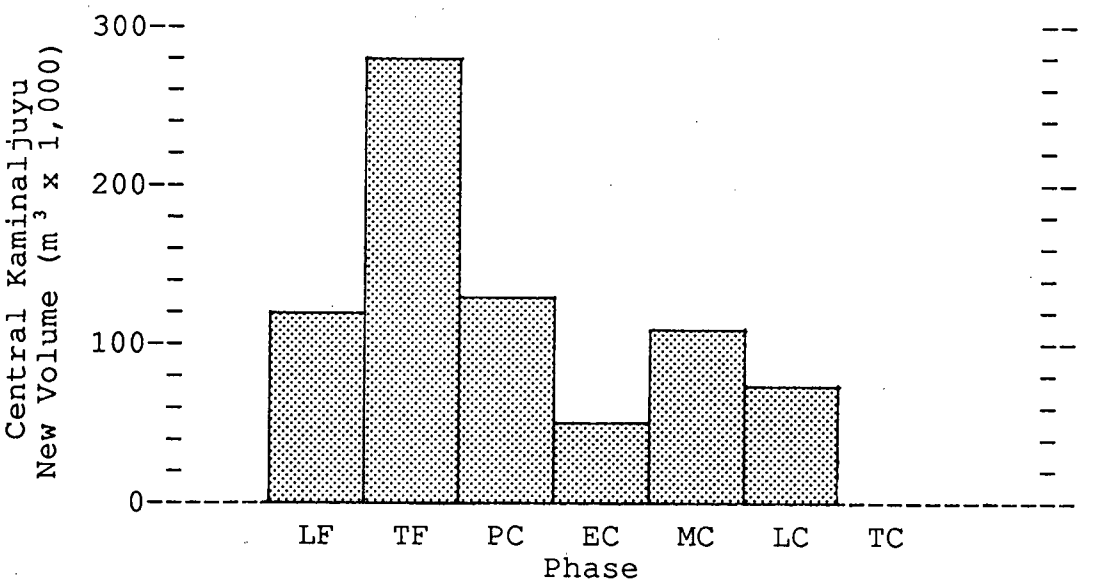


Figure 22. CENTRAL KAMINALJUYU. New Construction Volume by Phase. (See Table 15).

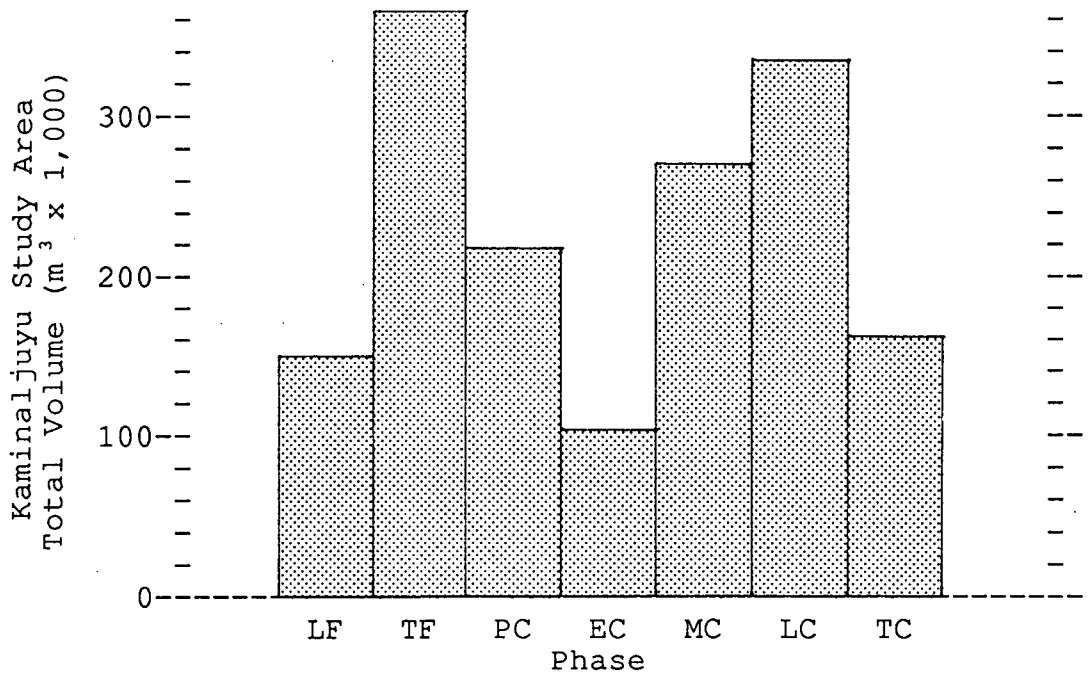


Figure 23. KAMINALJUYU STUDY AREA. Total Construction Volume in Use by Phase. (See Table 15).

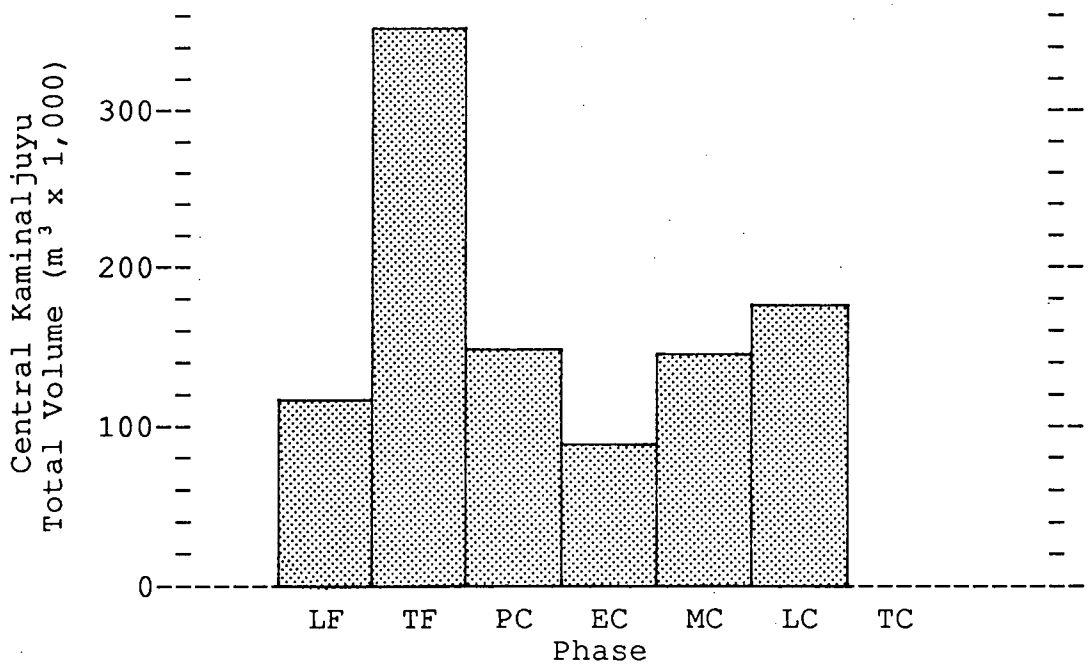


Figure 24. CENTRAL KAMINALJUYU. Total Construction Volume in Use by Phase. (See Table 15).

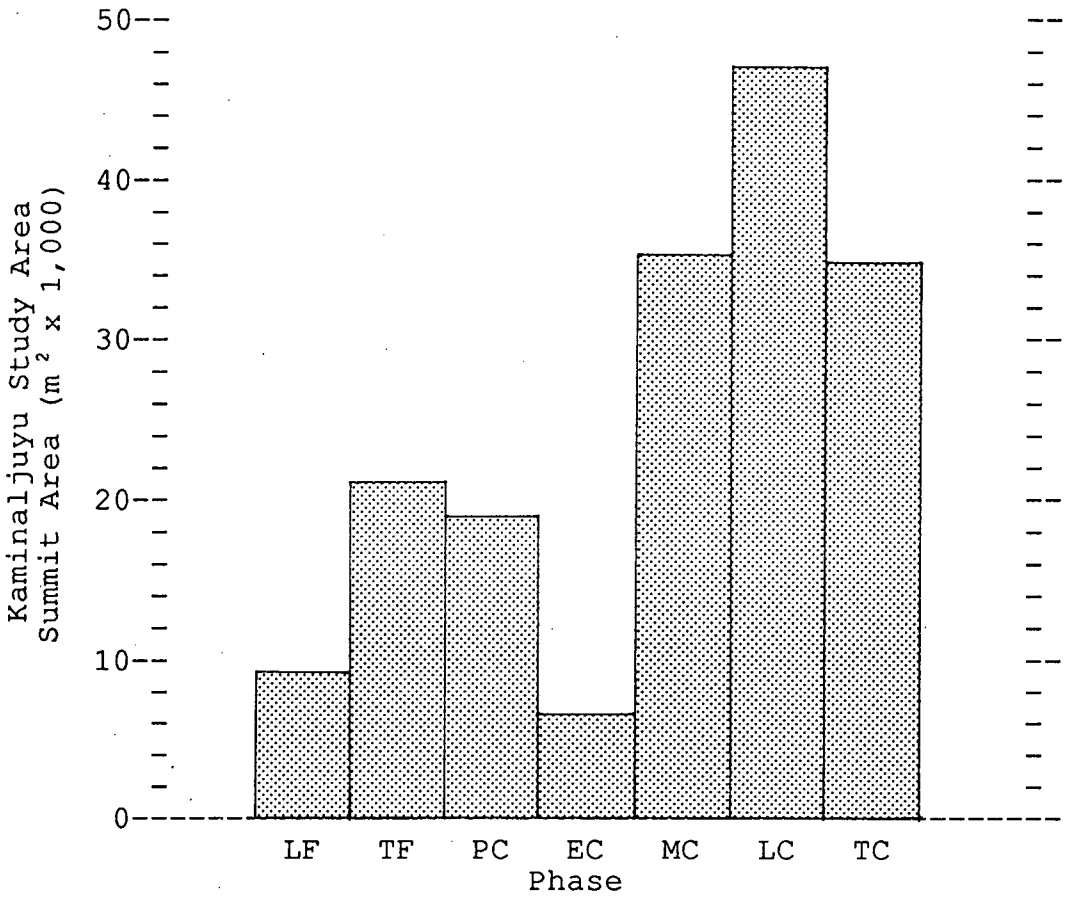


Figure 25. KAMINALJUYU STUDY AREA. Total Summit Area in Use by Phase. (See Table 15).

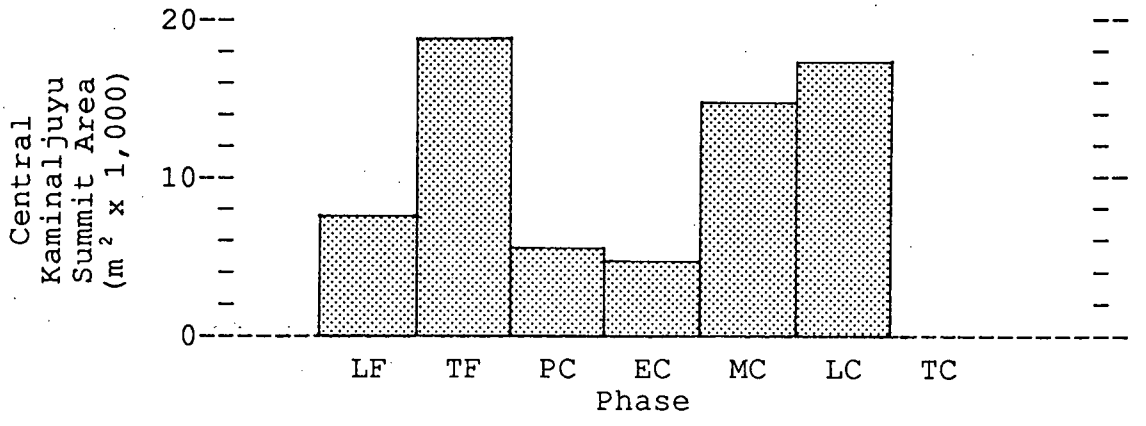


Figure 26. CENTRAL KAMINALJUYU. Total Summit Area in Use by Phase. (See Table 15).

This section on construction activity at central Kaminaljuyu is divided into two parts. The first part examines construction volume and derivative measures relevant to the study of status demonstration. The second part examines construction summit area and derivative measures for both central and rural Kaminaljuyu as a means to study political maintenance (administration) in the study area.

Construction Volume and Status Demonstration

This analysis examines construction volume at central Kaminaljuyu and its components including new and total (in use) construction (Table 15 A.-C.), and derived indices (Table 16), such as labor investment in construction (tribute ratio), status ranking of construction (V/A ratio) and centralization of constructed volume (% of construction at central versus rural Kaminaljuyu).

The general qualitative pattern of construction is summarized as follows.

1. Late Formative. Very active new construction in at least five large, formally-planned mound groups similar to mound groups found at sites elsewhere in the region (Murdy 1984:112-116). Kaminaljuyu was the largest of these sites. Presumably, there were no significant older (Middle Formative) mounds to use as core structures, so the construction effort in the Late Formative was substantial. These mounds were most likely built as lineage monuments groups, not as personal monuments, because, although

some mounds contained burials (Mounds B-IV-1, B-V-6 and B-V-15), they were not elaborate, containing mainly utilitarian goods (Murdy 1984:118).

2. Terminal Formative. New, massive mound groups were formed (Mound groups C-I-6, C-V-9 and E-III-3). In two cases (Mound groups A-V-8 and C-III-7) there was substantial overbuilding of Late Formative groups. Mounds were more numerous (68) and diverse in size and form than at any other time. There was a clear emphasis on conspicuous, "personal" monumental construction containing richly-furnished tombs (Mounds E-III-3 and D-IV-2).

3. Protoclassic. A period of very active, mound group construction. All Terminal Formative mound groups were abandoned and 12 smaller mound groups were constructed around the perimeter of the older Late and Terminal Formative groups. Michels (1979a:25-28, 27, Figure 7) has argued that this represents the division of the older mound (or lineage groups) into separate moiety groups. This pattern of active construction, in tightly organized groups, dispersed in space was also apparent in rural Kaminaljuyu.

4. Early Classic. Very little new mound construction (Mound groups B-I-4 and D-II-4), and continued occupation of most Protoclassic mound groups.

5. Middle Classic. The Early Classic construction "hiatus" was followed by the resurgent Middle Classic in which construction activity was concentrated in the Acropolis and Palangana complexes, and nearby mound groups. Smaller, isolated complexes

appeared at this time in peripheral areas of the site (Mound groups E-V-1, F-VI-2 A and B, D-IV-6 and B-III-5). Formally planned ballcourt complexes appeared at the site for the first time (D-IV-6 and B-III-5).

6. Late Classic. Although there was continued occupation of the massive, imposing structures of the Middle Classic, new construction involved enclosure of the Palangana with connecting platforms and further raising of the Acropolis platform. Scattered new ballcourt complexes appeared (E-V-2, F-V-1 and B-IV-20), while older ones continued in use (B-III-5 and C-III-3).

7. Terminal Classic. There was no new construction and all mound groups were abandoned. Although there is evidence of (elite) occupation in central Kaminaljuyu during this period, none was definitely associated with any mound construction (M. Hatch, personal communication 1990).

A quantitative description of construction activity is presented in Table 15 B. This shows that, at about 280,000 m^3, the volume of new construction in the Terminal Formative was more than double that of the next ranked period (130,000 m^3 in the Protoclassic). This was closely followed by the Late Formative (120,000 m^3) and the Middle Classic (110,000 m^3). The periods of least active construction were the Late Classic (75,000 m^3) and the Early Classic (50,000 m^3). No construction is assigned to the Terminal Classic.

All Late Formative construction was contributed by new

construction. Total (as opposed to new) construction volume in use during the Terminal Formative, at about 355,000 m^3, was again more than double that of the next highest total (177,000 m^3) in the Late Classic. However, most of the total volume in the Late Classic was contributed by the retaining older construction (103,000 m^3), in particular at the Palangana and Acropolis complexes. The Protoclassic (148,000 m^3) and Middle Classic (143,000 m^3) were relatively equal in volume used, though the latter period carried slightly more earlier construction. At 94,000 m^3, Early Classic total volume was again well below that of the other active periods, and nearly one-half of this total (or 43,000 m^3) was contributed by older (mostly Protoclassic) construction.

Thus, the Terminal Formative was by far the most active period in which mounds were built and used, in sharp contrast to rural construction activity at this time (7,133 m^3). The Early Classic (excluding the Terminal Classic) was the least active, as was rural construction at this time (5,313 m^3). The Protoclassic and Middle Classic, though equally active, were differentiated as about 80% (or 89,000 m^3) of the Middle Classic new volume was concentrated in the core ceremonial area (Acropolis and Palangana), while Protoclassic new construction was dispersed in various relatively equal-sized mound groups throughout the core area. As noted above, most of the Late Classic construction was carried over from the large Middle Classic complexes, supplemented by new construction to enlarge and enclose them.

Tribute Ratio

The tribute ratio (Table 16 col.3) measures the amount of new construction (volume) per rural population. It is a general measure of the amount of labor (tribute) invested in construction for (elite) status display. It was calculated with the assumption that elite core area inhabitants did not contribute to construction labor. This is a relative measure since it does not account for variations in population size within each period, and it assumes that the size of the labor force (adult, able-bodied males) was a constant proportion of the rural population.

The tribute ratio shows that labor for Terminal Formative core area construction was emphasized most (38.29 m^3/person). It may be argued however, that labor demands for the Terminal Formative are somewhat misleading as construction labor was drawn from a labor pool larger than that present within the bounds of the study area, mainly due to the regional extent of Kaminaljuyu's political influence at this time. Thus, labor may include transient labor from captives or outlying districts' tribute obligations. However, it is also clear that most sites in the Valley of Guatemala and adjacent regions had been abandoned at this time (Murdy 1984:128). Thus populations from these areas were not available for labor commitments, or formed only a minor component. Possibly, they were relocated closer to Kaminaljuyu, where they appear in the study area.

Protoclassic labor investment (20.74) was second only to the Terminal Formative, followed by the Late Formative (14.09). These

follow the same rank order as new construction volume. However, the Early classic ranks next (11.00), even though new construction volume was the lowest among active periods. This is partially explained by the very low rural population total at this time, and it is possible, since non-elite households formed the majority of habitation components at central Kaminaljuyu (Michels 1979a:165-167,219), that some core area popoulation contributed to construction labor. The tribute ratio for construction decreased sharply through the Middle and Late Classic. Even though rural population increased the amount new construction within the core area declined. Finally, in the Terminal Classic, as population size peaked, there was no new construction.

From this examination it is apparent that construction at central Kaminaljuyu was the focus of labor investment in the earlier periods up to and including the Protoclassic. Thus, there was a greater emphasis on expressing status through investment of tribute and public labor in monumental (lineage or personal) construction. However, during and after the Middle Classic, there was relatively less investment in construction, exactly when the rural labor potential was greatest. Clearly priorities had changed as public energy was invested elsewhere or simply not subject to centralized control.

Finally, the tribute ratio for construction at both central and rural Kaminaljuyu combined (Table 16 col.4) shows a very consistent pattern. Labor demands for construction decreased

uniformly with time (except for the Early Classic-Middle Classic periods). There are two possible explanations for this pattern. First, labor investment may have been generally required for each household in the earlier periods, when population was relatively small and when the emphasis was on demonstrating status. As the Late Formative appears to have been relatively egalitarian, perhaps this labor was contributed to support the local lineage, rather than a paramount leader. Second, the absolute number of construction laborers may have been similar in all periods, but restricted to a specialized class in the later periods. This would account for the relatively consistent amounts of volume constructed in each phase (Table 15 C.), with the notable exceptions of the Early and Terminal Classic, even though population size was much greater in the later periods. Presumably, the remainder of the population was left free to carry out other specialized activities. Thus, the tribute ratio may be an indicator of social specialization.

Volume to Summit Area Ratio (V/A)

The volume to summit area ratio (V/A) is presented in Table 16 (cols 1,2) for both new and total construction at central Kaminaljuyu. This indicates the emphasis on status display or rank in construction (volume) relative to the administrative or functional component of mounds (summit area).

The Late and Terminal Formative rated equally for V/A values, even though the latter period had a greater amount of

total construction (col.2). This indicates that there was a similar emphasis on mound function (with a focus on to status demonstration), even though the later mounds were larger and more numerous (46 mounds at 2,593 m^3 each in the Late Formative, and 68 mounds at 5,220 m^3 each in the Terminal Formative).

Demonstration of status was important for the Protoclassic polity. Central Kaminaljuyu ranked first in this category for both new (V/A=22.13) and total (V/A=25.20) construction, ranking even higher than the Late and Terminal Formative. This pattern of status demonstration was also apparent in rural Kaminaljuyu, where the Protoclassic ranked a close third, after the Late Formative and Middle Classic (5.44, Table 14 col.1). The emphasis on status demonstration was supported by substantial labor investment (Table 16 col.3).

The Early Classic V/A (11.46 for new construction) indicates a sharp decline in construction activity and scale. It is clear that the V/A value for total construction (21.12) is accounted for by continued utilization of many high status Protoclassic mound groups (for example, groups D-IV-5, C-VI-1, D-V-3 D-V-1, A-III-4). Thus, though labor was less available for mound construction, status was maintained through the use of older mounds.

Finally, the V/A values for the Middle Classic (7.73) and Late Classic (4.21), when construction was focused at the two large complexes, indicate an emphasis on summit area. This is attributed to the technique of constructing broad platforms on

high, steep-sided bases, unlike earlier methods of building pyramid-like mounds with small summit areas. These facilities were also very complex, as the platforms supported a variety of raised mounds and sunken plazas.

This final analysis of construction volume examines the degree to which new construction (or emphasis on status through construction and control of labor) in the study area was concentrated at central Kaminaljuyu. This measure of political/status centralization is given as the percentage of new volume located at the core site relative to that at rural sites (Table 16 col.7).

Construction centralization was most evident during the Late Formative (88%) and Terminal Formative (98%). In both phases, centralization was associated with a focus on status demonstration and tribute demands (Table 16 cols 1, 3). The Terminal Formative differential between the rural and central volume was outstanding, particularly given the degree of population decentralization (23.8%) at central Kaminaljuyu. During the Protoclassic, only 64% of constructed volume was located at central Kaminaljuyu, even though the amount of new volume here was ranked second overall. This indicates the strength of the decentralization processes in the Protoclassic, and also shows that it was associated with an emphasis on status components in all new construction. Centralization in the Early Classic (91%) is explained by minimal construction at rural Kaminaljuyu. This was not accompanied by massive construction at

central Kaminaljuyu (as in the Terminal Formative) since both central and rural areas ranked last in amount of construction. Relative to the Protoclassic, there was a clear decline (or reversal) of all status indicators used in this study (Table 14), and a general decline of cultural activity in the Early Classic was associated with extreme population centralization. These conditions argue against the hypothesis that population centralization correlates with greater political power. In the Middle Classic, although central Kaminaljuyu contained only 53% of constructed volume, most of this was found in the two main complexes. This construction amounted to about 80% of new volume at the site and 33% of the study area volume. Furthermore, a large portion of the rural volume was invested at Solano, which together with central Kaminaljuyu, accounted for 87% of all new volume. So amid apparent decentralization of construction, there was in fact centralization at two nodes with approximately equal amounts of construction at each one.

In the Late Classic, as in the Protoclassic, there was a relatively equal balance between rural and central construction. In both cases, this was associated with active new construction in the rural area. However, Late Classic construction was dominated by additions to the Acropolis and Palangana, rather than the wholesale creation of new mound groups, as in the Protoclassic. Thus, there was more continuity in construction between the Middle and Late Classic than between the Terminal Formative and Protoclassic.

This analysis of status demonstration as evident from volume of construction in central Kaminaljuyu shows that status was important in the earlier periods up to and including the Protoclassic. However, this mode of status expression was dominant in the Protoclassic in both central and rural contexts. minimal mound site development at central Kaminaljuyu in the Early Classic was also apparent in rural areas. High status Protoclassic mounds were often carried over into this period in both areas. It seems that the Early Classic was a period in which elite power and status was greatly diminished. During the Middle Classic construction activity was renewed, but there was less emphasis on status and labor investment in construction. There was evidence of centralization of construction effort (Kaminaljuyu and Solano), although the labor investment was not great relative to earlier periods and to population size. These conditions indicate a fundamental difference in construction behavior between the two representatives of the Alternative Formation, for while the Terminal Formative had centralized construction, it was located at the core site alone, and was associated with higher labor investment and status. Finally, in the Late Classic, new construction in both rural and central areas placed much greater emphasis on the provision of summit area.

The examination of construction activity at central Kaminaljuyu shows that there were periods of continuity and disjunction, but these changes were not clearly defined in a two-

period cycle. For example, the transition between the Terminal Formative and Protoclassic was very sharp as all large mound groups were completely replaced by dispersed, small scale groups with an emphasis on the status-ritual component. This pattern was parallel to that in the rural area described earlier (that is, replacement, dispersal, emphasis on status, active construction). On the other hand, there was strong continuity between the Middle and Late Classic, even though there was great change and decentralization in rural areas analagous to that between the Terminal Formative and the Protoclassic.

Although there was little continuity between the Protoclassic and Early Classic in rural Kaminaljuyu, there was greater continuity in the core area. Nevertheless, the polity in the latter period was distinctive as it maintained status by utilizing of older mounds in the decline of access to labor. The expected analagous shift from the Late Classic to the Terminal Classic showed no continuity as all mound sites were abandoned, even though occupation of the site continued.

However, in examining the sequence of new volume alone (Figure 22), there is a pattern showing two peaks (Terminal Formative and Middle Classic), followed by two successive periods of declining construction. This also shows that the second cycle had less emphasis on volume of construction, even though the labor potential was greater. Figure 22 is clearly contrasted with Figure 26 (summit area in use at central Kaminaljuyu), which shows the comparative emphasis on summit area even when the

volume declined.

Although the site of Kaminaljuyu remained important in all periods, there were changes in the activities of the elite segment and their means of expressing status and power. In the earlier periods, they monopolized and centralized power and labor and this was expressed in mound construction. In the later periods, particularly during and after the Middle Classic, there was much greater concern the provision of summit area in both the central and rural areas. The effects of scale became relevant as the administration of a large population became more complex and required greater delegation of administrative functions and more specialized space in which to carry them out. At some point, this involved a transition to a type of bureaucratic administration characteristic of (archaic) state-level political organization.

Summit Area and Administration

This analysis examines the provision of summit area at central Kaminaljuyu as a means to study aspects of political administration. The components of analysis include the calculation of summit area (Table 15 B.), and derived measures such as the administration ratio (AR, Table 16 col.5) and administrative centralization (% of summit area at central Kaminaljuyu versus rural Kaminaljuyu, Table 16 col.6).

Totals for the amount of summit area located at central Kaminaljuyu are given in Table 15 B. One might assume that the totals would correlate with the amount of volume, but as the V/A

ratio shows, this was not the case. While the Terminal Formative had the most summit area (18,600 m^2), this did not occur (as with volume) in double the quantity of the next highest total. In fact, it was just slightly larger than the total for the Late Classic (17,500 m^2), and only 30% larger than for the Middle Classic (14,000 m^2). While the Protoclassic ranked second for the provision of new volume, it ranked only sixth in summit area (5,900 m^2), ahead of only the Early Classic (4,500 m^2). The most outstanding feature of the sequence is that the later periods, particularly the Middle and Late Classic had a disproportionate amount of summit area relative to mound volume.

Since the category of summit area for central Kaminaljuyu relates to the conduct of political administration for the entire study area, the summit area of rural Kaminaljuyu must be included in the analysis. Therefore, the administration ratio (AR) was calculated as the ratio of total population in the study area to total summit area. This measures, in effect, the amount of space (summit area) available to service each person, and facilitates the examination of population change and administrative stress. The following is a review of temporal changes in political administration at central (and rural) Kaminaljuyu as revealed by analysis of summit area and derived measures.

Based on the spatial distribution of summit area in the Late Formative polity, administrative activity was concentrated at Kaminaljuyu, which posessed over 80% of the summit area in the study area (Table 16 col.6). While the rural area was poorly

serviced (AR=1.50, Table 14 col.8), the overall AR was comparable with other periods (AR=0.49, Table 16 col.5).

Administrative centralization was clearly apparent in the Terminal Formative as 87% of the summit area was located at central Kaminaljuyu. The degree of centralization is also evident with a comparison of the AR for rural Kaminaljuyu (2.69, Table 14 col.8) and central Kaminaljuyu (0.45, Table 16 col.5). This centralization appears to carry forward a trend begun in the Late Formative. Note again that, when the summit area of central Kaminaljuyu is included in the calculation of study area AR, the value is comparable with other periods (Table 16 col.5). That is, the apparent "shortage" of summit area in the rural area was accommodated by provision of space at central Kaminaljuyu. The centralization of administrative activity (summit area) is all the more revealing as the population of central Kaminaljuyu was only about 24% of total population, and of unusually high status (Michels 1979a:226-227). The Terminal Formative elites were able to carry out the program of centralization while actively engaged in elite long-distance trade, and against the (decentralizing) pattern of population growth. The inference is that elites were able to maintain monolithic, centralized power using wealth goods to control and finance distant administrative activities and rural populations.

As if to compensate for the hyper-centralized political system of the Terminal Formative, extreme decentralization was apparent in the Protoclassic. The majority of political

administrative space (69% of total summit area versus 13% in the Terminal Formative) was located in the rural area, outside of central Kaminaljuyu. The contrast is further emphasized since total population was virtually identical (9,616 for the Terminal Formative to 9,647 for the Protoclassic). Decentralization processes were expected on the basis of previous analysis of construction activity and settlement in rural areas, but this scale of decentralization is surprising.

The model for decentralization of the subsistence based political system (Early Formation) expects that rural mound sites will appear with frequency and that they will be similar in plan and form, but smaller in scale than, mound groups at the core because political power will be delegated by the paramount leaders to account for population growth and the development of political competitors in poorly serviced rural areas. Apparently, this process of change applies for the transition from a centralized trade based (redefined Alternative Formation) political system. The key factor is the power differential between the central and rural areas in a context of rural population growth.

An examination of Protoclassic mound groups (Table 17) shows that the 12 mound groups assigned to central Kaminaljuyu (Michels 1979a:27) averaged about 12,000 m^3 in volume, while the 13 mound groups in rural Kaminaljuyu averaged about 5,500 m^3 each. Since Kaminaljuyu mound groups consisted of 2 to 6 (average=4) mounds, while rural groups consisted of 1 to 6 (average=3.75) mounds, the

individual mounds at central Kaminaljuyu were much larger. However, summit area averaged about 1,200 m^2 at rural sites but only about 500 m^2 at Kaminaljuyu.

TABLE 17. PROTOCLASSIC MOUND GROUPS: KAMINALJUYU. Construction Activity.

	RURAL KAMINALJUYU	CENTRAL KAMINALJUYU
NUMBER of MOUND GROUPS	13	12
MOUNDS per GROUP		
-Range (min-max)	1-6	2-6
-Average	4	3.75
AVERAGE VOLUME per GROUP (m^3)	5,500	12,000
AVERAGE SUMMIT AREA per GROUP (m^2)	1,000	500

This is explained as each mound group at Kaminaljuyu, unlike rural groups, contained a single high pyramid mound (for example, D-IV-5, D-V-3, C-VI-1, D-III-14), which contributed greatly to measures of status demonstration, while some rural mound sites (for example, Naranjo), provided large low-lying platforms, which contributed more to measures of administration (summit area). This examination points to a functional difference between central and rural groups, showing that full duplication of central mound types did not occur in rural Kaminaljuyu. Rural mound groups were associated more closely with administrative functions, and political authority was distributed among thirteen

mound groups in the study area. Nevertheless, rural mound groups were in many ways similar to central groups. For example, status demonstration was still important among rural groups, and the site plans were similar to central groups, but smaller in scale. Thus, it seems that the Protoclassic polity was not necessarily more complex or hierarchical than the Terminal Formative polity simply because there were more secondary sites. Rather, it seems that the Terminal Formative system of political administration simply fragmented into series of small-scale units. The main evidence of specialization was that the rural sites were oriented to administration and the core sites to status display, indicating that there was some interdependence between the two. Thus, the Protoclassic is a good representative of the process of decentralization of political power as described in the model for the Intermediate Formation.

Administratively, Early Classic populations were poorly serviced. The AR for the rural area (AR=2.25, Table 14 col.8) was not accommodated by the provision of summit area of central Kaminaljuyu area was included (AR=1.40). This condition in Early Classic Kaminaljuyu is clearly contrasted with superficial similarities in administrative organization in the Terminal Formative (AR=2.69), when underdeveloped rural facilities (AR=1.50) were accommodated by massive development at the core (AR=0.45). Consequently, the indices for the Early Classic represent a lapse (or hiatus) in political and administrative activity in both central and rural Kaminaljuyu.

The re-emergence of the wealth based economic system in the Middle Classic appeared within a politically weak context (Early Classic), as proposed by Fox (1977:75). Administration (summit area) became "re-centralized" (87%) between two nodes (Kaminaljuyu and Solano). The population was well-served by administrative space (AR=0.42), as it was in the Terminal Formative. Most of the summit area was provided in large complexes with specialized or diverse architectural forms (Acropolis and Palangana). Brown has argued, on the basis of the distribution of goods and production places, that the local elites did not participate directly in the trade system (as they had in the Terminal Formative) other than by collecting fees or "royalties" from the traders (Brown 1977:334-339,352). Implicitly, the wealth based economy had become somewhat specialized and was not under the exclusive control of the local political leaders. He further argues that trade valuables were differentially distributed among the elite classes, indicating a political financing system was in operation (Brown 1977:326-330). Together with evidence of an emphasis on summit area in construction and diversification of types of spaces provided in the Acropolis and Palangana, it is apparent that a complex, internally specialized political system was already in operation during the Middle Classic.

Population had increased greatly during the Middle Classic, and continued to increase in the Late Classic. However, administrative control (though showing internal specialization)

had been centralized at Kaminaljuyu (and Solano) in the Middle Classic. This was in some ways analagous to the transition from the Terminal Formative to the Protoclassic. Yet, by the Late Classic, population size was much greater (9,647 in the Protoclassic but 27,207 in the Late Classic) and the administrative complexity and specialization was much greater.

If population growth was promoted in the Middle Classic, then the consequences were apparent in the Late Classic. The administrative system had the potential to decentralize, as it had at the end of the Terminal Formative, under similar conditions of "scalar stress". Consequently, rural mound sites appeared as noted above, and they were more complex (for example, Cementerio, Sanja, Guacamaya I) and hierarchically organized, and the cultural system itself was more complex socially (Tables 6 and 7). The AR shows that there was a balance between population size and summit area, but nevertheless showing signs of stress (AR=0.58 and rising). Based on evidence for V/A ratios (Table 16 cols 1 and 2), political leaders were becoming more concerned with administrative activities. This emphasis on administration was, as noted above, already operating in the Middle Classic. Michels had taken a similar point of view, arguing from analysis of changes in site plans (closure) and the decline of elite ceremonialism that Late Classic society was more "secular" than before (Michels 1979a:216-220). If the parallel with the Protoclassic is reasonable, then there was greater competition among various groups and sub-groups. This architectural evidence

is further supported by the appearance of ballcourt complexes and sculptural traditions emphasizing military themes (Parsons 1986).

Although the parallel with the Terminal Formative-Protoclassic change (Early Formation to Intermediate Formation) is apparent, it is clear that the decentralizing transition from the Middle Classic to the Late Classic was marked by a greater degree of rural specialization and complexity (and greater population size). At central Kaminaljuyu, there was greater emphasis on the provision of summit area at the expense of status display. This is evident as earlier constructions, in particular the at Acropolis and Palangana (as were not replaced as were the large mound groups of the Terminal Formative), but maintained and enlarged. Thus, although the processes were similar (decentralization), the scale and complexity of the administrative system was much greater.

Although rural mound site activity continued into the Terminal Classic, the core area, while occupied, contributed no new construction and the Late Classic mound groups (Acropolis and Palangana) were abandoned along with the other groups. Apparently, administrative associations between central and rural Kaminaljuyu had been disrupted. Unlike the Early Classic, even minor construction activity was absent at central Kaminaljuyu. Thus, all measures for construction activity in Tables 15 C. and 16 refer to data for rural Kaminaljuyu alone.

There are two main observations drawn from these analyses of political administration. First, despite wide variations among

periods in the amount of summit area provided and in population size, the AR shows remarkable consistency for the entire study area (Table 16 col.5). Excluding the Early Classic, there was certainly a balance between the two variables when central and rural Kaminaljuyu are considered together. Despite variations in the centralization of political authority, status hierarchization and construction activity; administrative functions and the provision of space for them was important and was consistently associated with population size (AR). This is the best indicator of the effects of (forced) population growth found in this study (Terminal Formative and Middle Classic). Second, there is a pattern in the administration ratio which corresponds with the two-period cycle. The two lowest values occurred in the Terminal Formative (0.45) and Middle Classic (0.42), which also correspond to the periods of greatest centralization of summit area (87% when Middle Classic Solano is included with central Kaminaljuyu). The subsequent periods in each case (Protoclassic and Early Classic; Late and Terminal Classic) indicate gradual increments in the value and a clear change after the second (Early Classic and Terminal Classic). This indicates that spatially centralized administration (Terminal Formative and Middle Classic) required relatively more summit area (and complexity) to service the population. In the context of rapid rural population growth and dispersed population distribution, there may have been difficulties associated with conducting operations of the required scale at these distances, despite the financing

advantages offered by the use of portable valuable goods. The vulnerability of these administrative systems was evident in the decentralization processes that occurred in the subsequent periods (Protoclassic and Late Classic).

Evaluation of Construction at Central Kaminaljuyu

For the Early Formation, I expect to find active, centralized construction with an emphasis status display (V/A). At central Kaminaljuyu, the V/A ratio (for new construction) in the Late Formative (15.37) ranked second highest among the six phases (Table 16 col.1), though ranking first in the rural context (8.93, Table 14 col.1). However, labor demands for combined rural and central construction were higher than for any other period (5.95, Table 16 col.5).

By these measures, administration, construction activity and population were almost entirely concentrated at central Kaminaljuyu in the Late Formative. However, the display of status was associated more with the lineage group than with the individual leader or chief. Therefore, the Early Formation, for which I expect political centralization to accompany the appropriation of community powers and conspicuous display, is not well-represented by the Late Formative polity.

The Terminal Formative is a better candidate for the Early Formation. It exhibits the highest values for summit area (87%) and volume (98%) centralization with a clear emphasis on conspicuous, "personal" monumental construction, with richly-

furnished burials (Mounds E-III-3; D-IV-2). However, since there was a clear involvement with long distance trade at this time, it is apparent that centralization of political administrative authority was associated with this trade, and in fact, may have been masde possible through this activity. Therefore, I prefer to associate the Terminal Formative with a re-defined Alternative Formation.

The Protoclassic again appears to be a good representative of the Intermediate Formation. Population, which increased rapidly in the Terminal Formative, had been underrepresented by local rural services. The Protoclassic response shows that political authority had become fragmented, since rural mound groups were small-scale versions of the core groups, but lacked the high central mound. These groups were dispersed in the study area, though concentrated in ring 4 (Figure 20 c), peripheral to the reserve area. The rural groups shared standard site plans (Murdy 1984:131-132) and participated in a similar ideological system, the stela and altar tradition and production of low-relief sculpture emphasizing personal attributes (Parsons 1986:60-63). These conditions suggest that secondary chiefs or junior lineages were located in these rural areas, as proposed in the model.

It should be noted that these conditions did not follow directly from those of the Early Formation, as proposed in the model, since the identification of the preceding Terminal Formative period, in terms of the model, is ambiguous.

Nevertheless, using the perspective on political relations expressed in the model, it was possible to make these changes comprehensible.

Conditions for the Late Formation, such as rapid population growth and decentralization, the appearance of complex rural and central mound groups and the de-emphasis on construction of traditional lineage monuments are not represented in the subsequent Early Classic. While Table 4 indicates re-centralization of population, summit area and construction volume, Table 15 shows that this occurred in a context of greatly reduced new construction activity (5083 m^3). In fact, at this time, new construction is ranked last among periods in both central and rural Kaminaljuyu. The building inventory and apparent status was maintained by utilizing existing structures, particularly high status Protoclassic structures.

The Early Classic "hiatus" was followed by the resurgent Middle Classic in which total construction within the study area ranked second only to the Terminal Formative. The values for central (110,337 m^3) and rural (95,192 m^3) construction volume show that new construction was almost equally balanced between central and rural Kaminaljuyu, explaining the low values for centralization of summit area and mound volume (40% and 53%, Table 16 cols 6,7). However, despite this evidence, political authority was nevertheless centralized at two nodes (Kaminaljuyu and Solano), revealing an underlying similarity with the Terminal Formative. In the Middle Classic, as in the Terminal Formative,

the rural population appears to have little local administrative support (AR=2.69, Table 14 col.9). Thus, it is possible to argue that similar processes of centralization based on wealth trade were operating in both periods. However, the Middle Classic clearly indicates greater degree of social complexity and specialization. As with the Terminal Formative, the model for the Alternative Formation only partially explains changes in this period and required re-definition.

The Late Classic, like the Protoclassic, represents expectations for the Intermediate Formation, such as, active political decentralization (volume and summit area) and less emphasis on status display. Also, it emerged in a context (the Middle Classic) in which the rural population was not well represented by local administration.

The model for the Intermediate Formation argues that core area construction will be replicated on a smaller scale in rural areas. This was generally apparent for the Protoclassic. However, analysis of central and rural Kaminaljuyu construction for the Middle and Late Classic has shown that administration was complex and hierarchical. In the Late Classic, complex core area functions were unlikely to be replicated at the local level, since the the complexity depended on administrative size or scale and population size. Decentralization was accomplished by replicating various parts of the system. For example, larger sites such as Cementerio and Sanja with large plazas enclosed by platforms and mounds, were similar in concept to the Palangana

complex, while sites such as Cotio and Aycinena, with ballcourts and one or two associated mounds, were similar to core area facilities such as mound group B-III-5. This perspective suggests that the nature of the administrative system did not change, but simply experienced decentralization and replication of various parts, and not of whole units, as in the Protoclassic. This also indicates that Late Classic political administration was highly integrated, but with an emphasis on management in a context of increasing population size and spatial crowding (circumscription). Thus, Late Classic decentralization was analagous to Protoclassic decentralization, but occurred within a more complex social system.

During the Late Classic, new construction activity at central Kaminaljuyu was concentrated at the Acropolis and Palangana complexes. The majority of effort was devoted to enlarging and/or enclosing the Middle Classic architecture at these locations. About 53% of total volume in use was located at Kaminaljuyu (Table 16 col.7), and only about 42% of this was new construction (Table 15 B.). Meanwhile, about 37% of the total summit area was present at Kaminaljuyu (Table 16 col.6) as administrative facilities were provided in rural areas. Although the main centers at Kaminaljuyu (Acropolis and Palangana) were massive, imposing structures, most of their volume was contributed by Middle Classic construction. Thus the tribute demands were low (Table 16 col.3) relative to the population size. Consequently, the emphasis on status display in

construction as the volume component declined relative to summit area (V/A=4.21 and 10.10, Table 16 cols 1,2).

In the Terminal Classic, the general parallel with the Late Formation is apparent as features such as population growth, development of rural areas and decentralization were present, as well as increased settlement (use) of marginal agricultural land. However, as the data on construction activity demonstrate, the core area was unexpectedly dormant, though some elite population was present there. It is inferred that the polity remained integrated in some way as the spatial-demographic structure was retained from the Late Classic, as were many of the mound sites. The Terminal Classic appears to represent the very late stages of the Late Formation as the polity may have been intensely engaged in political competition with other polities in the Valley of Guatemala.

CHAPTER 6. CONCLUSIONS

Summary of Objectives and Procedures

The general objective of this work was to develop a theory and test model of political and cultural change for application to a Prehispanic community in Mesoamerica. The research procedure outlined four criteria.

1. Investigation was to begin with anthropological theory, not data.
2. Diversity of data in the material record were to be used to explain change.
3. Explanation was to depend on interactive (not monocausal) relations among variables.
4. Change was to be viewed as a continuum, as a series of interrelated periods, and archaeological phases were to be used as "checkpoints" (not as discrete stages of evolution), or as facets of a singe organizational type.

Using material from various branches of anthropology (social, political, economic, urban, demographic, systems theory, information theory) a political theory of political change was generated. The perspective argues that static models of social organization (such as the conical clan chiefdom), monocausal models (such as population pressure) and deterministic ecological models can restrict investigation of archaeological cultures and anticipate results. Thus, a less structured means of investigation was sought.

It was argued that competition for status, power and prestige motivates change. Proposed interactions between competition and economic and consensual support, political maintenance (administration) and status demonstration, offers the basis to investigate political change.

Since it is not possible to examine intangibles such as competition directly, theoretical links between status rivalry and the archaeological record were proposed so that competition would be visible in its effects on the record.

From this theory, a general model of change was proposed. It consists of three defined temporal formations and describes socio-cultural change in a polity in which status and competition are supported by a predominant agrarian economy. A fourth formation was proposed in which a wealth trade support system is predominant. The two types of economy, however, were not viewed as mutually exclusive status support (economic) systems. Specific hypotheses were generated from the theory and model, though as a heuristic device, the model itself was considered a hypothesis.

Since the theory demanded a wide range of archaeological data, the site to be analysed required a long, continuous temporal sequence, and an extensive and diverse (published) archaeological record. For these reasons, the site of Kaminaljuyu in the Valley of Guatemala, was chosen.

Review of Theory and Model

The basis for the processual sequence is that political

leaders/units, insofar as they are able, will attempt to support and increase status by controlling and increasing economic-subsistence production for tribute, while promoting population growth for purposes of obtaining additional productive labor and service. In the process, they must devise and employ administrative mechanisms for managing larger populations, greater workloads and more complex problems. Meanwhile, rival secondary factions will appear and will exploit administrative "gaps" in the administrative system. Thus, population growth is viewed as a dependent variable in cultural change, since it is defined as subject to manipulative actions by political leaders within the polity. Nevertheless, population size does have implications for the maintenance of political power since greater size (or scale) requires more efficient administration to maintain political integration. In this respect, population size acts as an independent variable. Subsistence production is treated in a similar fashion. There is pressure to increase production in order to increase material support and status, but associated coordinating functions require more complex management systems. Ultimately, with large population size, massive production quotas, stress on the capabilities of administration and economic production, the system will develop the potential for change to a more efficient system, and may include collapse of the integrated political system.

It was proposed that this sequence could change or transform with active participation in a wealth based economy (long-

distance trade in valuable and commercial goods). This must be an opportunistic episode as it depends on certain threshholds, such as the existence of sufficiently developed external polities willing to participate in mutual exchange. In any case, it was proposed that when participation in a wealth economy was predominant, status competition would shift away from an exclusive reliance on the local subsistence support system and toward control of the commercial and status goods support system. Consequently, rural population and subsistence production will decline as population was located at the core site to engage in activities associated with the manufacturing/commercial system. This system would be characterized as "urban" and be associated with population centralization, massive construction and wealth based finance.

With the collapse of the wealth economy, political support would depend more on the subsistence economy. There would be renewed population growth in rural areas (population decentralization), possibly with increased production demands to maintain former wealth-based status.

Review of Methodology and Hypotheses

The three analytical divisions introduced in the theory (political support, status demonstration and political maintenance) are represented by three analytical (archaeological) categories:

1. Population, representing aspects of support.

2. Settlement and land use, representing aspects of support.
3. Construction activity, representing aspects of status demonstration and political maintenance.

Thus, the analytical divisions were expressed in terms of quantifiable variables such as population size and distribution, land and soil classification, mound volume and summit area. Useful measures, derived from the main variables, were defined, such as tribute ratio (labor invested by the rural population in mound construction), administration ratio (maintenance in terms of persons served per unit summit area), volume to summit area ratio (relative emphasis in construction on status versus administration), centralization (spatial distribution of status, power and administration in terms of volume and summit area), complexity (maintenance in terms of variety in settlement types).

With respect to the model, seven main hypotheses (with variations) were proposed. Each hypothesis was divided into two parts, one for expectations for the subsistence dominated economy ans expectations for change, and one for the wealth dominated economy. An eighth hypothesis described the qualitative expectations for the wealth dominated economy in order to identify the qualifying periods.

In order to control the variables and focus analysis on the Kaminaljuyu core political unit, a circular area study area of 9.5 km in radius, divided into 9 concentric rings, and centered on Kaminaljuyu was employed. This configuration enabled research to focus on a single political unit and allowed the political

unit to define its own spatial patterns and geographic limits (within the confines of the given radius). Population estimates could be calculated on the basis of distribution by distance from the core area. The ring structure facilitated examination of relations between central and rural Kaminaljuyu and between the rings themselves.

Processual Synthesis

This synthesis provides a chronological overview of political and cultural change at Kaminaljuyu, based on the analyses presented in this study, and integrates the theoretical perspective and model with additional relevant archaeological data with the results of the analysis.

Although the analyses generally support the conditions and sequence in the model, there were areas where they indicated problems and contradictions. For example:

1. There was conflicting evidence for the expected characteristics of the Alternative Formation. For example, there was expected increased settlement on optimal land, intensive construction activity at the core and active long distance trade, but no population centralization, no rural population decline and there was unexpected evidence of agricultural intensification (the canal).
2. There was apparent similarity between observed conditions for the Alternative Formation and expected conditions in the Early Formation (e.g. relatively low initial population size, moderate

to high population growth rates, concentration of settlement on optimal agricultural land and minimal rural mound site development).

3. Because of unexpected trends observed for the Early Classic, there was lack of uniformity of change from the end of the Terminal Formative to beginning of the Middle Classic combined with evidence for a cyclical pattern of cultural change.

4. There was no description in the model of a Formation characterized by conflict and warfare.

Late Formative

The distribution of standardized mound group plans during the Late Formative indicates that, including Kaminaljuyu, there were perhaps 8 to 10 political centers located within the Valley of Guatemala (Murdy 1984:119). Each center contained a single standard group (Murdy 1984:113-116), except Kaminaljuyu, which contained two (and possibly five) such groups (A-V-8 and C-III-7), each the locus of a (segmentary) political unit (Michels 1979a:23-25; Murdy 1984:112-114). The construction of these large ceremonial-lineage mounds shows that labor potential was organized.

There was a distinct emphasis on building impressive mounds with great volume and relatively small summit area (emphasis on status). The available evidence indicates that this was true even for the 6 rural mounds within the study area. As single-mound sites, it may be argued that they did not represent fully

independent political groups. Lack of variety in these mound groups, and the concentration of groups at central Kaminaljuyu, supports arguments that a (simple) chiefdom will consist of relatively unspecialized construction types (Spencer 1987:372-373).

Murdy has suggested that a two-level social hierarchy was present at this time (Murdy 1984:120). This would be analogous to Alfoldy's description of Early Roman society, when it was nominally divided into a two social classes (Patricians and Plebians) (Alfoldy 1988:13-19). Certainly, Kaminaljuyu society was not as complex as it was in later periods. Following Kosse (1990), population size (estimated at 1,935 for central Kaminaljuyu and 2,834 for rural Kaminaljuyu) would be large enough to support an internally differentiated, endogamous elite class (Kosse 1990:285).

Stone sculpture programs shared traditions with contemporary complex societies on the Pacific Coast (Izapa, Monte Alto), and included early "potbelly" figures, colossal heads, zoomorphic altars and plain or carved stelae (Parsons 1986). This sculptural program suggests that an elite class was present (Parsons 1986:27-44,91-93). This is supported by evidence for residential (B-V-8, B-V-15, E-II-1, E-II-2) and funerary mounds (B-IV-1, C-III-6) (Murdy 1986:120).

Although burials were associated with mounds, richly-furnished interments were not present among the eight interments dated to this phase. In fact, only three burials were found in

mounds at central Kaminaljuyu (Mounds B-IV-1, B-V-6 and B-V-15), and all were modestly furnished. While post-Olmec, Izapa-style artifacts and features were present (jades, ceramics, basalt columns stone carvings and ceremonial deposits), they were not found in association with individual burials.

The Late Formative is puzzling for the absence of elaborate burials (in lineage mounds) when other indicators suggest a relatively complex, hierarchical society. Other evidence shows that the rural area was quite developed and independent, and while the rural population was small relative to Kaminanljuyu, it was scattered throughout the area. At Kaminaljuyu, the mound groups were relatively equally apportioned by size, indicating that no one lineage group predominated, unlike what was expected for the Early Formation. Thus the model for the Early Formation does not entirely agree with these conditions for the Late Formative.

Terminal Formative

Changes in the Terminal Formative occurred in the context of the appearance of the "Miraflores" complex of cultural traits in the central Highlands and south Coastal regions of Guatemala (Demarest and Sharer 1986; Hatch 1987). The complex or "sphere" is characterized by similarities in ceramic and lithic assemblages, religious and ceremonial practices associated with "potbelly" figures, "Jaguar Head" sculptures, and common themes in iconography, site planning and architecture (Demarest and

Sharer 1986; Hatch 1987, 1989; Parsons 1986:94-97). Apparently, Kaminaljuyu held a central position in this complex as many of the traits (in particular the potbelly figures) were concentrated at the site, and were linked with the local Las Vacas complex in the Valley (Hatch 1987). Following a period of severe population loss at other mound centers in the Valley of Guatemala, only Kaminaljuyu survived and prospered (Murdy 1984:123). Involvement in long-distance elite trade was concurrently evident at Kaminaljuyu, and revealed contact with areas outside the Miraflores sphere. This was the period of greatest construction activity, accompanied by some of the most elaborate burials at the site. This evidence supports the idea that Kaminaljuyu had great political and economic power and influence within the Valley and throughout the extent of the Miraflores sphere. The reasons for these developments may have roots in the Late Formative, but these are not yet fully apparent. Population pressure on resources was probably not a factor as population size was well below that supported during the Classic periods. Furthermore, population was concentrated on optimal lands, when, under conditions of population pressure, one would expect greater use of marginal lands. The proliferation and interaction of minor chiefdoms in a competitive context was possible, but what was the basis of competition? Was it control of trade goods (obsidian), trade routes and associated status? Was it an attempt to solve problems related to increasing demands for production and labor? Did the solution involve conquest or expansion? Whatever the

case, Kaminaljuyu must be viewed in a wider geographical context in the Terminal Formative, as its sphere of political control and influence was certainly greater than the area under study here. This wider territorial perspective, combined with participation in elite trade, provides some justification for identifying the Terminal Formative with the proposed Alternative Formation. However, as noted above, observed rural population increase, increased rural complexity, and population decentralization do not meet expectations for this Formation. Furthermore, while the observed focus of settlement on optimal agricultural land was expected, there may be another explanation, that is, agricultural intensification practices were used to develop production on optimal land. This hypothesis is supported by the discovery of the canal system near Mound group A-V-8). Site location studies indicate that, of the six sites found in rings 2 and 3 at this time, all were located on class three optimal land, and the phase as a whole had the lowest incidence of marginal land use for any phase. From this evidence, I concluded that the political leaders in the Terminal Formative were focused on the control and growth of rural populations and on developing subsistence production, especially in the area adjacent to central Kaminaljuyu. Although population decentralization occurred at this time, this did not mean that power was decentralized as well. This is supported by: 1) The apparent regional extent of Kaminaljuyu's power (based on the distribution of ideological themes centered at Kaminaljuyu) beyond the Valley of Guatemala, within the Miraflores sphere,

2) The centralization of construction volume and administrative summit area at central Kaminaljuyu.

3) The emphasis on mound volume in construction combined with a focus on labor investment in these structures.

4) The appearance of elaborate, richly-furnished tombs at Kaminaljuyu (Mounds E-III-3 and D-IV-2) with evidence of elite, long-distance wealth trade (Kidder, Jennings and Shook 1946).

5) Centralization of construction activity and weak development of rural mound sites.

Furthermore, I observe that the elites realized production benefits from the high ratio of producers (rural population) to elites (core population), enhanced by the implementation of intensive methods of agricultural production. Significantly, Michels' analysis of test pit assemblages indicates that the Terminal Formative population at central Kaminaljuyu, though small relative to rural population, nevertheless maintained the highest proportion of elite components for any period at the site (Michels 1979:232-233). In other words, central Kaminaljuyu had become an elite enclave.

The results of this study imply that elite, wealth-based economy and status, contrary to the model, was interdependent with the subsistence-based economic system. Apparently, it was simply "added on" to, and supported by, the local subsistence system. The economic systems were integrated to the extent that they both contributed to the power and effective control of political elites in management of the local economy, whether for

subsistence-utilitarian or trade goods production. There was an effort made to maximize production in all areas of the economy and they mutually supported one another to the benefit mainly of the political elite.

Protoclassic

Evidence presented here shows that trends developed in the Late and Terminal Formative did not continue into the Protoclassic. In fact, many of the indicators represent reversals of Terminal Formative trends. For example, the Protoclassic data indicate the beginning of population centralization at Kaminaljuyu, decline of rural population, political decentralization (delegation) and a higher proportion of settlement on marginal agricultural land. For the first time, elite centers were found in ring 2 (three sites), immediately adjacent to central Kaminaljuyu. Demarest and Sharer (1986) and Hatch (1987) have argued that the Protoclassic pattern in Guatemala was coincident with the intrusion of diagnostic Protoclassic ceramic traits into the Terminal Formative Miraflores sphere. These traits were associated with a complex, named the "Solano Tradition", which developed earlier to the northwest of the Valley of Guatemala, outside the Miraflores sphere. Shortly after this appearance, the Miraflores complex sub-divided, but the individual divisions continued to develop independently in various sub-regions. Some time later, at Kaminaljuyu, the Miraflores-Las Vacas complex was "abruptly and

totally replaced by the Solano Tradition" (Hatch 1987:157-158), marking the transition to the Early Classic pattern.

Hatch has suggested that the introduction of the Solano ceramic tradition into the Valley of Guatemala represented an expansive invasion of a population from the north and northwest which disrupted the Miraflores economic and political network, and led to its takeover by the invaders (Hatch 1987:158). Whatever the actual case, it seems that Protoclassic period changes at Kaminaljuyu were associated with developments outside the Valley of Guatemala. The evidence shows that, while population was concentrated at central Kaminaljuyu, elite power had nevertheless become decentralized. However there was a great emphasis on labor investment in construction (status) at both central and rural Kaminaljuyu, though there was greater emphasis on administration (summit area) in rural Kaminaljuyu. With indications of conflict in iconography, this suggests that the Protoclassic political system was composed of a series of highly competitive political units within a loosely integrated polity.

I would conclude from the above evidence that changes at Kaminaljuyu in the Protoclassic were related to events associated with the break-up of the Miraflores complex and the decline (or removal) of the old elite lineages. The emergent pattern is one of population centralization Kaminaljuyu combined with political segmentation and mound site development in rural Kaminaljuyu (Murdy 1984:131-132).

The Protoclassic pattern of dispersal developed in the

context of the Terminal Formative pattern of hyper-centralization, in which the rural area was very weakly developed. The pattern of delegation and competition among relatively equal mound site groups, shows that there was no dominant leader. The Protoclassic exhibits many of the characteristics expected for the Intermediate Formation.

Early Classic

Since population became nucleated at central Kaminaljuyu and economic production developed greater specialization and complexity during the Early Classic, Murdy has argued that Kaminaljuyu was becoming a stratified society (Murdy 1984:139-143). This argument seems to have been devised to support theoretical ideas for the emergence of state-level political organization in the Middle Classic. Yet central Kaminaljuyu, which contained nearly one-half of the total population, showed no equivalent evidence for development of complex administrative facilities, or for contexts for the display of valuable goods, or that it was experiencing any kind of florescence. Instead, the canal mentioned earlier was filled in by the Early Classic, indicating that agricultural intensification was abandoned at this time (thus the ability of elites to organize labor and increase production declined). At the same time, the proportionate use of marginal land for settlement increased, even though total rural population had declined. Interestingly, Murdy has observed that population nucleation in the Valley of

Guatemala was a general phenomena at this time, not an isolated case at Kaminaljuyu (Murdy 1984:140).

Considered in conjunction with the decline of all types of rural settlement amidst declining complexity, and noting that most Protoclassic rural mound sites fell into disuse and were not replaced, that tribute investment in construction declined sharply, that there was little administrative service (summit area) available for the population, that stone sculpture production declined sharply, that burials were few and poorly furnished, it is clear that events taking place at this time had little to do with processes leading to increased social stratification or state-level formation.

An alternative interpretation for the appearance of the Early Classic pattern is proposed here. Some insights into the context of Early Classic conditions are presented above (Demarest and Sharer 1986; Hatch 1987, 1989). Hatch has discussed the possibility that two ceramic complexes ("Solano", "Naranjo") with mutually exclusive stylistic traits and spatial distribution came into contact with one another during the Early Classic in the vicinity of the Valley of Guatemala (Hatch 1987:164-166). Following the spatial distribution of each one over time, she argues that they were associated with two separate expansionist ethnic groups which overran different parts of the old Miraflores sphere. While it is questionable to identify ethnic groups with potsherds, considered together with the evidence from this study, these conditions strongly imply that the Early Classic was a

period of turmoil as the Miraflores sphere continued to weaken and sub-divide. Conflict and warfare within the Valley of Guatemala was very likely.

In this context, the increased occupation of marginal land indicates that people settled on less desirable land as intensification facilities and practices were abandoned, and that, under conditions of turmoil, it was impossible to maintain such facilities. Perhaps marginal lands were located in areas judged more suitable for defensive purposes. This perspective introduces a relationship between warfare and land use, implying that a greater focus on marginal land was associated with defensive requirements for settlement and not necessarily related to increased demands for increased production as argued in the model.

The conditions for the Early Classic suggest that the rural population fled into central Kaminaljuyu for protection, and into other sites in the Valley as well, which accounts for the high values for population centralization. Low rural population and complexity are attributed to ravages caused by warfare. Ninety percent of rural sites were either trace or hamlet occupations, and only four elite centers are known, one of them the defensible site at Solano. Two sites were Protoclassic mound sites near Kaminaljuyu. Meanwhile, minimal construction activity at central Kaminaljuyu indicates that centralized control of labor potential had diminished. In this context, the construction of defensive works is expected, although this has not been documented, unless

one counts Solano.

In conclusion, changes in the Early Classic are attributed to a combination of local and external developments, which indicate a period of regional and local conflict. This type of political formation (dominated by conflict) was not specifically addressed in the theory and model. The closest formal type would be the Late Formation. I conclude that a new formation must be developed to explain these conditions.

Middle Classic

The transition to the Middle Classic marked the appearance of conditions characteristic of the Terminal Formative (and opposite to those of the Early Classic); population decentralization, combined with increased rural population size and complexity, but not of elite site development, dominance of wealth trade and increased settlement on optimal land. Apparently, the difficulties of the Early Classic had been resolved, although there is clear evidence that the Valley was divided into two major sociopolitical units, one centered at Kaminaljuyu, the other in the south Valley at San Antonio Frutal (Brown 1977; Murdy 1984:144-170). The boundary between the two is was located in a sparsely populated zone, without elite centers, running near the site of Solano.

There are a number of indicators which support the hypothesis that political power was centralized by the end of the Middle Classic, perhaps at two loci (Kaminaljuyu and Solano).

First, summit area and volume of construction at the two sites was about 90% of totals for the study area. Second, based on evidence for construction volume and loci of elite craft production, political power and economic strength were concentrated at the Acropolis and Palangana Complexes (Michels 1979:199,203-204). Michels' analysis of the test pit assemblages shows that central Kaminaljuyu was dominated by elite occupation (Michels 1979:219), as it had been during the Terminal Formative (though to a lesser degree). Also, unlike mixed-status occupation with a majority of lower rank households, as was the case in the Early Classic, elites were themselves hierarchically ranked within the site. Furthermore, Michels' study indicates that, although the absolute number and proportion of highest rank households declined from the Early Classic, the majority were located in the area near the Acropolis. I interpret this to mean that there was a greater distance between the high and secondary elites and that the elite structure was more "pyramidal" than in the Early Classic or Protoclassic periods. Lastly, as in the Terminal Formative, there was high ratio of rural to elite population (population centralization). Again, as in the Terminal Formative, there is well-documented evidence of intense involvement in elite long distance trade. Contact with Teotihuacan and the Lowland Maya through a Mesoamerica-wide communication and trade network no doubt enhanced the status of those elites who managed to establish important social contacts, and to gain control of important resources (obsidian, wealth and

status goods) and communication routes. Thus, the reappearance of conditions similar to those of the Terminal Formative argues in favor of the hypothesis that wealth trade and production and rural population growth were associated in a maximizing economy. In this context, these conditions imply that population dispersal with centralized political services was accomplished with wealth goods financing.

More intensive settlement on optimal land in the Middle Classic was associated with this process, although there was no direct evidence for intensive agriculture as there was for the Terminal Formative. Some argue that stone hoe blades and digging stick weights, which appear at this time, are such evidence, but the argument is linked to models of cultural evolution that rely on theories of population pressure, agricultural intensification and increased use of marginal land (Michels 1979:209-210,223-224; Murdy 1984). As this study shows, there was no increase in the use of marginal land. Also, as observed above, agricultural intensification will focus on development of optimal lands, especially those located near the polity core. By analogy with the Terminal Formative, I expect that intensification facilities, such as canals, dams, terracing or related features were in use in the Middle Classic and they will be found near optimal agricultural land near central Kaminaljuyu.

A major difference between the Terminal Formative and the Middle Classic communities was that the latter's sphere of influence or direct control was much less extensive than that for

the Miraflores sphere. While the Miraflores sphere was apparently the political creation of the Terminal Formative expansive elite, the Middle Classic polity was "hemmed in" by neighbouring communities within the Valley. Its geographical scale of operations was much smaller as it seemed to depend on its strategic location and on the "trade differential" running through the Valley. This is the basis for Brown's argument that local elites simply benefitted from trade through the Valley, rather than actually conducting it themselves as in the Terminal Formative (Brown 1977:382).

The current evidence supports the idea that the Middle Classic represents conditions expected for the Alternative Formation. Expected changes with respect to earlier Formations were difficult to evaluate because the Early Classic represents conditions of warfare/conflict, which were not described in the model. In any case, trade wealth status assisted elites in their involvement in subsistence production. Wealth-based status created a pyramidal social structure, even within the elite class, and facilitated the centralization of power. Although secondary elite centers were present in rural areas, their political importance was limited. Centralized political power was associated with population decentralization and concurrent intensification of elite population at central Kaminaljuyu. The site became an elite enclave. If political power was highly centralized and supported by trade wealth, there was pressure to develop rural population and the use of optimal land increased.

Population pressure (or growth) was not associated with increased use of marginal land. On the basis of evidence for the Terminal Formative and Middle Classic; elite trade, centralization of political power and status, development of subsistence production with an emphasis on optimal land, elite segregation of the core site, rural underdevelopment, population dispersal and rural population growth were all directly related.

Late Classic

Some set of conditions brought about the decline of centralized political power held by elites located at the Acropolis and Palangana complexes. Michels argues that "land pressure", caused by growing rural populations forced lineage components into competitive land disputes for access to arable land (Michels 1979:232). This position was a consequence of accepting population pressure models of cultural evolution and is a logical extention of arguments presented to explain developments in the Middle Classic. Again, population growth is taken as given and is not explained.

I presented arguments that loss of contact with high status, wealthy foreigners undermines access to and the monopoly of prestige and power. Despite the sequence of events, elites were no longer able to support their status because their ability to display wealth, distribute rewards and finance public projects was undermined. Having recognized, contrary to expectations of the model, that there were strong positive links between wealth,

agricultural production, rural population growth and centralized power, I think it is reasonable to argue that the political elites lost their monopoly on local power, subsistence and craft production, and access to tribute (in fact the entire basis of status), with the collapse of the Middle Classic trade network. In any case, the consequence must imply decentralization of power in a context of competition (as argued for the Intermediate Formation), but the main burden of support has shifted to the subsistence system. In the Late Classic, population size was a factor because the rural population had increased steadily in the Middle Classic to between 15,000 and 16,000 persons. I presume, given the relatively low core population and the low administration ratio (AR), that the rural population was closely managed by powerful elites. With the decline of centralized, wealth-supported power, political segmentation would follow a similar course to that in the change from the Terminal Formative to the Protoclassic.

The evidence for the Late Classic certainly indicates that elite activity at central Kaminaljuyu had diminished. Though elites at the site were still present and active, construction activity at the major complexes was only about 30% of that for the Middle Classic (primarily in the Acropolis and Palangana). However, some small-scale (ballcourt) complexes appeared. The proportion of elite households was very low, and were not as wealthy as before (Michels 1979:241). Meanwhile, a complex hierarchy of mound sites began to appear throughout rural

Kaminaljuyu as such sites had following the decline of the Terminal Formative, Miraflores period. These "secondary" centers (which might now be considered relatively independent political units) proliferated throughout rural Kaminaljuyu in the Late and Terminal Classic, but were most often found in rings 3 and 4, with minor development in ring 5, and no development in ring 2. Non-mound sites developed in association with these sites as well, but not particularly in ring 2, which has the highest population density. Also, Michels observed that "commoner" households were present around the perimeter of central Kaminaljuyu in higher proportions than before, while elite components showed an absolute and proportional decline (Michels 1979:221-223). That is, rural populations were settling both central Kaminaljuyu and the former "reserve" lands in rings 2 (and 3). Population was becoming crowded in the area around the core while ballcourt complexes with supporting populations were appearing in the intermediate rings (especially rings 3, 4 and 5).

Considered together with evidence for a rural (mound site) complexity and hierachical organization, emphasis on administrative space in construction and a de-emphasis on status display, the polity was coping with administrative problems associated with population size (and growth) in the absence of strong wealth finance system. The Late Classic polity was apparently loosely integrated, but highly competitive.

In addition to these local problems, the community as a

whole was faced with similar population increases in neighbouring polities, particularly those in the southern part of the Valley. Evidence for conflict and warfare between the two groups has been proposed (Brown 1977:297,321; Michels 1979a:235-239). There is certainly evidence for a sparsely populated "buffer zone" across the Valley during the Middle to Terminal Classic. The conflict theory may also explain the concentration of population around central Kaminaljuyu (as in the Early Classic) most apparent in the Late and Terminal Classic, possibly forcing confrontations between the core and secondary elites.

Consequently, the Late Classic, like the Protoclassic, is identified closely with conditions expected for the Intermediate Formation. The recurrence of similar relationships between the Terminal Formative and Protoclassic, and between the Middle Classic and the Late Classic, though separated by 400 years, and differing in aspects of scale, complexity and specialization, indicate strongly parallel processes that support the two-period, cyclical model of change.

Evaluation of Methodology and Hypotheses

The patterns of settlement in the study area (concentric rings) showed that the area was sufficiently large to study change in the data as the political unit changed in size and shape. The analysis of the ring structure led to the discovery of a demographic-spatial structure in the study area. The structure facilitated examination of relations between central and rural

Kaminaljuyu and between the rings themselves. The main difficulties were that uneven distribution of sampled sites (especially mound sites) could lead to distortions in the data. For example, I could not be certain that the distribution of rural mound sites was representative within the study area, even though 35.5% of the area had been surveyed. Also population estimates may have been distorted if the surveyed part contained sites with unusually high or low population estimates. The main problem with the Valley of Guatemala data is that site components are certainly underrepresented, although the results of analysis were quite consistent.

Examination of temporal patterns based on an initial analysis of population and settlement patterns showed that there was a cyclical pattern to change, consisting, in this case, of two distinct cycles; the earlier cycle includes the Terminal Formative, Protoclassic and Early Classic periods, the later cycle includes the Middle Classic, Late Classic and Terminal Classic.

The main hypotheses are evaluated as follows.

1. Criteria for Identifying a Wealth-Dominated Economy. The criteria, such as predominance of status marking and commercial goods in elite contexts, massive and innovative construction projects, elaborate burials, and segregated elite precincts indicated that the Terminal Formative and the Middle Classic periods, and possibly the Protoclassic best represented the expected characteristics. The Middle Classic especially has

been well documented. Brown has argued, and I agree, that wealth trade in the Middle Classic was managed by trading specialists who gave dues or tribute to the local elite, while in the Terminal Formative it was (as with most aspects of cultural activity), directly managed by the political elite. These two periods were also very similar with respect to the other criteria for the wealth trade system, though the model requires modification to account for the unexpected emphasis on subsistence production and population growth.

2. Status Demonstration (V/A=volume per unit summit area).

For the subsistence economy, there will be less emphasis on status (V/A) with time. The V/A ratio did decline with time (Table 16 col.1). There was less emphasis on status (total volume) with time through the two-period cycle, although a peak for status demonstration occurred in the Protoclassic. Both indicators (total volume and V/A) reveal a shift from unspecialized to specialized administration with time. This hypothesis was supported.

For the wealth economy, there will be an emphasis on the status component in construction (higher V/A). This was not strongly apparent in the Terminal Formative (ranking third of seven periods) or the Middle Classic (ranking fifth). Though mound construction was massive in these periods, there was considerable emphasis on providing summit area, indicating a focus on administration. This was not confirmed, though it was clear that scale of construction (volume) was important.

3. Administration Ratio (population per summit area).

For both the subsistence and wealth economy, this ratio should remain constant. As expected, this did remain relatively constant with time, but the two-period cycle did appear (Table 16 col.5). The AR was lower in the Terminal Formative and Middle Classic (Alternative Formation), when population growth increased, and when summit area became centralized.

For the wealth economy, the AR will be higher than for other periods. In fact, it was lowest in the Terminal Formative and Middle Classic. This is explained as the emphasis was on population growth, thus summit area increased as the polity became more complex. This indicated that there was a focus on bureaucratic administration associated with centralization indices (volume and summit area) and that these features imply that a state-like administration was in effect.

Variation 1. Earlier periods will have relatively less summit area (higher AR). Earlier periods (for example, the Late Formative) had average summit area (Table 16 col.5). Apparently, services were maintained at local mound groups. However, it should be pointed out that a significant portion of summit area was contributed by the low platform mounds at the unusual site of Mulato. Otherwise, the AR ratio would have been higher. The evidence for this hypothesis is inconclusive, but probably negative.

Variation 2. Later periods will have relatively more summit area (lower AR). This was not apparent. In fact, it was generally

higher in the Late and Terminal Classic. This seems to indicate stress in these periods, as though administration was not keeping pace with population growth and complexity, even though total summit area in use was higher than at any time. This indicates that the political system was under stress, and the hypothesis is not conformed.

Variation 3. Weakly integrated periods will have higher AR. In the case of the Early Classic, this appears to be true, and higher values in the Late and Terminal Classic may indicate weakening political integration (Variation 2).

Observations. In some periods there were very great differences in the AR for rural areas alone (Table 14 col.8) versus the study area (Table 16 col.5). This was associated with the degree of centralization of administration (summit area). The Terminal Formative and the Middle Classic (-S) clearly showed this centralizing trend, and, to a certain extent, the Late Formative. On the other hand, the Early Classic, though displaying weak rural AR, also showed weakness within the entire study area, indicating a general lapse of political integration.

4. Tribute Ratio (mound volume per rural population).

For the subsistence economy, the tribute ratio should decline with time, with less emphasis on volume (status), and with greater population size. This was very clearly evident, and it was uniform, not cyclical in nature (Table 16 col.4). This strong pattern may indicate that a group specialized in construction was present (perhaps an occupational social class,

war captives). Other data for political and administrative specialization at central Kaminaljuyu show that the population was more functionally specialized in later periods. Also, there was less emphasis on volume (status) in construction. This hypothesis is confirmed.

For the wealth economy, the tribute ratio should be higher due to a greater emphasis on status (volume) in construction. This was not evident. The measure was overwhelmed by rural population growth and an emphasis on summit area, regardless of economic organization. The wealth economy was perhaps more occupationally specialized than other periods.

Observations. The Early Classic seems to be out of sequence. The ratio is quite low due to minimal construction investment throughout the study area, and to low rural population. This again indicates low levels of political integration.

5. Centralization.

For the subsistence economy, the percentage of construction located at Kaminaljuyu will decline with time. This was generally true but variable for both volume and summit area (Table 16 col.6). Extreme centralization was evident in the Late and Terminal Formative, and in the Middle Classic (including Solano), and decentralization was apparent in the later periods (Late and Terminal Classic). This generally shows that status (volume) and administration (summit area) did decentralize with time.

For the wealth economy, construction will become more centralized. This was true, even though rural population

increased in the Terminal Formative and Middle Classic, when one would otherwise expect rural development. This pattern suggests the degree of political strength associated with wealth and an ability to reinforce and centralize political integration despite conditions which work against this process (population growth, population dispersal combined with centralized administration). Observations. This is a useful measure. It would be interesting to have data on functional uses for mound summit space, plazas and other formal spaces because this would give a better idea concerning the distribution of specific administrative activities. Notably, the Early Classic is unusual, as it reveals a centralizing tendency for both population and (minimal) mound construction (compare the Terminal Formative).

6. Complexity/Hierarchy (rural sites)

For the subsistence economy, there will be a greater variety of site types and a greater percentage of complex sites with time. This was generally true (Tables 6 and 6) but periodic, not uniform. Table 8 shows that the Terminal Formative and the Midle Classic (Alternative Formations) had increased complexity over preceding periods, when the rate of rural population growth was greatest. However, complexity declined after the Terminal Formative (with population size stability), but increased after the Middle Classic (with continued population increase). Thus, patterns of change in complexity were apparently associated with rates of population change (that is, greater complexity with faster population growth, and greater population size).

Table 6 (number of site types) shows that the number of site types general increased with time. However, this measure is not fully reliable since only 13 site types were defined, their classification was based on surface collections only, and some types were exclusive categories (for example, "ER" type ballcourt sites occurred only in the Late and Terminal Classic). In any case, the number of site types was related to the total number of sites present, which is an indication of population size. This hypothesis is generally confirmed, but periodic, depending on population size and rate of change. This shows a case where population size was an independent variable.

For the wealth based economy, there will be fewer site types and low percentages of complex sites. Rural site organization in the Terminal Formativrwas and Middle Classic was clearly more complex than for preceding period, even though there was only a marginal increase in the total number of sites. This is interesting as it shows that rural population increase in the Terminal Formative and Middle Classic was absorbed in larger sites, but few of them were mound sites. This hypothesis is contradicted.

Observations. There was a clear cyclical pattern in these measures and they were associated with population size and growth rates. Increases in rural complexity and hierarchy in the Late Classic and Protoclassic (Table 17) were associated with decentralization of earlier periods of political integration and increases in rural complexity alone (Terminal Formative and

Middle Classic) were associated with centralization.

7. Spatial Distribution of Settlement and Sites.

For the subsistence economy, there will be greater spatial distribution of population and sites with time and greater population size. There was evidence of periodic (not uniform) change in distribution (Figures 7, 9 and 10). There were two basic patterns relative to the study area (not Kaminaljuyu alone). The first was marked by rapid population growth and dispersal (Terminal Formative and Middle Classic) and the second by population centralization (all other periods). Thus, the subsistence economy was associated only with population centralization. This contradicted the hypothesis.

For the wealth economy, population will be dispersed and relatively smaller than for other formations. The population was dispersed, but grew rapidly, and from evidence of centralization, was closely administered from central Kaminaljuyu. The hypothesis was partially confirmed, but for different reasons than proposed. Observations. In periods when administration became decentralized relative to Kaminaljuyu (Protoclassic, Late Classic, Terminal Classic), population gravitated to the core area. When administration became centralized (Terminal Formative, Middle Classic), population declined in the core area and became dispersed in the region. These results were contrary to expectations but revealed consistent patterns. Population size was not a factor in distribution as centralization was evident at different sizes.

The analysis of spatial distributions showed that the area had a definite demographic-spatial structure consisting of five districts: core (Kaminaljuyu), reserve (possibly argicultural), secondary zone, periphery and boundary zones.

8.Land Use

For the subsistence economy, optimal land will be occupied first. This was true as Table 12 indicates. The earlier periods (Late and Terminal Formative), following the initial commitment to agriculture, settled (used) optimal land more intensely than later periods. However, other evidence, such as population distribution and administrative centralization, shows that there were explanations besides demands for more tribute that encouraged the use of marginal land. For example, more defensible sites might be located on less desirable land (promontories, hills). Population growth did not explain greater use of marginal land in the Early Classic since rural population declined sharply. There were other factors at work.

For the wealth economy, there will be greater settlement on optimal land than previously. This was true for both the Terminal Formative and the Middle Classic, but not because demands for subsistence production declined. In fact, it seems that production was emphasized. This was demonstrated since rural population increased (rather than decreased, as expected), but there was actually greater use of optimal land. Also, there was evidence in one area (Mound group A-V-8) of agricultural intensification (canal). This hypothesis is confirmed, but not

for the reasons given.

Observations. The examination of land use by productive potential shows that this is an interesting area of investigation with respect to political organization. Even though the data were somewhat arbitrary and imprecise (allocation of settlement to land type and identification of settlement location to land usage), strong patterns did emerge. Land use practices in relation to economic organization were apparent, where intensive use of wealth goods implied intensive subsistence production, even in the absence of population pressure on resources (for example, the Terminal Formative), which is an argument against populastion pressure models of change.

Evaluation of Theory

1) Status Competition and Population Change.

The theory and model proposed the effects of status competition on the material record. There was no definite proof that status competition led to increases in economic production and population growth. Nevertheless, though largely circumstantial (and in some cases contradicting expectations), the results show that there was a direct relationship between:

a) measures for centralization of political administration and (status and power) and

b) rural population growth, within a context of emphasis on increasing all forms of economic production.

This relationship was most evident in the Terminal Formative, but was also apparent in the Middle Classic. These results, though they actually contradict expectations of the model, nevertheless lead to the following proposition: political units in which status and power is highly concentrated in an elite minority, perhaps with the support of trade wealth and external contact, will attempt to raise production and increase population. Ecological, population pressure models of cultural change could not explain this emphasis on production in the Terminal Formative because the relatively low population size would not likely be considered sufficient to cause pressure on resources. In fact, Murdy argues that population in the Valley of Guatemala (which was concentrated around Kaminaljuyu) grew very slowly from the Late Formative, when more productive varieties of maize were introduced, through the Early Classic as the population size came "ever closer to the carrying capacity of the agricultural system in use" (Murdy 1984:104). A more likely explanation is that (promoted) rural population growth was not accompanied by equivalent rural development (that is, of local mound sites), as political administration was conducted mainly from the core area. This was evident from the distribution of summit area (mainly at the core) and is consistent with the idea that political leaders maintained control of most aspects of socio-political life. Interestingly, subsequent periods (for example, the Protoclassic and the Late Classic) were defined by strong patterns of political decentralization and development of local mound sites,

complexity and hierarchy. However, these sites were not completely separate political units as the location, design, scale and architectural complexity of the facilities indicated that political power was delegated by core area elites.

2) Political Administration.

The key indicator for political maintenance was the comparison of population size with the administration ratio (AR Tables 14 and 16; Figures 19 and 27) which shows that this ratio remained relatively constant (except for the Early Classic) despite changes in population size, centralization indices, number and size of sites and other factors. This indicator was independent of measures for political centralization (volume and summit area at Kaminaljuyu) for the same reason (i.e. a constant ratio). That is, if rural summit area was low relative to rural population size, the balance of space would be found in the core area. Thus, there was some factor at work other than population size. Population centralization was also dismissed as a measure of the of political centralization because it was found that political centralization was associated with population de-centralization (Terminal Formative and Middle Classic). The best explanation refers again to the spatial distribution of administrative activity (or summit area) in relation to the distribution of population. That is, though total administrative representation was constant, in terms of the total space available per person, extremes in the spatial distribution

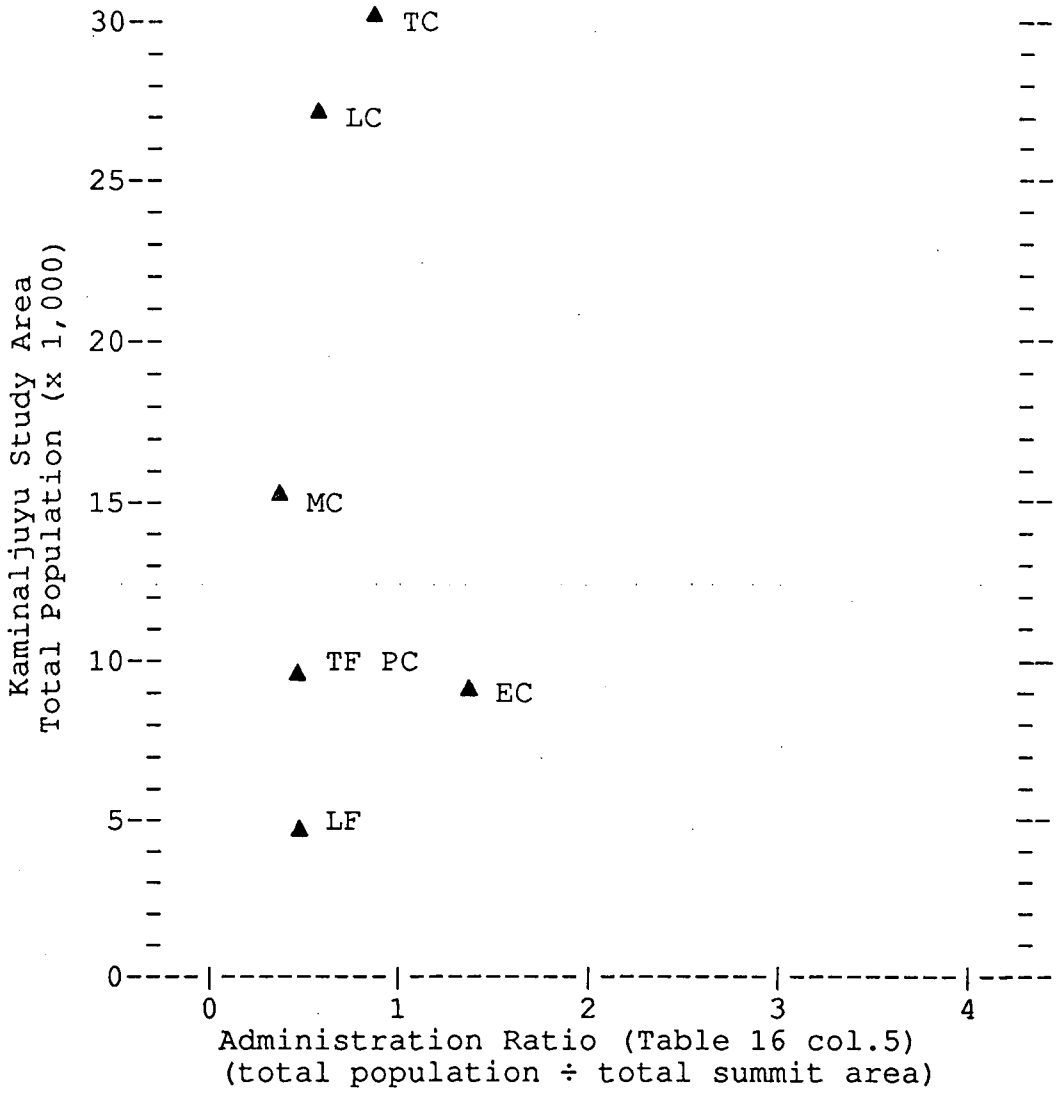


Figure 27. KAMINALJUYU STUDY AREA. Administration Ratio by Rural Population.

relative to population will create a potential for change, especially if rural populations were "underrepresented" by local summit area. This differential between the core and rural areas was apparent since, when rural space increased, central space declined, and vice-versa (except for the Early Classic). Therefore, "scalar stress" or population pressure are viewed as conditions that were created by political relations; specifically, periods in which centralized political power was able to promote rural productive support. Thus, political centralization, supported by population growth and increased production, was maintained as long as the administrative mechanisms were able to sustain centralized political integration.

3) Economic Organization.

There was a qualitative difference between economic systems based primarily on subsistence production and those based on wealth/commercial production, though the types were not mutually exclusive. This was evident as there were clearly periods with a greater emphasis on wealth trade (Terminal Formative and Middle Classic). This study demonstrated that wealth trade (valuable and commercial goods) was associated with more centralized political power (Helms 1988:170), supporting suggestions that wealth goods were used to finance political operations and control status. Another observed difference was that when the wealth-based system predominated, population became decentralized; otherwise,

population became centralized. The inference is that wealth goods extend the effective range of political operations because they are portable and valuable. This is the complementary explanation to arguments that centralization was caused by a defensive posture in conditions of minimal wealth trade and of active warfare.

I noted that there were many similarities between the Terminal Formative and the Middle Classic polities aside from intensive participation in trade. These patterns were evident elsewhere in Mesoamerica. For example, a reading of archaeological conditions for the slightly earlier Period III A in the Valley of Oaxaca (Kowalewski et al. 1989:201-250), shows that conditions were very similar to those during the Middle Classic at Kaminaljuyu. The common denominator was contact with Teotihaucan and participation in an extensive trade network. I suspect that patterns similar to those for the Middle Classic at Kaminaljuyu and for period III-A at Oaxaca will be found elsewhwere at sites active in this system.

Evaluation of the Model

Construction of evolutionary models is a problematic exercise because models can oversimplify complex cultural systems and compromise explanatory potential. They can force the record into arbitrary categories of analysis and suffer from poorly-conceived assumptions. I have tried to treat the processual model as a heuristic device, based on ideas about political, economic

and social organization of complex society. It is used to test the record and learn from the results, and modify the model.

The model defined is clearly imperfect, but it does address critical (political, economic, demographic, ecological, social) variables within a processual context. This led to an investigation of unanticipated relationships among the variables, often contradicting the model, but nevertheless revealing meaningful patterns. It was important that the model remain flexible so that the record could dictate where changes should be made.

I assumed that the record at Kaminaljuyu would be uniform, that the analytical variables (such as centralization indices, administration ratios, V/A ratios) would follow a continuous progression from beginning to end. For example, demands for increased production would force continuous population growth, increased marginal land use, administrative-political decentralization, agricultural intensification and eventual collapse. Furthermore, some expected characteristics of the proposed Formations were contradicted (population characteristics such as growth and complexity for periods representing the Alternative Formation), or inaccurate (relationship between population pressure and agricultural intensification). Nevertheless, the testing procedures led to investigation of relevant relationships.

I realized there was a two-period cyclical pattern to the record that did conform to the model. Theoretically, the earliest

mound building period (the Late Formative) should correspond to the Early Formation, but this was not observed. There appears to have been some social ranking, but little direct evidence of this from burial or residential contexts. Political power among the lineage groups may not have been very centralized, as there appeared to be a series of relatively independent polities organized around ceremonial centers. Rural areas may have been relatively independent as well. Kaminaljuyu was simply the largest among these groups, consisting of up to five separate lineage segments or components (Michels 1979a). The mounds were not primarily burial mounds built for high status individuals, so they did not represent efforts by political leaders to justify their appropriation of community powers. Their large volume and small summit area indicated ceremonial-symbolic functions. It would be necessary to redefine the Early Formation or consider a formation incorporating ideas about emergent pre-conditions for the Early Formation.

The Early Formation was actually better represented by the Terminal Formative since elaborate mortuary mounds were present, there was significant rural population growth, minimal secondary mound site development and concentration of settlement on optimal agricultural land. However, indications of active participation in wealth trade identify this period with the (redefined) Alternative Formation. I would conclude that it is possible that the overthrow of the Late Formative system was accomplished with the assistance of contacts with outsiders and the control of

wealth and commercial trade goods by a centralized authority. As a representative of the Alternative Formation as originally defined, the Terminal Formative fits, but the population patterns were different (centralization was absent and rapid rural population growth was present).

The material for the subsequent Protoclassic fits the description for the Intermediate Formation quite well, including the appearance of rural mound sites, delegation of administration, specialized hierarchical sites, evidence of intense competition (from stone sculpture). However, observed stability in population size and population centralization was not expected.

The Early Classic appears to represent a Formation not defined in the model, possibly identified with conditions of conflict, military conquest or some form of political suppression, resulting in a cultural hiatus. There was very weak development in both rural and core areas, combined with extreme population centralization. I do not view this as a pre-state formation as proposed by Murdy (1984) and Sanders and Murdy (1982), as this period should display that it was complexly organizated and at the threshhold of transformation. All indications are that it was one of the least developed periods in the sequence.

The second period of the cycle began with the Middle Classic, which, like the Terminal Formative, emerged from a period of relatively low complexity and political

decentralization. As in the Terminal Formative, conditions were similar to those expected for the Early Formation, however, contact with Teotihuacan and the extensive Mesoamerican trade network, had a part in the transformation, as suggested for the Alternative Formation. I argue that the idea of the Alternative Formation is reasonable, but that it should be redefined to account for the conditions found in the Terminal Formative and Middle Classic, in particular, rural population growth, centralization of political power and status and development of state-like bureaurocracy.

The Late Classic is analogous to the Protoclassic and the Intermediate Formation, as it succeeded a period of administrative and political centralization (Middle Classic), limited local development in the context of rapid population growth.

The Terminal Classic displayed continuity with the Late Classic, but the pace of construction activity and population growth had diminished. Rural Kaminaljuyu apparently survived the Late Classic elite collapse, but population began to concentrate around the core area, even more than in the Late Classic. Consequently, there appeared to be a two-stage collapse process, first the core area, then the rural area. The Late Formation is indicated with population increase to peak totals, complex secondary centers scattered throughout the area and increased settlement on marginal land. The emphasis was on bureaucratic, state-like administration, there was minimal new construction

anywhere, but unlike the Early Classic, there was clear evidence of hierarchical construction with an emphasis on administration (summit area in construction).

Observations and Revision of Model

Based on the anayses and observations contained in this study, revisions to the model are proposed as a means to resolve problems and contradictions. Of course, these are based solely on the evidence for Kaminaljuyu, though the model was intended to be general. Consequently, I have tried to keep the comments general so observations could be applied to other cases (sites), but refer to Kaminaljuyu in specific instances.

1. An Early Formation requires an option for a polity which has social and lineage ranking, but which does not have a supreme lineage or paramount leader in which political power is highly centralized. Public construction, monumental art and evidence for specialization could be present, as in the Late Formative, but not extensive wealth or commercial trade. That is, a model needs to account for relatively equal distribution of power and status among lineage units, and individuals within these units, as a precondition for the emergence of centralized power.

2. Based on the evidence for Kaminaljuyu, it is possible that the centralization of political power (as in the Terminal Formative) was initiated or facilitated by external contact and/or by wealth and commercial exchange (Alternative Formation). Thus, conditions expected for the Early Formation (population

growth, centralization of power, monumental construction) are accounted for by the inclusion of aspects of the Alternative Formation (wealth trade). The two would be collapsed into a single Formation and a new one created to explain how it arose from preceding conditions. Generally, this view of Kaminaljuyu would have to be evaluated against observations by Fox (1977) and Hohenberg and Lees (1985) that polities displayed certain social characteristics that depended on the primarily function of the site, for example, whether it had primariy "mercantile" or "administrative" functions. Thus, the sequence at Kaminaljuyu may have depended to some extent on site function, geographic location, or proximity to certain resources (obsidian).

3. There was no direct transition at Kaminaljuyu from the Early Formation to the Intermediate Formation. However, the sequence, Alternative Formation to Intermediate Formation occurred twice (Terminal Formative to Protoclassic; Middle Classic to Late Classic). This observation again shows that a revised model should combine characteristics for the Early and Alternative Formation. As noted in point 2, this condition may be influenced by site function. For example, Kaminaljuyu was located on a major communication route, near important obsidian deposits, so participation in a wealth trade system might be expected to influence political development. The general conditions for this transition on two separate occasions, separated by about 600 years, are similar enough to confirm the sequence.

4. The Alternative Formation (or "Mercantile" model) is a

reasonable form for Kaminaljuyu (contra Sanders and Webster 1988), but it appears to be a system that maximizes all forms of economic production and promotes population (labor) increase, while enabling centralization of political power. This demonstrates that formalist and substantivist explanations of economic organization need not be mutually exclusive.

5. The model for the Late Formation does not fully define observed conditions in the Terminal Classic, specifically the apparent political collapse at the core, combined with rural activity and (loose) political integration. The model presumes total collapse in both areas in the Late Formation. This condition would have to be explained.

6. The model must incorporate a Formation for conditions dominated by warfare, perpetual conflict, or political suppression as a result of (military) conquest. This may be evident at either the local (internally competitive) level or at the interpolity level. The conditions observed for the Early Classic, described as "transitional" or as representing a cultural hiatus, would be characteristic of this Formation.

7. Based on the evidence for Kaminaljuyu, the subsistence dominated economy was always marked by decentralized political power and centralized population distribution. This pattern occurred in all periods except the Terminal Formative and Middle Classic (Alternative Formations). A general model would have to examine the implications of this pattern, as it is often assumed that population centralization is associated with political

centralization (for example, de Montmollin 1989; the literature on Teotihuacan).

8. The model must account for cyclical patterns of development, but must also account for the effects of scale (population size, economic output), complexity (degree of social stratification and occupational specialization). For example, the Protoclassic and the Late Classic, though similar in many respects, differed in complexity and scale (as did the periods that immediately preceded them). The Late Classic appeared to be much more politically fragmented, hierarchically organized, specialized and decentralized than the Protoclassic, which may have contributed more to general (or elite) collapse.

9. A revised model should account for regional interaction, so that aspects of trade and warfare are more apparent as they affect a specific site. This would be particularly important for a period such as the Early Classic in which warfare or conquest is likely at Kaminaljuyu. For example, a study similar to this one could be applied to other defined polities in the Valley to determine other patterns in the temporal sequence of social Formations.

In summary, a model needs to be "open" to account for cyclical patterns, sudden shifts, and account for the effects of scale and complexity of the current and preceding period. Ideally, the model should consider the regional context, or conditions defined by a sequence at neighboring or regional sites.

To summarize the preceding discussion, I present, by chronological period, the sequence of Formations at Kaminaljuyu as follows.

CYCLE	PERIOD	FORMATION
-	Late Formative	Early (Emergent)
1	Terminal Formative	Alternative
	Protoclassic	Intermediate
	Early Classic	Late (Hiatus)
	Middle Classic	Alternative
2	Late Classic	Intermediate
	Terminal Classic	Late (Collapse)

The suggested changes are noted in brackets, otherwise the Formations are aligned according to an evaluation of the "best fit" for the Kaminaljuyu study area.

Contributions of this Study

The process of carrying out this study contributed to the explanation of socio-political change in the archaeological record for Kaminaljuyu. I devised a model of cultural change based on assumptions about political behavior (status competition), economic organization (wealth and subsistence economies) and population change, and linked it to the material record for purposes of testing a specific site. Thus, the record was approached from a theoretical basis, which allowed the use of the complete archaeological record, but could be tested in component parts to reinforce (or contradict) the theory. The

testing procedure was structured so that it was capable not only of contradicting or questioning the model and theory, but also of revealing relationships and patterns in the data and permitting the model and theory to adjust and change with changes in the patterns.

The results show that similar categories in the material record, such as sites, population characteristics, land/soil classification, construction activity can be used to examine culture despite classification systems such as chiefdom, state, or other types of political organization. The culture system (or Formation) was outlined but left to define itself with the common variables. Also, chronological periods, though important analytical categories, were not identified with these categories, as specific stages of evolution. Therefore, it was possible to argue that state-like social organization appeared (say in the Terminal Formative), but suffered periods of decentralization or decay only to reappear again.

The results also show that there was continuity and change from period to period, not a series of discrete stages. For example, I think that political centralization in the Terminal Formative and Middle Classic was facilitated by conditions of weak political integration, as Fox (1977) suggests, but created the potential for decentralization in the subsequent periods by fostering population growth and economic production, and thus administrative stress, without an appropriate response. From this perspective, political change was imminent, but may have occurred

by confrontation or force. This is analagous to Bailey's idea of a resolution between "normative" and "pragmatic" standards (Bailey 1969:189), in which the existing system, though inappropriate to current (pragmatic) conditions, undergoes a transformation to account for these differences. Cheek (1977) and Brown (1977) give a good account of these type of changes for Middle Classic Kaminaljuyu. Consequently, there is change, but it arises out of preceding systemic conditions. This was most evident in the changes from the Terminal Formative to the Protoclassic and from the Middle Classic to the Late Classic.

Perspectives on Further Research

What could be done to develop or improve this type of study? Naturally, a reliable, complete settlement survey with good dating for components is desirable. There should be some indication of site function, or at least a land-soil classification system. I would use a number of spatial divisions within the concentric ring configuration, for example north-south divisions, or segments or hemispheres as long as it seemed clear that these sub-divisions indicated political divisions. For mound sites, a determination of whether interior components are present is crucial so that period totals for volume and summit area can be better evaluated.

This study showed that regional relations and interaction were present and that they were an important part of local social change. The regional context should be incorporated, particularly

for analysis of social formations associated with intense trade and warfare. It would be interesting to apply this type of analysis to various sites in a regional area (for example, Highland Guatemala, Pacific Coastal Guatemala) to determine the relationship between contemporary sites and their political formations, and to see how this changed with time. The research could be based on theories about regional interaction and of sequences of social formations.

Within rural Kaminaljuyu, a series of individual sites could be investigated to test some aspects of the model. For example, the distribution of wealth goods in various sites would assist in evaluation of types of political and economic financing, especially in relation to differences between wealth and subsistence finance. It would also be interesting to have some information relating to rural (mound and non-mound) site function to answer questions about the type and distribution of economic and administrative activities.

Another area of research could develop more theory on the relations between political and economic behavior, and the material record, as they relate to less well-defined areas such as status competition. Investigation into the nature and characteristics of "centers" as developed by urban anthropologists was useful in this study, and could be adapted to and developed for Mesoamerican research. This would further contribute to the study core-rural relations as attempted in this study.

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APPENDIX A

Kaminaljuyu Construction Activity: Rural Mound Sites

This appendix presents the data which were used in the analysis of construction activity for rural Kaminaljuyu within the study area. The data are organized by chronological period, from the Late Formative to the Terminal Classic. Each mound site determined to be "in use" in a particular period is listed by its site name. An asterisk (*) following the site name indicates that original construction can be dated to the associated phase. Otherwise, listed sites are considered to be "re-occupied" without significant additional construction or renovation. Previous occupational episodes are noted by phase initials in brackets after the site name. To indicate location, the Kaminaljuyu Project survey reference number (GRID REF.) for each site is also given. For example, Villalobos (46-40-125) indicates the survey grid zone (46), the area within the zone (40) and the sector within the area (125) in which the site is located. The concentric ring number in which the site falls is also given (see Table 10). Figures for summit area (SUMMIT AREA) and volume (TOTAL VOL) are given as the total of all mounds, platforms and ballcourt enclosures identified at the site. SITE TYPE is given according to the site classification system used by Murdy (1984:42-43). For key to site type names, see Table 6.

Source: Murdy (1984, Appendix B). Supplementary data for Cementerio (47-20-185) and Rosario Naranjo (46-11-054) were collected by the author during visits to these sites (1990).

Appendix A

No.	SITE NAME	GRID REF.	RING NO.	SUMMIT AREA m^2	TOTAL VOL m^3	SITE TYPE
Late Formative						
1	Villalobos*	4640125	3	100	8337	SNV
2	Mulato*	5922209	5	816	4026	SCC
3	Aeropuerto*	5934237	7	200	1000	?
4	Aurora*	6000306	5	200	1000	?
5	Arcos*	6021154	7	392	1168	?
6	Solano*	7103133	9	179	1325	SNV
	Total			1887	16856	
Terminal Formative						
1	La Brigada*	4502059	5	518	2992	SCC
2	S.C'bal Mansilla*	4543147	4	549	1403	SCC
3	Roldan II*	5843286	8	1656	2738	LNV
	Total			2723	7133	
Protoclassic						
1	Bran*	3244094	4	1293	6745	SCC
2	Rincon*	3300204	7	1885	13770	SDV
3	Naranjo*	3333299	4	2966	8447	LCC
4	Rosario Naranjo*	4611054	2	1634	17540	SNV
5	Cruz de Cotio*	4611329	2	572	2901	SNV
6	Garland*	4631055	2	36	527	H
7	Campo de Marte*	4743351	6	1456	4626	SCC
8	San Isidro II*	4841116	9	298	2256	SCC
9	Reformita*	5903234	3	204	1386	?
10	Las Charcas*	5912084	4	1262	3225	SNV
11	Portillo*	5913287	4	687	4845	SNV
12	Eureka*	5933380	6	665	3950	SCC
13	Pilar*	6034049	9	204	1386	?
	Total			13162	71604	
Early Classic						
1	Cruz de Cotio (PC)	4611329	2	572	2901	SNV
2	Garland (PC)	4631005	2	36	527	H
3	Pinol*	5911087	4	738	2695	SNV
4	Solano*	7103133	9	709	2620	SNV
	Total			2056	8743	

Appendix A

No.	SITE NAME	GRID REF.	RING NO.	SUMMIT AREA m^2	TOTAL VOL m^3	SITE TYPE
Middle Classic						
1	Bran (PC)	3244094	4	1293	6745	H
2	La Brigada (TF)	4502059	5	518	2992	SNV
3	Rosario Naranjo (PC)	4611054	2	1634	17540	SNV
-	Rosario Naranjo*	"	"	657	6071	-
4	Garland (PC,EC)	4631055	2	36	527	H
5	San Cristobal V*	5814179	5	196	1561	SCC
6	Rancho Azul III*	5844151	7	334	1052	ER
7	Solano*	7103133	9	15907	86508	PC
-	Solano (LF,EC)	"	"	888	3945	-
	Total			21463	126941	
Late Classic						
1	Rincon III*	1944290	8	466	2404	ER
2	Guacamaya I*	3340355	3	619	2642	PC
3	Pelikan*	3343139	4	96	579	ER
4	Minerva*	3432326	6	90	450	SNV
5	San Rafael*	3443188	7	208	1528	ER
6	Laverreda*	3540372	9	194	1065	ER
7	La Brigada (TF,MC)	4502059	5	518	2992	SNV
8	Belen II*	4503379	4	245	321	SNV
9	Sanja*	4503389	4	725	6297	SEC
10	Cotio*	4524116	3	388	1320	SEC
11	La Comunidad IA*	4534171	3	2014	3792	SEC
12	S.C. Mansilla (TF)	4543147	4	516	1254	H
13	Aycinena*	4600210	3	553	1236	SEC?
14	El Club*	4631024	2	140	1132	SNV
15	Garland (PC,EC,MC)	4631055	2	36	527	SEC
-	Garland*	"	"	221	686	-
16	El Canal I*	4631096	3	180	900	LNV
17	Cementerio*	4720185	3	7291	33477	RC
18	Colonia Abril*	4723118	6	318	2549	ER
19	Palmita*	4723232	6	308	1350	ER
20	Concepcion*	6004050	8	308	1350	ER
21	Los Guajitos*	7204365	9	32	63	H
22	Solano (LF,EC,MC)	7103133	9	16795	90453	LNV
23	El Zacatal*	7210125	9	384	568	H
24	S.Clara Cementerio*	7310049	9	31	100	SNV
	Total			32676	159035	

Appendix A

No.	SITE NAME	GRID REF.	RING NO.	SUMMIT AREA m^2	TOTAL VOL m^3	SITE TYPE
Terminal Classic						
1	Castillo*	3204073	8	188	499	ER
2	Fuentes*	3323202	5	164	497	ER
3	Cristina*	3324212	5	594	1630	ER
4	Naranjo (PC)	3333299	4	2966	8447	ER?
5	Guacamaya II*	3341118	3	994	2200	ER
6	Pelikan (LC)	3343139	4	96	579	ER
7	Zapote*	3421297	7	52	147	SNV
8	La Cruz*	3440108	4	366	911	ER
9	San Rafael (LC)	3443188	7	208	1528	ER
10	Balsamo*	4503116	4	212	711	ER
11	Belen II (LC)	4503379	4	245	321	ER
12	Sanja (LC)	4503389	4	725	6297	SEC
13	Cotio LC)	4524116	3	388	1320	SEC
14	La Comunidad IA (LC)	4534171	3	2014	3792	SEC
15	S.C. Mansilla (TF,LC)	4543147	4	516	1254	H
16	Aycinena (LC)	4600210	3	553	1236	SEC
17	El Club (LC)	4631024	2	140	1132	SNV
18	Cementerio (LC)	4720185	3	7291	33477	RC
19	Palmita (LC)	4723232	6	308	1350	ER
20	Portillo (PC)	5913287	4	687	4845	SNV
21	Solano (LF,EC,MC)	7103133	9	16795	90453	PC
22	Solano II*	7114023	9	65	126	LNV
	Total			35567	162752	
Undated Sites						
1	Rodeo	4611143	2	no data	no data	SNV
2	San Carlos	5922367	8	380	999	SCC