CONCORDANT CHANGE AND CORE-PERIPHERY DYNAMICS:

A SYNTHESIS OF HIGHLAND MESOAMERICAN

ARCHAEOLOGICAL SURVEY DATA

by

CHARLOTTE ANN SMITH

(Under the direction of Stephen A. Kowalewski)

ABSTRACT

This study synthesizes quantitative data from 20 archaeological surveys scattered across 80,000 km^2 of highland Mesoamerica, and uses those data to examine macroregional-scale interaction and integration, concluding that this very large area behaved as system with integrated parts (regions). I argue that variations among contemporaneous regions (measured by population density, distribution, depth of settlement hierarchy, etc.) stemmed from the varying roles of cores and peripheries (cores have higher populations, higher population densities, and more urbanization, and peripheries have the opposite).

The study area spans the highland region from the greater Basin of Mexico southeast to the greater Oaxaca Valley area. The 20 regional surveys contribute basic data (site size, periodization, civic-ceremonial architecture) on over 14,000 components. The study examined seven periods, roughly equivalent to Early Formative through Early Classic, Epiclassic, and Late Postclassic.

Integration is evident in concordant or coordinated changes across the study area in, e.g., overall population (including both growth and contraction), urbanization, internal settlement hierarchy, and fortifications. Contemporaneity among the regions is established through ceramic crossties and trade wares. Times when more regional phases aligned indicate more integration; periods such as the Terminal Formative and Epiclassic have poorer inter-regional alignment, or less integration.

This synthesis allows examination of how civilizations grow. Previous syntheses have focused on only core regions and/or not been quantitative. I conclude that Gordon R. Willey was correct that there were periods of greater and less integration and interaction, but that market exchange was the basis for the interaction (Willey argued it was ideology). I conclude that William T. Sanders was correct that regional interactions were important in the highland sociopolitical evolution, but that interaction within the highlands were the most important (Sanders argued that it was highland-lowland interaction).

These data reveal several striking patterns, including: Early and Middle Formative populations were highest in the southern Basin of Mexico and Mixteca Alta; community size tended to increase and settlement hierarchy tended to deepen over time, except in the Epiclassic; ratios of mounds/person were highest in the south in the early periods; and, ball court construction was earliest in the southeastern study area.

INDEX WORDS: Archaeology, Mesoamerica, Highland Mexico, Macroregional analysis, Core-periphery dynamics, World-systems, Political economy, Market exchange, Sociopolitical evolution, Settlement pattern studies, Civic-ceremonial architecture, Mounds, Ball courts, Teotihuacán, Monte Albán, Tula, Cholula, México, Puebla, Tlaxcala, Oaxaca, Aztec, Mixtec, Zapotec

Concordant Change and Core-Periphery Dynamics: A Synthesis of Highland Mesoamerican Archaeological Survey Data

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Chapter 1

Introduction

Mexican and foreign archaeologists have compiled archaeological survey data for large areas of highland Mesoamerica; this study is the first systematic synthesis of those data. In this study, I unite quantitative data from 20 survey projects, and qualitative and excavation data from several dozen more research endeavors, to analyze change and continuity over 3000 years of the highland Mesoamerican past. The 80,000 km^2 study area spans major centers of development in the Basin of Mexico, Tlaxcala-Puebla Valley, Valley of Oaxaca, and areas in between.

Over the last half-century, archaeologists have increased the scope of their studies from households, neighborhoods, and communities, to examine the sociopolitical evolution of civilizations at the macroregional scale. We have borrowed concepts from sociologists and geographers, and now consider the dynamics of core-periphery development and world-system integration. Nevertheless, systematic macroregional studies of long-term social change are few, incorporate spotty data, or are not data-driven (good examples, however, include Blanton [2000] and Wright [1986]).

Archaeological surveys in the Mesoamerican highlands

Archaeological surveys are accomplished by teams of fieldworkers combing the countryside on foot, looking for the remains of past human habitation and land use. Most of the Mesoamerican highlands today are fields or sufficiently lacking in vegetation that a visual inspection can discover surface remains, both artifactual and structural (buildings). In more heavily vegetated areas, however, subsurface testing methods are necessary to discover archaeological sites. Archaeological surveys are intended to discover evidence of previous human habitations across broad areas. Early archaeological surveys sought to identify contemporaneous sites and enough about their preservation to determine which was the best candidate for excavation. Although assessing preservation continues to be important in archaeological survey, the focus today is on recording the full range of human remains (residential and non-residential sites), their sizes and periods of use, to enable regional-scale analyses of population distributions and sociopolitical dynamics.

Gordon R. Willey's (1953) Virú Valley survey initiated a tradition of archaeological research that focused on settlement patterns, or the distribution of sites across the landscape. Regional settlement pattern surveys are a foundation for anthropological analyses from locales across the globe, and are especially useful for comparative studies—e.g., of city-states (Nichols and Charlton 1997) and of archaic states (Feinman and Marcus 1998). Recently, William T. Sanders has described the evolution of archaeological survey in highland Mesoamerica, which began with fieldwork he undertook in the Teotihuacán Valley over 40 years ago.

> The Teotihuacán Valley project was initiated in June 1960. From its inception, the project was visualized as the first stage of a long-term, ambitious plan to apply Gordon R. Willey's Virú Valley methodology (i.e., the study of regional prehistoric settlement patterns using a surface survey strategy) to a huge region (approximately 18,000 km^2) [Sanders 1999:12].

From the successes and failures of this and subsequent field seasons, the methods were refined, then used in subsequent studies elsewhere in the Basin of Mexico and across the highlands. Thus, almost all the data used in this study were collected in the same research tradition.

Highland surveys do not focus on sampling, but instead on finding all sites, large and small. They tend to do little excavation, but survey projects often have included some excavation, often to refine ceramic chronologies. Notes Richard E. Blanton,

> [a] goal of the surveys has always been to cover large expanses of territory as completely and systematically as possible, in order to maximize the accuracy of

> regional population estimates; thus we avoided using regional sampling strategies (at times over the objection of grant review panels). This tactic proved beneficial, as it facilitated the use of the resulting data for regional analyses—for example, rank-size measures of urban primacy that would be impossible using sampled data… [1990:11].

The site size, location, and periodization data fundamental to regional systematic studies (aka settlement pattern studies) are appropriate for big-picture studies. Nevertheless, a systematic, data-rich synthesis of these highland surveys has not been published prior to this study.

Sanders undertook archaeological surveys as "part of a research strategy designed to test the explanatory power of the ecological approach" (Wolf 1976:7). The model Sanders and colleagues espoused "postulates a spiraling relation between population growth, food production, societal differentiation, and the development of societal control hierarchies (social stratification and the state)" (Wolf 1976:17). For Sanders, the explanation for cultural evolution lies in human ecology, and "emphasizes demographic change as determinative of institutional change" (Sanders and Nichols 1988:35). Sanders and his coworkers believe the explanation for cultural evolution was to be found at the regional level. This was a major reason Sanders (1999) chose to work in the Basin of Mexico, and later at the regional cores (nuclear areas in Sanders's terms) of Kaminaljuyú and Copán in the Maya lowlands.

Blanton (although trained within Sanders's research tradition) and many Valley of Oaxaca researchers have disagreed with this approach (e.g., Blanton 1990). Blanton and colleagues (Blanton et al. 1999; Blanton et al. 1981; Blanton et al. 1993) argue that these regional data demonstrate that regional sociopolitical dynamics can only be understood by looking at interregional factors. This current project, a synthesis of regional settlement pattern studies, is an extension of a research tradition in highland Mesoamerica that began almost a half-century ago; my theoretical approach lies within the Blanton branch of the academic lineage.

The goals of this study

In this study, I examine the evolution of macroregional sociopolitical systems using quantitative and qualitative data from highland Mesoamerica as a case study; the study both explores how civilizations grow and the methods for doing long-term, data-driven, macroregional studies. To perceive the change and continuity that are the hallmarks of sociopolitical evolution, I look at key features of the political economy of social systems (especially integration) using variables based on settlement patterns and distributions of mound and ball court civic-ceremonial architecture.

The conclusions of this study

I conclude that this highland macroregion functioned as a system for the 3000 years from the Early Formative through the Late Postclassic; the integrated parts of the system were the constituent regions. Systemness is demonstrated by concordant (coordinated) change across the study area (and probably beyond, although this was not examined quantitatively) in settlement patterns and the distribution of ritual and administrative architecture (mounds and ball courts); I note concordant change in urbanization patterns, overall population growth and decline, settlement hierarchy, etc. Integration varied among the seven periods examined; highland Mesoamerica was more integrated in the Early Classic, for example, and less integrated in the Terminal Formative and Epiclassic. At the same time, I attribute regional variation to core-periphery dynamics. Cores are regions with higher populations and more urbanization, while peripheries are the opposite. Furthermore, I believe that interregional integration was greater within the highland study area than with regions outside the highlands, and that that integration derived from market interactions.

The importance of this research

Anthropologists seek to understand human beings and human behavior. In this era of "think globally, act locally," anthropologists are prompted to consider human behavior at its broadest scales. Fernand Braudel argues for the importance of understanding history at a time-scale beyond that perceptible in a single life, or even in several generations; he calls this the *longue durée* (1980 [1969]:27). Immanuel Wallerstein's (1974) idea of a modern world system, originally conceived of as an explanation for the post-industrial economy, has been reformulated to apply to the premodern world, overcoming what Wallerstein calls the trinity of economy, polity, and society, to see the three as integrated and perhaps inseparable (1990:292). Stephen A. Kowalewski's (1995; 1996) concept of concordant change provides one way to keep the trinity united because it does not prioritize any one of the three.

Ecologists, too, are concerned about large-scale studies, and the role of scale. They note that scale must be understood in appropriate dimensions, units of measurement, and scales of observation (O'Neill and King 1998:7). Scaling-up, or translating information from smaller to larger scales, is not a process of simple linear change (Meentemeyer and Box 1987), and causal processes operate at different scales (Meentemeyer 1989). Peterson and Parker note that

> [r]egardless of the level of organization or the scale of the study, ecological systems are not governed exclusively by local-scale processes. Instead, systems are linked by processes into larger systems, and by other processes into even larger systems [1998:508].

The same is true of social systems. Yet, even amidst this multidisciplinary realization that the processes we seek to study take place over the long-term, our conceptual tools lag, and few long-term projects and studies are funded, either in ecology (e.g., Franklin 1989) or the social sciences.

This study is important because it addresses this need for long-term studies by analyzing at the macroscale data that have already been collected and have yet to be synthesized. Although not highlighted as such, this study also presents techniques for macroscale analysis of archaeological settlement pattern and civic-ceremonial architecture data. This study is also important for the insights I tender for the development of Mesoamerican civilization.

The following chapters

Chapters 2 through 6 provide background and context for the data presented in Chapters 7 and 8, and the in-depth analysis of those data in Chapter 9.

In Chapter 2, I discuss the theoretical underpinnings for this study, which are anchored in core-periphery perspectives that have arisen from Wallerstein's (1974) world-systems theory. Wallerstein's world-systems perspective, which he originally applied to the post-industrial modern world, has been reformulated by archaeologists (e.g., Peregrine 1996a; Peregrine 1996b), who focus on the interplay of large-scale sociopolitical and economic processes in the development of civilizations.

In Chapter 3, I describe the study area and its environmental setting, emphasizing that the study area is bounded on most sides by high or rugged terrain, which I term bounding terrain. Within the bounding terrain, travel is easier than to places outside the study area, and indeed footpaths have webbed the area probably since at least the Early Formative. The study area includes many types of highland environments including broad basins and valleys, narrower mountain valleys, rough mountainous terrain, active volcanoes and exploded cones and lava flows, and a few peaks with year-round snow packs. Nevertheless, despite a tendency to aridity, good agricultural lands abound, along with many nutritious annual, perennial, and tree crops.

In Chapter 4, I develop a macroregional chronology by examining ceramic crossties and other ceramic clues for contemporaneity among the study area's regional chronologies. I applied sequential alphabetical designations to each separate period I identified from earliest to latest, then assigned those letter designations to each record in the database I'd created. The database includes site-by-site data (site size, estimated population, etc.) drawn from 20 field projects from across the study area (the quantitative survey areas). There were seven periods for which I had sufficient quantitative data from across the study area to examine macroregional patterns; they range from the Early Formative to Late Postclassic.

Chapters 5 and 7 both relate to settlement patterns. In Chapter 5, I discuss how archaeologists use settlement patterns to examine sociopolitical evolution, particularly through various analyses of population size and distribution changes over time. Settlement pattern studies allow archaeologists to analyze the development of complexity and integration, patterns of urbanization, and other aspects of population growth, decline, and small- and large-settlement dynamics. In Chapter 7, I present the quantitative settlement and population data from the study area, augmented by data from less rigorously published surveys, as well as excavation.

Chapters 6 and 8 both discuss civic-ceremonial architecture. In Chapter 6, I discuss how civic-ceremonial architecture provides a second hierarchy that can differ from the population-based hierarchies discussed in Chapter 5. Civic-ceremonial architecture has specific purposes such that their distributions may not be isomorphic with the most populous settlements. In Chapter 8, I present the mound and ball court data from the quantitative surveys in the study area, augmented with data from sites that are not in the quantitative survey areas yet have many mounds or ball courts.

In Chapter 9, I briefly summarize all previous chapters, including highlights of the findings presented in Chapters 7 and 8. In the final section of Chapter 9, I restate the most important points regarding regional and macroregional patterns of growth, decline, expansion, and settlement in highland Mesoamerica, and offer an explanation for the patterns I revealed in the analysis of quantitative and qualitative data.

Chapter 2

Theoretical Background and Concepts

The goal of this study is to examine the systemness of the highland Mesoamerican macroregion using quantitative data collected by a score of archaeological surveys. To evaluate systemness, I note concordant or coordinated change across the 80,000 km^2 study area. In this chapter, I discuss the theoretical framework I use to link archaeological data (settlement patterns of Chapter 7 and civic-ceremonial architecture distributions of Chapter 8) to recognition of and explanations for coordinated change or continuity in human behavior, and thus to the systemness of highland Mesoamerica.

The macroscale of this research means that different aspects of sociopolitical evolution are apparent than at the smaller scales more commonly used (e.g., household, community, valley). Data at this scale show large-scale changes and continuity; it is only when we move to a very large scale, larger than a region, that we can assess these issues. Nevertheless, we need multi-scalar analyses for the greatest breadth of anthropological understanding. Several exceptional studies have aimed to illuminate the effects of human behavior at broad scales, including many using data from Mesoamerica (e.g., Hegmon 2000; Nichols 1996; Sanders 1999; Smith 1976b; Stark and Arnold 1997; Wright 1986).

The basic question underlying this research is: how did civilizations evolve? At the macroregional scale, did change in one region affect other regions, and what is the macroregional context for the change? Or, to what degree was the study area a macroregional system? I use quantitative survey data that support evaluation of population and settlement patterns, as well as civic-ceremonial architecture to examine these questions. To analyze those data, I focus on scale, integration, complexity, and boundedness, key features of social systems, and how they illuminate patterns of hierarchy, urbanization, and centralization by highlighting change and continuity at a broader scale than the local or regional, using archaeological survey data.

Big-picture studies

Large-scale, longitudinal studies are vital in understanding social change and evolution. Notes Simon A. Levin (1995:278), "theoretical science…relate[s] processes that occur on different scales of space, time, and organizational complexity. Understanding patterns in terms of the processes that produce them is the essence of science…." Anthropologists focus their theoretical investigations on human behavior in general. Archaeologists use data with considerable time depth, comparable to that of landscape ecology. Ecologists believe that to identify pattern and variability changes over time researchers must first determine how to recognize patterns of variability, then develop measures to describe the patterns (Levin 1995:308). This same approach holds for human interactions.

Economists, geographers, historians, and anthropologists all realize that long-term studies are critical to understanding the dynamics of change and interaction among societies. Indeed, Braudel's (1980 [1969]) three scales of time, the longest several centuries in duration, which are a foundation to studying history, and Wallerstein's (1974) modern world–system, which examines long-term patterns in economic growth and stagnation and requires examination of interactions beyond the regional scale, are only two examples of large-scale, longitudinal approaches used by social scientists. Recent studies of long-term social evolution include those by Bintliff (1997; 1999), Blanton et al. (1993), Chase-Dunn (1994), Diamond (1997), Frank (1993), Hall (1996), Kristiansen (1998), Pollock (1999), Renfrew (1979), Sanderson (1990; 1995), and Wright (1986).

For decades, archaeologists tended to focus research and theory on the household and community, on burials and fancy crafted items, and on the most elaborate buildings and their contents. The first attempt to shift to systematic research at the broad scale in the Americas was Willey's (1953) survey of the Virú Valley in Peru. Today, archaeologists have conducted large-scale systematic surveys of several areas of the world (e.g., Mesoamerica, Mesopotamia, South America, China). These surveys produce longitudinal data that allows researchers to ask questions and investigate aspects of human intergroup interaction unavailable with finer-grained household- and community-focused data.

Theoretical framework

The general theoretical framework for this research is systems theory, which focuses on the exchange of matter, energy, and information among the constituent parts of the system, which are also to some degree interdependent (Kowalewski 1995:150). Thus, to apply systems theory to large-scale social systems we must define: 1) the parts of the system; and, 2) what is exchanged among them. In a system, the parts undergo change or endure continuity at the same time—the change is concordant (Kowalewski 1995, 1996).

World-systems theory is currently our most detailed conceptual approach for analyzing sociopolitical change and continuity, although it is based on economic issues. The most recent formulations are built upon Wallerstein's (1974) original world-systems concepts, which he applied to the modern industrial world; subsequently, archaeologists and sociologists have adapted Wallerstein's model to pertain to the pre-modern world. Nevertheless, social science has yet to provide many models for understanding broad-scale changes in human social systems. Our literature is still widely leavened by descriptive yet not particularly informative terms like "transformation," "collapse," and "revolution."

Wallerstein (1974) introduced the concepts of cores, peripheries, and semi-peripheries, in which

> the core dominates the periphery and exploits it by dictating the trade relationship (cheap raw materials for expensive finished products) through which the core constantly accumulates surplus, and by limiting the periphery's access to technology (by which it could, conceivably, produce its own finished products) [Peregrine 1996:3–4].

The semi-periphery acts as a "middle man" or political buffer between the core and periphery. I find the world-systems conceptual framework articulated in several publications by Christopher K. Chase-Dunn and Thomas D. Hall the most complete currently available. Their 1997 volume *Rise and Demise: Comparing World Systems* is augmented by their 2000 article "Comparing World-Systems to Explain Social Evolution," which focuses on studying change at the macroregional scale. Meaningful models of large-scale sociopolitical change, rather than models that focus on the entities or the exchange among them, have been persistently difficult to develop due to inherent complexities.

Chase-Dunn and Hall (2000:86) define the parts of world-systems as "composite units," by which they mean the full range of sociopolitical entities and include classless groups as well as polities. They suggest analysis focus on four types of exchange or interaction: 1) the bulk-goods exchange network; 2) the prestige-goods exchange network; 3) the political/military exchange network; and 4) the information exchange network (Chase-Dunn and Hall 2000:89). To examine change, they emphasize research in: 1) ***hierarchy***, including degrees of hierarchy, the units of the hierarchy, and peripheralization; 2) ***commodification*** of land, labor, wealth, and goods, including the forms and extent the commodification takes; 3) ***interaction***—the forms and densities of the interaction network as a whole and the relationships among the four types of exchange; and 4) the ***historical particularities*** of the system under study (Chase-Dunn and Hall 2000:93).

Along a similar vein, Blanton et al. (1993:14–18) define the core features of human societies or social systems as scale, integration, complexity, and boundedness (Table 2-1). Earlier, Eisenstadt et al. (1988:15–16) focused on the role of elites in the social system, noting that boundaries are socially constructed, yet integration allows the independence of the system while complexity within the system is highly variable. Even earlier, Butzer focused on "space, scale, complexity, interaction, stability or equilibrium state" (1982:7). These are but three examples within the social science literature that discuss the analysis of sociopolitical systems.

Social evolution is not linear, as in the band-tribe-chiefdom-state model (Service 1962), but far more complex. Several researchers have noted cycling, or pulses of growth

Table 2-1. Properties of regional and macroregional human systems.

property (definition)	**discussion and implications**
scale (size, both spatial or territorial and population)	Scale in human systems relate to the size of territory, the number of inhabitants and their distribution across the landscape. Information processing, both collection and decision-making (Flannery 1972, Johnson 1978, Johnson 1981), affects system size. Likewise, scale limits the productivity or success of institutions in a human system, which need more efficient institutional hierarchies and improved information flows (Johnson 1982) in a larger system. A larger system also must marshal more energy and material, but has more members to mobilize. Smaller systems must be analyzed using more and smaller-scale measures than larger systems (Meentemeyer and Box 1987).
integration (interdependence of component parts)	Poorly integrated systems have relatively self-sufficient, independent units, which need only low flows of information, goods, energy, or labor to be maintained (Kowalewski et al. 1983:38). Measures of integration include centralization, or flow through a single location—an exaggerated form of this is the primate system (Blanton 1976, 1981)—although a system may be highly integrated yet not centralized (Kowalewski et al. 1983:35). Expansion of the center is generally linked to political decentralization. Integration may be partial, for instance, and lie more in the sphere of economic exchange, rather than political integration. Larger systems tend to have more levels of integration, but political and economic integration need not be isomorphic. Archaeologically, we take evidence of interconnectedness (flows) to indicate integration (albeit with qualifications).
complexity (extent of functional differentiation among component parts)	Complexity encompasses both horizontal and vertical differentiation. The former refers to parts at the same rank, whereas the latter occurs when "rank differences can be seen among functionally diverse parts" (Blanton et al. 1993: 17). Discriminating between these two is important, as they characterize functionally different systems. Vertical complexity is linked to social complexity, or ranking; horizontal complexity can be exaggerated by the structure of the system. A more complex system requires more energy to be maintained (Kosse 1994). "An increase in complexity has occurred, for instance, if there is a transition from a high degree of redundancy in the production of household craft items to more diverse and specialized production" (Blanton et al. 1993:17).
boundedness (permeability of social system boundaries with respect to cross-boundary flows)	Boundaries can be well-defined and fixed, or fuzzy, overlapping, and porous (Trinkaus 1987), and there's a danger of over emphasizing them (Blanton and Peregrine 1997, McGuire 1996). With archaeological data, the intricacies of boundedness may be difficult to discern, though fortified, walled, or defensive sites are strong indications of closed boundaries and diligent boundary maintenance, which may arise in situations of political competition. Situations can occur with considerable boundary activity, but few cross-boundary flows (Kowalewski et al. 1983:36). The boundary qualities of the component entities (polities) affect the speed and types of communications and interactions among them (Blanton and Peregrine 1997, Kowalewski et al. 1983). Boundary permeability relates to the vigor of political controls of cross-border flows (Burghardt 1996). Centralization and boundary permeability are inversely related, and boundary maintenance at the regional scale is generally directed toward encouraging regulated flows across the boundary, rather than closure (Kowalewski et al. 1983:39–40).

and decline, or other complex repeating patterns. Hall (1996) and Chase-Dunn (Chase-Dunn and Hall 2000:100–101) note that world-systems exhibit cyclical pulsations. In archaeological cases, these pulsations are especially evident in interaction networks and the repeated emergences of large polities. Archaeologists have identified cycling in numerous archaeological examples, including highland (e.g., Charlton and Nichols 1997; Feinman 1998:99–102) and lowland (Marcus 1998a) Mesoamerica, the prehistoric North American Southeast (Anderson 1994, 1996a, 1996b; Hally 1996), and the Mediterranean (e.g., Bintliff 1999). Willey's (1991) discussion of alternating periods of regional integration and regionalization is another example of cycling.

Analytical framework

To analyze macroregional scale change and interaction, we must identify human behaviors at that scale. We must also realize that, in using archaeological data, the clues that indicate these behaviors are limited. Nevertheless, only by using archaeological data can we generate longitudinal studies with substantial time depth that address large-scale issues of the evolution of civilizations.

For world systems known only or principally from archaeological data, we have the most data on hierarchy, interaction, and the historical particularities of the system; commodification is more difficult to tease from the soil. To analyze these aspects of world systems for change (e.g., hierarchy, interaction), archaeologists borrow from geography's spatial and locational analysis, especially central place theory, rural-urban dichotomies, urbanization and centralization, and rank-size distributions (e.g., Drennan 1996; Hodder and Orton 1976; Shennan 1988). Archaeologically derivable variables that illuminate these core features and issues of exchange include settlement pattern variables such as total population, population density, settlement size histograms, settlement rank-size graphs, percent of the population in urban-scale communities (degree of urbanization), and the like. Since archaeological sites may be quite heterogeneous in function, and the plans of small and large sites may be dissimilar, part of settlement pattern studies includes separate examination of small and large settlements (e.g., histograms, densities).

In this study, I rely on an analytical framework derived from archaeological settlement pattern studies, which focus on the kinds of data archaeologists do generate. Further, archaeologists have adapted the analytical structure for settlement pattern studies to analyze what might be termed as aspects of the settlement pattern, for example patterns in civic-ceremonial architecture. In this study, I examine hierarchical patterning in both settlements (and population) and civic-ceremonial architecture (focusing on mounds and ball courts). In the next section, I discuss the evolution and import of settlement pattern analysis.

Settlement pattern studies: issues of hierarchy, polity, and time

To examine the core features described above, archaeologists rely on settlement pattern studies, including population estimates and site distribution patterns, to develop an understanding of sociopolitical organization and its change through time and across space. Settlement pattern studies reflect lessons learned from central place theory, which helps us understand the extent of polities across the landscape. In settlement pattern studies, the settlements provide one building block for studying hierarchy; clusters of settlements (Chase-Dunn and Hall's [2000:86] composite units) provide a second. Archaeologists often refer to these kinds of settlement clusters as polities, a term that encapsulates and even may obscure significant variation. Any studies of long-term change must also be vigilant in generating the chronology, or temporal articulations, upon which contemporaneity is based. In this section, I briefly examine these concepts.

Central place theory

Central place theory (CPT) was initially formulated by the German geographers Walter Christaller (1966) and August Lösch in the 1930s. Christaller suggested that economic centers were spatially distributed in a nested hierarchy; if uniformly distributed across the landscape, they would produce a hexagonal network of central places.

Christaller's CPT implies step-like increments in community size that are evident in histograms and rank-size graphs. Lösch argued that different economic functions might produce different hierarchies, and thus could not be bundled together. Later research has shown that actual communities often conform to a hexagonal network, but also may have solar or dendritic distributions (Smith 1976a:316). The form of settlement hierarchies varies, and relates to sociopolitical organization.

Settlement hierarchy

Using archaeological survey data, we can construct hierarchies of certain aspects of a society, including population and settlement pattern, economic and market networks, and ritual and ideological activities. The concept of hierarchies assumes the presence of centralized control, such that the lower units in the hierarchy are unified in larger units. Larger units may be organized differently, and cannot be assumed to be merely enlarged versions of smaller units (or vice versa). To focus on hierarchies is to imply the importance of information exchange networks, transportation networks, and communication issues. Analysis of settlement hierarchy illuminates "the complex interrelationships among demographic processes and social and cultural change" (Blanton et al. 1996:11). Archaeologists also argue that common technology and symbolic systems can indicate polity limits and interpolity interactions (e.g., widely used ceramic types or decorative motifs).

Archaeologists focus on population and settlement patterns because the distribution of people across the landscape relates to sociopolitical organization (Renfrew 1978:105–106), and to centralized sociopolitical controls—however strong or weak. Population size is a proxy for a community's importance or an index of the community's "functional size" (Kowalewski et al. 1989:127), although whether the importance of the community reflects economic, political, or ideological factors and hierarchies may be unclear (Pyburn 1997:160–161). Since we cannot assume that the population hierarchy parallels the sociopolitical hierarchy, we look beyond population to other hierarchies, for instance, to market and ritual or ceremonial networks. Clearly, these various hierarchies are somewhat falsely teased apart from an interconnected whole; however, by unraveling them, we can compare different hierarchies within archaeological data.

Polities

A polity is generally defined as the largest autonomous sociopolitical unit on the landscape; polities are often called chiefdoms, petty kingdoms, city-states, and states, depending on their size and how they are internally organized. To define a polity is to define which communities are bound together to deal with the outside world. If many polities are united in a larger-scale sociopolitical unit, this larger unit is often referred to as an empire, or sometimes as a confederation.

Polities are sociopolitical units, and we assume that the polity's population and settlement patterns strongly reflect how the polity functions. Market systems may or may not be isomorphic with polity boundaries, such that market systems may crosscut sociopolitical units. For example, Leah D. Minc et al. (1994) show that ceramic distributions in the Late Aztec period in the southern Basin of Mexico generally conform to the polities described in colonial and prehispanic documents, and that the cross-boundary ceramic trade was far more limited than that within polities, although cross-boundary trading did occur, perhaps, they suggest, at seasonal markets.

Defining polities in archaeological situations can be difficult. For example, we assume that boundaries tended to be maintained along zones of low-population density, such as those corresponding to physiographic and topographic barriers, such as mountain ranges. In the latest prehispanic periods, we have substantial archival data on the communities that pertained to head towns, which reflect polity size. The extent of polities is also related to transportation times—generally the time it takes to walk to the center from communities in the periphery. Based on walking time and settlement spacing, David J. Hally (1993; 1994) argues for a cross-polity distance of 40 km, and often less, for Mississippian chiefdoms in the North American Southeast.

Time

To accomplish a macroregional study, the contemporaneity of occupations must be established. Temporal attributions, or chronology, are necessary to demonstrate the validity of spatially cohesive sociopolitical units. The temporal periods that archaeologists use can span many generations, and therefore considerable fluctuation. This is why archaeologists prefer to think of population estimates as ranges rather than a single figure. The length of the time period to which a population estimate is ascribed is important. Time periods are generally defined by a combination of absolute dates and ceramic periods. Ceramic periods may be identified by clear breaks in the ceramics (old types disappear and new types appear), or by differing frequencies of ceramic types (styles). Yet, as George L. Cowgill (1996:325) notes, clock time (like the absolute time of radiocarbon dates) and phase time (as defined by diagnostic artifacts and artifact complexes) are independent and may not correspond, however much we hope to make them isomorphic (see Chapter 4). Therefore, the starting and ending dates of periods are not fixed in clock time and actually may span several generations. At the macroregional scale, we use ceramic crossties to show the contemporaneity of occupation, and therefore to demonstrate changes that happened in diverse regions at the same time, which we also call concordant change.

Data

Above I laid out a theoretical and analytical framework for this study. I also examined how settlement pattern studies support this framework. The archaeological data that inform us about hierarchies, interaction, and the particularities of the highland system, and illuminate scale, integration, complexity, and boundedness derive from the building blocks of settlement pattern studies—settlement size and distribution—augmented by special characteristics of settlements, especially defensible locations and architecture (e.g., walls, ditches). Both survey and excavation projects provide data from which we obtain important insights into exchange hierarchies, for example through style similarities in material remains, especially ceramics and architecture, and trade in exotic goods. Thus, the data upon which this study is based include: 1) settlement size, location, and special features including mound and ball court counts; and, 2) distribution and hierarchies of settlements, population, and civic-ceremonial architecture.

Summary

In this chapter, I describe the theoretical framework for this study and introduce the conceptual foundations I rely on to use archaeological survey data to examine macroscale sociopolitical evolution. I use core and periphery concepts developed from world-systems theory, emphasizing hierarchy and interaction. Using these, I assess the particularities of the case study I examine—prehispanic highland Mesoamerica. I have discussed settlement pattern studies to emphasize the complex and shifting natures of the entities of macroscale studies, the types of interactions and hierarchies obtainable from archaeological data, and the important role of chronology in understanding concordant change and continuity in large-scale sociopolitical evolution.

In the following chapters, I examine some of these concepts and issues in more detail, including issues of macroregional contemporaneity and settlement pattern analysis. Next, I describe the study area, highlighting its environmental variability and the impacts of that variability on natural physiographic boundaries. I also examine the ease of interregional travel and communication both within the study area and with regions outside it.

Chapter 3

Study Area and Environmental Setting

In this chapter, I discuss the study area upon which this dissertation is based, and its context. First, I introduce some regional terminology, define physiographic areas in the Mesoamerican highlands, discuss the limits of the study area, and describe the highland environment at the regional scale. Then, I relate these to agricultural potential across the study area, because the residents had to marshal sufficient subsistence productivity to maintain large populations from the Terminal Formative through the last period addressed in this study. Finally, I discuss inter- and intraregional communication, which was affected by highland topography; footpaths were avenues of trade, and could aid or confound conquest ventures.

Mesoamerica: a cultural macroregion

Anthropologists use the term Mesoamerica to refer to a cultural macroregion that is defined based on long-term and widespread similarities. In the early 1940s, when anthropologists sought to define cultures based on character traits, Paul Kirchoff (1943; 1952) defined Mesoamerica's common features. They included terracing for agriculture, lime- or ash-treated ground maize as a dietary staple, the use of *comales* (clay griddles for cooking tortillas and other ground maize foods), a game played with rubber balls in which the hands could not touch the ball, markets subdivided by specialty, sandals and cotton cloth, step-sided mounds, and a ritual calendar with a 52-year cycle. Evidence of these traits is found archaeologically, and they perdured for several thousand years. For such technologies to be in use for so long and over such a large area means that the inhabitants were in contact, and felt, at least stylistically, some kinship. In this study, I elucidate basic features of the sociopolitical landscape, which encompass considerable variability, both through time and across space while also conforming to the Mesoamerican pattern. Kirchoff's trait list is rather static and a long-term study of the past must examine dynamism. Thus, in this study, I look at change and continuity across the study area in specific aspects of material remains, assuming that concordant change across such a large area is a hallmark of the integration of the political economy, or its systemness (see Chapter 2).

The study area

Figure 3-1 shows the study area (gray dashed outline) in its Mesoamerican context. Within the study area are the surveyed areas (light gray). Four important urban centers are starred. In Chapters 7–9, I present, analyze, and discuss the implications of settlement patterns and distributions of civic-ceremonial architecture across the study area, and how those changed over time. I obtained the basic data for this study from reports on the surveyed areas, which I aggregate into the regions outlined in black.

The study area measures about 525 km NW-SE by 170 km NE-SW, and encompasses about 80,000 km^2 of Mesoamerica's estimated 1.25 million km^2 (Sanders and Price 1968:77), or 6.4 percent. It includes the three major highland sociopolitical core regions of the Classic period—the Basin of Mexico, the Tlaxcala-Puebla Valley, and the Valley of Oaxaca, including the Classic cities of Teotihuacán, Cholula, and Monte Albán, and the Late Postclassic Aztec city of Tenochtitlán in the Basin of Mexico.

The surveyed areas

I consider all the survey areas shown in Figure 3-1 systematic survey areas, meaning the project sought to do a full-coverage survey (Fish and Kowalewski 1990)—or close to it. The Tehuacán Valley survey, however, does not seem to have carried out a full-coverage survey, nor does the report give a boundary for the project area. For some, more detailed data are published; I call these the quantitative survey areas. For others, I have only qualitative data and not site-by-site, period-by-period data. Together, they encompass about 50 percent of the study area (Table 3-1).

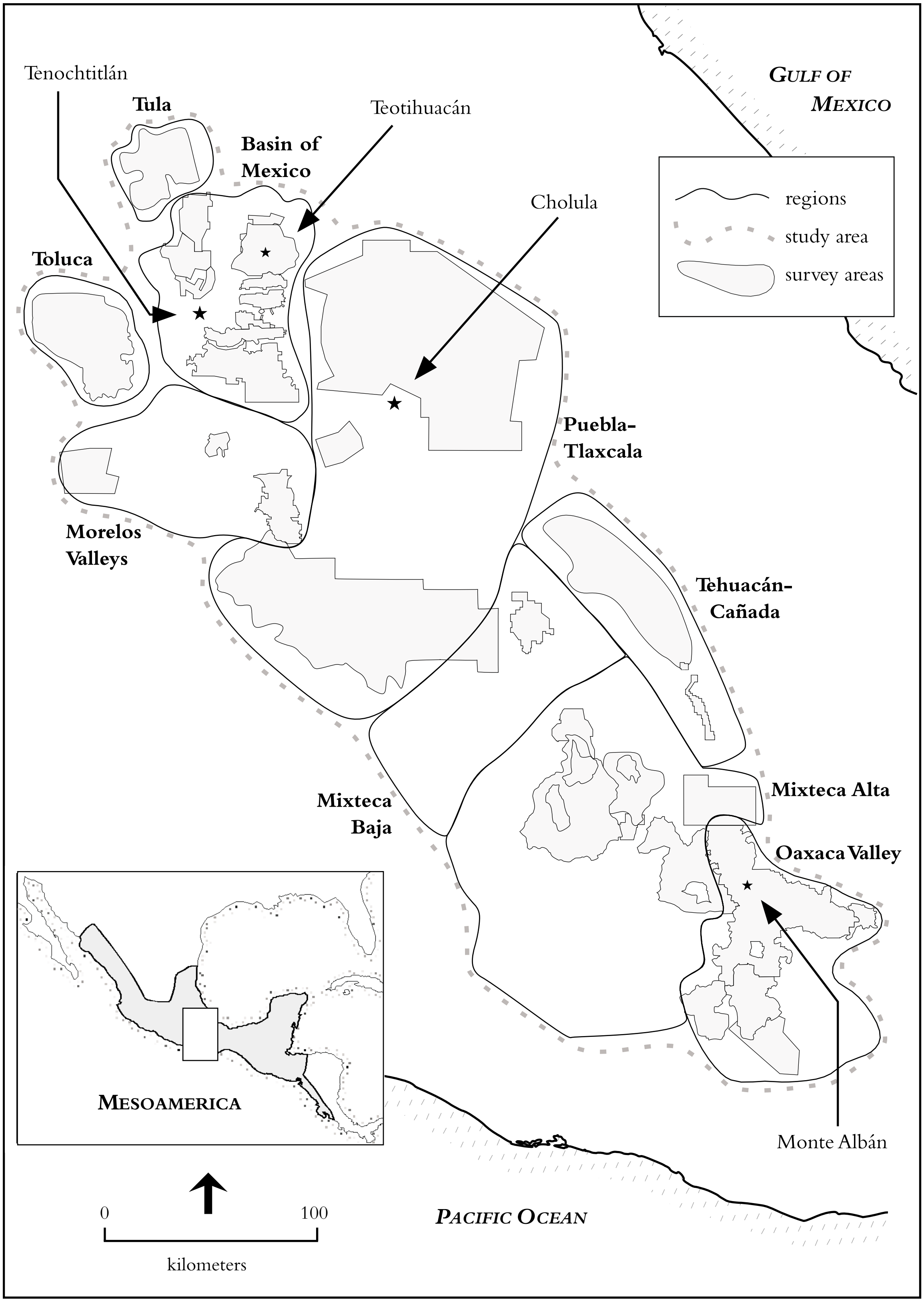


Figure 3-1. Mesoamerica, the regions of the study area, and the archaeologically surveyed areas within the study area.

Table 3-1. Total area of various types of survey areas. The systematic survey areas are composed of quantitative and qualitative survey areas. Quantitative survey area data are used in the database.

	km^2	percent
Total study area	80,000	100.00%
Systematic survey areas	40,532	50.67%
Quantitative survey areas	11,892	14.87%
Qualitative survey areas	28,640	35.80%

The environmental setting

The natural environment of an area does not determine the political economy of its human inhabitants, but it does limit their choices. The study area lies in a diverse highland zone encompassing a mosaic of mountainous areas and broad and narrow valleys. To the human inhabitant, the valleys and mountains of the surface topography made some areas more accessible than others. Even in the broadest valley bottoms, however, impediments to foot travel may include local ridges, volcanic cones, and drainage crossings. The study area, which I define as a macroregion for the purposes of analysis of sociopolitical evolution, has a complex, diverse topography. At the regional level, however, the climate and agricultural potential are more homogenous.

The principal food crops of prehispanic Mesoamerica grow reasonably well across the study area, with the exception of very high zones, such as near the tallest volcanoes, and especially arid zones, such as in the Gulf rain shadow. The important prehispanic food crops included the triad of maize, beans, and squash, plus tomato, chile peppers, various greens, and tree crops like avocado, papaya, and zapote. Maguey (century plant) and cotton were important for fibers. Maguey hearts were roasted from early periods on, and chewed for the sweetness they contained. Maguey hearts were later used to make the mildly alcoholic beverage *pulque*, which is still popular today (Parsons and Parsons 1990).

Across Mesoamerica are localized resources such as good pottery clay, obsidian, quartzite, and special minerals for dyes and paints, medicinal plants. Lime for stuccoing, etc. made some places special. Communities also needed trees for firewood and building beams. Firewood must have been an important resource; today, in the denuded Valley of Oaxaca bottomlands, farmers maintain scattered trees among their milpas, which are periodically pruned for firewood. In addition, limbs are lopped and aged for beams or other large projects.

The following discussion of the environmental context of this study focuses on two aspects: agricultural potential and interregional communication (transportation routes). Conventional descriptions of soils, climate, physiography, etc. of the study area, and their bearing on archaeological considerations are published elsewhere (e.g., Blanton et al. 1993; Byers 1967; Hunt 1994; Kirkby 1973; Kirkby 1972; Kowalewski et al. 1989; Marcus and Flannery 1996; Sanders 1976b; Sanders et al. 1979; Sanders and Price 1968). I divide the study area into four environmental regions in this discussion (Figure 3-2): the northern basins, the Mixteca Alta, the Valley of Oaxaca, and a transition area. The environmental regions are bounded by mountainous, high-elevation terrain, such that leaving the study area and crossing this terrain is more difficult (it requires more energy) than traveling within the study area.

Major valleys and basins

Figure 3-3 shows the major valleys, basins, and flatter terrain of the study area. Across upper quarter of the study area is a band of volcanoes, the largest of which are marked by squares. This is called the Trans-Mexican Volcanic Belt, and it includes still-active volcanoes and old volcanic cones, as well as substantial lava beds (*pedregal*, *malpaís*, *derrame*). Xitle (from the Aztec Náhuatl *xictle*, navel) is on the northeast slope of the Ajusco volcano (3950 m). The northern basins region includes the Basin of Mexico to the west, the Tlaxcala-Puebla Valley in the center, and the Eastern Basin (*Cuenca Oriental*). The Basin of Mexico includes the Teotihuacán Valley in the northeast and the Amecameca Valley in the

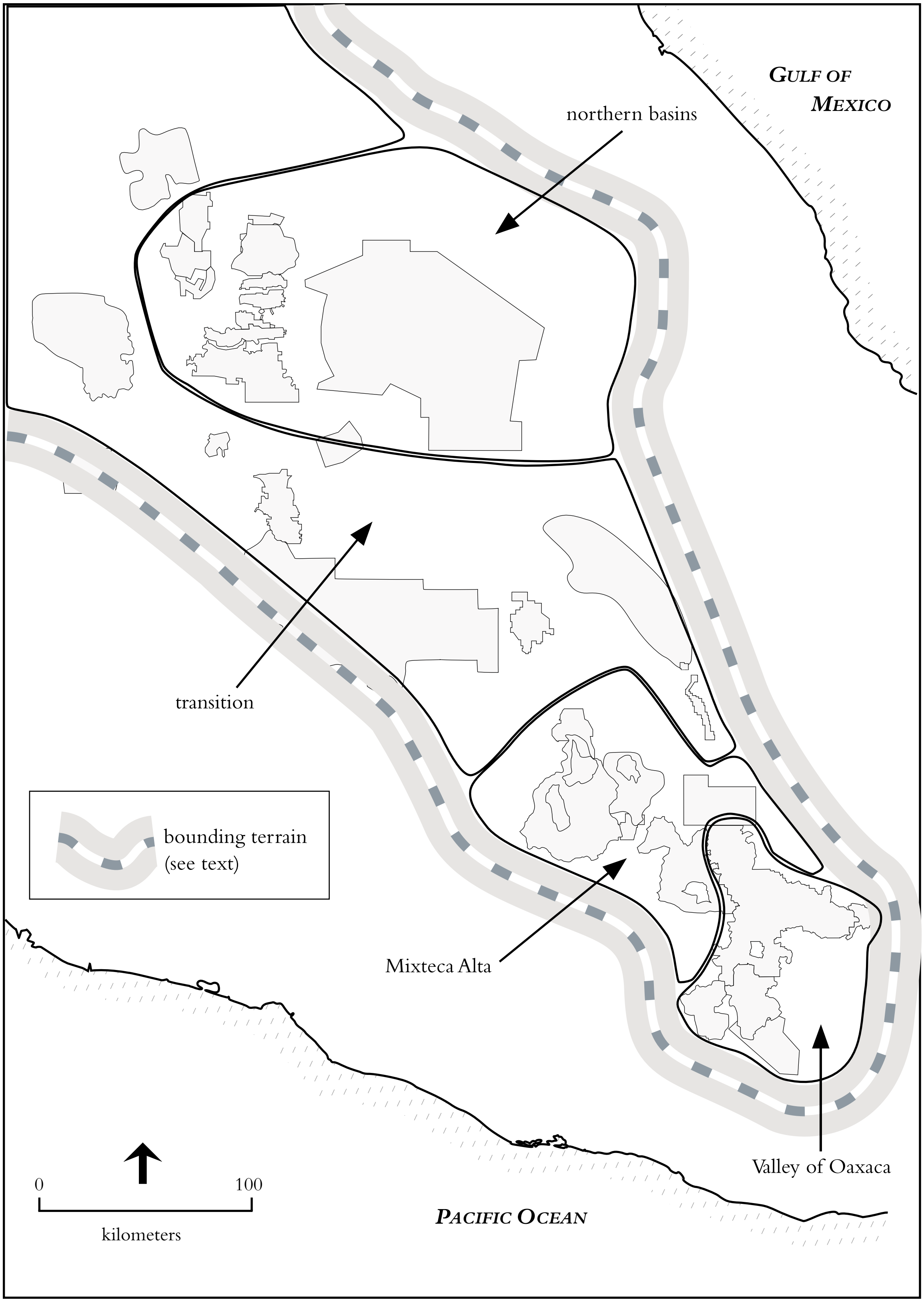


Figure 3-2. Central highlands' bounding terrain and four environmental regions, as discussed in the text.

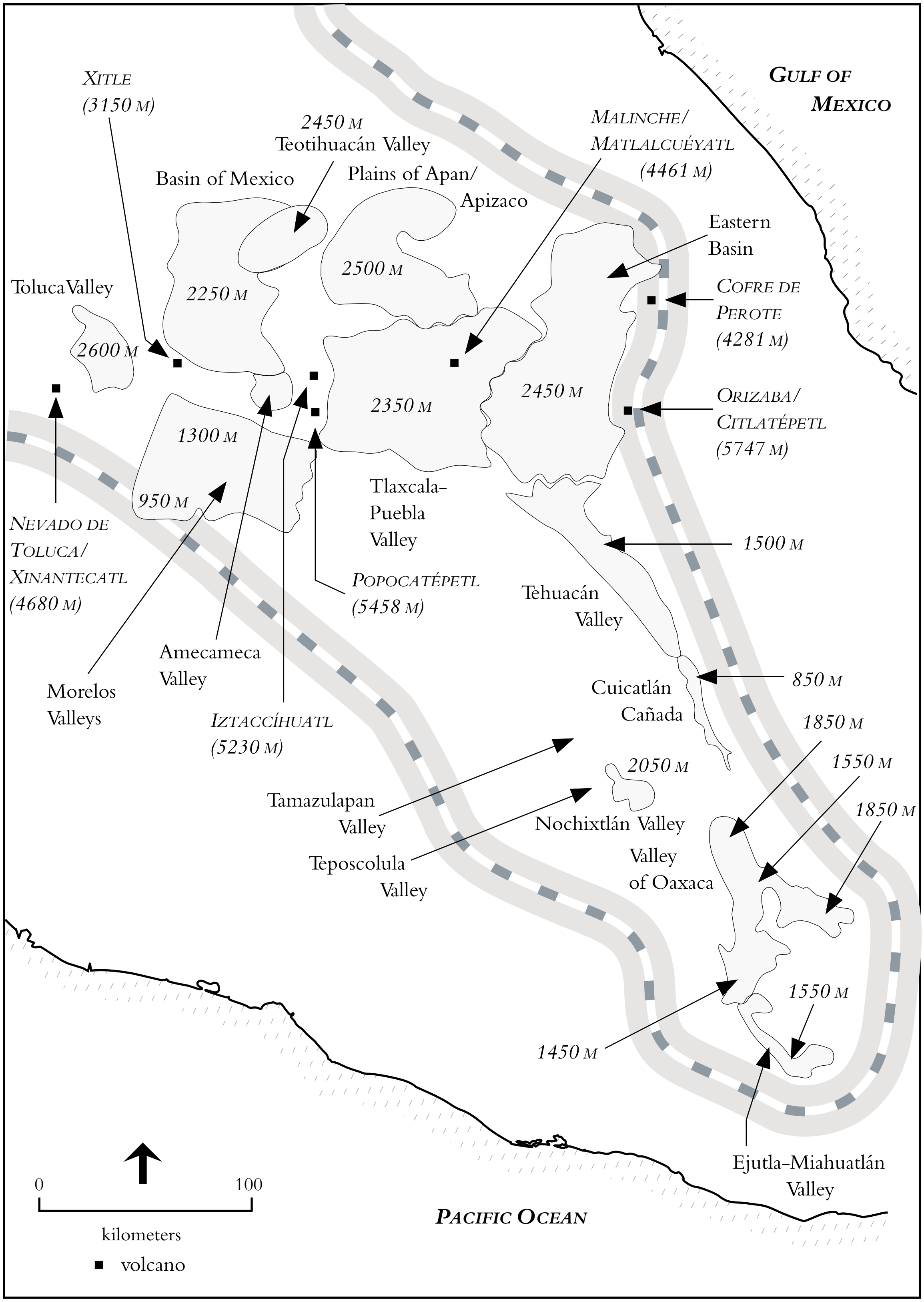


Figure 3-3. Major valleys, basins, and volcanoes. Elevations in valleys are of the spot the text overlies or the arrow points to. Wavy margins indicate indistinct boundary.

southeast. The Mixteca Alta region is mountainous, and includes several smaller valleys (e.g., Tamazulapan, Teposcolula); its largest valley is Nochixtlán. The Oaxaca and Ejutla-Miahuatlán Valleys dominate the Valley of Oaxaca environmental region in the south. Although technically not a basin—the Valley of Oaxaca's drainages exit the valley in the southwest corner—it nevertheless seems like it as the Valley of Oaxaca is ringed by high or rough terrain. The fourth environmental region is diverse, with many valleys (e.g., Toluca, several in Morelos, and the relatively dry Tehuacán Valley in the east) and more rugged areas. I have also included the narrow Cuicatlán Cañada in this region.

Lake systems and rivers

The Mesoamerican highlands are a relatively arid area, although there are some local zones of high water tables, and even some lakes. For agriculturalists, if the normal aridity is combined with lower than normal precipitation or rainfall at the wrong times, the risks of poor crops or crop failures increases. Good agricultural soils with high water tables will be less affected in drought years, and are good for pot irrigation. Swampy areas and lakes with open water provide habitat for species that otherwise would not grow in the immediate area, and thus increase the local biodiversity, and provide another kind of buffer in drought years. In later periods, Mesoamericans modified the lake margins to increase their harvests by building *chinampas* (lake-surface planting beds). The lakes in the Basin were also important corridors for communication, including transportation of goods via canoe.

Figure 3-4 shows drainages and three lake systems in the study area. I have based the rivers on those shown on the Mexican government's 1:1,000,000 scale topographic map (Instituto Nacional de Estadística, Geografía, y Informática undated), and they are sometimes a bit generalized; there are also areas where the drainages have been channelized or flooded by reservoirs, and I had to estimate the configurations of the prehispanic drainages. Note that in the Eastern Basin, most drainages end in the lower elevations due to evaporation. The stars are Tenochtitlán in the western Basin of Mexico, Teotihuacán in

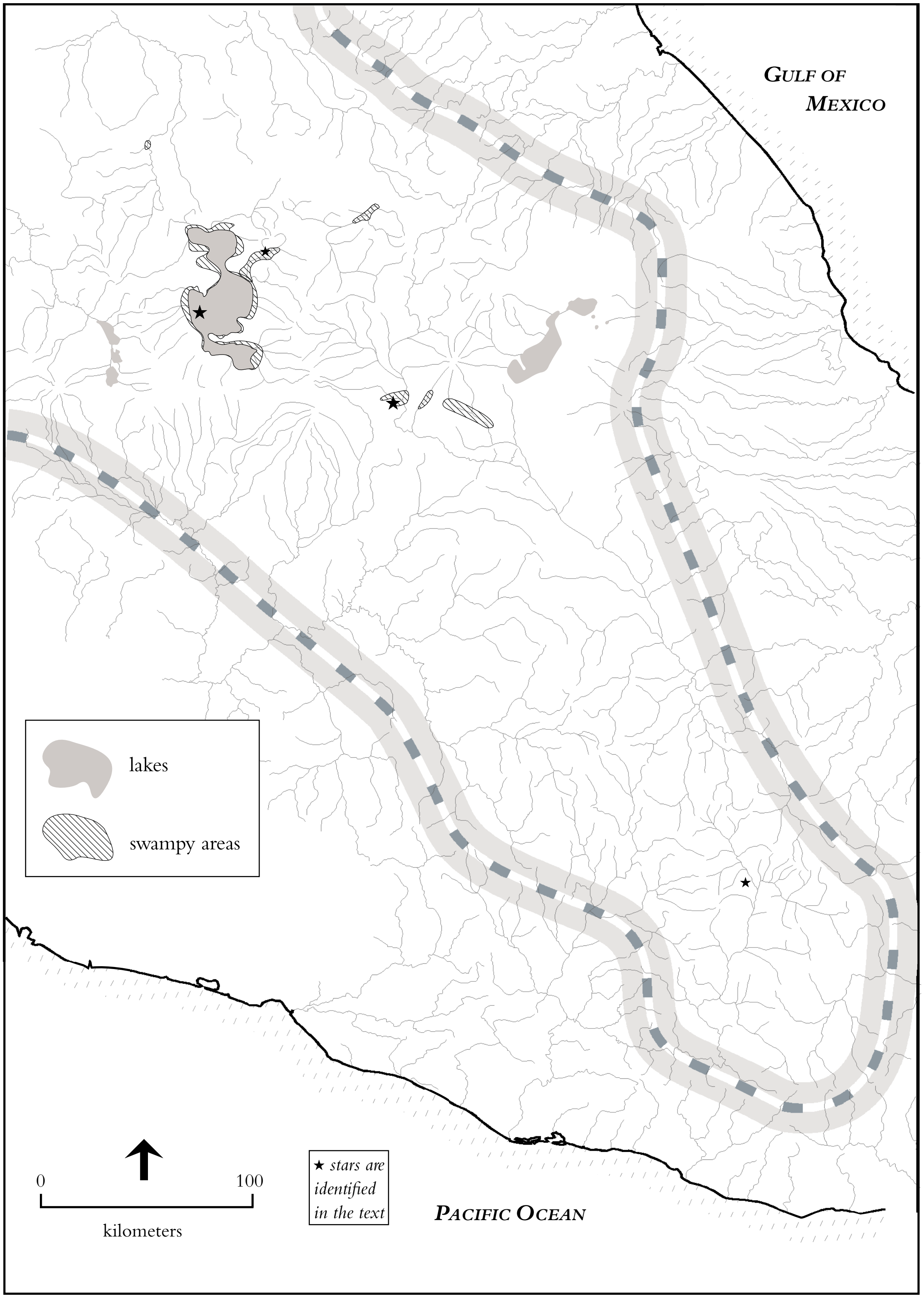


Figure 3-4. Surface water. Includes rivers in the study area, and lakes and swampy areas in the northern study area. Outlines approximate fifteenth century size.

the northeastern Basin, Cholula next to a swampy area in the Puebla Valley, and Monte Albán in the Valley of Oaxaca.

The Basin of Mexico lake system includes from north to south: Zumpango (northwestern lobe), Xaltocan, Texcoco (middle, largest, and lowest, receiving the drainage of the others), and Xochimilco and Chalco (east and west in the south); the northern three were saline, with Lake Texcoco the saltiest, and the southern two held freshwater. In the Aztec period, several dikes spanned Lake Texcoco. One dike connected the cities of Tenochtitlán and Texcoco, and used as a road. Another dike kept saline waters from intruding into the southern lakes. Intensive agriculture focused along the shores, and fish, waterfowl, and plants were all harvested, according to archival materials.

The Toluca Valley also had a lake system. The lakes apparently were as productive as those of the Basin of Mexico, albeit smaller and slightly higher in elevation. Along the lakes were stretches of irrigable lands, and the Tolucan (Tollocan) maize tribute was above normal, suggesting high productivity in the valley (Smith and Berdan 1996:268–269). Also, the Aztecs obtained as tribute petates, or floor mats, and other items made from reeds that grew along the lake margins in the Toluca Valley; springs (manantiales, ojos de agua) also dotted the eastern Toluca Valley (González de la Vara 1999:46–47).

In the Eastern Basin (*Cuenca Oriental*), the largest lakes are Laguna de Tepeyahualco in the northeast and Laguna de Totolcingo in the southeast. To the east and north of these large, shallow bodies of water are at least a dozen small circular lakes (*lagunas*, *lagunetas*) in craters called *axalapazcos* (Gasca Durán 1981); the three largest are shown on Figure 3-4. Although this is an arid zone, it has a few small springs, especially the western slope of Orizaba (Reyes Cortés 1979:36–37). Without a doubt, the lakes used to be larger than they are today; the shrinkages could be dated by coring, although I have not seen any publications that discuss how big the lakes might have been during the prehispanic periods I examine here.

Figure 3-4 also shows marshy or swampy areas mostly along the margins of the Basin of Mexico lakes and in the central Tlaxcala-Puebla Valley—indeed, Cholula is on the edge of a marsh. Due to modern deep-well irrigation and drainage channelization programs, most of these marshy areas are now dry. In the other three environmental regions, there are local high water table areas, often given names like Lagunas and Ciénaga, but they are very small.

Bounding terrain

Figures 3-2 and 3-3 show what I term bounding terrain that surrounds the study area on the east and south sides. Anyone leaving the study area would find this terrain more difficult to traverse due to elevation (e.g., northeast of the Valley of Oaxaca and east of the Eastern Basin) or ruggedness (e.g., north of the Plains of Apan/Apizaco, south of the Morelos Valleys), or both (e.g., east of the Tehuacán Valley). Nevertheless, none of the bounding terrain was too high or mountainous to restrict foot traffic entirely.

The study area also includes very high terrain along the ridge of the volcanoes Iztaccíhuatl and Popocatépetl, and the western edge of the Basin of Mexico. None of these areas is as extensive as the bounding terrain. Foot traffic could cross via passes, or circle the higher ground. For example, there's a major pass just north of Iztaccíhuatl where the modern highway from the Basin to Puebla crosses. Between Cofre de Perote and Orizaba is another pass.

Bounding within the study area

While the entire study area is surrounded on the northeast, east, and south (Figure 3-2) by bounding terrain, rugged terrain also lies

- to the west of the Tula region;
- along the western side of the Basin of Mexico region;
- to the north, east, and south of the Toluca region;
- to the north and south of the Puebla-Tlaxcala region;
- to the south, west, and north of the Morelos Valleys region;

- to the east of the Tehuacán Valley;
- to the east, south, and west of the Cuicatlán Cañada;
- within the Mixteca Alta region; and,
- all directions from the Oaxaca Valley region.

Within regions (including between many of the areas of Figure 3-3), there are also ridges and rough terrain that formed impediments to foot traffic. For example, a ridge extends from the west side of the northern edge of the Tehuacán Valley northwest about half-way to Cholula; an escarpment impedes travel north-south along the eastern flanks of Iztaccíhuatl and Popocatépetl toward the Plains of Apan/Apizaco; the Mixteca Baja is more mountainous than the southern Puebla-Tlaxcala region, and less mountainous than the Mixteca Alta; and, within the Mixteca Alta, travel in nearly every direction necessitates climbs and descents, although in the eastern part of the region, north-south trending travel is somewhat less demanding.

Just as the bounding terrain made interaction easier within the area it encompassed, more difficult to traverse terrain did focus exchange and interaction within the study area. Each region could and did exchange goods, people, and ideas with other regions in the study area, and with partners outside the study area, but exchange and interaction within the least topographically circumscribed regions was the easiest. The regions with the terrain that allowed the easiest communication also became the locus of sociopolitical cores, including the Basin of Mexico, Tlaxcala-Puebla Valley, and the Valley of Oaxaca.

Aridity

Rainfall across the study area is seasonal, and dry-season droughts can limit agricultural production on an annual basis. Rainfall peaks in June and September; the most arid season is through the winter months of January to March. Rainfall is often local, too, and even today farmers in the Mixteca Alta will hurry to shoot off fireworks in hopes of enticing a nearby cloud to rain upon their fields. Most of the study area receives its rainfall from storms that originate in the Gulf; unfortunately, most of the precipitation from these storms falls on the eastern slope of the highlands, or the east flanks of the bounding terrain. Some precipitation also comes from storms off the Pacific.

Due to the rain shadow effect of the high mountains east of the study area, the four environmental regions are generally more arid along the eastern edge, including the Eastern Basin, Tehuacán Valley, and the northeastern edge of the Valley of Oaxaca is drier than valley areas to the west. There were also arid areas in the transition zone. The Plains of Apan/Apizaco are the highest valley of the northern basins region, and are quite arid.

Portions of the study area have sufficiently low average annual rainfall that agricultural risk is increased and the plant species that can be grown are limited or their production is lowered significantly. The most arid areas cannot be irrigated because they lack surface water or the high water table that would allow pot irrigation (Kirkby 1973:41–44; Wilken 1987), so they have correspondingly low agricultural potential.

Rainfall is lower in the northern Basin of Mexico (500 mm/year) than in the southern portions and at Cholula (900 mm/year). Averages in the for the Valley of Oaxaca are 600–800 mm/year, in the Mixteca Alta 700–1000 mm/year (although the Nochixtlán Valley averages only 425 mm/year), and 500 mm/year in the Tehuacán Valley, whereas the Cuicatlán Cañada, in the rain shadow of the sierra to the east, averages less than 300 mm/year. Both timing and seasonal downpours can make utilization of the rainfall difficult. The aridity of the Mesoamerican highlands puts a premium on high water table areas and irrigation.

Elevation

Figure 3–3 includes elevations for specific places. In the northern basins, the elevations are generally the lowest across a broad area of the major valley or basin. The northern basins' lowest elevations are higher than all other regions, except for the Toluca Valley. Within the northern basins, the arid Plains of Apan/Apizaco are the highest.

The highest elevations in parts of the transition area and the Mixteca Alta are high enough to reduce the frost-free season, which most affects the maize crop because it requires a long growing season (tomatoes are perennials if they are not frosted too heavily). Some places are too high to grow maize at all. These areas historically have been forested, a source of timber for roof beams (*vigas*), pine heartwood for fat lighter (*ocote*) for starting fires, and for firewood.

Salt-making

Salt is a very important commodity, especially for people with vegetable-based diets, or who live in arid areas; not surprisingly, it was an important trade good in Mesoamerica (Coe 1994). The bodies of people living in hot areas excrete salts that need to be replaced. Salt was so important in the Late Postclassic that the Aztec tribute records note areas that lacked salt (Smith and Berdan 1996:Table A4-2). Indeed, battles were fought in Mesoamerica over control of salt sources (Brown 1980:5).

The northern lakes in the Basin of Mexico were partly ringed by salt-making sites where people repeatedly washed soils (creating pock-marked and irregular ground surfaces) to concentrate the brine that was subsequently boiled to further distill the salt. The salt was boiled in special Texcoco fabric-marked pottery vessels (Charlton 1969), which also may have been used for meat preservation (Brumfiel 1991:59). Other salt-making locales are known from the Tehuacán Valley, the Oaxaca Valley (Hewitt et al. 1987; Lind and Urcid Serrano 1990)—all saline springs, the Eastern Basin (Nárez Z. 1980), and elsewhere. In the study area, the Basin of Mexico was the greatest salt producer (Parsons 1996), but only from the Classic period on. Jeffrey R. Parsons (1996:458) argues that Cuicuilco may have controlled the salt trade in the southern basin in the Terminal Formative, but that salt was only produced at the 19 ha El Tepalcate (Tx-TF-46) on the southeastern shore of Lake Texcoco. Significant amounts also came from both Gulf of Mexico (Andrews 1983). However, due to a climate shift to cooler and wetter weather, salt production in the Yucatan was suspended for several hundred years in the Early Classic (Folan et al. 1983:462).

I have included this brief review of salt-production and trade in the highlands to highlight the interplay of resource extraction and trade, and thus some of the relationships between local resource extraction and the long-distance trading network. Obsidian was another highly prized resource that fulfilled a similar role linking local resource extraction sites and interregional trading networks (e.g., Cobean et al. 1991; Drennan et al. 1990; Elam 1993; Ferriz 1985; Gaxiola González and Clark 1989; Hirth 1995; Neff et al. 2000; Parry 2001; Pires-Ferreira 1976; Santley et al. 1995; Spence 1987a, 1987b). Wood was another important resource (especially for construction and firewood), and, unlike obsidian, made for heavy and awkward loads; huge amounts of firewood were needed to process calcium carbonate to make stucco, which was used extensively in the Basin of Mexico from at least the Early Classic on (Manzanilla 1997:27).

Agricultural potential

Agricultural potential reflects a combination of climate (e.g., rainfall amount and timing, temperature and length of growing season), soils and geology, vegetation and fauna, and diseases (Evans 1978:2), along with the inherent productivity of a given crop (its genetics), and the efficiency of labor input. Farmers reduce risk by where they choose to farm, what crops they grow, and how they grow them (e.g., irrigation gives more control of soil moisture, thus improving productivity). Genetics and productivity can be and are manipulated by human stewards, as preferential characteristics are selected for through those seeds saved for planting, a careful matching of crop to field, and judicious multi-cropping.

Techniques for agricultural intensification

In the highlands, agriculturalists implemented many techniques for increasing agricultural productivity, or for achieving what Karl W. Butzer (1996) calls fine-tuning the agrosystem for risk-minimization and to counteract the effects of environmental degradation. Farmers seek to manage risk in order to maintain sufficient productivity; they can ameliorate risk by agricultural intensification, by having fields in various microenvironments (e.g., scattered at different elevations), and relying at a household level on some trade (exchange or bartering) in crafted goods. Agriculturalists tend to exploit fewer microenvironments than nomadic hunter-gatherers; indeed, fewer microenvironments are readily accessible to sedentary agriculturalists because they have settled in one location (Coe and Flannery 1964). Households needed and desired more than food; they had to obtain building materials (e.g., roof beams), fiber for cordage and cloth, containers (e.g., gourds, pottery, banana leaves), special and exotic food items (e.g., for periodic rituals), minerals, medicinal plants, etc.; they could either produce their own or trade for these goods.

The first problems that incipient agriculturalists would have faced were erosion from removing extant vegetation and opening the ground surface, and the risks of insufficient or ill-timed rainfall. Among the earliest examples of human intervention for reducing risk in the highlands is the Purrón Dam in the upper Tehuacán Valley, first constructed in the Early Santa María period and subsequently modified four times. The dam was in use at the time of the conquest (Woodbury and Neely 1972), but is abandoned now.

Techniques of agricultural intensification used in the highlands included terracing (Donkin 1979), *chinampas* (Hassig 1985:47–53), irrigation systems (Doolittle 1990), and multi-cropping; these techniques generally were implemented regionally. Terracing on slopes helps control erosion and creates a small zone of deeper soils behind the terrace wall that can retain more moisture. Terracing was often integrated with irrigation canals (e.g., in Tlaxcala, see Abascal M. 1980). Irrigation systems were (and are) widespread across the study area. In flatter terrain, ditches and canals diverted surface water in sometimes extensive valley bottomlands. Irrigation systems in the highlands were fed from high-elevation springs, as in the Mixteca Alta (Garvin 1994), and on the lower slopes of mountain ranges such as those bounding the Toluca Valley to the east. In parts of the Mixteca Alta, a special type of terracing system, called *lama-bordos* (Spores 1969), consists of vertical chains of terraces across what once were erosional gullies. Aztec-period crosschannel terraces are also documented for the upper Morelos Valleys (Smith and Price 1994), and may have been part of agricultural intensification programs that kicked off a burst in productivity in the Early Aztec period (Berres 2000). By the Late Postclassic, the slopes of the Basin of Mexico were covered with terraces (Sanders 1972:116).

The northern basins environmental region

This region has large basins at its east and west ends that bracket a wide valley between them. The basins have lakes and swampy areas that supported water-loving plant and animal species including high-protein food sources such as migratory birds, fish, edible insects, and algae (Parsons 1996). In general, before it was cleared for agriculture, the Basin of Mexico supported a wide variety of forest floral and faunal species (Serra Puche 1988); deforestation must have had profound effects on the water table as well as encouraging erosion.

In addition, salt-making was important from the Early Classic on along the shores of the Basin of Mexico's saline northern lakes. Salt also might have been produced in the Eastern Basin, but this area's archaeology is poorly reported.

During the Late Postclassic, Basin of Mexico residents instituted an extensive swamp reclamation program, increasing their agricultural areas by about 10,000 ha along the southern lake margins (Sanders 1972:115–116). By the time the Spanish arrived in the early 1500s, *chinampas* covered Lake Xochimilco (Sanders 1976a:102). Along the western slopes of Iztaccíhuatl and Popocatépetl springs draining into Lake Texcoco produced considerable fresh water (Sanders 1976a:107). Springs near Teotihuacán provided a sizeable flow from the central Teotihuacán Valley that drained southwest into the Basin, watering a broad delta.

The Mixteca Alta environmental region

Characterized by rugged sierra with even its largest valleys far smaller than those of the other regions (the largest, the Nochixtlán Valley, was about 250 km^2; see Figure 3-3), this region has many more microenvironments concentrated in smaller areas than in the other three environmental regions. Ecologists remind us that accessibility to more ecotones and microenvironments ameliorates risk and increases the variety of resources available for exploitation. The Mixteca Alta suffers less from rain shadow than the other regions, and includes small relatively water-rich areas that constitute pockets of irrigable lands in otherwise rather dry areas, especially near the Cuicatlán Cañada (Monaghan 1994:144). The earliest Europeans to cross the Mixteca Alta reported that it was lush and densely populated (Romero Frizzi 1990a:31–36). After the conquest, populations dropped and terraces were no longer maintained, and erosion set in, especially in some areas.

The Valley of Oaxaca environmental region

The Valley of Oaxaca is the easternmost large valley in the highlands; to its east is rugged terrain that fades in elevation to the much lower elevations spanning the Isthmus of Tehuantepec. The Valley is bounded in all directions by high, rugged terrain, and its northeastern limits follow the continental divide. Its bottom contains extensive irrigable lands and a few freshwater springs. Between the valley and the mountains are transitional landforms (piedmont) often with fortified sites atop them. Monte Albán sits on a 400 m high mountain in the central valley, above the confluence of the rivers from the northern and eastern arms of the valley. Nicholas (1989) reminds us that even when the Valley of Oaxaca supported low populations, many people did not live adjacent to the best soils and in those areas with the highest agricultural potential.

The transition environmental region

This large region has considerable environmental diversity. In the east, it suffers from rain shadow; however, the rain shadow area also includes pockets of irrigable lands in the northern Tehuacán Valley and Cuicatlán Cañada. Across portions of the area immediately south of the Tlaxcala-Puebla Valley are some relatively flat, irrigable bottomlands. The Morelos Valleys, Toluca Valley, and small areas north and northwest of the Basin of Mexico also include irrigable bottomlands. Elsewhere, the region is sometimes relatively mountainous (e.g., Mixteca Baja region and along the southwestern margins of the study area; north of the Toluca Valley).

Summary

The study area is a highland macroregion of high environmental diversity; although it is generally arid, it has local irrigable areas. The environmentally richest areas are along the lakes in the northern part of the study area, particularly in the Basin of Mexico. The areas with the greatest agricultural potential are in the Basin of Mexico region near the lakes and swampy areas, in the central Tlaxcala-Puebla Valley, in small moister areas in the central and western transition region and Mixteca Alta, and in the central valley bottomlands of the Valley of Oaxaca. All of the study area, except for the southern Valley of Oaxaca, was subject to frosts that effectively limited farmers to a single crop of maize annually, although some of the highest Mixteca Alta milpas even today are planted in maize varieties that take 18 months to mature (Garvin 1994).

Intraregional communication

In this section, I discuss inter- and intraregional communication based on trade routes. On Figure 3-5, I have mapped routes noted by Kenneth G. Hirth (2000:206), Eduardo Merlo Juarez (1980), Manuel Orozco y Berra (1992 [1522]), and María de los Ángeles Romero Frizzi (1990b:28–32), augmented with a few hypothesized routes across areas not included on those maps (stars are, from left to right, Tenochtitlán, Teotihuacán, Cholula, and Monte Albán). Ross Hassig (1985:32) notes that "the principal constraint on foot travel is distance, not turns or grades. Indigenous roads reflected this, stressing directness over gradient in route selection." Judging by paths in use today in the Mixteca Alta, in the steepest terrain, routes often climbed to high ground, then followed ridges sometimes for long distances across the landscape. Even in the Formative period, there must have been many trails that facilitated long-distance trade in exotic items.

What is important in understanding trade routes and their impact on sociopolitical evolution, I think, is that they crisscrossed the study area from the earliest ceramic period.

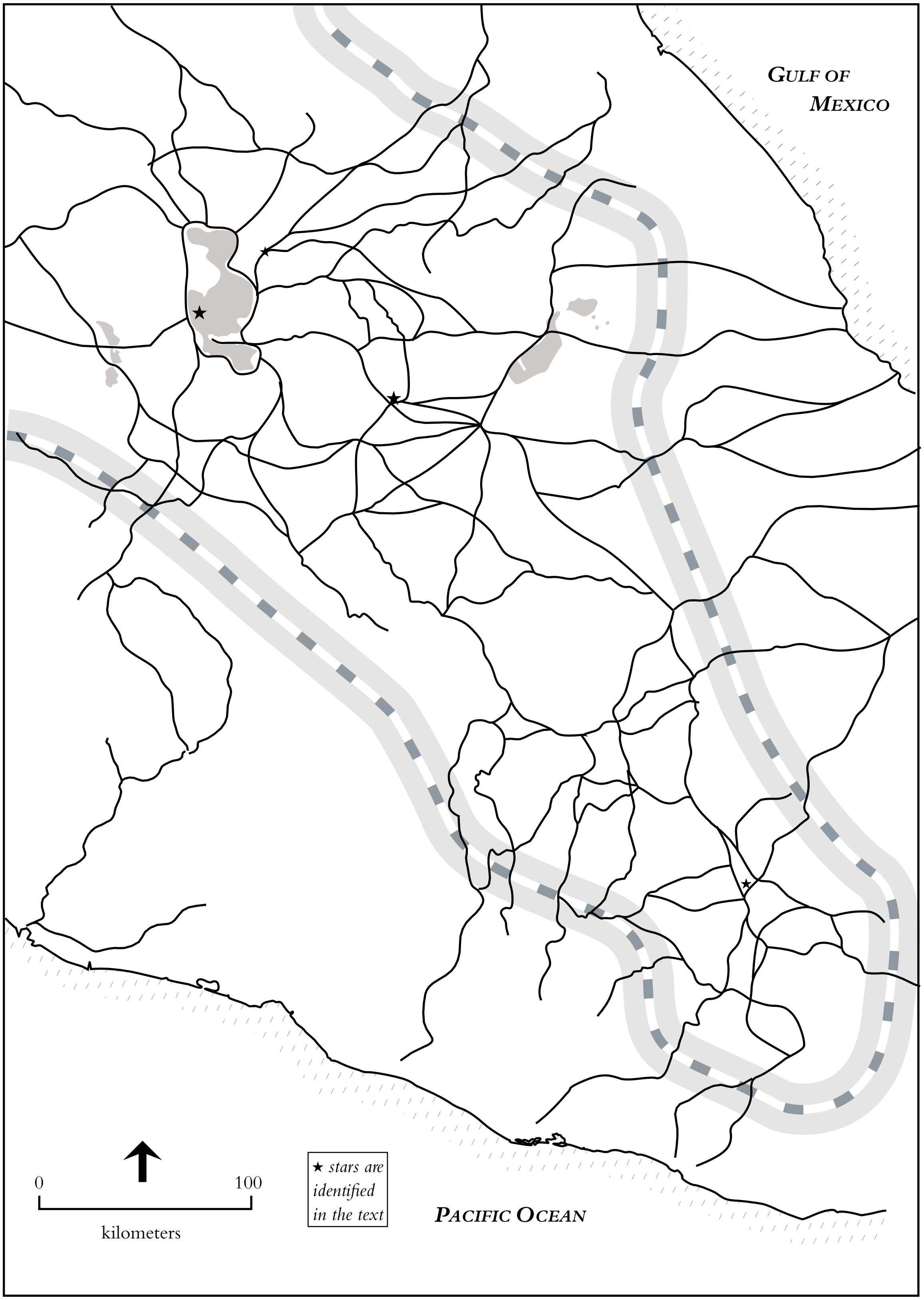


Figure 3-5. Highland trade routes. Focus is on area within bounding terrain. Routes generally terminate in rugged areas because they are unknown, not because there are none.

Of course, this network changed through time, as new settlements were established and old ones abandoned, but I believe it extended throughout the study area, and the residents of the highlands lived within a network of paths.

In the Late Postclassic, traders and religious pilgrims traveled widely. Pilgrims often travel across political boundaries (Turner 1972–1973:202), as do traders. Indeed, Geoffrey G. McCafferty (2000:358) argues that Cholula was organized around administration of religious activities that were linked to long-distance trade from as early as the Epiclassic, although its roots may have been in the Classic. Cholula's merchants traveled widely and traded so-called Mixtec-Puebla objects for exotic goods from distant places; with their accrued wealth, merchants sponsored religious ceremonies (McCafferty 2000:358). William M. Ringle et al. (1998) suggest that pilgrimages were a hallmark of the Epiclassic, although they do not detail how a pilgrimage-oriented social system played out at Teotihuacán, the largest Epiclassic city, which lacked extensive civic-ceremonial architecture since it had been burned and destroyed at the end of the Classic period.

I discuss interregional communication because people did interact both within the different regions of the study area, and with areas outside the study area. Figure 3-5 serves to show how extensive the network of routes was. Interregional communication within the study area was easier than with regions outside it, however, due to the impediment of the bounding terrain discussed above.

Summary

In this chapter, I have described the study area's natural environment, with an eye to its strengths and limitations, particularly in terms of agricultural potential and interregional communication. I anchor this discussion with these two aspects of the highland environment because they are important factors in the framework within which sociopolitical evolution occurred. I do not argue that prehispanic peoples sought to live in agriculturally optimal locations or that territories united along the best communication routes.

Instead, the mosaic of diversity that is the central highland environment formed the stage for change and continuity in its sociopolitical economy.

The bounding terrain that surrounds much of the study area served to make communication and interaction within the study area easier than with areas external to the study area. In addition, the lands within the study area have higher agricultural potential than the bounding terrain, which is rugged and includes high elevations that made agriculture less productive and riskier. Across the highlands, the study area comprises the best possibilities for livelihood; for the intensification of agricultural production; and for a better communications network for conveying products, information, and people with ease. This is the geographic basis for the high degree of interaction shown repeatedly in Chapters 7 and 8.

Chapter 4

Chronology and Database

In this chapter, I describe the pitfalls and assumptions of the process of creating a macroregional chronology for the study area that unites all temporal periods used in various surveys in a single coordinated chronology, and then how I used that chronology to unite basic information from survey reports about sites across the study area in a single database. In Chapter 2, I discussed how important it is in macroregional studies to generate a chronology that shows contemporaneity across the study area. Archaeological chronologies tend to be rather local, including some that are site-specific, which complicates this process.

Once I had a chronology that spanned the study area, I could assign the site-by-site data from each survey report to a temporal period within that chronology. In the second part of this chapter, I describe other considerations and inconsistencies I had to address to make the data from 20 survey projects into a single compatible database. Population estimation posed the trickiest compatibility issues once I had constructed a common chronology.

Ceramics and dating

In this section, I discuss ceramics, once appropriately described as "the workhorse of dating" (Blanton et al. 1999:49) in archaeology. I use ceramics to establish the multiregional contemporaneity upon which the macroregional chronology is based. I also discuss how ceramic seriation permits the dating of sites found by archaeological surveys.

Ceramics

On highland archaeological sites, broken ceramics—*tepalcates*—are ubiquitous, so that residents must have "consumed" pottery at a good clip. On some sites, the ground surface is nearly carpeted by *tepalcates*. Ceramics of course are important because they reflect changing styles and manufacturing techniques and preserve well. Once ceramic seriations are developed for an area, survey archaeologists can then readily date the sites they record.

Scientific approaches to analyzing pottery necessarily intersect with our understanding of what the residents of archaeological sites did with ceramics—how they produced *tepalcates*. Most ceramics were used in daily life (cooking, storage, eating), while some had ritual purposes. Each household or cooking area had a variety of cooking, preparation, and serving vessels, plus dishes for individual servings. Highland Mesoamericans made (apparently) single-use pottery, as we sometimes find little-used vessels in burials. They also made other items from clay, including figurines and miniatures. We have considerable evidence of long-distance trading networks in pottery and other goods, and for communities that specialized in producing ceramics.

Relative and absolute dating

Until the 1960s when radiocarbon dating began to be widely used, archaeologists relied on stratigraphy, and thus relative dating to seriate ceramics. Radiocarbon dating is the most commonly known and widely used absolute dating method. Originally it was assumed that radiocarbon, or ^{14}C, decayed (changed from ^{12}C to ^{14}C) at a constant rate through time after the death of the organism being tested (e.g., the chopping down of a tree for firewood or building material, the harvesting of maize for food or seed). However, we now know that the rate of carbon decay has not been constant, and today radiocarbon dates are corrected according to complex tables and calculations that are widely available (e.g., Marlowe 1999; Nash 2000; Taylor 1987, 2000; Taylor et al. 1992).

Since the early days of radiocarbon dating, the laboratory processes have been considerably refined; however, archaeologists must still exercise care in comparing dates determined by different laboratories, and made on different materials (e.g., Blackwell and Schwarcz 1993; Pazdur and Pazdur 1994). One key piece of information that is considered crucial is the type of material that was dated (e.g., wood, fiber, charcoal from a hearth, shell, etc.), and the context in which it was found—exactly, for instance, which diagnostic sherd was associated with the organic material, and were they under, over, or next to another feature. While it has long been understood that these factors are important, they remain underreported even today. Indeed, across the study area, radiocarbon and other absolute dates are poorly reported, if at all.

Ceramic seriation and archaeological survey

Unless there are many good absolute dates, ceramics remain our best way to date sites located by surveys. Yet ceramic typologies are an imperfect way to date sites, in the sense that the utility of the typology directly relates to the breadth and quality of the data upon which it is based (e.g., van der Leeuw 1991). Because of how sites (and which sites) have been excavated, Mesoamerican typologies often were made from the contents of burials and other special collections, and this bias continues to hobble ceramicists today. Chronologies based on burial ceramics are not particularly useful for dating sites found by archaeological surveys (Sanders 1999:14), because most household ceramics are excluded from such chronologies. For the Valley of Oaxaca, Alfonso Caso et al. (1967) based their legendary volume on Monte Albán ceramics on burial pottery; but later studies modified and added to that interpretation so we now have a broader understanding of ceramic seriation for the Valley (e.g., Kowalewski et al. 1978).

Across substantial portions of the study area, pottery clays were locally available (Payne 1994). This means that pottery production was not limited to specific areas, as was, for instance, obsidian mining. Pottery-making was also an activity that could be undertaken at the household level. Thus, pottery, as a commodity, must have been, at least the types generally used each day, readily available and relatively inexpensive. This means that patterns of pottery making and use provide valuable clues to market-use strategies and household labor allocation, and sometimes large-scale political strategies (e.g., Cyphers Guillén 1992; Feinman 1985; Feinman et al. 1989; Hodge and Minc 1990; Minc et al. 1994).

Most pottery seriation originally was constructed for a specific site or small set of sites. As archaeologists continue to work in new areas, they base their ceramic studies on those that came before. For example, when Ronald Spores (1972; 1974) began working in the Nochixtlán Valley northwest of the Valley of Oaxaca, he based his ceramic studies on Valley of Oaxaca typologies and Caso, Bernal, and Acosta's (1967) study of Monte Albán ceramics. He was able to add considerable data about local Nochixtlán variations in the ceramic types, as well as types unseen at Monte Albán and in the Oaxaca Valley.

Thus, using ceramic seriation from one area, archaeologists examine pottery from nearby areas and are often able to determine generally the seriation of that new area. As work continues, they develop a local pottery seriation, generating, after a series of such research projects, chronologies at a broader scale.

Mesoamerican chronology: introduction

Archaeologists conceptually break the long time-span of the past into segments of longer periods (periodos) and shorter phases (fases), and seek to create an unbroken list of non-overlapping periods (with no hiatuses of apparent lack of occupation)—a continuum of the past. In Mesoamerica, the names of the major periods were drawn from classical archaeology, so the periods of "high culture" and large cities were referred to as the Classic (and it was thought there could be only one such heyday in Mesoamerica), with the Preclassic (or Formative) preceding it, and the Postclassic following it. This tripartite division is commonly followed today, although archaeologists frequently bemoan it as the flawed and misleading model it is. Nevertheless, we are stuck with it, despite hopes to the contrary (e.g., Cowgill 1996).

The tripartite time blocks reflect perceived transformations or major changes in the past. For example, the end of the Classic in the Maya lowlands was correlated with the stela exhibiting the most recent date. There are several serious problems with this method of anchoring segments of the past in a single event. The last dated stela—and thus the date of transition—may change as more stelae are discovered. In addition, the sociocultural behavior researchers mean to indicate by the word "Classic" may have ended before the last dated stela, or have continued after the date on it. In addition, the last stela is from a single place, and "Classic" is meant to indicate a social pattern valid across a large area, which may not correlate with that single stela and its date. Perhaps, too, the events early archaeologists listed to denote large cultural changes may have not happened as researchers had originally envisioned—they may not have been the dramatic transformations the archaeologists conceived, or the changes may have taken longer (e.g., more than a century) to transpire, thus introducing significant periods of transition (*transición*).

Thus, this connection of what researchers perceive to be dramatic events (e.g., the founding of Monte Albán) to an unbroken chronology is a flawed approach. In Cowgill's (1996) terminology, this method conflates "clock time," "phase time," "social time," and "characterization" (see Table 4-1). To accurately discuss when events happened in the past, we need reliable dates (e.g., radiocarbon dates) for events. Instead, absolute dates from Mesoamerican tend to be poorly reported (e.g., context is not given) and unavailable

Table 4-1. Cowgill's (1996:325) archaeological approaches to time.

clock time (e.g., radiocarbon years)	"the time of the physical world, measured by clocks" using interval scales (e.g., years) and "subject to possible systematic or random errors"
phase time (e.g., Classic, Formative)	ranked, sequential segments of clock time identified by "distinctive sets of archaeological categories" such as ceramic styles and artifact complexes
social time (e.g., "*mañana*")	perception of time in various societies, and how it connects with clock time (e.g., duration, rhythms, cycles)
characterization (e.g., chiefdom, theocratic, Hellenistic)	"identifying segments of clock time or phase time that are characterized by some interesting social and cultural features, and/or distinguished from preceding and following segments by interesting changes"

because they've never been entered into the literature; also, some materials were dated long ago, using older laboratory methods, and thus are difficult to assess with recent dates.

For both excavation and survey projects, the most temporally diagnostic artifacts from Mesoamerica are ceramics—(generally broken) fired clay vessels, mostly, but also figurines. Ceramic vessel shape, clay paste, and surface decorations are time sensitive (and generally obvious with a simple visual inspection), such that certain ceramics are from certain periods (only), or the suite of ceramic types used at a particular time include distinct percentages of certain ceramics. For those unfamiliar with highland ceramics, please note that most of the ceramics on sites in the study area are undecorated body sherds, which almost always are temporally undiagnostic (Flannery and Marcus 1994:42). Highland Mesoamericans produced a welter of ceramic types, making pottery identification extremely time-consuming to learn. Nevertheless, identification of ceramic styles and complexes present a reliable system for articulating the chronologies of various regions, each with its own local ceramic chronology.

In the following sections, I present a chronology for the entire study area, based on ceramic crossties, meaning I have relied heavily on the presence and absence of trade wares and imitative types. I have downplayed a reliance on radiocarbon (and other absolute) dates, and deliberately prioritize ceramics over radiocarbon dates, but I do not exclude insights suggested by radiocarbon dates (in a recent volume, Flannery and Marcus [1994: 374–384] elegantly employ this approach). John L. Sorenson (2000:Appendix A-1) has recently taken the opposite approach, using both ceramic crossties and radiocarbon and other absolute dates, but prioritizing the latter; however, I have little confidence in how accurately this actually portrays contemporaneity in the past.

Technique for constructing a master chronology

Several researchers have published chronologies that include both the Basin of Mexico and the Valley of Oaxaca (e.g., Blanton et al. 1993:56; Coe 1981; Cyphers Guillén 1992:23; Johnson and MacNeish 1972:Figure 4; Manzanilla 1995:143; Sorenson

2000:Appendix A-1). I felt, however, that it was best to create a correlation tailored to this study because the rationale behind determinations of contemporaneity is rarely described. Many chronologies (Table 4-2) and considerable chronological data (e.g., Aufdermauer 1973; Caso and Bernal 1965; Caso et al. 1967; Flannery and Marcus 2000; Noguera 1947, 1965) have been published for all or parts of the study area. One common pitfall, however, is that scholars often do not discriminate between corrected and uncorrected dates in determining cross-regional correlations. For example, although they note which ceramic types occur in each of several areas ranging from Guatemala to various Mexican highland and lowland locales, Richard S. MacNeish et al. (1970:Figure 153) try to merge well-researched ceramic correlates with relatively uncritical date ranges for periods, creating a detailed figure with, unfortunately, conflicting information.

All surveys used in this study relate local chronologies (e.g., Tula, Tehuacán) to either the Basin of Mexico or Oaxaca Valley chronologies. Thus, the correlation of the Basin and Teotihuacán chronologies with that of the Valley of Oaxaca form the core of the macroregional chronology used in this study. I began with the Basin of Mexico and Teotihuacán Valley chronologies published by Parsons et al. (1996), with insights from Cowgill (1996) and Evelyn Childs Rattray (2001). Based on ceramic crossties, I matched the Valley of Oaxaca chronology to the pair from central Mexico. Then, I added chronologies for other survey areas, to create a master correlation. This approach is consistent with that advocated by Kent V. Flannery and Joyce Marcus (1994:373–374) to avoid the pitfalls of overstressing problematic radiocarbon determinations. This reliance on crossties is generally assumed to work well, although we must always recall that its accuracy depends on relatively rapid deposition of chronologically diagnostic types—e.g., brief circulation time and little or no continued use of old (heirloom) pieces (Kristiansen 1998:34).

The earliest time period I used in this chronology is the earliest widely recognized ceramic period in the highlands, which began ca. 1500 B.C. I built forward in time,

Table 4-2. Some published chronologies consulted before constructing a master chronology for the study area. (*Note*: "comparative" means more than two or three regions are listed; "Basin" means the Basin of Mexico.)

reference	region	page	figure/table
Balkansky 1999	Oaxaca/Mixteca Alta	193	Figure 13.2
Blanton 1983	Oaxaca/Teotihuacán	254	Table 6.1
Blanton, Kowalewski, Feinman, Finsten 1993	comparative	56	Table 3.1
Cobean 1990	Basin/Teotihuacán/Tula	26	Figura 3
Coe 1981	comparative	122–3	Table 5-1
Cowgill 1996	Teotihuacán	329	Figure 1
Cyphers Guillén 1992	comparative	23	Cuadro 2.1
Diehl 1983	Tula/Basin	19	Table 1
Drennan, Fitzgibbons, Dehn 1990	comparative	178	Figure 8.2
Flannery and Marcus 1994	comparative	4	Figure 1.2
García Chávez 1998	comparative	482	Figura 1
García Cook and Merino Carrión 1989a	comparative	163	Figura 2
García Samper 1989	Tlaxcala/Cholula/Puebla	305	Figura 13
Hare and Smith 1996	comparative	282	Figure 1
Hirth 2000	comparative	11	Figure 1.3
Hirth and Cyphers Guillén 1988	comparative	32	Figura 3.1
Johnson and MacNeish 1972	comparative	40/41	Figure 4
Kowalewski, Feinman, Finsten, Blanton, Nicholas 1989	Oaxaca	2	Table 1.1
Lind 1991–1992	Monte Albán	185	Figura 5
Lind 1994a	Monte Albán	99	Tabla 1
MacNeish, Peterson, Flannery 1970	comparative	268	Figure 153
Manzanilla 1995	comparative	143	Cuadro 1
Markman 1981	Oaxaca/Miahuatlán	2	Table 1-1
Martínez López, Winter, Juárez 1996	Monte Albán	83	Figura 2
Martínez López, Markens, Winter, Lind 2000	Oaxaca	10	Tabla 2
Millon 1981	Basin/Teotihuacán	207	Figure 7-7
Morelos García 1998	comparative	88	Cuadro 1
Niederberger 1987	Basin of Mexico	500–1	Figure 373
Parsons 1987	Basin of Mexico	39	Cuadro 1
Parsons, Brumfiel, Hodge 1996	Basin/Teotihuacán	218	Figure 1
Plunket 1983	comparative	44	Table 1
Pye and Clark 2000	comparative	10	Figure 2
Rattray 1991	comparative	12	Figura 2
Rattray 2001	Oaxaca/Teotihuacán	435	Figure 1b
Redmond 1983	Oaxaca/Cañada/Tehuacán	43	Figure 8
Rivera Guzmán 1999	Oaxaca/Mixtecas	15	Cuadro 1.1
Sanders 1970	Basin/Teotihuacán	8–9	
Sanders 1994	Basin/Teotihuacán	7	Table 1
Sanders and Price 1968	comparative	15	Figure 2
Sorenson 2000	comparative		Appendix A
Spencer and Redmond 1997	Oaxaca/Cañada/Tehuacán	90	Figure 4.1
Tolstoy 1989	Basin of Mexico	283	Figure 12.2
Tolstoy 1989	comparative	284	Figure 12.3
Tolstoy, Fish, Boksenbaum, Vaugh, Smith 1977	Basin of Mexico	96	Table 1
Tolstoy and Paradis 1971	Basin of Mexico	22	Figure 1
Winter 1994a	Oaxaca/Mixtecas	204	Figure 2
Winter 1995	various Oaxaca	128	
Winter, Martínez López, Peeler 1998	Oaxaca/Teotihuacán	463	Figura 1

through the "Olmec" horizon, etc., constructing a correlation spanning 3000 years. This correlation thus begins with the first period for which we have enough data to discuss cultural evolution with a sufficiently fine chronological control to include regional variation and change at the rate of within about 20 generations or so (approximately 350–400 years), across the study area.

As with ceramics, figurines (*figurillas*), and spindle whorls (*malacates*) also are temporally diagnostic. Figurines are small clay human sculptures with distinctive facial features, hair, garments, etc. that may be hand-fashioned or mold-made. Spindle whorls are weights used in fiber spinning, and their configurations vary through time; also, larger whorls were used for agave spinning than for cotton. Figurines are found across the study area, while spindle whorls are known only from certain areas. The study of these artifacts is specialized and beyond the scope of this work. The reader may wish to consult publications that discuss figurine traits and chronologies (e.g., Abascal M. et al. 1974; Barbour 1976; Blomster 1998; Caso et al. 1967; Kolb 1995; Marcus 1989, 1996, 1998b, 1999b; Marcus and Flannery 1996; Martínez López and Winter 1994; Parsons 1972a; Sánchez de la Barquera Arroyo 1996) or spindle whorl variation (e.g., Cook de Leonard 1971; García Cook and Merino Carrión 1974; Noguera 1954; Parsons 1972b, 1975; Piña Chán 1971). Although spindle whorl chronologies are incompletely developed, considerable progress has been made with the more abundant figurines. Nevertheless, since figurine chronologies seem to be matched to ceramic chronologies rather than created independently of them, for the purposes of this study I feel confident in ignoring figurine chronologies. Also, figurines are infrequently found while surveying, so cannot easily be used to date sites.

Researchers have developed chronologies of stone projectile points (e.g., MacNeish et al. 1967; Parry 1987; Tolstoy 1971), but these artifacts are so infrequently found that, unlike in much of North America for example, archaeologists basically do not use them to date Mesoamerican ceramic sites, and instead rely on pottery types for dating.

The next sections discuss in more detail, by broad period (ordered earliest to latest), the sources I relied upon for constructing the Basin/Oaxaca correlation, as well as other areas, including key decision points.

Basin/Oaxaca ceramic correlation rationale: Formative

The Formative is a long time span prior to the establishment of the large prehispanic cities of Mesoamerica. While populations were low until the end of the Formative, the first large communities occurred during this period, heralding significant changes in social organization. From similarities in ceramic decorations and other artifacts, archaeologists conclude that Formative-period people, although sparsely distributed across the vast Mesoamerican landscape, remained in contact over large distances, at least intermittently.

Pre-"Olmec" Formative

The principal sources I used for deriving the earlier Formative correlation between the Basin of Mexico and Teotihuacán Valley area and the Valley of Oaxaca were correlations presented by Robert D. Drennan et al. (1990), Flannery and Marcus (1994), and Paul Tolstoy (1989:283–284). During this period, similar ceramic types are found across the study area, which allow construction of this chronology. The earliest Formative horizon is dominated by red-on-buff or red-on-brown (*rojo-sobre-café*, *rojo-sobre-bayo*) ceramics found across the study area and beyond (Marcus and Flannery 1996:88; Piña Chán 1971:161–166; Winter 1989:464). The red-on-buff horizon does not extend east past the Isthmus of Tehuantepec, however; instead, the contemporaneous Locona horizon overlaps it spatially in the Isthmus, and extends east along the Pacific coast across what is now Guatemala and El Salvador (Clark 1991:Figure 8).

The red-on-brown ceramic horizon has ceramic correlates in the Tehuacán Valley in the Early Ajalpán phase, and at Chalcatzingo in the Early Amate phase. Ceramic correlates from Basin include Pilli Red-on-Buff and from the Valley of Oaxaca include Avelina Red-on-Buff and Tierras Largas Red-on-Buff (Flannery and Marcus 1994:375; Spores 1983). Other similar contemporaneous ceramics from the study area include Ajalpán Fine

Red and Coatepec Red-on-Buff (Flannery and Marcus 1994:375) from the Tehuacán Valley, Cuautla Red-Slipped from the Amatzinac Valley (Flannery and Marcus 1994:375), and Etlatongo Buff wares from the Nochixtlán Valley (Spores 1983:73). The Amatzinac (Morelos) Cuautla Red-Slipped vessels, while similar in surface treatment, are dissimilar in shape to the types listed above (Flannery and Marcus 1994:375), but nevertheless are considered correlates. Two common vessel forms are hemispherical bowls (*cajetes semiesféricos*) and round jars (*ollas esféricas*) thought to be water containers (Winter 1989:464).

The "Olmec" Formative

The next Formative horizon is the distinctive "Olmec," which has been identified across Mesoamerica (see Flannery and Marcus 1994:385–390; Flannery and Marcus 2000; and Grove 1989b for elucidation of problems with the term Olmec). Olmec-style ceramics have distinctive incised and carved motifs, and are found from the greater Basin area south to Honduras. These were not (generally) exported ceramics, but were locally made in the Olmec style. The so-called and readily recognized gray Olmec-style ceramics were fired and decorated in new ways to produce the distinctive appearance.

Archaeologists have long used the term horizon (*horizonte*) to refer to a suite of ceramic types, and often other artifacts, that are found together, and thus were used at the same time (Willey 1945). I use this term cautiously, and only in a general way, as serious criticism has been leveled against the use of the concept (e.g., Cowgill 1996:326). In a provocative article, Flannery and Marcus (2000) argue that the principal traits used to identify occupations with Olmec-style artifacts probably originated in the highlands, although they are commonly attributed to the northern Isthmus.

The Basin of Mexico/Valley of Oaxaca "Olmec" phase correlation is between the Ayotla, Coapexco (Tolstoy 1989:285), and Manantial (Tolstoy 1975) Basin phases, and the earlier part of Oaxaca's San José phase; the three Basin phases are lumped together by some researchers as the Ixtapaluca phase. Manantial per se is little discussed in the literature. However, based on the ceramics described by Christine Niederberger (1987) and comments by Tolstoy (Tolstoy 1978; Tolstoy et al. 1977), Manantial is an "Olmec" phase (also see Gámez Eternod 1993, which is more available, for a summary of Niederberger's chronology and diagnostics), this is consistent with a recent interpretation by ceramic specialists (Flannery and Marcus 2000:20). The later Amate period of Chacatzingo correlates with the Ayotla and Coapexco phases of the Basin of Mexico (Grove 1987b, 1989a, 1989b; Tolstoy 1989:285).

For the most detailed discussion of Olmec-style correlates, see Flannery and Marcus's recent article (2000); for a description of Olmec-style motifs, see Joralemon (1971). Ceramic correlates include various types of "white" (*engobe blanco*, *la blanca*) ceramics, which have been identified across most of the study area. Local names are Cesto White and Pilli White from the Basin (García Cook 1981:248) with distinctive double line breaks (*doble línea interrumpida*), also seen in the Oaxaca Valley's very similar Atoyac Yellow-White (Flannery and Marcus 1994:377, 378; 2000; Spores 1972:174). "Black-and-white" types include the Valley's San José Black-and-White and the Basin's Valle Negative Rim (Flannery and Marcus 1994:377). Calzadas Carved is a well-known type found in both the southern Basin and Oaxaca (Flannery and Marcus 2000:25–29). Xochiltepec White, apparently identical to white pottery of San Lorenzo (Coe and Diehl 1980:152, 159–160) in the Isthmus (considered by some to be the Olmec heartland), was imported to the Oaxaca Valley (Flannery and Marcus 1994:381). Other ceramic correlates include Tlatempa Blanca from Tlaxcala (García Cook 1981:246), Amatzinac White from Morelos (Flannery and Marcus 1994:379), Canoas White from the Tehuacán Valley (Flannery and Marcus 1994:351, 381; García Cook 1981:246; MacNeish et al. 1970), Nochixtlán's Reyes White (Spores 1972:51, 174), and the Oaxaca Valley's Atoyac Yellow-White (Flannery and Marcus 1994:377; Spores 1972:174).

Post-"Olmec" Formative

From this time until the Postclassic, there were no dominant horizon styles that extended across the entire study area. Instead, the area-wide chronology can be identified through some combination of the following: trade wares, local wares imitating those of other locales, and overlapping types across portions of the study area that, once pieced together, form a composite ceramic-based correlation for the entire study area.

Table 4-3 shows correlations for the projects used in this study, derived from ceramic data from various publications listed above as references useful for chronology construction. I believe the Basin Middle Formative is contemporaneous with Guadalupe/Rosario of the Valley of Oaxaca. Likewise, the Ticomán phases of the Basin correlate with the Cuanalán of the Teotihuacán Valley, as well as the Late Formative designation used in some Basin surveys. (Note that in their discussion of Basin prehistory in *The Basin of Mexico*, Sanders et al. [1979:94–98] allocate a mere four pages to discussing prehistoric occupation through the early Ticomán phase.) The Terminal Formative correlates with Monte Albán II in the Valley, and Early Palo Blanco in the Tehuacán Valley. By the Terminal Formative, a few towns, including Teotihuacán and Monte Albán, were growing relatively large.

Basin/Oaxaca ceramic correlation rationale: Classic

The Classic is the time of the dominance of Teotihuacán in the Basin of Mexico and surrounds, Cholula in the Tlaxcala-Puebla Valley, and Monte Albán in the central Oaxaca area. These centers did not control all the lands within the study area (and every hinterland survey we complete points up this fact), but they were important sociopolitical factors in the economic and political landscape of this period. In this study, I see Tlamimilolpa, Monte Albán IIIA, Late Palo Blanco, and so on as Early Classic correlates. For a minority of surveyed areas, researchers have also reported Late Classic data (Xolalpan, or Xolalpan-Metepec), but Sanders et al. (1979) do not for the Basin.

Basin/Oaxaca ceramic correlation rationale: Epiclassic

The original general periods, Formative (aka Preclassic), Classic, and Postclassic, did not recognize the patterns that characterize the Epiclassic, and the name reflects its later insertion into the older flawed schema. Highland researchers realized that while the term

Table 4-3. Macroregional chronology (part 1 of 3). Columns are alphabetical in order of survey area (second line). Highlighted periods are those used in the seven-period analysis.

region survey	Mixteca Alta Achiutla	Morelos Valleys Amatzinac Valley	Basin of Mexico Chalco-Xochimilco	Tehuacán-Cañada Cañada	Oaxaca Valley Guirún	Basin of Mexico Ixtapalapa	Oaxaca Valley Miahuatlán	region survey
V	Late Natividad	Late Postclassic	Aztec/Late Aztec	Iglesia Vieja	Monte Albán V	Late Aztec	Monte Albán V	V
U	Early Natividad	Early Postclassic	Early Aztec			Early Aztec		U
T								T
S			Late Toltec			Late Toltec		S
R								R
Q	Late Las Flores		Early Toltec		Monte Albán IV	Early Toltec	Monte Albán IIIB-IV	Q
P								P
O								O
N		Late Classic	Late Classic			Late Classic		N
M								M
L	Early Las Flores	Early Classic	Early Classic	Trujano	Monte Albán IIIA	Early Classic	Monte Albán Transition-IIIA	L
K								K
J								J
I	Late Ramos	Terminal Formative	Terminal Formative	Lomas	Monte Albán II	Terminal Formative	Monte Albán II	I
H	Early Ramos	Delgado			Monte Albán Late I	Late Formative		H
G			Late Formative		Monte Albán Early I		Monte Albán I	G
F	Late Cruz			Perdido	Rosario			F
E		Cantera	Middle Formative			Middle Formative		E
D		Barranca						D
C								C
B	Early/Middle Cruz	Amate	Early Formative			Early Formative		B
A								A

Table 4-3. Macroregional chronology (part 2 of 3). Columns are alphabetical in order of survey area (second line). Highlighted periods are those used in the seven-period analysis.

region survey	Mixteca Alta mountain survey	Mixteca Alta Nochixtlán	Oaxaca Valley Valley of Oaxaca	Oaxaca Valley Sola	Mixteca Alta Tamazulapan V	Tehuacán-Cañada Tehuacán V	Basin of Mexico Teotihuacán	region survey
V	Monte Albán V	Natividad	Monte Albán V	Monte Albán V	Late Natividad	Late Venta Salada	Chimalpa	V
U					Early Natividad		Zocango	U
T							Atlatongo	T
S							Mazapan	S
R							Xometla	R
Q	Monte Albán IIIB-IV		Monte Albán IV	Monte Albán IIIB-IV		Early Venta Salada	Oxtotipac	Q
P							Metepec	P
O							L Xolalpan	O
N			Monte Albán IIIB				E Xolalpan	N
M							L Tlamimilolpa	M
L	Monte Albán IIIA	Las Flores	Monte Albán IIIA	Monte Albán IIIA	Las Flores	Late Palo Blanco	E Tlamimilolpa	L
K							Miccaotli	K
J							Tzacualli	J
I	Monte Albán Late I/II	Ramos	Monte Albán II	Monte Albán II	Ramos	Early Palo Blanco	Patlachique/Tezoyuca	I
H			Monte Albán Late I	Monte Albán Late I		Late Santa María		H
G	Monte Albán Early I		Monte Albán Early I	Monte Albán Early I	Late Cruz		Cuanalan	G
F			Rosario					F
E			Guadalupe			Early Santa María	Chiconautla	E
D							Altica	D
C			San José			Late Ajalpán		C
B		Cruz	Tierras Largas		Middle Cruz	Early Ajalpán		B
A			Espiridión		Early Cruz	Purrón		A

Table 4-3. Macroregional chronology (part 3 of 3). Columns are alphabetical in order of survey area (second line). Highlighted periods are those used in the seven-period analysis.

region survey	Mixteca Alta Teposcolula	Mixteca Baja Tequixtepec	Basin of Mexico Texcoco	Tula Tula	Mixteca Alta Yucuita	Basin of Mexico Zumpango	region survey
V	Natividad	Nuyoo	Late Aztec	Late Postclassic	Natividad	Late Aztec	V
U			Early Aztec	Early Postclassic	[Early Natividad]	Early Aztec	U
T							T
S			Late Toltec			Late Toltec	S
R							R
Q			Early Toltec			Early Toltec	Q
P							P
O							O
N			Late Classic		Late Las Flores	Late Classic	N
M							M
L	Las Flores	Ñuiñe	Early Classic	Classic	Early Las Flores	Early Classic	L
K							K
J							J
I	Ramos	Ñudee	Terminal Formative		Ramos	Terminal Formative	I
H							H
G			Late Formative			Late Formative	G
F	Late Cruz	pre-Ñudee			Late Cruz		F
E			Middle Formative				E
D							D
C							C
B	Early/Middle Cruz		Early Formative	Formative	Middle Cruz		B
A					Early Cruz		A

Postclassic was effectively being used to refer to the Aztec periods, a period between the end of the Classic boom and the rise of Aztec dominance needed a name. The Epiclassic (Rattray 1996), as it became understood, had many dominant cities across the study area, each with a smaller territory than the largest Classic centers. Indeed, in the early Epiclassic, both Teotihuacán and Monte Albán remained locally large communities, though lacking their earlier dominance, and Cholula seems to have retained its regional dominance (McCafferty 1996a; Sanders 1989). Some researchers, especially those working in the northern Basin, call this the Toltec period, referring to the historically known inhabitants of Tula, northwest of the Basin of Mexico.

In this study, Monte Albán IV is considered contemporaneous with the Early Toltec of the Basin, or the Coyotlatelco phase, also known as the Oxtotla and Xometla phases in the Teotihuacán Valley, and Early Venta Salada in the Tehuacán Valley.

Basin/Oaxaca ceramic correlation rationale: Postclassic

In the study area, this time is generally linked to the expansion of the Aztec empire, although the Aztecs did not control the entire study area (Berdan et al. 1996; Carrasco 1996). Aztec control was not established until A.D. 1428, or the Late Aztec phase. The dominant Aztec population center was at Tenochtitlán, in the Basin's large central Lake Texcoco. So-called Mixteca-Puebla style pottery (e.g., Nicholson and Quiñones Keber 1994), with colorful polychrome designs, is an obvious ceramic marker for the Postclassic across the study area.

Phase designations in this study

For this study, I use alphabetical letters to denote the phases/periods represented in the study area. As described above, these phases are derived from ceramic crossties, including trade wares and pottery types that imitate wares from other areas. I have chosen alphabetical letters because if I used a set of existing terms that would prioritize the region they came from. In addition, the ceramic types are not the same across these broad areas, so that would be an inaccurate use of the regional chronology designations. For similar reasons, I did not use horizon designations, such as Formative, Classic and Postclassic, or Early Horizon, Middle Horizon, etc. I thought it would be unwieldy if I invented new terms for the periods. Thus, I chose to use the English alphabet to designate the ceramic periods I identified through the processes described above. I begin with the earliest correlation, period A, as shown in Table 4-3.

After I ascribed these letter designations to the database entries, only seven periods had sufficient data from across the survey area to make macroregional comparisons. These seven periods roughly correspond to the Early, Middle, Late, and Terminal Formative, the Early Classic, the Epiclassic, and the Late Postclassic. I use a tilde (~) before each mention of these period names to denote that I am referring to the period from my chronology only. The implications of the correlation of these seven periods are discussed in Chapter 9. Note that these periods do not include the widespread "Olmec" period contemporaneous with San José in the Valley of Oaxaca and Ayotla/Coapexco/Manantial or Ixtapaluca in the Basin of Mexico (my period C), because I have no Basin of Mexico region site-by-site data for this period.

Combined periods

I combine data from four early periods to create the ~Middle and ~Late Formative period subsets (this only applies to the Valley of Oaxaca, Sola, and Guirún data). Also, for the Oaxaca Valley region E/F period, I combined San José Mogote site areas as described by the original researchers (Kowalewski et al. 1989:72–73), eliminating individual occupation areas (defined by 100 m separations; occupations 1-4-21, 1-4-22, 1-4-23, 1-4-25, 1-4-26, 1-4-30, and 1-4-31).

"Aztec" periodization

Many reports do not distinguish between the Early and Late Aztec periods in the Basin of Mexico; they often note that the ceramics make it difficult to do in every case. I have considered those sites from the Basin of Mexico areas listed as "Aztec," but neither Early nor Late, as ~Late Aztec (period V). This pattern is followed for other projects where appropriate (e.g., Natividad and Monte Albán V also are considered ~Late Postclassic period V).

The database

To unite data from various regional surveys into a single data set, I created a database using FileMaker Pro (versions 4 and 5) with each record describing a single occupation, (or component) limited in time and space. The complete database has over 14,200 records from the 20 survey areas listed in Table 4-4. In keeping with the variables I am examining, I have included only residential and civic-ceremonial sites, and not those of other types, such as lithic quarries and other specialized processing areas (salt-production sites

Table 4-4. Reports on quantitative survey areas.

survey area	reference
Tula	Mastache and Crespo Oviedo 1974
Zumpango	Parsons et al. 1983
Teotihuacán Valley	various (Evans and Sanders 2000; Sanders 1986, 1987, 1994, 1995, 1996a, 1996b; Sanders and Evans 2000; Sanders et al. 1975a, 1975b)
Texcoco	Parsons 1971
Ixtapalapa	Blanton 1972
Chalco-Xochimilco	Parsons et al. 1982
Amatzinac	Hirth 1980, 1987a, and 1987b
Tehuacán Valley	MacNeish, Peterson, and Neely 1975
Cuicatlán Cañada	Spencer and Redmond 1997
Tequixtepec	Rivera Guzmán 1999
Tamazulapan Valley	Byland 1980
Achiutla	Balkansky et al. 2002
Teposcolula	Stiver 2001
Nochixtlán Valley	Spores 1972
Yucuita	Plunket 1983
Mountain survey	Drennan 1989
Valley of Oaxaca	Kowalewski et al. (1989), plus additional data from Blanton 1978 and Blanton et al. 1982
Guirún	Feinman and Nicholas 1995
Sola Valley	Balkansky 1997
Miahuatlán Valley	Markman 1981

along the water's-edge in the Basin are included only if they have a residential component), roads and other non-residential features, and irrigation ditches and agricultural terracing. Database entry fields include settlement size and population estimates, civic-ceremonial architecture (including mound base sizes and mound height, if given), other periods of occupation (including continuity data), and text notes.

I do not have well-reported quantitative survey data from all the regions in the study area; however, I do have *qualitative* data from all regions I've defined. For the purposes of this study, if survey data have been reported in sufficient detail for database entry (including component size and some attempt at periodization of civic-ceremonial architecture), I have used the data in a quantitative manner. If I do not have these quantitative data, I did not attempt to enter data into the database, and I have used the data qualitatively. This analysis is also illuminated by data from excavations. Table 4-4 lists the reports from which I obtained the quantitative data. I have systematic survey data on far more occupations (and far more people) from three regions—the Basin of Mexico, Mixteca Alta, and Oaxaca Valley—which I often refer to as the big three regions, than from the Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions.

General assumptions behind the database

While I generally found it easy to obtain the data I needed from the survey reports, I found making them comparable sometimes rather difficult. Ultimately, I was unable to obtain sufficient data to examine all the variables I had hoped to analyze before I began this study. In this section, I detail assumptions I made to make the data comparable.

Site limits

I created separate records for each component following the 100 m rule: if more than 100 m separates areas of artifactual or residential remains, they constitute two separate sites, occupations, or components. Thus, regardless of how a report designated sites, if two contemporaneous occupations were within 100 m of each other yet reported as two sites, I called them one component in the database, and entered them in a single record. On the other hand, if two contemporaneous zones over 100 m apart were called one site in a report, I divided them in the database—*if* I could determine the size of each. By defining sites this way, I have sacrificed some anthropological reality (clusters of contemporaneous settlements reflect truer settlement patterns, yet cannot be determined from the database) to improve data comparability.

Sometimes reports did not include site sizes, yet gave a site type name to each site (e.g., "small village," "hamlet," "low density line village"). For each site type listed by each project, I developed an estimated site area, which I applied to all sites given that description. The site area estimates I used are listed below in the reports section. They are not the same for each project, even if the description is, because the range varied by project. Although this estimation introduced a level of error, I had to do it to obtain comparability across the database. Population estimates for these sites use a standard density, which will bias certain types of analyses (e.g., they will tend to exhibit a step-like pattern in rank-size graphs).

Site size and population—very small sites

Small sites that seem from descriptions to be one or two house occupations, or have only a few sherds reported with no area given, I have listed as .5 ha in size. In some cases, .5 ha may be larger than the actual scatters; however, since small scatters frequently disappear from the archaeological record due to erosion and land-disturbing activities, one could argue that my assumption redresses this loss.

Sites with civic-ceremonial architecture

Most sites with civic-ceremonial architecture (CCA) had resident populations, but not all. Some hilltop ritual sites reported from the Basin of Mexico and Oaxaca Valley have little or no pottery, and are assumed to have lacked a resident population. Thus, if these sites had mounds, I entered them in the database. If they were described as house mounds, I did not include them.

If site descriptions included a phrase like "several mounds" or "two mound-plaza complexes," I used the minimum number of mounds that would satisfy the description. For those sites and projects for which I was forced to do this, the civic-ceremonial architecture counts should be considered a minimum.

Site area estimates if length and width are given

If site length and width measurements are given in a report, but no area, to estimate the component area I have multiplied length times width, then multiplied that figure by 60 percent (.6). I use this correction because a simple length times width (a rectangle) is larger than the irregular configuration of almost all prehispanic sites. This calculated site size estimate may be a little low for some relatively blocky valley sites, and rather high for "spaghetti" sites that follow meandering ridge crests. Overall, I conclude 60 percent is a reasonable multiplier.

Population estimate assumptions

Survey archaeologists commonly determine the size of artifact scatters, the density of artifacts, and the character of the occupation while in the field, and later use those data to estimate the number of residents the site had. Estimating populations is complex, but very important. With a population estimate, both site-by-site and regional populations can be compared, including to archaeological case studies from around the globe.

Site population estimation in the highlands began with the initial estimates made by Sanders (1965:50) and colleagues (Sanders et al. 1979) for the Basin of Mexico. They based their estimates of population densities on modern communities in the Teotihuacán Valley, which they adapted to reflect the surface density of archaeological debris, especially artifacts, as structural remains were often absent. As a test, Sanders et al. compared the archaeological data to ethnographic observations of population densities in villages from the early colonial period, ultimately concluding their original population estimates were about 20 percent too low (Parsons et al. 1982:70; Sanders and Nichols 1988). In an early publication, Sanders (1970) concluded that at contact, Basin households averaged seven persons. These data inform the assumptions made in the Basin of Mexico and Teotihuacán Valley survey reports, and are reflected in many reports from other regions.

Sanders (Kolb and Sanders 1996:492; Sanders 2000:66), using population estimates made during the 1960s in contemporary villages, recommends the following densities for Basin of Mexico archaeological sites:

scattered or dispersed villages	5–10 persons/ha
low density compact villages	10–25 persons/ha
high density compact villages	25–50 persons/ha

He acknowledges, however, that these densities are really along a continuum, and the communities he investigated actually displayed a considerable range in variation of population densities. These parameters have been adopted by other researchers, and applied, for example, to Puebla and Tlaxcala sites.

Some researchers are reluctant to estimate populations, and only report site types that infer the site function (e.g., *poblados con estructuras ceremoniales*), but no population estimates. Others use site types that refer to size and artifact/architecture density, mimicking Sanders's typology (e.g., García Cook 1981; García Cook and Merino Carrión 1989b; Rivera Guzmán 1999).

As a comparison, I averaged the population densities used for sites larger than 1 ha and smaller than 200 ha for those projects that published population estimates. Nine projects (Achiutla, Chalco-Xochimilco, Guirún, Ixtapalapa, Sola, Teotihuacán, Texcoco, Oaxaca Valley, and Zumpango) reported both site size and population; 4540 components were within that size range. They had an average size of about 10 ha, and the average minimum density multiplier was just under 14 persons/ha in the schema noted above, while the maximum was 30 persons/ha. This suggests that more settlements were considered lower rather than higher-density, which is consistent with descriptive information in those reports.

General periodization

The database contains records (components, or sites, with the implication that the site data is for a single period) from the entire spectrum of the ceramic period. In Chapter 4, I develop a chronology upon which I base the data and analysis presented in Chapters 7 and 8 and the conclusions in Chapter 9; it includes only seven periods. Thus, I cull from the entire database a subset that includes records for just those components dating to the seven periods, which are a majority of the records.

Standardized population estimates

I made population estimates three ways. All are based, to a greater or lesser degree, on the extent of the artifact and architectural remains (site or component size). One estimate is based on population estimates given in the quantitative survey reports; the drawback of this method is that different researchers may have made quite different assumptions about population density. Another is based on the population density 10–25 people/ha (1000–2500/km^2), for all sites except the smallest (less than .5 ha), which have a minimum population of 5–10 people (here considered the standard household size). The third estimate is based on a combination of the above in an attempt to merge the best of both—observer variations on occupation density and a standardized population density. To carry these out, however, is more complex.

Considerations and assumptions

Before making my own population estimates, I evaluated those published in the survey reports that gave them. I especially looked at the population estimates relative to settlement size, and discovered that while often standard multipliers, such as densities of 5–10 or 10–25 persons/ha, were used, intermediate or irregular multipliers also were employed, and a few settlements were given very high population densities: 50–100 inhabitants/ha, or higher. Population estimates for the Achiutla survey area are based on the most detail; they acknowledge four different, archaeologically recognizable types of occupation area, each with its own population density: terraced areas with 50–100 people/ha, compact villages with 25–50 persons/ha, scattered villages with 5–10 people/ha, and isolated settlements with 5–10 people total. This level of specificity is given in no other report.

For some sites, I had to determine component size. Wanting to include as much as archaeologically defensible, I estimated size for any "site" for which archaeological evidence was reported. Therefore, I ignored Basin of Mexico period V (Late Aztec) sites not substantiated in the field (see Berdan et al. 1996:15 for a discussion of merging documentary and archaeological data from highland Mexico)—thus, the Aztec period may be underrepresented in this database. Because of how data were reported, sizes for some projects were mostly or entirely determined by me (e.g., Tehuacán Valley and the mountain survey), as detailed below. For those sites reported as having no resident population (from a paucity of ceramics), I recorded them as having no population.

Table 4-5 shows that while many of the components in this database are small occupations smaller than or equal to .5 ha in extent, their percentage varies regionally. I do not have enough data to know if this is an inconsistency or if it reflects an archaeological reality. In other words, I cannot tell if the Oaxaca Valley region truly had more small

Table 4-5. Data on all components in the seven periods (*n*=11,432) by region. Includes percent components, percent with population given, percent with no population given (shrines, "ritual" sites), percent with zero population, percent with a single population given and no range, and percent sites ≥.5 ha.

region	**components**	**population given**	**no population given**	**zero population**	**no range only**	**≥.5 ha**
Tula	1.07%	none	1.07%			.51%
Basin of Mexico	16.67%	13.44%	2.79%	.01%	.06%	4.11%
Morelos Valleys	3.02%	2.39%	.63%			1.40%
Tehuacán-Cañada	7.75%	.01%	7.74%			5.86%
Mixteca Baja	1.74%	none	1.74%			.24%
Mixteca Alta	19.45%	16.62%	2.83%	.04%	2.6%	4.98%
Oaxaca Valley	50.30%	49.37%	.87%	.10%	.02%	26.94%
Totals	**100.00%**	**81.83%**	**17.66%**	**.15%**	**2.68%**	**43.86%**

occupations than the other regions, or if some field projects did not record these very small sites. These small sites form the lowest part of the settlement hierarchy and do contribute to site densities, population totals, and population hierarchies.

In the next sections, I discuss the details of how I made the three population estimates used, then I summarize the relative strengths and weaknesses of the three.

CALC POP

Of the three population estimates I made, CALC POP most strongly reflects the researchers' assumptions of population density. However, I did add some regularization to the population calculation process for those components for which populations were given. If the population was only given as a single estimate, without a range, I multiplied that figure by .65 to estimate a comparable minimum, and by 1.35 to estimate a maximum; this range is comparable to those given by other projects.

I determined what multipliers of site size were used to determine minimum and maximum estimates by dividing given population estimates by the component area. I studied these multipliers and determined that researchers appeared to have used a series of multipliers that I could standardize to the following ranges: 5–10, 10–25, 25–50, 30–60, 50–100, and higher than 50–100. Table 4-6 shows the percentage of components from

Table 4-6. CALC POP population ranges. Percentages of all components in the seven periods (n=11,432) with populations in the following ranges: 5–10 persons/ha, 10–25, 25–50, 30–60, 50–100, and higher than 50–100 (high).

region	**5–10/ha**	**10–25/ha**	**25–50/ha**	**30–60/ha**	**50–100/ha**	**high**
Tula						
Basin of Mexico	3.65%	5.29%	.54%	.46%	.02%	.01%
Morelos Valleys	.40%	.86%	.05%			
Tehuacán-Cañada						.01%
Mixteca Baja						
Mixteca Alta	2.83%	8.39%	.24%	.14%	.93%	.03%
Oaxaca Valley	.47%	19.82%	1.58%	.30%	.59%	.27%
Totals	**7.36%**	**34.35%**	**2.42%**	**.90%**	**1.53%**	**.31%**

each region that fit those ranges. Approximately 82 percent of the components had population estimates given (including those with no range, which were just under 3 percent), while over 17 percent had no population given. About 34 percent of the components had population estimates based on the 10–25 multiplier, and over 7 percent used the 5–10 multiplier. Just over 5 percent used multipliers with greater density than 10–25 persons/ha.

STD POP

This population estimation is the most standardized and the least reflective of the observations made in the field. Except for the smallest sites, for which I assumed a minimum population of 5–10, I used the 10–25 multiplier to estimate minimum and maximum populations.

STD high POP

This estimation method is much like STD POP except that it includes the reported population estimates for all sites with the 50–100 and higher than 50–100 multipliers. The assumption behind this inclusion is that researchers used these very high-density multipliers based on true archaeological data—high artifact densities and certain types of residential architectural remains.

Comparing the three methods

Figure 4-1 and Table 4-7 compare the three estimates. I believe STD POP is too flat, or does not take into account sufficiently known variations in population density, and so eliminated it right away. However, STD POP an important yardstick for comparing other methods of population estimation. By comparing CALC POP and STD high POP, we see that the populations of high-density sites profoundly affect total population curves. Interestingly, comparing period V CALC POP and STD high POP estimates, the Mixteca Alta region is higher than the Basin of Mexico region in the latter (for the areas surveyed). This suggests that more high-density population occurs within that region's occupations, and thus that fewer high-density populations were ascribed in the Basin. Is this

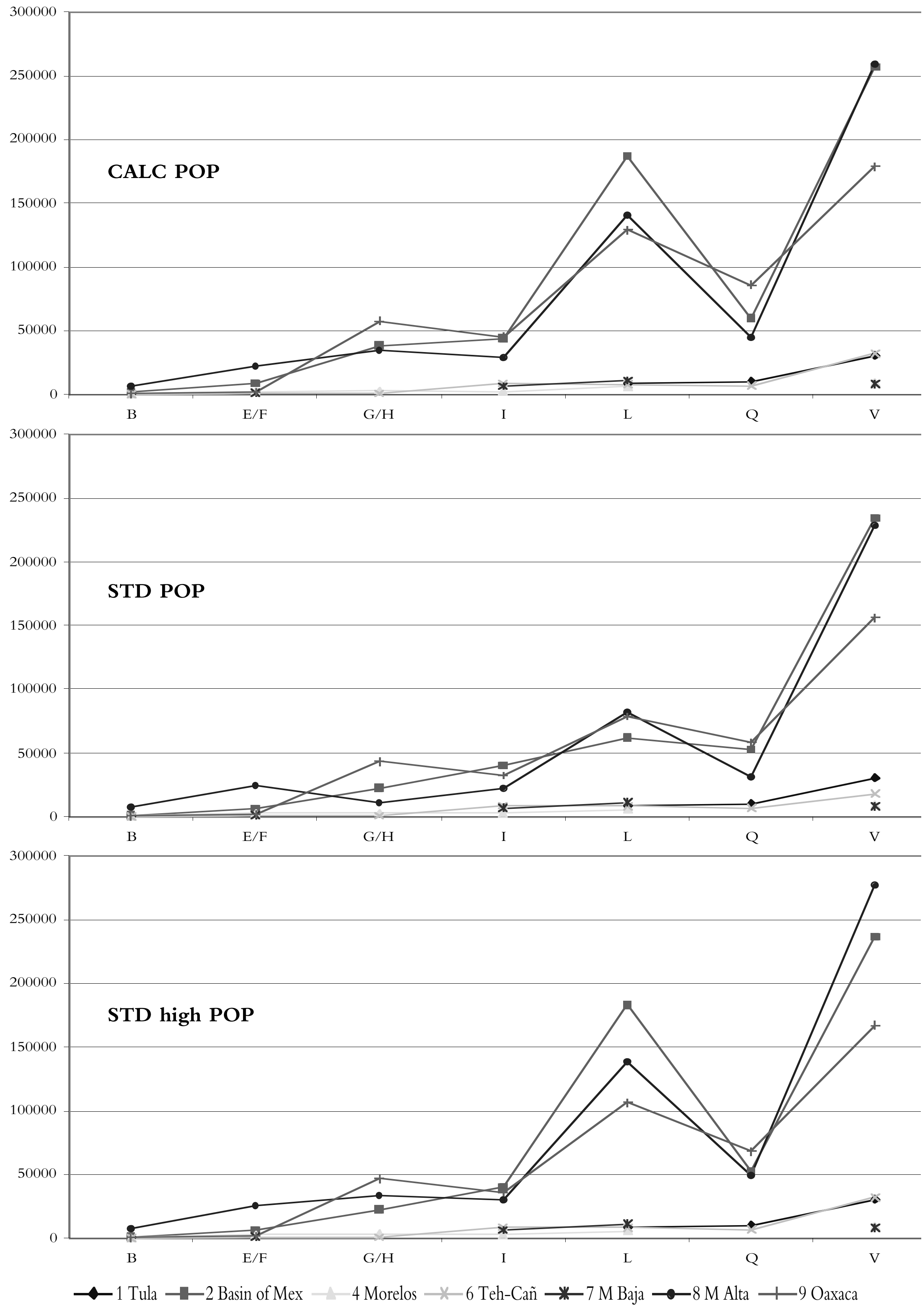


Figure 4-1. Comparison of total population (average between minimum and maximum) estimated by three methods, for the seven periods analyzed in this study.

Table 4-7. Total population estimates using three methods (top three sections), and comparison among those estimates (bottom two sections). Time increases from left to right, or from ~Early Formative period B through ~Late Postclassic period V.

CALC POP: total population, using average CALC POP

	B	E/F	G/H	I	L	Q	V
Tula	299				8305		30,314
Basin of Mexico	1639	8461	38,230	43912	186,938	59,497	256,788
Morelos Valleys	321	2534	3091	2447	5864		9329
Tehuacán-Cañada	16	976	812	8786	8022	6761	32,119
Mixteca Baja		974		6597	10,943		8150
Mixteca Alta	6178	22,145	34,757	28,695	140,462	44,301	259,462
Oaxaca Valleys	323	1936	57,616	45,560	129,643	85,652	179,796
sum	8776	37,026	134,506	135,997	490,177	196,211	775,958

STD POP: total population, using average STD POP

	B	E/F	G/H	I	L	Q	V
Tula	333				8303		30,265
Basin of Mexico	1050	6160	22,405	39,835	61,730	52,659	234,135
Morelos Valleys	368	2604	2849	2661	5691		9300
Tehuacán-Cañada	15	1024	809	8788	8052	6710	18,275
Mixteca Baja		981		6622	11,012		8213
Mixteca Alta	7546	24,697	11,032	22,604	81,770	31,187	228,199
Oaxaca Valleys	312	1827	43,125	32,309	78,722	58,132	155,735
sum	9624	37,293	80,220	112,819	255,280	148,688	684,122

STD high POP: total population, using average STD high POP

	B	E/F	G/H	I	L	Q	V
Tula	333				8303		30,265
Basin of Mexico	1050	6160	22,405	39,835	182,905	52,659	236,361
Morelos Valleys	368	2604	2849	2661	5691		9300
Tehuacán-Cañada	15	1024	809	8788	8052	6710	32,225
Mixteca Baja		981		6622	11,012		8213
Mixteca Alta	7546	35,699	33,960	30,008	138,589	49,213	276,809
Oaxaca Valleys	312	1862	46,601	35,676	106,354	68,046	166,889
sum	9624	48,330	106,624	123,590	460,906	176,628	760,062

% STD high POP is higher than STD POP

	B	E/F	G/H	I	L	Q	V
Tula							
Basin of Mexico					196%		1%
Morelos Valleys							
Tehuacán-Cañada							76%
Mixteca Baja							
Mixteca Alta	0%	45%	208%	33%	69%	58%	21%
Oaxaca Valleys		2%	8%	10%	35%	17%	7%
sum		30%	33%	10%	81%	19%	11%

% CALC POP is higher than STD high POP

	B	E/F	G/H	I	L	Q	V
Tula	-11%						
Basin of Mexico	36%	27%	41%	9%	2%	11%	8%
Morelos Valleys	-15%	-3%	8%	-9%	3%		
Tehuacán-Cañada	6%	-5%				1%	
Mixteca Baja		-1%			-1%		-1%
Mixteca Alta	-22%	-61%	2%	-5%	1%	-11%	-7%
Oaxaca Valleys	3%	4%	19%	22%	18%	21%	7%
sum	-10%	-31%	21%	9%	6%	10%	2%

researcher variation or archaeological variation? Possibly, it is both. However, to prioritize and preserve the original assessments of those surveyors who actually visited the archaeological sites, examined surface remains and artifact density, and knew intimately the results of nearby excavations, I rely on (minimum and maximum) CALC POP for population estimates in this study.

Average CALC POP

For most of the population analysis in this study, I have used "average CALC POP." I figured this by subtracting the minimum CALC POP from the maximum CALC POP (or the population minimum and maximum range), halving that difference, and adding it to the minimum CALC POP figure.

estimated population = number of ha occupied x people/ha

This is a reasonable estimate for the average population of these settlements. Note that by relying on CALC POP, the data set necessarily includes the variation in population densities given by original researchers (including variation among projects), and thus includes some rather glaring inconsistencies regarding the densities of individual settlements, when project-by-project population estimates are compared. Nevertheless, comparison of CALC POP to STD high POP suggests that in any projections involving total population are fairly close to researchers' original estimates, because the occupations deemed higher density are generally the larger ones, and therefore strongly influence total population estimates. When studying the smaller sites, however, this effect is masked, and project-by-project differences more greatly influence outcome.

Population estimation: Summary

The three methods for estimating population described above reflect similar basic assumptions about population estimation methods, and all are relatively conservative. STD POP assumes that the population density was the same for all settlements. STD high POP modifies STD POP to include a few sites with much higher population densities. CALC POP includes the most variability of population densities on different types of settlements, and most reflects field observations of the idiosyncrasies of each site. In the remainder of this study, I rely on CALC POP, which is a range of minimum and maximum estimates; although, to simplify presentation, I use average CALC POP, or the population in the middle of the minimum-maximum range.

The reports

In this section, I discuss the sources from which I derived the data for the database, including projects, reports, and data relevant to population estimation. I also comment on other comparability issues such as whether civic-ceremonial architecture (CCA) are noted and mound counts seemed complete.

Basin of Mexico and Teotihuacán Valley surveys

The first major summary reference for the Basin of Mexico was Sanders et al.'s (1979) *The Basin of Mexico*, which remains a standard reference for the archaeology of that region, in part because all the site descriptions upon which that summary is based have not yet been published (Table 4-8). The history of this fieldwork, and of surveys across highland Mesoamerica, is summarized by Deborah L. Nichols (1996). From the Teotihuacán Valley clockwise, the Basin areas outlined for survey were the Texcoco region, Ixtapalapa Peninsula, Chalco, the Amecameca region, Xochimilco, Tacuba, Cuauhtitlán (sometimes called Tenayuca-Cuauhtitlán), Zumpango, and Pachuca (Sanders et al. 1975b:Figure 79). Not all were actually (systematically) surveyed, and not all the sur-

Table 4-8. Published data from regional surveys in the Basin of Mexico.

region	basic site data	settlement pattern maps	site descriptions
Chalco-Xochimilco	x	x	x
Cuauhtitlán		x	
Ixtapalapa	x	x	x
Temascalapa	x	x	x
Tenayuca		x	
Teotihuacán	x	x	x
Texcoco	x	x	x
Zumpango	x	x	

veyed areas have been reported. Site-by-site information is available for the Teotihuacán Valley, Texcoco, Ixtapalapa, and Chalco-Xochimilco. The Zumpango area is reported only in tabular form (Parsons et al. 1983), and site-by-site descriptions remain unpublished. Sanders et al. (1979:193–194), based on limited survey and excavation data (the area is greatly obscured by modern habitation), think the Tacuba area settlement patterns parallel those of the systematically surveyed areas. Based on material in Sanders et al. (1979:209–213), the Tenayuca-Cuauhtitlán area was systematically surveyed, though no site-by-site monograph exists. Apparently, the Pachuca region was never surveyed (Sanders et al. 1979:213–216). In addition to the publications mentioned above, the Texcoco, Ixtapalapa, Chalco-Xochimilco, and Zumpango data are downloadable from the web (http://www.umma.lsa.umich.edu/NewWorld/ValleyofMexicoSurvey/index.htm). There are small differences among the data in the individual reports listed above, the data table report (Parsons et al. 1983), and the material posted on the web.

In the Teotihuacán Valley, monographs with site descriptions were not published completely until 2000, when the Aztec period monograph (Evans and Sanders 2000; Sanders and Evans 2000) appeared.

From the late nineteenth century on, many sites in the Basin region have been excavated. Some of this research actually has been reported. To a far greater degree, however, later residents have robbed sites of building materials, or prospected in mounds and other ruins for interesting or marketable items. Thus, the destruction of archaeological sites in this densely occupied area has been extensive.

Central Mixteca Alta Settlement Pattern Project

The CMASPP is an amalgam of three separate field projects that are being united into a single database. They include the Huamelulpan survey, so far only reported in an article, Stiver's dissertation research around Teposcolula, and the 1999 Achiutla survey (see Table 4-4). When I gathered the data for this study, the Huamelulpan data were not yet integrated, so my database does not include it, but it does include both the Teposcolula and Achiutla data.

Population estimates for the CMASPP project reflect three types of settlement densities; a single site may exhibit zones of each. The types are: terraced, compact, and scattered. Using all these types on a single site is a sophisticated way to estimate population, and depends on good preservation to make the determinations.

The Tlaxcala-Puebla Valley data

Considerable data has been gathered about archaeological and historical sites of the northern Puebla-Tlaxcala region, the Tlaxcala-Puebla Valley; this project was spearheaded by German researchers. The archaeological survey and site testing data have been partly published in a two large, rare volumes (Tschohl 1976; Tschohl and Nickel 1972); however, a third planned volume has yet to be published, making one-third of the data unavailable. The site periodizations are very general and no site sizes are reported, nor are mound counts and mound sizes. The focus of this work seems to have been to obtain general information about site locations (so they could be relocated), rather than to record sites in detail. Ángel García Cook and others completed several other surveys in Tlaxcala and Puebla, but no site-by-site reports are available, and the data are published in short articles (cited as mentioned in the text).

Achiutla

The fieldwork for this project was conducted in 1999, and a final monograph is not available as of this writing. I derived the data used here from an initial article (Balkansky et al. 2002) and materials graciously supplied by project co-directors Stephen A. Kowalewski and Andrew K. Balkansky. Because of the in-process state of this report, I did not rely on text site descriptions, but instead on tabular entries from the Central Mixteca Alta Settlement Pattern Project database.

Amatzinac Valley

These data initially were published by Hirth (1980) in a monograph focusing on the Formative and Classic periods (based on his dissertation), later expanded and republished in David C. Grove's (1987a) summary volume, focusing this time only on the Formative period (Hirth 1987a, 1987b). Thus, the Postclassic period U and V data was incompletely reported (mostly just mentioned), with no site sizes or population estimates given. Hirth does give a site type for each site, and the size assumptions I used are as follows, along with the number of components of each type:

regional center	60.0 ha	4 components
large village	25.0 ha	5 components
small village	12.0 ha	16 components
hamlet	3.0 ha	26 components
isolated household	.5 ha	52 components

Chalco-Xochimilco

Both site size and population estimates are available for this survey area, in the original report (Parsons et al. 1982), a tabular combined report, and on the web (see above). CCA seem reasonably well-reported.

Cuicatlán Cañada

These data are reported in a monograph (Redmond 1983) derived from Elsa M. Redmond's dissertation, with supplementary ceramic and site data expanded upon in a later publication (Spencer and Redmond 1997). Charles S. Spencer (1982) also published a book interpreting these data. To understand the ceramic sequence, Spencer and Redmond looked to the ceramics of both the Tehuacán and Oaxaca Valleys. Although these neighboring regions provided a solid structure for relative dating, the Cañada also has many local types. The Cañada reports include site size, but no population estimates. CCA seems to have been carefully mapped

The northern zone of the Cañada survey area overlaps the southernmost sites recorded during the Tehuacán survey (MacNeish; Peterson et al. 1975). In constructing my database, I eliminated duplicate listings (three sites), based on equivalences noted by the later project, but this was difficult to do, as the listings matched poorly.

Guirún

This survey is well-reported in an unpublished monograph available from the authors (Feinman and Nicholas 1995), with both site size and population estimates by period, and good CCA data. The Guirún data also are discussed in two articles (Feinman and Nicholas 1996, 1999).

Ixtapalapa

Based on Blanton's dissertation, this report (Blanton 1972) includes both site size by period and population data; these data were later republished in tabular form along with data from several other Basin of Mexico projects, and are downloadable from the web, as discussed above. CCA data seem well reported. The Late Classic sites are mixed into Early Classic site descriptions, but can be separated.

Miahuatlán

Two archaeological surveys have been conducted in this valley. First, Donald L. Brockington (1973) examined the area immediately around the town of Miahuatlán. Later, Charles W. Markman (1981) did an intensive survey of 50 km^2 centered on Miahuatlán, along with five narrow transects to the north of town, and an opportunistic examination of some areas outside the transects. The Miahuatlán data I have included in the database are from Markman's survey, sometimes augmented by earlier data (by Markman himself), if they were more complete (e.g., if the site had been heavily disturbed). Markman gives site size, but makes no population estimates. He reports CCA, but it is poorly periodized.

Mountain survey

The data in this report are sketchy. Drennan (1989) includes no site maps, and individual site sizes and populations are neither given nor are any site types reported. As a proxy for that important information, I derived an approximate site size by measuring the site dots (length and width) on the period maps, which I could do only to the nearest 50 meters. This figure gives a good *relative* idea of a site's proportional dimensions. I multiplied the length times the width to get a total area, then summed them by period. Not surprisingly, this yielded estimates much too high. Next, I multiplied the length-width total times a percentage to adjust the figures downwards. For all periods but IIIA and IIIB-IV, I used 35 percent; for IIIA and IIIB-IV, I used 27.5 percent. This yielded period site area totals very close to the totals Drennan reports, and provided the only way I could approximate individual site areas. Drennan gives no population estimates.

Drennan does not date the CCA, plus his CCA descriptions are very general. I have made my best guess, and considered the CCA either Classic or Postclassic, or both, if those periods were both represented. For all sites, my mound and plaza counts are approximations, except in the few cases where Drennan reports exact counts, and intended to be conservative. I generally assumed those he described as "low" mounds and low mounds with foundations to be residential. This may also contribute to an undercount. Some of the CCA configurations suggest Classic patterns, while others seem Postclassic, judging by better dated nearby projects.

Nochixtlán Valley

Several projects have resurveyed areas that had originally been examined by Spores (1972) in the late 1960s. While some sites seem to have disappeared, probably from erosion and modern land use, for the most part, later researchers, including Patricia S. Plunket (1983) and the Achiutla survey (Balkansky et al. 2002), have been able to relocate Spores' sites. However, the later surveys tended to find the site areas to be larger, and the occupations to date to more periods. In most cases, I've relied on the later surveys for data on sites that have been relocated.

Spores reports site length and width, which I have converted to site size according to the general assumptions noted above. In addition, in areas that have not been resurveyed, I have combined sites based on the 100 m rule as measured on Spores's map of all sites. I came to this judgment in part because Plunket's resurvey nearly always found the sites to be larger than what Spores reported.

Spores did not make population estimates and often only generally mentions CCA, not giving total mound counts. I have made minimum guesses based on a careful reading of his wording, but I think some are significant undercounts. Note that when Plunket revisited some sites, mounds had disappeared. In those cases, I used the larger counts offered by Spores.

For two sites (N-224 and N-404), Spores gives no size data; I estimated each to be 20 ha.

Oaxaca Valley

This survey profited from the experience garnered during the Basin of Mexico projects, although surveyors reported about twice as many components. Blanton, Kowalewski, and colleagues surveyed the Oaxaca Valley in sections, which they summarized in 1989 (Kowalewski et al. 1989). When considered with Blanton's (Blanton et al. 1982) first survey summary, and his (Blanton 1978) Monte Albán survey and later data from Monte Albán (e.g., Markens and Martínez López 2001; Martínez López et al. 2000; Winter 1994b), plus data from myriad excavations and intensive surveys, a fairly detailed picture of the Valley's human past is available.

Database entries for the Oaxaca Valley are drawn from tabular data in the appendices in the second volume of Kowalewski et al.'s 1989 report, with a few minor exceptions (e.g., sites with no size, Monte Albán, the combined E period San José Mogote mentioned above). While mound data seem complete, plaza counts are not—they are only given for some sites. I derived Valley of Oaxaca ball court data from a summary article (Kowalewski et al. 1991), and original field notes and maps stored at the University of Georgia.

Sola Valley

The Sola Valley data are reported by Balkansky (1997) in his dissertation. They include sketch maps of CCA, site size data by component, and population estimates.

Tamazulapan Valley

The most disturbing inconsistency in this report is Bruce E. Byland's (1980) tendency to insist that a site dated to a period for which he had no artifactual evidence—in short, he apparently thought he should have Ramos period occupations on sites with occupations that dated to the prior and succeeding periods, *even though he found no Ramos period ceramics*. I have not included those speculative components.

The following list shows the site sizes I used for periods with the following site types, if Byland gave no other clarifying information.

hamlet	3.0 ha	3 components
small hamlet	2.0 ha	2 components
very small hamlet	1.0 ha	1 components
isolated household and unknown	.5 ha	61 components

Byland notes CCA, but often it seems poorly periodized.

Tehuacán Valley

This early survey report (MacNeish; Peterson et al. 1975) has project area maps that are difficult to reconcile to later, more accurate maps, making precise site locations difficult to determine. This is especially a problem at the southern end of the Tehuacán study area, which was later examined during the Cañada study (Redmond 1983; Spencer and Redmond 1997). Fortunately, the Cañada report notes the Tehuacán sites they relocated.

In the very early Tehuacán Valley studies, researchers (MacNeish; Peterson et al. 1975) reported 426 "indeterminate" sites, with no site size or population information given. I have assumed they are situations where a few sherds of that period were found. I have estimated them to be .5 ha in size, although this is probably an underestimate. If more than a few sherds are reported, I have estimated the site size to be 1.0 ha. For two other site types, I have estimated the following sizes if size is unreported.

village	18.0 ha	2 components
hamlet	3.0 ha	16 components

While CCA counts seem well-reported, they tend to be poorly periodized.

Teotihuacán Valley and adjacent surveys

These reports have suffered from the peculiar history of this long project. In particular, the long span between most of the fieldwork and most of the reporting means that significant advances in field, laboratory, and reporting methods and techniques serve to underscore the early date of the initial investigations. In general, the editing and proofreading of the published volumes is poor, and inconsistencies abound. I have tried my best to accurately transcribe data from the various Teotihuacán Valley survey reports (data are reported by general period) despite these problems.

I tried to record the Aztec period sites reported by Parsons and Sanders (2000) for areas north of Cerro Gordo, but they did not note site size, and their site types do not conform to the standard types. Instead, they include wordy descriptions like "probably a small somewhat nucleated village with dispersed outliers of hamlet size" and "small dispersed village with a possible hamlet outlier." They also do not seem to conform to the 100 m rule. With these many uncertainties, I did not see how I could bring these data into the database with sufficient comparability, so I have ignored them. The implication of this decision is that data from a small but important area peripheral to the Teotihuacán Valley is excluded; certainly, the exclusion depresses regional settlement totals and settlement and population density calculations, but I do not think the omission affects overall conclusions. There remain, however, 145 ~Late Postclassic period V Teotihuacán Valley components.

For 250 components, Sanders et al. give no site size. These are the site sizes I've ascribed to each of the site types that were reported.

large, high-density compact village	40.0 ha	1 component
low density line village	30.0 ha	1 component
large village	25.0 ha	5 components
scattered village	15.0 ha	1 component
small village	12.0 ha	12 components
dispersed hamlet	6.0 ha	5 components
hamlet	3.0 ha	168 components
compact hamlet	3.0 ha	1 components
unknown	2.0 ha	11 components
hilltop ceremonial	.5 ha	6 components
ritual cave	.5 ha	4 components
isolated household	.5 ha	1 components
questionable (trace of artifacts)	.5 ha	35 components

I have not included component data from two Aztec period reports: the Trade Route Survey (Otis Charlton and Charlton 2000) and the Temascalapa survey (Gorenflo and Sanders 2000) in the database, as I had no component data reported for other periods. Thus, I use both to generally inform this study.

Teposcolula

Laura R. Stiver (2001) has reported the Teposcolula area data in her dissertation, including sketch maps of CCA, site size data by component, and population estimates. These data are being combined with GIS and tabular data assembled by the Achiutla project to form the Central Mixteca Alta Settlement Pattern Project.

Tequixtepec-Chazumba

Unfortunately, the copy of this survey report (Rivera Guzmán 1999) I worked from had a few pages missing, so several sites could only be incompletely recorded, and are skipped here. Ángel Iván Rivera Guzmán always gives component size—but no population estimates. CCA seem well-reported and reasonably well periodized, although he uses only four periods, which limits the comparability of this study to others.

Texcoco

The Texcoco data are available in three forms: the original survey report (Parsons 1971), a later publication with data from multiple surveys, and on the web (see above). The 1971 report lists some component as "less than 1 ha" that are mostly listed in the 1983 report as .9 ha. Indeed, I relied on the 1983 report over the 1971 report for population figures.

There was one discrepancy I was not able to rectify, however. "Appendix II Tlatel Descriptions" (Parsons 1971:315–381) does not include any Classic period mounds, although some are mentioned in the site descriptions. I attempted to glean mound data from the latter as much as possible, but only one of the 60 period L and N sites is reported with CCA, which may be an undercount.

Tula

Alba Guadalupe Mastache and Ana María Crespo Oviedo (1974) do not give sizes for most of the sites they report. They have four site types, and I attributed arbitrary sizes as follows:

poblado con estructuras ceremoniales	15 ha
aldea	5 ha
caserío	1 ha
presencia	.5 ha

These are probably an underestimate for sites in the larger two categories, yet also a reasonable solution. Mastache and Crespo Oviedo do not give population estimates.

The periods attributed are very generalized (Formative, Classic), except for periods U and V (Postclassic). I have called Formative period B and Classic period L.

CCA counts must be considered minimums, in most cases. Unless I had data that clarified that particular settlement, I attributed only a single mound to *poblado con estructuras ceremoniales* occupations.

For period Q, I derived some data from two summary volumes on Tula (Diehl 1983; Healan 1989). I do not have contemporaneous survey data to complement it. I felt it important, however, to be able to use the Tula site data for most populous occupations, and in analyzing CCA.

Yucuita

For her dissertation research, Plunket (1983) resurveyed a portion of the Nochixtlán Valley previously surveyed by Spores (1972), to focus on the occupation and area around the sites of Yucuita and Yucuñudahui. She generally found the sites to be larger and was able to identify more periods than Spores had recorded earlier. In reporting the sites that both projects recorded, I read both descriptions and entered what seemed to be the maximum information.

Zumpango

These data are discussed broadly in the Basin summary report and tabular data are reported along with other Basin data and on the web (see general Basin discussion above). The data included here are from the web, and I had no site descriptions to read or site maps to examine. CCA may be underreported, as fewer than 20 components of over 700 have CCA. Otherwise, the Zumpango data do include site size and population estimates.

The maps

Chapters 7 and 8 include numerous maps of the study area and provide spatial representations of data on variables I analyze. Maps pertaining to a particular period show only those survey areas that contributed that kind of data for that period. Also, the period shown is highlighted in the bar at the bottom of the figure. Sometimes, I have added selected settlements that are outside the survey areas (marked with stars and mentioned in the text), yet important to our understanding of the dynamics portrayed in that map.

Summary

In this chapter, I discussed the myriad issues involved in uniting data from 20 survey projects into a single database, even one including only a few types of data. I discussed determining the contemporaneity of occupations across the study area, and present a macroregional chronology for the study area, which uses letter designations for each individual period. I also discuss how I made other types of data comparable for the dataset, including population estimates. When I had entered all the data, I realized that I only had sufficient data for macroregional-scale comparison for seven periods. I mark these periods with a tilde to denote that they are not exact correlates of the conventional periods to which their names correspond (e.g., ~Early Formative or ~Late Postclassic).

Chapter 5

Settlement Patterns

Settlement pattern studies are based on archaeology's equivalent of census data. They show the distribution of people across the landscape, including where the largest, most populous settlements were and unoccupied areas. Mapping the largest settlements illuminates population hierarchies, based on the assumption that certain communities are larger than others for important reasons. Settlement pattern studies may also consider unusual characteristics of settlements (e.g., monumental architecture, economic features, defensive constructions). Settlement patterns contribute to our understanding of scale, integration, complexity, and boundedness, the core features of macroregional sociopolitical evolution.

This chapter provides background and context on settlement pattern studies, beginning first with a brief history and basic terminology. Then, I discuss inconsistencies in the database and potential sources of error. One of the most thoroughly discussed (and argued) aspects of settlement pattern studies is population estimation; I weigh in with my assessment of this with regard to the highland study area data. Finally, I summarize the chapter and briefly discuss linking settlement pattern data to sociopolitical change and continuity.

Archaeological settlement pattern studies

Settlement patterns are the distribution of human residences across the landscape, or "the pattern of sites on the regional landscape" (Flannery 1976:162). It is not only important to know where people lived, but how many lived in each place. Estimating past populations is generally rather contested, yet it is a vital facet of settlement pattern studies.

The history of settlement pattern studies in the New World is considered to have begun with Willey's (1953) research in the Virú Valley, Peru, in the 1940s (Billman

1999:1). Willey (1999b:10) traces the term "settlement pattern" to Julian Steward, in discussions the two had before Willey went to Peru. Willey (1999b:11) also notes that settlement pattern studies are based on the belief that temporally diagnostic artifacts from all periods are evident on the ground surface (either by visual inspection, if vegetation does not obscure the surface, or using relatively simple subsurface testing methods); this is generally true of archaeological remains in highland Mesoamerica.

This study explicitly relies on settlement patterns at the regional scale to elucidate regional- and macroregional-scale sociopolitical evolution (Table 5-1). Archaeological research questions must match the scale of the data. Thus, the regional- and macroregional-scale questions of this study examine, for example, multi-polity, semiperiphery, or core-periphery issues.

Basic terminology of settlement patterns in archaeological fieldwork

Archaeological settlement patterns are determined from the most basic data obtained during fieldwork: site size and periodization. Determining each of this requires assumptions and estimation. Further, better analyses and comparisons are possible if we transcend site size and estimate populations. Site size is an estimate of the size of an occupation area or an area used in the past. In this study, I focus on residential sites (other specialized site types include quarries and other resource extraction locales, transportation features like roads, and non-residential ritual sites (e.g., shrines). In highland Mesoamerica, residential

Table 5-1. Types of sociopolitical units evident at various spatial scales (see Neitzel 2000: Figure 2.1 for a similar breakdown).

archaeological spatial units	sociopolitical units
macroregion	core-periphery, world system
region, area	regional system
locality	society, polity
site	settlement, community, perhaps household
structure, house, building	household, family, non-residential architecture

sites may include civic-ceremonial architecture, or special ritual and administrative buildings (see Chapter 6). Residential areas might be obvious based on the pattern of wall foundation remains. On other sites, residential areas are assumed based on the density and types of broken ceramics (*tepalcates*) found on the ground surface. Ceramics are among the most durable of material culture remains that record the stylistic changes that are the hallmarks of change survey archaeologists rely on to date prehispanic remains.

While ceramics are considered sufficient to define residential sites, archaeologists also look for more substantive remains like building foundations and terraces to help determine the number of occupants on a site. Some pottery, however, does not suggest a residential use of the locale; for example, some artifact scatters along the old lake edge in the Basin of Mexico are the remains of salt-making operations; not all included residential structures or fragments of ceramic vessels used in the household context. From those sites with structural remains and data from excavated sites, archaeologists derive estimates of the number of people in a household, and of the density of households in a given period of occupation and type of community; these assumptions then can be applied to site lacking structural remains. For the latest prehispanic period, populations given in archival data can be compared to archaeological data.

In the next section, I discuss potential sources of error in population estimation and settlement pattern analyses. In the rest of this section, I introduce common terminology and concepts used in highland archaeological surveys.

Residential architecture

Residential architecture includes fewer structural forms than civic-ceremonial architecture. The most prominent are houses (*casas*, *hogares*, *unidades domesticas*, and *unidades habitacionales*) and house mounds (*tlateles*), patios, and residential compounds. By convention, mounds less than 1 m tall are considered to be house mounds, unless their context suggests otherwise. Patios are considered private (while plazas are considered public), and the activities that occurred in them were probably not always visible to passers-by. Some patios are completely enclosed by buildings, so that the only access was through one of the buildings. Other patios had walls or other visual barriers on one or more sides. Teotihuacán and Teotihuacán-style communities have distinctive residential architecture called apartment compounds (*conjuntos apartamentales*). They generally include multiple patio groups that probably were occupied by extended families. The floors of these compounds are sometimes at different heights, facilitating collecting of rainwater through elaborate drains. The open patios also let light and air into these otherwise closed architectural units (Manzanilla 1993:33).

The above are not the full range of residential architectural features. Many sites with dense residential architecture have alleyways, passages, and sometimes stairways connecting otherwise closed architectural compounds. Patio groups also sometimes have storage and other rooms that do not seem to have been for cooking or sleeping. Occasionally excavation reveals altars and other apparently ritual features within patios or residential compounds.

Residential terraces

Many sites on rough terrain have residential terraces that created flat ground on otherwise sloping or precipitous terrain. A typical terrace has a stone, adobe or earthen wall on its downhill side, and the uphill side can be cut into the slope. Today's residential and agricultural terraces are sometimes anchored with vegetation, for example maguey plants, which are used for fiber and to make the mildly alcoholic beverage *pulque* thought to have been made and consumed at least since early in the Formative period (Parsons and Parsons 1990:349). Archaeologists record residential terrace counts and sizes as a means for estimating population, with the number of residences estimated for a terrace based on the surface area of the terrace. Indeed, Monte Albán has 2073 terraces across its 6 km^2 (Blanton 1978:7), and sites in the Mixteca Alta region may have several dozen (or even over 1000) residential terraces.

Assumptions and potential error in this settlement pattern study

Potential sources of error are myriad in settlement pattern studies in general, and this study in particular. They range from problems in the field to assumptions made in analysis. This study has a greater potential for error because of the complexities in creating a single comparable or standardized database. In this section, I discuss the most prominent ones, including determining site limits, the periods in which sites were occupied, and complexities of estimating the resident population.

Field methodologies

While fieldworkers are assumed to have been diligent in recording archaeological remains they encountered while surveying, not all sites can be recorded for several reasons, discussed below. The issues involved in demographic analysis of archaeological survey data (e.g., intensity of survey, considerations for "missing sites," distribution of temporally diagnostic ceramics and varying discard rates) recently have been aptly summarized (Sbonias 1999).

Some prehispanic occupations lie buried under later occupations, or have been so severely disturbed by modern land use practices that the original configurations can no longer be determined. Across the study area, modern occupations obscure the remains of the archaeological past. Most surveys ignore such heavily occupied areas, creating empty spots that lack archaeological sites on maps; that they have no sites because of modern occupation almost always are not indicated, so the casual reader erroneously assumes that the lack of sites mean the area was checked and lacked evidence of occupation.

Defining site limits can also be a problem. By convention, reports often specify that a gap in artifacts or features of more than 100 m means that the scatters are designated as two different sites. This is a recording convention, and may not accurately reflect the anthropological realities of dispersed communities. Also, artifact distributions can be near-continuous and make site limits difficult to determine; Bernal (1965:795) noted that in the Valley of Oaxaca he "found that it was easier to mark places where there was nothing" on his maps than to try and define the limits of artifact scatters.

In addition, reports sometimes do not detail how intensive survey coverage was, or how closely surveyors scrutinized the landscape (e.g., transect spacing). In practice, it is difficult to check everywhere for material remains. A survey report may not explicitly note whether fieldwork prioritized areas that were more accessible, those pointed out by local residents, or whether the landscape was systematically examined.

An additional problem is that some of these surveys were conducted a generation ago, when, for example, ceramic chronologies were poorly defined. Several projects, in periodizing sites, did not attempt a finer chronology than "Formative" and "Classic," which makes their data difficult to compare to other surveys that used more periods.

Site sizes and population estimation

Many locations across the Mesoamerican landscape have been continuously occupied or repeatedly reoccupied, including in modern times. This means there has been considerable redeposition, churning, or reuse of soil and the artifacts it contains. Nevertheless, it is important that archaeologists make population estimates, which are derived from site areas that are calculated based on periodizations made from such churned artifacts. Population estimates allow comparisons with other regions of the world.

To determine population, a site must have a residential component. Some sites seem to have had only an ideological purpose (e.g., shrines), and hence do not contribute to population estimates. Some survey reports used in this study give site area, and some also include population estimates (see Chapter 4 for details). From project to project, however, population estimates for the same size site from the same period may differ wildly.

J. Nicholas Postgate (1994:53) suggests archaeologists consider these variables when estimating population: 1) total site area; 2) proportion of the site that was residential; and 3) the correlation between the area of residential compounds and number of occupants. None is as simple as it seems, and all may vary through time. Mesoamericanists commonly estimate population based on a combination of surface artifact densities (especially of ceramics) and site area. Some researchers also factor in the time period of the population estimate (assuming population density varied by period), and architectural clues to house counts (such as residential terraces). Blanton (1988:53 response to Sanders and Nichols 1988) notes that his estimates of Monte Albán's population (Blanton 1978) based on total site area (including plazas, roads, etc.) are similar to the population estimated using a different multiplier based on just the residential area.

To double-check population estimates, researchers have compared Late Postclassic archaeologically based estimates to colonial census data on residence counts and population. Based on records for 1519 for the Teotihuacán and Tehuacán areas, Sanders et al. (1979) argue for the primacy of archival population data, which shows the archaeologically estimated figures were 20–25 percent low; as a result, Sanders et al. added a 20 percent correction to their archaeologically based estimates. Reviewing this issue almost a decade later, Sanders (1988:43–44) continued to argue for the appropriateness of the 20 percent correction, not only for the Teotihuacán and Tehuacán Valleys, but also for the Valley of Oaxaca for pre-Aztec time periods. Feinman and Nicholas (1988:56 response to Sanders and Nichols 1988) find the 20 percent correction suspect for several reasons, including that it is a reverse projection based on 1565 population estimates (roughly two generations after the Spanish arrived), and that it assumes a rate of population decline after contact of 65 percent. Clearly, Sanders' "correction" involves several estimates, is difficult to substantiate, and may introduce even more error into the already problematic population estimation process. In Chapter 7, I briefly compare two Sanders et al. estimates of the Basin population with one of my own (CALC POP).

Analytical errors

In large-scale studies, the errors mentioned above can be compounded because data are derived from multiple sources. In this study, I have sought to standardize the data by closely reading the reports and studying published maps to as uniformly as possible apply the 100 m rule (scatters more than 100 m apart are separate sites). I have also constructed my own population estimate (CALC POP) that takes into account survey observations of particularly high-density settlements, while at the same time standardizing across all projects the population density multipliers used to estimate populations.

Population estimation

The size of the population under study is a crucial variable in regional settlement pattern analysis. Many of the projects used in this study include population estimates of the sites in their reports; these estimates are based, first, on the size of the occupation, and then on residential density. I prioritized the researchers' estimates, although they contain inconsistencies, because I assume that the researchers who visited sites, or have read the field notes of those who did, have a better feel than I for whether the population of a given site may have been denser or less dense than average. While population estimation requires many assumptions, it does provide an essential tool for assessing urbanization, population clustering, and other important characteristics of the demographics of the human landscape that cannot be addressed using only settlement counts, densities, and distributions. See Chapter 4 for a more complete discussion of population estimation issues.

To proceed with this study, I decided to create my own population estimates because: 1) for some surveys, researchers did not estimate population; 2) sometimes population was given only as a single estimate and not a range, which is held to be more appropriate (Blanton et al. 1996:11); 3) there was considerable variation in the population densities used by various researchers; and, 4) I believe that minimum populations are best given as 5–10 individuals, the most common assumption for the population of the prehispanic highland Mesoamerican household.

To evaluate various approaches, I made population estimates three ways, which I call CALC POP, STD POP, and STD high POP (details on the estimations are in Chapter 4). CALC POP relies upon the researcher's assessment of population density, with the following adjustment. I have regularized the multipliers used from the researchers' originals (and sometimes variable within certain ranges) to the densities: 5–10 people/ha; 10–25/ha; 25–50/ha, 30–60/ha, 50–100/ha, and those higher (denser) than that. I also assumed that the smallest settlements had populations of 5–10 individuals. This model standardizes from project to project the various densities used, yet preserves the researchers' densities for the highest density settlements, and most closely resembles the researchers' estimates.

I made two other estimations, both considerably more standardized than CALC POP, to gauge the effect of various standardized densities. STD POP is the most regularized, or assumes the same population density for all sites but the smallest (thus making population rank-size graphs very similar to occupation size rank-size graphs). For the smallest sites, I assumed a minimum population of 5-10 people. For all other sites, I assumed a density of 10–25 people/ha. This density is that Sanders recommends for low-density compact villages, which he says most of the Basin of Mexico settlements correspond to. The effect of STD POP is to make the population curve mimic the site area curve. To bring the high-density settlements back into the model—because I thought researchers had valid reasons for assigning high densities to some settlements, I made a third estimation, STD high POP. STD high POP is like STD POP except for settlements that researchers defined as having densities that fit the 50–100 persons/ha density for CALC POP, and higher.

Summary

Archaeological settlement pattern studies are roughly analogous to a census of living populations, and are used similarly. They show the distribution—including clustering and unoccupied areas—of settlements, and therefore people, across the landscape, which indicates important population centers, etc. The spacing of residential sites is taken as an indication of the results of sociopolitical and economic decision-making within a polity, and thus of aspects of macroregional systemness. Archaeologists use site size as an aid in constructing an administrative hierarchy, noting, for instance, a more centralized pattern with sites clustered around the largest sites, or a decentralized pattern with sites scattered across the landscape. In addition, settlement patterns can be plotted for different periods to show diachronic patterns analogous to a series of censuses, as I do in Chapter 7. Changes over time in settlement patterns and the settlement hierarchy indicate important sociopolitical shifts (e.g., in land tenure, economic opportunities, etc.).

Chapter 6

Civic-Ceremonial Architecture

Civic-ceremonial architecture is distinct from residential architecture, and served a different function within the highland community related to ritual and administrative activities. In this chapter I describe civic-ceremonial architecture and discuss the importance of hierarchies constructed based on it. I had hoped to look at plazas, the configurations of civic-ceremonial architecture complexes, etc., to examine civic-ceremonial architecture hierarchies in several ways; however, I had sufficient data only to use mound and ball court counts and distributions (hierarchies).

In this chapter, I first present a general description of highland Mesoamerican architecture. Then I discuss mound-plaza complexes and ball courts, which are special kinds of civic-ceremonial architecture (CCA), and how characteristics of CCA can be linked to scale, integration, complexity, and boundedness. I also briefly note variations in highland Mesoamerican civic-ceremonial architecture.

Highland Mesoamerican civic-ceremonial architecture

Civic-ceremonial architecture includes mounds, platforms, and ramps. Although sometimes sites have lone mounds, or single mound-plaza complexes, generally, sites with mounds have more than one mound. Often, one or two mounds are larger than the others facing a plaza, and seem to dominate the group. Large mound-plaza groups sometimes cluster together and compose a distinctive civic-ceremonial zone that may be surrounded by a wall or otherwise visually and actually set apart from the surrounding residential areas. On uneven terrain, CCA is usually on the highest part of the site, and therefore was above any homes or other buildings that surrounded it.

Mounds are the most commonly encountered type of CCA. In Spanish, they may be referred to as *teocallis*, *montículos*, *mogotes*, *mojoneras*, *templos*, or *pirámides*. Although they are generally square or rectangular, a few are circular (e.g., large mounds at Cuicuilco and Xochitecatl). Erosion, vandalism, and reuse of building material generally obscures the details of surface decorations, such as stairways (*escalones*, *escalinatas*, *escaleras*), carved stone panels, etc., along with the buildings that may have graced the final summit. Colonial and precolumbian records show summit structures included both residential (for priests or ritually important personnel) and non-residential buildings (for ritual and administrative activities). Certainly, activities carried out in buildings atop mounds were obscured from observers standing in the plaza.

Some mounds have distinctive decorations on their lower flanks. Generally, they are only discernable after excavation, however. The lower flanks often consist of a lower band that slants outward (*talud*), with a vertical band above it (*tablero*). *Talud-tablero* decorative styles (Gendrop 1984; Nagao 1989:91) have a regional distribution—for example, a "Teotihuacán style." The relative size of the *talud* and *tablero* vary, and the tablero may be elaborately carved.

Plazas are distinctive open areas, usually adjacent to mounds, although sometimes they lack associated mounds. Plazas are most often square or rectangular, or with squared corners and straight sides, although irregularly shaped plazas are known. The word "plaza" implies a public area, but for some Mesoamerican plazas, access may have been severely restricted, which brings into question the public aspect of their use (also see Moore 1996 on Andean Chimu plazas). Plaza edges may be defined by adjacent mounds, or by walls that may or may not have extended above the plaza surface. Archaeologists still debate what activities happened in plazas, and why people built them. For example, the large, 300 m long central plaza at Monte Albán is thought by some to have been the city's and the valley's main market (e.g., Winter 1995:112), while others think it most definitely was not because access was too constricted to permit ready passage by vendors and customers (e.g., Flannery and Marcus 1990:56–57).

Mounds and mound complexes were sometimes constructed atop platforms (*plataformas*), which are artificially flattened and filled areas. Large CCA complexes can be a welter of mounds, platforms, and plazas. In some cases, it is difficult to distinguish mounds from platforms. Sometimes, the steep sides of platforms effectively barred access to their surfaces, thus separating activities there from the surrounding community. Certainly, platforms both raised the architecture atop them to a higher level and provided an elevated activity area adjacent to any mounds they supported. Like mounds, platforms were often modified after initial construction. Since they are larger flat areas, they are often farmed today, so small architectural features they once supported are often disturbed or destroyed. Because mounds and platforms cannot always be distinguished, I have included both mound and platforms in the mound counts in the quantitative database. This is consistent with analyses by other Mesoamerican archaeologists (e.g., see Blanton's study discussed below).

Ball courts, when encountered on survey, resemble a special arrangement of two long parallel mounds set relatively close together, and can appear rather different than reconstructed ball courts with stone-faced interiors. Ball courts are known from an area from east of the Isthmus of Tehuantepec, including across the Maya Lowlands and Belize, Guatemala, and El Salvador, to considerably west and north of the study area (Taladoire 2001:100)—or across Mesoamerica.

Other structures in civic-ceremonial architecture complexes include adoratorios (variously shaped features found in plazas; their functions are unclear, or they had various uses), round structures thought to have been sweat baths or temascales (Finsten et al. 1996), and closed patio groups that were residences. In addition to civic-ceremonial architecture, archaeologists also find house remains, terracing, walls, fortifications, and other architectural features. During certain periods, defensible hilltop sites proliferated.

With these basic terms defined, I turn to the role of civic-ceremonial architecture in prehispanic society, and how it relates to this study.

Civic-ceremonial architecture and sociopolitical analysis

Construction of civic-ceremonial architecture required labor mobilization and organization, pre-construction planning of the architecture complex, and ongoing maintenance. Activities carried out in CCA complexes related to a range of functions including governing and religious ceremonies; it is not my intent to distinguish among them, so I refer to it as civic-ceremonial architecture. Detailed descriptions of excavations of civic-ceremonial architecture include, for example, those of the Templo Mayor in Tenochtitlán (e.g., Matos Moctezuma 1999; Matos Moctezuma and Pohl 1999; Olmo Frese 1999), the Great Pyramid at Cholula (e.g., Marquina 1970), El Templo de Quetzalcoátl and the Ciudadela at Teotihuacán (e.g., Cabrera Castro 1991, 1998; Cabrera Castro et al. 1989; Cabrera Castro et al. 1982; Cabrera Castro et al. 1991), and various structures at Xochicalco (e.g., González Crespo et al. 1995).

Many CCA complexes were modified over time, signaling their continued importance in the community. The CCA complexes were a visual symbol of the power of those who marshaled the labor used to construct and maintain them. Nevertheless, not all communities had CCA complexes, not even all high-population communities. Therefore, the distribution and hierarchy of CCA-rich settlements is assumed to indicate the relative importance of those places for ritual and administrative activities. Archaeologists assume that a site with both a large population and large amounts of CCA (e.g., Monte Albán, Teotihuacán) was important as a ritual and administrative center, and also could attract and support a large population. Several Mesoamerican studies have constructed civic-ceremonial architecture hierarchies (e.g., Adams and Jones 1981; Kowalewski et al. 1989; Steponaitis 1981); studies have also been published for other regions (e.g., the Mississippian Southeast [Steponaitis 1978], the island of Keos in the Mediterranean [Cherry et al. 1991], and Peru's north coast [Wilson 1997]). In a series of publications, Flannery and Marcus (e.g., Flannery and Marcus 1976; Marcus 1999a; Marcus and Flannery 1996) have discussed the evolution of the public building in the Valley of Oaxaca during the Formative period.

The prominence of settlements with civic-ceremonial architecture

Just as for settlement patterns (Chapter 5), the distribution of civic-ceremonial architecture can be used to construct a hierarchy of important ritual and administrative centers, if we assume that a site with more civic-ceremonial architecture was more important in this hierarchy. A deeper CCA hierarchy relates to key features of the political economy—scale, integration, complexity, and boundedness. While CCA complexes show considerable variation in size, plan, and number of structures from site to site and from period to period, I assume that more (and larger) CCA equates with a greater importance of that site in the ritual and administrative spheres, at least locally, as well as regionally and perhaps macroregionally.

Regional variation based on mound-plaza architecture

Both the configuration of mound-plaza complexes and the facades of mounds have regional styles. While the former can be recorded during survey, if there's sufficient preservation, generally the latter cannot be determined until excavation, if then. Certain sites have distinctive CCA plans and mound decoration undiscovered elsewhere (e.g., the central architecture complexes at Monte Albán and Cantona, and El Templo de Quetzalcoátl at Teotihuacán). I had hoped to address architectural styles in my discussions of regional variability, but, unfortunately, those data are lacking. I can only comment on regional variations in the density of mounds and ball courts.

If the data were available, regional architecture styles, including decoration, orientation, and layout, would provide a comparison to ceramic style distributions. In contrast to ceramics, however, buildings were not portable. Ceramic style similarities might result from either the pots being transported, the potters moving to a new location, or someone who saw the pots of one region directing the making of similar pots in another region.

Because architecture is not transportable (though individual carved blocks could have been moved), structural style similarities imply that the builder-designers moved from one region to another. Nevertheless, if patterns of architecture and ceramic styles from two regions are isomorphic, then an assumption of repeated interactions among the residents of the two regions seem appropriate. In addition, not only were there interactions, but at least one of the two groups thought it important to imitate or have buildings or items in the same style as the other region.

Blanton's analysis of the Valley of Oaxaca mound-plaza complexes

The most detailed multi-site architecture analysis using data from the study area has been conducted by Blanton, who looked at CCA recorded in the Valley of Oaxaca survey area. Blanton first limited the dataset for his analysis to those "sites where I could be reasonably certain that the group of structures represented the entire assemblage of mounds at the site, or nearly so" (1989:410). In general, he considered mounds over 1 m in height as public architecture, unless they were part of a plaza group. His sample included 1231 buildings—1117 mounds and 54 platforms, or about 50 percent of the buildings recorded by the survey (1989). To connect features of the architectural complexes that the survey archaeologists were able to record to scale, integration, complexity, and boundedness, Blanton examined evidence of city planning, or of preferred configurations and how they changed over time. He analyzed the scale and orientation of mound-plaza complexes, their configurations and how standardized these were in each period, how closed plaza complexes were (or whether access was limited), and ratios of mound and platform volume to population on individual sites.

Blanton (1989:444–446) concluded that the Valley of Oaxaca CCA complexes were more formalized at major population centers than at rural sites, with more variation in the rural site forms as well. In addition, during the Early and Late Classic (periods L and N), when Monte Albán dominated the valley, plaza groups were more similar than earlier or later periods. While Late Postclassic (period V) CCA was relatively centralized, Blanton found it did not tend to be so closed to access as in other periods.

Architecture data available for this study

Blanton's (1989) analysis of the most securely dated CCA of the Valley of Oaxaca provides a model for study of well-dated civic-ceremonial architecture. However, to do such a study requires considerable detail on CCA complexes, including site maps that show the scale, orientation, and details of the complexes, and mound base size and height. Unfortunately, few survey reports from which I obtained quantitative data include these measurements.

Unlike Blanton, for this study, I will not limit my analysis to those mounds clearly dated to a single period. Many reports attribute mounds to several periods, which is reasonable, as we know mounds were modified and reused, sometimes for several periods. I also lack consistently reported mound size data (although base measurements and height are most often reported), so for this study, I use only mound counts per component. Unfortunately, as noted in Chapter 4, some reports do not give specific mound counts, reporting only that a site has "several mounds" or "two mound-plaza complexes" or similar non-specific descriptions. In those cases, I estimated the minimum number of mounds that were indicated, meaning that the mound counts on those sites may be somewhat or greatly underestimated. As I entered data from the survey reports, I considered as mounds any mound or platform designated as civic-ceremonial architecture, or any not specifically referred to as a house mound. I did not use a minimum height criterion.

Ball courts

Ball courts are distinctive architecture, built throughout the prehispanic periods, and ballgames were observed by the Spanish. Early Formative ballplayer figurines are known from Michoacán and the Basin of Mexico sites of Tlatilco and Tlapacoya (Day 2001:66–67), but Early Formative ball courts are rare. Interestingly, the earliest dates on rubber balls are earlier than the earliest dates for ball courts; several balls from El Manatí, in southern Veracruz, are dated to at least 1600 B.C.; they were found in offerings (Ortíz C. and Rodríguez 1999:242–243). Ball court activities must have very important to the Aztecs, as they received from the Gulf Coast province of Tochtepec, where the rubber trees grew, as tribute 16,000 balls twice a year (Filloy Nadal 2001:28), although relatively few Basin of Mexico Aztec-period Basin of Mexico ball courts are reported. Aztec nobility were great fans of the ballgames, apparently gambling heavily (Day 2001:76). Ballgames believed to have prehispanic antecedents still are played today, and generally are accompanied by considerable gambling. Nevertheless, early Spanish documents and prehispanic murals and ceramic decorations all suggest prehispanic ball courts hosted activities associated with interregional conflict resolution and inter-elite competition (Santley et al. 1991:23), and some gambling. Prehispanic ball courts show diversity in size, configuration, and architectural context, and the games played on them were also spatially and temporally diverse (Gillespie 1991:344).

Ball court studies

There are few published systematic studies of Mesoamerican ball courts. Most are simply a gathering of data, often including those that have not been published before, and lack quantitative or detailed analysis (e.g., Agrinier 1991). Two studies are worth discussing in more detail: Taladoire's (2001) typology of Mesoamerican ball courts, and the analysis of the Valley of Oaxaca ball courts by Kowalewski et al. (1991).

Eric Taladoire has ambitiously sought to analyze ball courts from across Mesoamerica. His goal is to construct a typology of ball court configurations (2001:104), both in terms of their morphology and where they occurred (2001:108). Probably because this is a survey article in a catalog of an exhibition, Taladoire does not present the data on which his typology is based, specific maps of the distributions of the types he defines, or even the number of ball courts of each type. Typologies are often constructed with a goal of connecting form to function, or style variation to migrations and cultural affiliations. With ball courts, the function is known (at least generally), and Taladoire does not link the variation outlined in his typology with any cultural variations, though he does place the types spatially, but only in a general way (e.g., Pacific Coast, Yucatan, Maya Lowlands and Highlands). Otherwise, Taladoire's analysis replicates the flaws often included in other ball court studies: context is derived from only a few sites; data from across Mesoamerica are intermingled indiscriminately (especially regarding the meaning of the game and how it was played).

Kowalewski et al.'s (1991) examination of the Valley of Oaxaca ball court data provides not only systematic data, but an analysis aimed at assessing shifts in formal aspects of the design and context of ball courts, to address temporal variation in the role of this specialized architecture, and in regional sociopolitical evolution. They conclude that ball courts were not necessarily built on the most populous settlements, and suggest that the earliest extensive construction occurred in the Terminal Formative, and was part of the heightened militarism of the Oaxaca Valley at that time, which included placing ball courts in frontier towns along boundaries. Kowalewski et al.'s analysis indicates the importance of context in ball court studies, which is mostly ignored by Taladoire.

In this study, I must define ritual and administrative architecture correlates that indicate the key features of scale, integration, complexity, and boundedness. I include the distribution of ball courts across the study area, their density in each region, and their density per person. The results of these analyses are presented in Chapter 8.

General trends in architectural variation across the study area

The mound and plaza complexes of highland civic-ceremonial architecture represent a significant labor investment, for both construction and maintenance. CCA was built on large and small sites, along with residential architecture. Through time, however, highland CCA reflected significant shifts in integration and hierarchy.

Public, or non-residential, architecture first appeared in highland Mesoamerica in the ~Early Formative (period B; see Chapter 4 for my periodization scheme), the earliest period examined in this study. By the ~Middle Formative (period E/F), the CCA was more elaborate and included platforms and many sites with central place functions. By the ~Late Formative (period G/H), much larger population centers with large CCA complexes that required pre-construction planning and an organized labor force, were beginning to emerge. In the ~Terminal Formative (period I), Monte Albán was by far the largest community in the database and its mound complexes seem to have a slightly different cardinal orientation than earlier complexes (Blanton 1978:45), suggesting a shift in sociopolitical organization.

In the ~Early Classic (period L), populations across highland Mesoamerica became more centralized; the largest centers were Teotihuacán (Millon 1981, 1993), in the northeastern Basin of Mexico, Cholula in the Tlaxcala-Puebla Valley, and Monte Albán in the Valley of Oaxaca. Teotihuacán became the largest settlement in the highlands (although we do not know Cholula's trajectory of development, it may have been a large center in the ~Early Classic, but is not believed to have been larger than Teotihuacán), with the most prominent architecture at the northern end of the Avenida de los Muertos (including the largest pyramids—Sun and Moon—and the Ciudadela) constructed early in the city's history. This clustering of population and these major construction projects happened quickly, and the Basin as a whole became relatively depopulated. These changes signal a major shift in the organization of people of the Basin. In the Valley of Oaxaca, although populations centralized, some administrative functions became more decentralized, or distributed to centers smaller than the primate center of Monte Albán (Kowalewski et al. 1989:201). Therefore, in the two cores for which we have good data, the sociopolitical systems increased greatly in scale in the ~Early Classic, and became more integrated.

In the ~Epiclassic, Teotihuacán and Monte Albán remained large population centers, although not at their Classic period levels; populations declined from their ~Early Classic highs. New large population centers grew in other regions, including at Tula, Xochicalco, and Cantona, and Cholula may have been larger than Teotihuacán. Cholula apparently had a civic-ceremonial architecture construction boom (McCafferty 2000:351), while the other three centers I listed were in defensible locations, and had ball courts. Xochicalco had several defensive walls, and a jumble of civic-ceremonial architecture on several summits. Cantona had two dozen ball courts, and is located on a tongue of lava along a pass between the Tlaxcala-Puebla Valley and the Gulf Coast to the northeast. Cantona could have been on a trading network that extended to and beyond the Yucatan peninsula (not that this was the only trade route between the Basin of Mexico/Puebla-Tlaxcala regions and the Gulf Coast). In the ~Epiclassic, the scale of polities decreased, and sociopolitical functions were dispersed among separate entities. Enmity increased, and many of the most regionally prominent settlements had defensive fortifications or were in defensible locations.

In the ~Late Postclassic, highland populations were higher than they'd ever been before. The study area was carved into small polities with local administrative complexes and more settlements had civic-ceremonial architecture. At the time the Spanish arrived, the Aztecs had been consolidating these polities into the Aztec empire in order to control territory as a means of extracting tribute. Thus, the ~Late Postclassic landscape was a mosaic of central places in a more similar range of sizes, many with mound-plaza complexes and adjacent elite residences.

Summary

Mounds and ball courts are the most readily recognized civic-ceremonial architecture in the highlands, and the most likely to survive post-abandonment degradation sufficiently well-preserved to be recorded by archaeological surveys. I consider the activities conducted at both to have had both ritual and administrative functions, and do not try to discriminate between them in this study. Nevertheless, mound counts constitute a valid basis for generating a hierarchy of most important ritual and administrative sites. However, it can be difficult to date multi-component civic-ceremonial architecture (both mounds and ball courts) from surface sherds, because of modifications to structures, and mixing of pottery for other reasons, as Marcus and Flannery (1996:190) have noted. Most of the 20 projects from which I derived quantitative data provided good mound counts, although a few did not (e.g., Tula, Nochixtlán Valley). The most consistent civic-ceremonial architecture reported across the highlands are mound and ball court counts, and I focus on them in Chapter 8. I use the density and distribution of these types of structures, both regionally and relative to population, to examine change and continuity in highland Mesoamerican ritual and administrative architectural hierarchies, and thus sociopolitical evolution (see Chapter 9).

Chapter 7

Settlement Pattern Data and Analysis

In this chapter, I use settlement pattern analyses to examine sociopolitical evolution at the macroregional scale. This chapter includes systematic data from seven periods in Mesoamerican prehistory, focusing on variables that reflect change and continuity in hierarchy, integration, and scale, the core features of social systems; the variables include settlement and population sizes, large and small site dynamics, continuity of settlement occupation, distributions of most populous and largest settlements over time, and population rank-size distributions. This chapter on settlement patterns in the study area pairs with the next to present the data and analysis fundamental to this study; in Chapter 8, I discuss various aspects of civic-ceremonial architecture patterning, focusing on mound and ball court counts and distributions.

For the purposes of this analysis, I have defined sites as material remains of an occupation dating to a single period, separated by at least 100 m from other material remains. One of the implications of using sites defined in this manner as the basic unit of analysis is that groups of sites, or clusters of contemporaneous settlements, are submerged into the database and cannot be united. Settlement clusters more closely resemble human communities than the sites I have defined. Nevertheless, this site definition was necessary to create a single comparable database.

As I described in Chapter 3, I have obtained the data from which this analysis is based from two principal sources: quantitative and qualitative. I derive the quantitative data in the database from 20 surveys scattered across the highlands (their citations are listed in Table 4-4); I use qualitative data from other surveys and excavations to expand our understanding of these patterns. This is not an unbiased or random sample, as they include more larger valleys than smaller valleys or terrain that is more rugged. Figure 7-1 shows the distributions of these two types of surveys.

In this chapter, the first analytical sections address aggregate variables. I begin with a brief discussion of settlement size and density, and then move on to population. Although the jump from artifact density and the size of artifact scatters, which has been referred to as "pots = people" (Bintliff and Sbonias 1999), requires several assumptions and estimates, it is important to do because of the wider variety of analysis it allows, and the doors it opens to data comparability around the world. I begin with simple population variables, and move on to rank-size distributions. The next section, on the most populous and largest settlements, is fairly long and detailed, and incorporates qualitative information not included in the quantitative database. At the end, I briefly compare three population estimates for the Basin of Mexico.

Settlement variables

In this section, I discuss the number of settlements recorded, their density within surveyed areas, and their average size. Because population densities vary among settlements, settlement analysis does not yield results isomorphic with population data, although obviously the two do relate to one another. Summary data for this section are presented in Table 7-1.

Settlement counts

This variable considers the number of settlements across the surveyed landscape (Figure 7-2), and thus indicates the intensity of development. The seven regions with systematic survey data break into two main categories at this scale: regions with consistently few sites and those with variable counts. The Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions have few sites in the database, due to the lack of survey data from those areas. Comparing those with more settlements, the Basin of Mexico, Mixteca Alta, and Oaxaca Valley regions—the big three—all show the L-Q-V pattern (higher in the ~Early Classic, a drop in the ~Epiclassic, and a dramatic increase in the ~Late Postclassic).

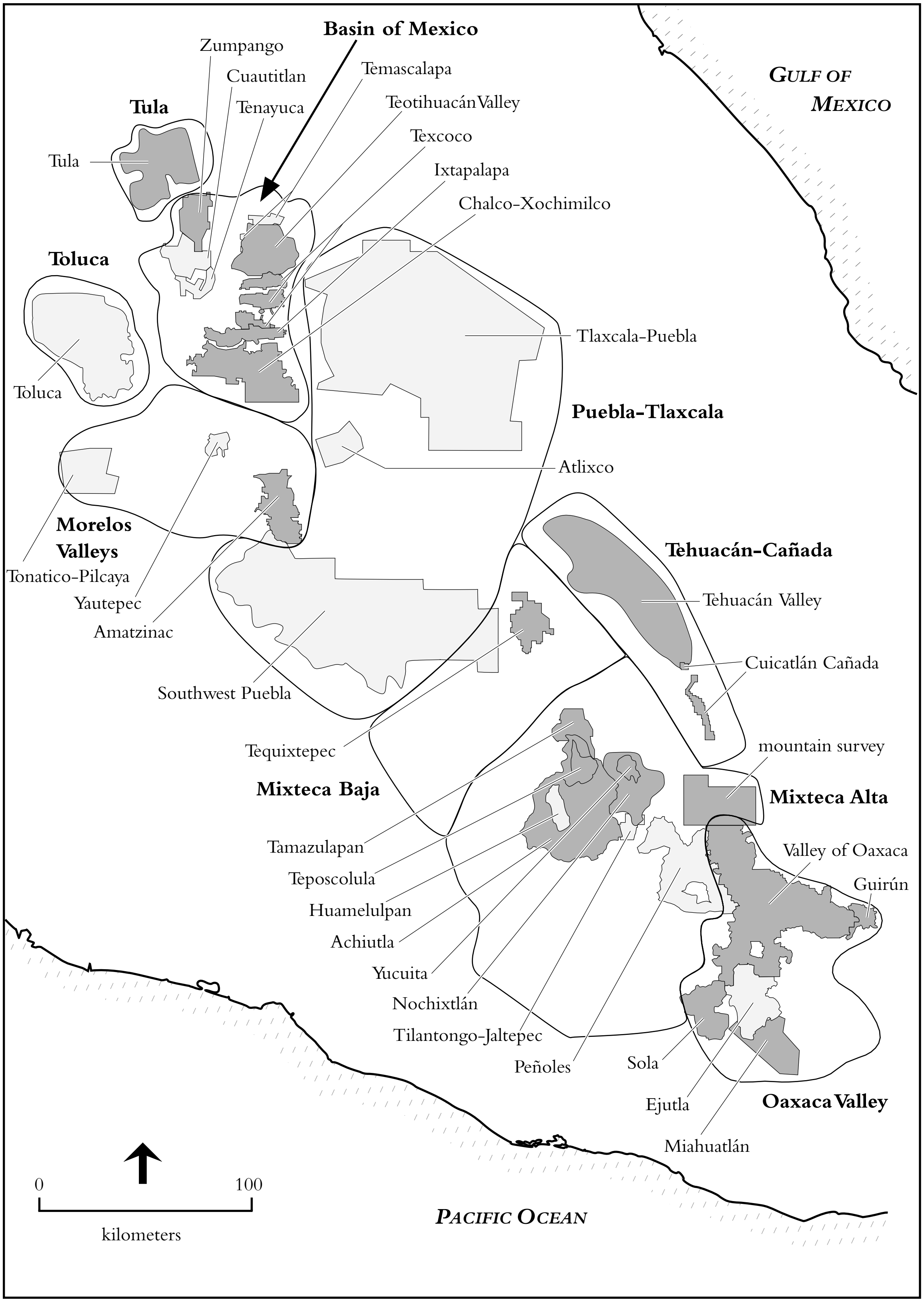


Figure 7-1. Qualitative (light gray) and quantitative (darker gray) survey areas, and nine regions in the study area. See Table 4-4 for references for quantitative survey reports.

Table 7-1. Summary data, settlements and populations (part 1 of 2). Listed by period from oldest to most recent, by region. Figure numbers for maps are listed in the right column.

B, ~Early Formative	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed	835	1040	437	1890		2285	2225	
number of settlements	3	15	10	2		94	26	7-2
settlement density	0.004	0.014	0.023	0.001		0.041	0.012	7-3
average settlement size	6.33	4.05	2.10	0.30		4.57	0.57	7-4
total population	299	1639	321	16		6178	323	7-5
population density	0.358	1.576	0.735	0.008		2.704	0.145	7-6

E/F, ~Middle Formative	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed		1885	437	2005	309	2285	2336	
number of settlements		56	48	32	7	249	81	7-2
settlement density		0.030	0.110	0.016	0.023	0.109	0.035	7-3
average settlement size		6.172	3.120	1.805	8	5.611	1.162	7-4
total population		8461	2534	976	974	22,145	1936	7-5
population density		4.489	5.799	0.487	3.152	9.691	0.829	7-6

G/H, ~Late Formative	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed		2155	437	1890		1987	3222	
number of settlements		135	58	42		72	785	7-2
settlement density		0.063	0.133	0.022		0.036	0.244	7-3
average settlement size		9.487	2.843	1.067		8.482	3.038	7-4
total population		38,230	3091	812		33,362	57,616	7-5
population density		17.740	7.073	0.430		16.790	17.882	7-6

I, ~Terminal Formative	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed		1885	437	2005	309	2285	3222	
number of settlements		230	55	135	41	125	555	7-2
settlement density		0.122	0.126	0.067	0.133	0.055	0.172	7-3
average settlement size		9.927	2.715	3.685	9.232	10.320	3.216	7-4
total population		43,912	2447	8786	6597	30,090	45,560	7-5
population density		23.295	5.600	4.382	21.350	13.168	14.140	7-6

Table 7-1. Summary data, settlements and populations (part 2 of 2). Listed by period from oldest to most recent, by region. Figure numbers for maps are listed in the right column.

L, ~Early Classic	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed	835	2155	437	2005	309	2929	3222	
number of settlements	15	310	103	209	73	473	1155	7-2
settlement density	0.018	0.144	0.236	0.104	0.236	0.161	0.358	7-3
average settlement size	31.633	11.383	3.086	2.191	8.605	9.862	3.785	7-4
total population	8305	186,938	5864	8022	10,943	140,462	129643	7-5
population density	9.946	86.746	13.419	4.001	35.414	47.956	40.237	7-6

Q, ~Epiclassic	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed		2155		2005		1987	3222	
number of settlements		165		208		101	516	7-2
settlement density		0.077		0.104		0.051	0.160	7-3
average settlement size		18.217		1.888		17.646	6.100	7-4
total population		59,497		6761		44,301	85,652	7-5
population density		27.609		3.372		22.295	26.583	7-6

V, ~Late Postclassic	Tula	Basin of Mexico	Morelos Valleys	Tehuacán-Cañada	Mixteca Baja	Mixteca Alta	Oaxaca Valley	Figure
area surveyed	835	2155	437	2005	309	2929	3222	
number of settlements	102	996	71	258	78	1111	2630	7-2
settlement density	0.122	0.462	0.162	0.129	0.252	0.379	0.816	7-3
average settlement size	16.995	13.413	7.521	4.046	5.978	11.682	3.258	7-4
total population	30,314	256,788	9329	32,440	8150	259,462	179,796	7-5
population density	36.304	119.159	21.348	16.180	26.375	88.584	55.803	7-6

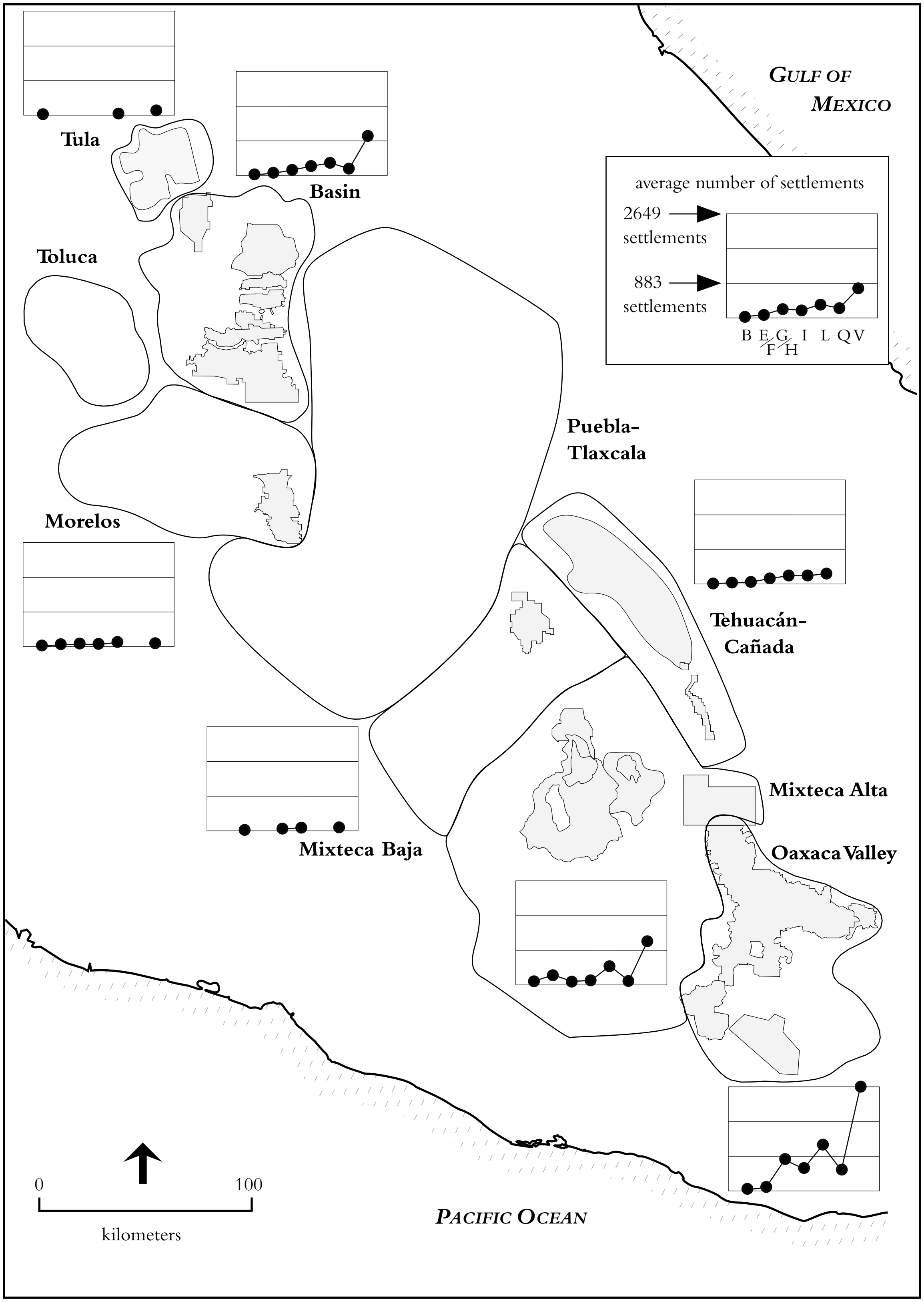


Figure 7-2. Number of settlements in each region. Each graph is at the same scale as the average graph in inset.

When all data are averaged, however, the drop in the ~Epiclassic was not as dramatic (see inset, Figure 7-2).

In early periods B and E/F (~Early and ~Middle Formative), more settlements are known for the surveyed area in the Mixteca Alta than even in the surveyed Basin of Mexico and Oaxaca Valley regions. This is important because the population (and thus settlement) cores have been assumed to be in the major highland valleys—the Basin of Mexico, the Tlaxcala-Puebla Valley, and the Valley of Oaxaca. With less than half the Mixteca Alta region surveyed, archaeologists have already recorded more settlements than in the Oaxaca Valley, a smaller region that has been more completely surveyed.

The low ~Late Postclassic period V settlement counts from the Tehuacán-Cañada region may be due to some combination of: 1) survey strategies may have been less systematic than later fieldwork; 2) my outline for the survey area may be over-generous (no survey area outline was published by MacNeish et al. [1975]); and, 3) actual settlement counts may be low. Michael E. Smith and Frances F. Berdan (1996:338) have recently mapped Aztec settlements that date to my period V; they show that while the Cuicatlán Cañada area was within the Coayxtlahuacan (Coixtlahuaca) province, no province encompassed the Tehuacán Valley. Thus, there may indeed have been few people in this region, as reflected in the low settlement counts shown here. The lower valley, corresponding to the Tehuacán Valley survey area, is drier than the upper area examined by the Cañada survey, due to the rain shadow from the Gulf, and may have been less intensively occupied for that reason.

Settlement density

Figure 7-3 shows the densities of settlements in each region. Increasing settlement density indicates intensification of use of the landscape, and suggests the importance of smaller settlements. By using density rather than simply settlement counts, variations in the size of the surveyed area are eliminated. The settlement density variable is augmented when considered together with population estimates.

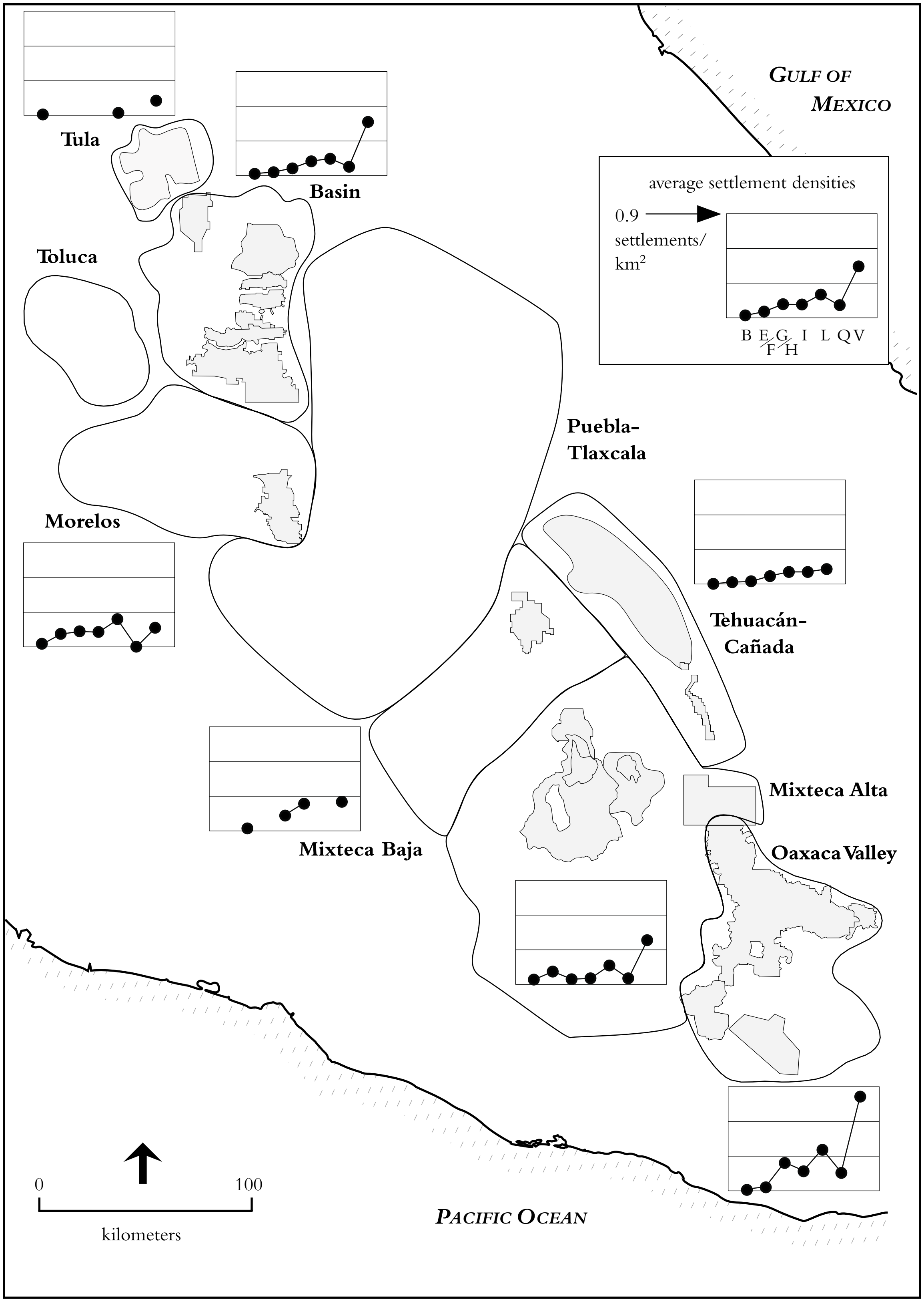


Figure 7-3. Settlement densities: settlement count divided by area surveyed in that region. Each graph is at the same scale as the average density graph in inset.

The L-Q-V pattern is evident, and, with the relative size of the surveyed areas no longer a factor, the dip in settlement counts in the ~Epiclassic is apparent in the Morelos Valleys region, also. The settlement densities of the Mixteca Baja region are higher than the average for all the regions (inset), although it does not exhibit the ~Late Postclassic increase evident elsewhere. Similarly, the Morelos Valleys region also does not show a period V increase to levels exceeding those of the ~Early Classic. In contrast, Smith and Berdan (1996:328) show this survey area lies almost entirely in the southeast lobe of the Aztec's Huaxtepec tribute province, and that it had several important communities. Perhaps when Hirth did that survey he skipped existing modern communities, which may obscure Aztec-period settlements, yielding an undercount of ~Late Postclassic settlements. In Hirth's description of his survey strategies, it seems that crews concentrated on fields and skipped "modern cultural features such as town and water reservoirs" (1980:10).

The Oaxaca Valley region showed a higher settlement density in the ~Middle Formative period G/H than other regions, and retained a higher density for all succeeding periods examined here. My first reaction is to attribute this to improved survey strategies (relative to all but most Mixteca Alta region surveys), which may indeed be a factor. If, however, this is an archaeological reality, it indicates more (and perhaps smaller—see settlement size discussions below) settlements in the Oaxaca Valley region than in the surveyed area of the Basin of Mexico. Contrasting the ~Early Classic period L Basin of Mexico and Oaxaca Valley regions, Oaxaca had significantly higher settlement density. This is consistent with interpretations of the Teotihuacán Valley and the Basin of Mexico that note relatively few settlements in the ~Early Classic, with a huge population concentration at Teotihuacán.

If we take these patterns at face value and assume that the data in Figure 7-3 reflect true patterns, these data suggest more settlement density variability through time, and especially prior to the ~Epiclassic period Q, in the Mixteca Alta and Oaxaca Valley regions (and possibly the Mixteca Baja region) than in all other regions. Thus, the Tula, Basin of Mexico, and Morelos Valleys regions may have had a somewhat different settlement pattern trajectory with less variation in settlement density.

Average settlement size

Figure 7-4, average settlement size, shows a slight increase over time for the big three regions with the most extensive survey data, except for a drop in the ~Late Postclassic period V. The average values across all regions are graphed in the inset; they are: B, 3.64 ha; E/F, 4.44 ha; G/H, 4.07 ha; I, 5.65 ha, L, 6.18 ha, Q, 8.97 ha, and period V, 7.37 ha. Thus, there's really a small dip in period G/H ~Late Formative, and then again in period V. While G/H is slightly higher for the Tehuacán-Cañada and Mixteca Alta regions, it is lower for both the Basin of Mexico and Oaxaca Valley regions. These major valleys may have already been organizing differently than the people of the more mountainous Mixteca Alta and drier Tehuacán-Cañada in ways that are linked to the primacy of the Teotihuacán and Monte Albán systems. Indeed, Monte Albán (Kowalewski 2002) was already the largest community in the surveyed areas in ~Late Formative period G/H, with an estimated population of 16,575, and may have exceeded 20,000 inhabitants.

In contrast to the L-Q-V pattern shown for settlement counts, the big three regions each show average settlement size *increased* in the period Q ~Epiclassic, and decreased in the period V ~Late Postclassic. Thus, period Q had more large settlements, but a lower overall population, than periods L and V, suggesting a very different settlement hierarchy.

Since the Tula survey report did not give settlement size, the points shown here must be considered only an approximation, and probably a poor one. Indeed, the very high period L figure seems erroneous when compared to the other regions. The Tula report describes 15 period G/H settlements, with Chingú at 254 ha; settlement sizes are not given for the others (Mastache and Crespo Oviedo 1974). In addition, the Tula survey area may encompass only part of a regional system.

The Basin of Mexico and Mixteca Alta regions had larger settlements than the other regions—including the Oaxaca Valley—which are consistently below the average of all

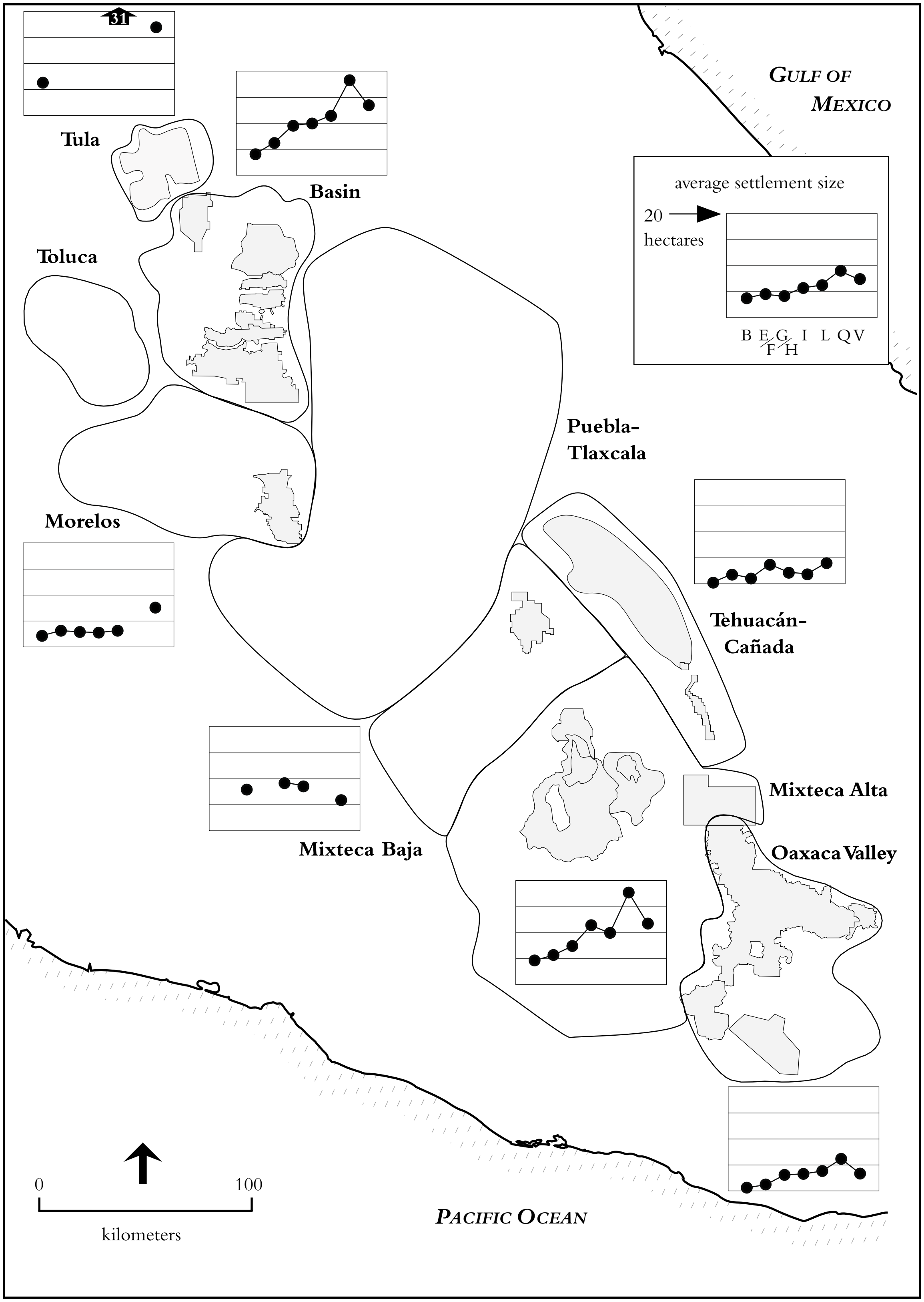


Figure 7-4. Average settlement size (total settlement size divided by number of settlements). Each graph is at the same scale as the average graph in inset.

regions (inset in Figure). Did those people residing in the Mixteca Alta prefer to be aggregated in larger settlements, or did their preference for ridge top locations require them to cluster more? The Mixteca Alta region differs from both the Basin of Mexico and Oaxaca Valley regions in the decrease in average settlement size in period L. At about 10 ha, its average settlement size is still over twice that of the Oaxaca Valley region. The question perhaps is more properly: why the increase in average settlement size in the Mixteca Alta region in period I? The answer may lie in the ascent of Monte Albán in the Oaxaca Valley; population clustering may have been a defensive reaction to aggressions by people of the Monte Albán polity.

The larger average settlement size in the Basin of Mexico region for all periods after the ~Early Formative may be due to smaller scatters being dismissed as non-residential, although the inhabitants may have avoided living in small separate locations, instead preferring to aggregate, thus favoring larger settlements and boosting average settlement size.

The Tehuacán-Cañada region consistently had smaller sites than the multi-region average, which is because I arbitrarily set settlement size conservatively, as size was unreported for most settlements. I also suspect MacNeish et al. considered the site size, when they did mention it, to be the zone of civic-ceremonial architecture and building remains and not the entire occupation area, as later surveys would have recorded the settlements. In general, Cuicatlán Cañada survey area settlements were small, so they do not increase the regional settlement size figures much.

Summary: settlement variables

The three variables discussed above, settlement counts, settlement count density, and average settlement size, indicate a general increase in settlement counts and density over time, except during the ~Epiclassic period Q, although not consistently so. Settlement densities are higher for the Mixteca Alta than for the Basin of Mexico and Oaxaca Valley regions for the ~Early and ~Middle Formative periods, B and E/F. Average settlement size was similar in those periods in the Mixteca Alta and the Basin of Mexico; however, the

Oaxaca Valley had smaller settlements on average. This early burgeoning of settlement in the Mixteca Alta was evident in the Nochixtlán and Yucuita survey data, but it was unanticipated in adjacent mountainous areas to the west prior to the 1999 Achiutla survey.

These settlement variables are best understood when paired with an understanding of population variables, which are discussed in the next sections.

Simple population variables

For this study, I made population estimates three ways, detailed in Chapter 4. All are based on the extent of the artifact and architectural remains, or site size. CALC POP is derived from population estimates given in the survey reports. I did not use them uncritically, however, but lumped the estimates into six density groups ranging from 5–10 people/ha to over 100 people/ha. This reduced the most radical discrepancies between the estimates made by researchers, yet retained the variability gained from field observations of variations in artifact density, dispersion of residences, etc.

In this chapter, I use average CALC POP, or a single population estimate (rounded to the nearest whole number) at the center of the minimum and maximum range of CALC POP. While considering population to be a range is vital (Blanton et al. 1996), for certain purposes using the midpoint of that range is sufficient, given that it is understood that the midpoint pertains to a range.

In the following sections, I develop three variables that aggregate populations by region. They are total population, population density, and rank-size graphs. The total population is biased by those regions with far more settlements than other areas; this bias is eliminated with the population density variable. Rank-size graphs indicate the form of the settlement hierarchy—if there's a primate center, if there are several settlements at one level, etc., and if multiple hierarchies are included in a dataset.

Total population

The total population graphs for each region (Figure 7-5) are based on data presented above in Table 7-1. In general, they show: 1) the highest populations are in the surveyed

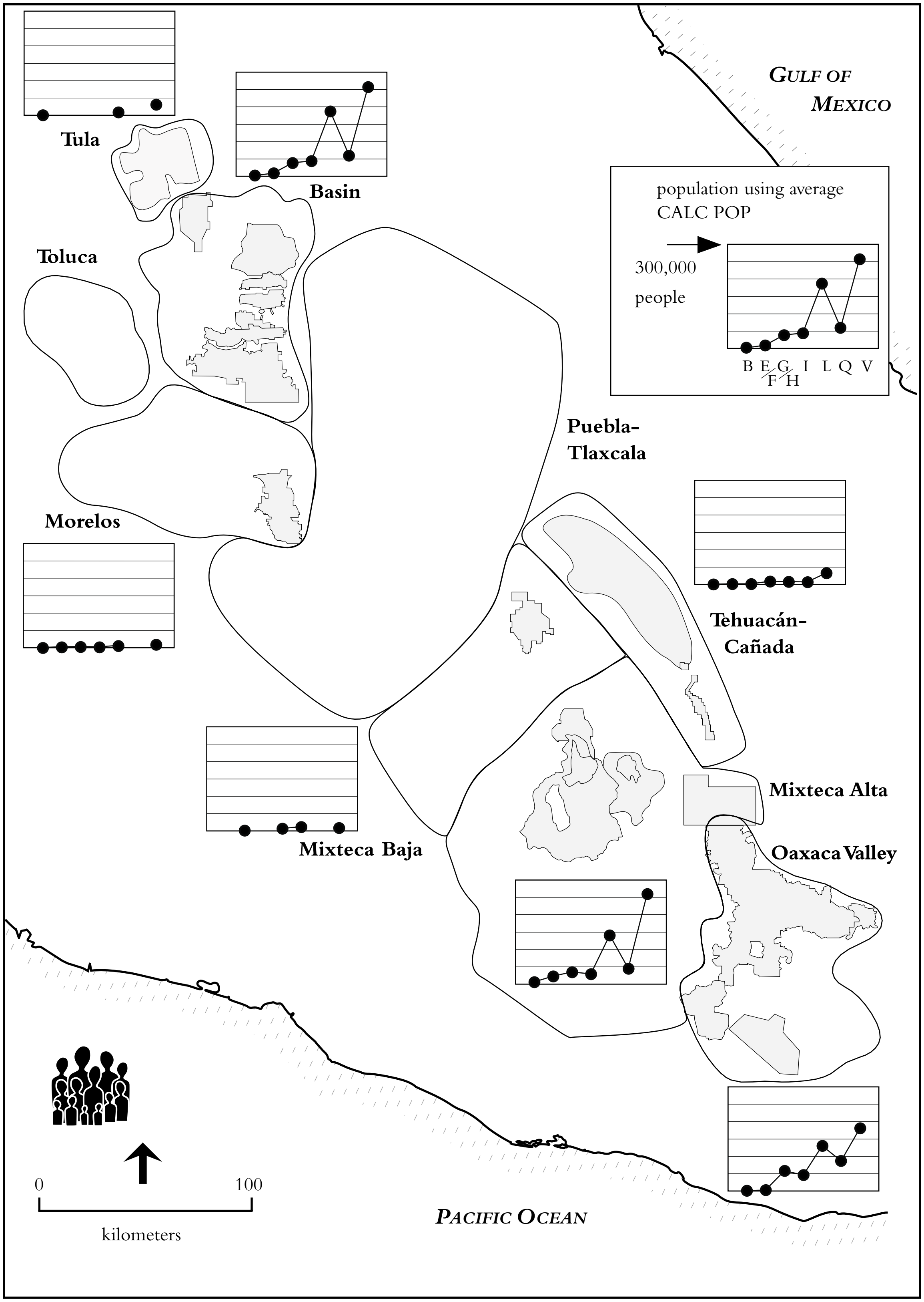


Figure 7-5. Total population using average CALC POP. Each line of a graph represents 50,000 people, as shown in the inset graph (legend).

areas of the big three regions; 2) the L-Q-V pattern is prominent in those three regions but not the others; and 3) population generally increases over time, with the exception of in the ~Epiclassic period Q. That's not the whole story, however.

The big three regions all show a population increase in ~Late Formative period G/H. This increase was greatest in the Oaxaca Valley region, and reflects the dramatic growth of Monte Albán. In both the Mixteca Alta and Oaxaca Valley regions in ~Terminal Formative period I, total population decreased slightly, while Monte Albán's population dropped only slightly. The Oaxaca Valley region showed a drop in settlement density, which makes the population drop more understandable.

In the ~Early Classic period L, there was a dramatic population increase, more so in the Basin of Mexico and Mixteca Alta regions than in the Oaxaca Valley region. This correlates to population increases in the Teotihuacán and Monte Albán cores, as well as some mid-sized settlements in the Oaxaca Valley region. The drop in period Q matches our L-Q-V expectations, but was less dramatic in the Oaxaca Valley region than the Basin or Mixteca Alta regions.

Archaeologists and ethnohistorians have written extensively on the match between archaeologically and archivally derived estimates of highland Mesoamerican populations (see Spores 1965 for a cogent discussion of matching the two data streams from one who knows both particularly well). Sherburne F. Cook and Woodrow W. Borah (1968) detail several methods for estimating the population of the Mixteca Alta based on archival sources, finally concluding the 1520 population was about 700,000. The surveyed areas are less than half the area of the Mixteca Alta, and had a total average CALC POP of 259,462, which tallies with the Cook and Borah estimate, if the population density is approximately the same across the remainder of the region (the unsurveyed areas).

Because the regions surveyed are relatively small (or possibly settlements are underreported), the Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions are too overshadowed by the big three regions to be compared based on total population. Population density, in the next section, is a more useful variable.

Population density

Population density is average CALC POP divided by the area surveyed in that region, reported in individuals/km^2. Thus, population density is not affected by the size of the survey area, as is total population, making it more comparable among regions. Note that the population density graphs (Figure 7-6) closely track the total population graphs of Figure 7-5 for all regions except Tula and the Mixteca Baja.

The single highest density is period V ~Late Postclassic in the Basin of Mexico region. Again, the L-Q-V pattern is evident, but only noticeable in the big three regions, because of the lack of period Q ~Epiclassic data for three of the other regions, and population estimates that are skewed downward for the fourth (Tehuacán-Cañada).

The population density in the Mixteca Alta region in the ~Early and ~Middle Formative periods B and E/F exceeds that of the Basin of Mexico and Oaxaca Valley regions. Considering that almost all of the bottomland of the Valley of Oaxaca has been surveyed, and proportionally less of the Mixteca Alta has been surveyed, this is a significant difference (Balkansky et al. 2002). Clearly, more people lived in the Mixteca Alta than in the Oaxaca Valley, which was unanticipated when most archaeological data were from the valleys. Perhaps the greater rainfall, and thus more lush character, of the Mixteca Alta in these early periods made it more attractive for settlement than the broader, drier valleys, as the risk of crop failure would have been lower. Or perhaps the elevation of their mountain ridge residences made it easier to communicate within and among communities than in the flatter valleys, for instance by shouting or with conch shell "trumpets," and thus allowed chiefs to more readily control their subjects; such control was important to maintaining chiefly authority (Flannery and Marcus 2000:4).

Population density shows the L-Q-V pattern, but also a jump from the ~Terminal Formative to the ~Early Classic, or the Classic population boom. The relatively high peri-

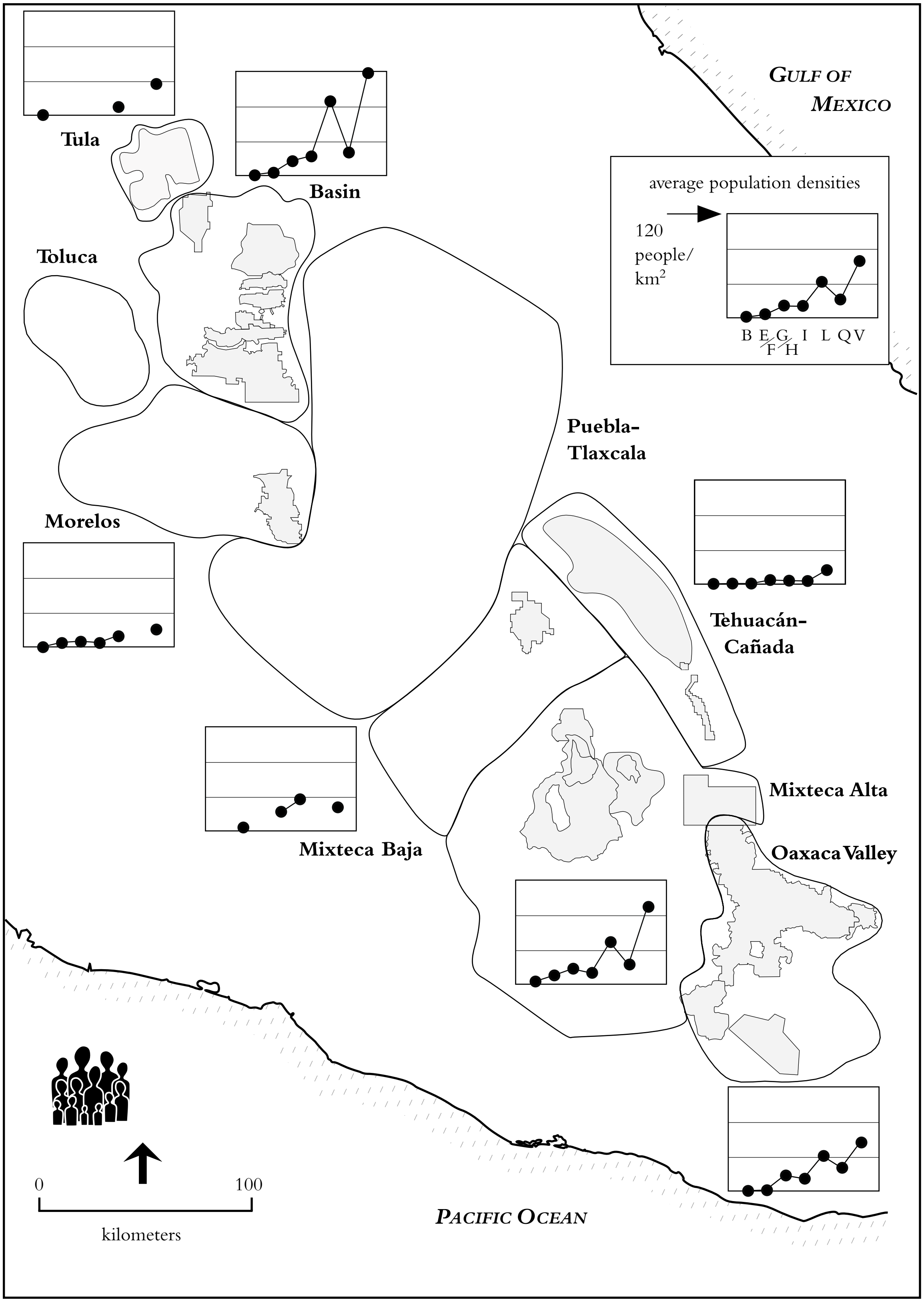


Figure 7-6. Population densities using average CALC POP divided by area surveyed in that region. Each graph is at the same scale as the average density graph in inset.

od I and L densities for the Mixteca Baja make its densities higher than the flat curves of the other non-big three regions; however, the limited periodization of the Mixteca Baja make further comparisons futile.

One does not expect the population densities to so closely parallel the total population curves. That they do seems to be a reflection of the regularities within each region, rather than dramatic changes.

Summary: simple population variables

Total population indicates the scale of habitation. Paired with population density, the most important regions in this interpretation are the big three. Population density shows a steady rise from the ~Early through ~Late Formative, then steady or a small decline in the ~Terminal Formative period I, then the L-Q-V up-down-up pattern of the ~Early Classic, ~Epiclassic, and ~Late Postclassic. From the sketchy data available for the Puebla-Tlaxcala region, it seems that populations there parallel these general patterns.

In the next section, I examine rank-size distributions for each region and period.

Population rank-size distributions

Archaeologists, geographers, economists, and other demographic analysts use rank-size distributions to study integration and urbanization in settlement systems. Rank-size analysis has been applied to archaeological data from Mesoamerica (e.g., Appel 1986; Kowalewski et al. 1989), Mesopotamia, Denmark, China, Thailand, and comparatively (e.g., Sanders 1972; Smith 1976c; Wright 1986). Settlement hierarchies and the process of urbanization are quite variable through time and across space.

To construct rank-size graphs, the population size of each settlement, ordered by decreasing size, is graphed on a log log scale. Deviations from log normality, shown by a 45° line when both axes are scaled identically, indicate characteristics of the system. Primate systems show a quick drop from the first to the second rank site. Convex plots result from increased numbers of same-size settlements near the top and middle of the plot, and indicate poor integration of the system, or that several systems are combined or pooled (Johnson 1980:234). Markedly concave plots indicate a minimization of competition or political administration (Johnson 1977:498), or that multiple similar-sized centers dominate the system. In practice, most rank-size plots are convex, primate, or primo-convex (primate at the top and convex below). Gregory A. Johnson (1980:242) concludes that the primo-convex pattern indicates the lack of integration of primate systems, or the lack of interdependence among parts of the system below the primate level. Although primate systems can endure for over a millennia, Kowalewski (1990:48) notes that the shift from primate "to convex distribution is related to permeability of regional boundaries, scale of the regional system, and manner and degree of interaction among centers" (see also Kowalewski et al. 1983).

While Steven E. Falconer and Stephen H. Savage (1995:55) conclude that for Mesopotamia and the southern Levant, the small settlements "are most important" in defining "the overall contours of rank-size distributions," this is not the case in the highland examples evaluated here. However, Falconer and Savage use site size, not estimated population, in graphing rank-size distributions, which assumes constant population density in settlements of all sizes, at all periods, in all places. I believe this to be an erroneous assumption, and probably why they find the small settlements at the low end of their rank-size distributions more important than larger settlements in determining the curve. Fernán González de la Vara (1999:189), plotting data from the Toluca Valley, also chose to use settlement size rather than population in his rank-size analysis.

Figure 7-7 shows rank-size graphs for each period (time advances from bottom to top of the page) of each region for which I recovered population data. I have included a 45° line on the graphs, with the point of origin matching the curve at the top, unless it is a primate system. In primate plots, the origin matches the lower parts of the curve, to better assess its normality or convexity. At least five of the primate graphs show a primo-convex pattern (the Tula data are more difficult to gauge given the data here), with period L in the Basin of Mexico having the most convex primate graph.

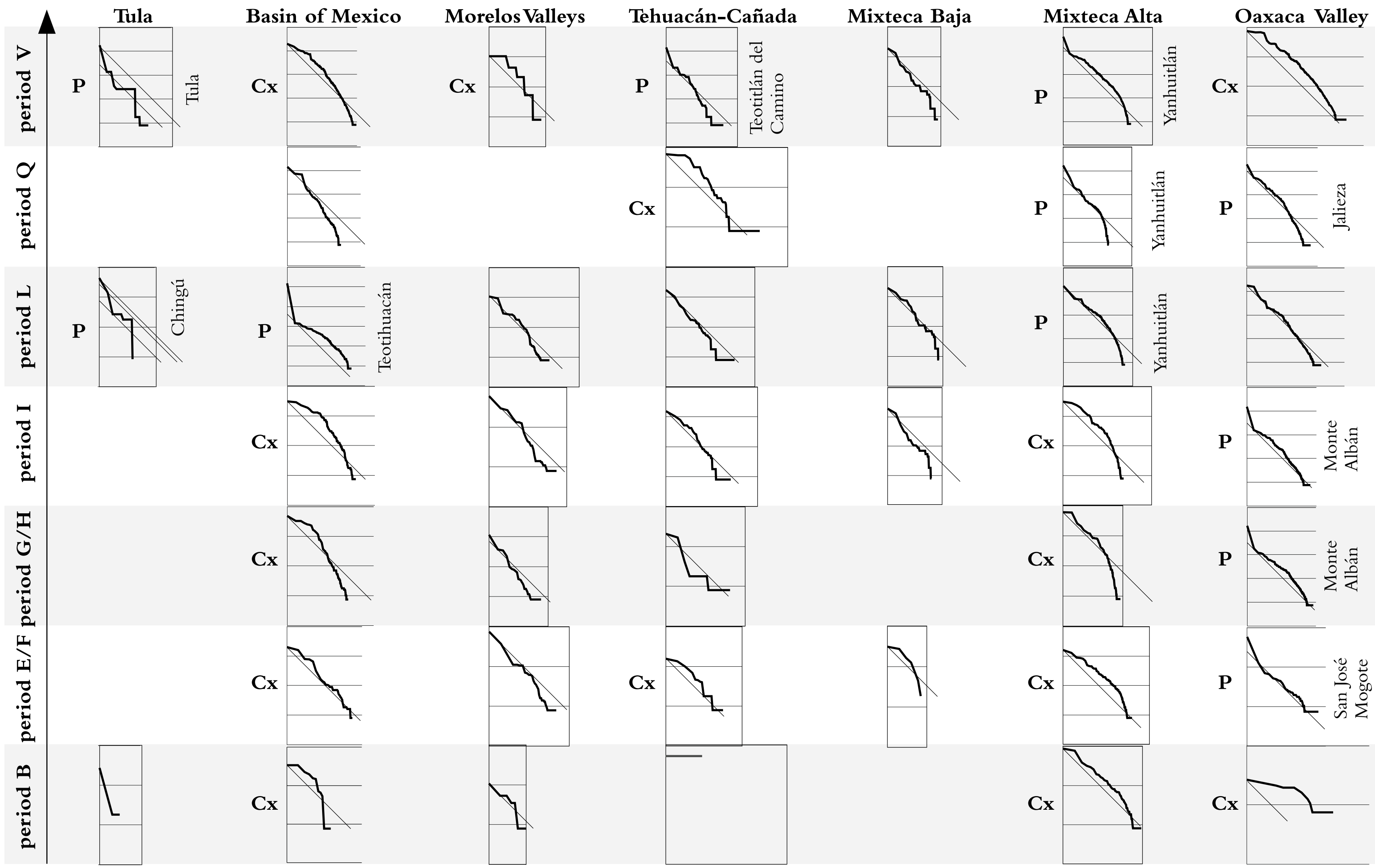


Figure 7-7. Rank-size graphs using average CALC POP. A 45° line shows normality. Primate systems are marked “P”; markedly convex systems are marked “Cx”. Horizontal lines from the bottom up in each graph are populations of 10, 100, 1000, 10,000, and 100,000.

Stepped patterns in rank-size graphs result from many settlements with similar populations. According to central place theory, comparable economic functions are assumed for similar-sized settlements. The lower ends of some graphs (toward the right) are in some cases (see Tehuacán-Cañada, Tula, and period V Morelos) markedly stepped; however, this is the result of my estimation of site size, and thus population, in which many sites are assumed to have the same size in this study because size data are not supplied (see Chapter 4). Thus, the stepping shown here would not be expected if actual settlement sizes, and therefore more variable (and accurate) population estimates, could be used.

Tula region

The Tula region in ~Early Classic period L exhibits a step pattern, with Chingú about four times the size of the next largest center, and these two settlements much larger than any other site in this region at this time (based on these data). The Tula survey area certainly does not encompass the entire Chingú system in this period.

Tula in ~Epiclassic period Q had an estimated population of 9625, centered at Tula Chico (Healan 1989); it is not included in most analysis presented in this study because I have no regional survey data for this same period. I do not know the relative size of contemporaneous ~Epiclassic period Q centers within the Tula region, but most researchers suggest Tula was the region's largest population center.

Tula also dominated in the ~Late Postclassic period V. On both the graphs for the Tula region, I have added more than one log-normal line to highlight the marked primacy of these systems. The Tula survey area is small, however, and centered at the very large Tula site; it is probably only part of a system, and this is why the primacy of the Tula site is so marked. The survey region is centered at Tula, yet does not extend more than 25 km from Tula's central plaza, so most of it is nearer Tula than that. Given that Tula in the ~Late Postclassic covered more than 11 km^2, the region it controlled is probably larger than the Tula region survey area.

Basin of Mexico region

The ~Early Formative period B convex graph is probably the result of pooling, or the inclusion of several polities in a single graph. This is consistent with our understanding of ~Early Formative chiefdoms. The graph flattens in period E/F, suggesting less pooling in the ~Middle Formative. In the ~Late Formative period G/H, the graph shows increased convexity, suggesting more pooling. In the ~Late Formative period I, however, the Basin region was relatively strongly convex, the result of multiple settlements with similar populations near the top of the hierarchy.

The most primate system in this entire figure is, of course, the Basin of Mexico region in the ~Early Classic period L, when Teotihuacán dominated that region and beyond. Indeed, period L Teotihuacán was over 11 times larger than the next largest center (Techachal de San Martín de las Pirámides Este, almost a suburb of Teotihuacán) in the region as I have defined it. This period I to L shift suggests a significant reorganization of people across the landscape.

In period V, the Basin of Mexico graph was once again convex, suggesting some pooling. This is consistent with our understanding that Tenochtitlán, which is not in the survey areas, and Texcoco dominated the region, with many smaller centers dotting the Basin landscape. Thus, many people lived in secondary and tertiary centers, yielding the pooled curve seen here.

Morelos Valleys region

The graphs for the Morelos Valleys region are based on data from the relatively small Amatzinac survey area. In the ~Early through ~Terminal Formative, the curves are close to normal, suggesting a lack of pooling. In addition, the survey was centered around the population cluster around Chalcatzingo, suggesting the survey area encompassed a single Formative population core, and therefore was not pooled. In the ~Early Classic period L, the top of the curve shows several centers had similar populations, which may indicate pooling, or that this area was part of a larger system, with more populous center outside the survey area. In the latter case, the obvious candidate is Teotihuacán. The Morelos Valleys region ~Late Postclassic period V data is based on population estimates I made in the absence of published estimates, and therefore is over-regularized and stepped.

Tehuacán-Cañada region

The ~Middle Formative period E/F graph shows some convexity, suggesting the data are pooled, or that they include multiple systems. This is consistent with the chiefdoms we believe dominated during the ~Middle Formative. Stepping at the lower end of the period G/H graph is due to my size and population estimates for "indeterminate" settlements, and the upper curve is enigmatic.

The ~Terminal Formative period I and ~Early Classic period L graphs are close to normal, suggesting a well-integrated system that lacked single prominent center. In period L, this region may have been dominated by a center outside the survey areas, or it may have been simply peripheral to the developments in the Oaxaca Valley region, and probably the Tlaxcala-Puebla Valley region, where large population centers were burgeoning.

The ~Epiclassic period Q shows a very convex pattern, with many large centers with similar populations. This pattern results from pooling, or from combining several polities. This pattern is consistent with our understanding of the period Q hierarchy.

Teotitlán del Camino is a primate settlement in ~Late Postclassic period V in the Tehuacán-Cañada region (based on the population given in MacNeish; Fowler et al. 1975), which is a considerable shift from the convexity of the ~Epiclassic period Q. Also, whereas in period Q there were four sites greater than 30 ha in size, and none greater than 39 ha, in period V the Tehuacán-Cañada region had 10 sites greater than 30 ha in size, with nine of those larger than 39 ha. Therefore, not only had the settlement system been reorganized, it encompassed significantly more people.

Mixteca Baja region

This small survey area provides little data for interpretation at this scale. In each period, it is probably part of a spatially larger system. The possible exception is in the ~Middle

Formative period E/F, when the flat top of the upper curve suggests multiple similar-sized centers, and may represent pooling. In periods I, L, and V (the ~Terminal Formative, ~Early Classic, and ~Late Postclassic), the patterns at the top of the curve are similar, and the Tequixtepec survey area probably was part of a larger polity. The lack of convexity and the stepping at the bottom of the curves are due to the constant population density used to estimate populations.

Mixteca Alta region

The convex graph of period B and the flat line of the upper curve suggest multiple centers and pooling. This is consistent with our understanding of ~Early Formative settlement systems and the social organization of chiefdoms. This pattern continued into the ~Middle Formative period E/F, although the top of the curve is not quite so flat, suggesting a bit more variety in the population of the largest settlements in the multiple systems. In the ~Late Formative period G/H, the curve is less convex, with the flatness at the top of the graph once again apparent. This suggests the data encompasses multiple polities with similar-sized principal centers. In the ~Terminal Formative period I, the graph shows more marked convexity, suggesting pooling or that a more prominent center was outside the survey areas (if a more prominent center had been included, it would transform this into a primo-convex curve). I lean, however, to interpreting the curves of periods G/H and I as showing parts of larger polities with the largest settlements in the hierarchy are not included, rather than a pooled dataset.

The primacy of Yanhuitlán (Cerro Jazmín) in the last three periods in the Mixteca Alta region is, for the later two periods, approximately as marked as Monte Albán in periods G/H and I, although the curve below the primate section is not as convex as that of the Oaxaca Valley. This suggests that the parts of the Mixteca Alta region for which I have data were relatively well integrated below the primate center, although the polity that Yanhuitlán dominated must have extended north and east of the surveyed areas.

Oaxaca Valley region

The extreme convexity of the Oaxaca Valley curve in ~Early Formative period B is the result of pooling, or of multiple chiefdom polities being collapsed together in this single graph. In the next three periods, first San José Mogote and then Monte Albán were primate centers, with slightly primo-convex curves. The somewhat more convex period G/H graph is the result of more secondary centers with similar populations.

The ~Early Classic Period L graph is flat at the top due to the similar populations of Monte Albán (17,813) and Jalieza (15,304). This suggests that they were competing centers in different systems. Actually, there's a third demographic center of approximately equal size and roughly equidistant from the other two centers (see map in Finsten 1995), which Kowalewski et al. (1989:229) refer to as DMTG, for Dainzú, Macuilxochitl, Tlacochahuaya, and Guadalupe, for the major separate settlements (by the 100 m rule) that comprise it. Because of how I defined sites, however, the DMTG populations are not combined, so do not appear as a single population in this curve. Kowalewski et al. (1989) have presented a rank-size graph for the Valley of Oaxaca data based on most of the Oaxaca Valley region data I use in this analysis, which has a curve very similar to the one I present. This suggests that adding in the data from regions peripheral to the major centers does not change the rank-size graph appreciably.

Jalieza's population rose in the ~Epiclassic period Q to exceed 20,000, and the curve below it is close to normal. Macuilxochitl, the second largest settlement, had a population of 5217, only 26 percent of Jalieza's. Note that Monte Albán's population of 4688 made it the region's third largest period Q center, with just 23 percent of Jalieza's population.

The flat top of the ~Late Postclassic period V graph shows a pooled system, headed by multiple similar-sized population centers. This is consistent with the multi-polity petty kingdoms known for this region.

Discussion

Rank-size graphs based on population provide insights into the urbanization and integration of the systems from which the data are derived. Like most pre-industrial systems, highland Mesoamerica seems to have only normal, convex, or primo-convex curves. Primate systems, where a single population center has at least twice the population of the next largest center, occurred in the Oaxaca Valley region in periods E/F through I (San José Mogote then Monte Albán), in the Basin of Mexico in period L (Teotihuacán), and in the Mixteca Alta in periods Q and V (Yanhuitlán). The Tula and Tehuacán-Cañada regions both had primate systems in ~Late Postclassic period V, too.

Convex graphs are generally a hallmark of early periods of development, and are evident for nearly every period examined here, indicating that multiple similar-sized centers dominated the top of the hierarchy. This occurs when the graph includes competing centers, or pooled systems (Johnson 1980:241). I have defined regions that are large relative to the scale of the social systems we understand operated in the early periods (chiefdoms and archaic states). The convex Mixteca Alta and primate Oaxaca Valley graphs of the ~Late and ~Terminal Formative periods G/H and I contrast, suggesting a continuation of the multi-center patterns evident in previous periods in the Mixteca Alta region, while a shift occurred in the Oaxaca Valley to a primate system with the ascendancy of Monte Albán.

For the ~Late Postclassic period V, the regional systems included multiple competing centers, shown by the flat or near-horizontal curve for the high-ranked sites. This pattern is most evident for the Oaxaca Valley region, but is also visible in the Basin curve. Archival data supports this interpretation, with the caveat that the important demographic center of Tenochtitlán, where central Mexico City is today, is not included in the Basin survey data.

Kowalewski (1983) compared Teotihuacán and Monte Albán area rank-size distributions using population data from smaller regions than I have used, as no secondary centers in the larger regions alter the upper sections of the rank-size curves markedly. The larger regions used here retain the patterns he found, suggesting the larger regional limits I have defined do not exceed the limits of the systems in which these centers operated.

Having looked at rank-size graphs, the next section examines the upper end of the settlement hierarchy—the most populous and largest settlement distributions.

Most populous and largest settlements

In this section, I present seven pairs of maps, two for each period. The first shows the most populous settlements, based on average CALC POP. The second in each pair shows the largest settlements. Readers who are skeptical of my population estimates, or of population estimation in general, might prefer the latter maps. These maps portray the spacing between the most prominent sites in a multi-regional settlement hierarchy. With all the settlement data from across the study area lumped for ranking, the relative scale of settlements in each region therefore are compared.

I determined the ranking of the most populous settlements, upon which the maps in this section are based, by histogramming the populations beginning with the most populous settlements. I looked for obvious breaks in the histograms, and used that to divide the most populous settlements into ranks (see the results in Table 7-2). Then, I mapped the locations of the top three or four ranks. I did not attempt to include a specific number of settlements, or have them total a certain percentage of the population. Instead, I based the count in the top ranks on the natural breaks indicated by the histogramming. At the end of this section, I analyze the percentages of population in the mapped ranked settlements, and other characteristics of this group of settlements. For settlement sizes, the second map of each pair, I used the same process.

This mapping would better reflect social realities if populations of neighboring contemporaneous settlements, or clusters of settlements, were combined (considered as a single population center), rather than strictly adhering as I have done here to separating into different settlements archaeological remains that are 100 m or more apart. Valley of

Table 7-2. Top ranked population and settlement size ranges.

Figure		Rank I		Rank II		Rank III		Rank IV	
		largest	*smallest*	*largest*	*smallest*	*largest*	*smallest*	*largest*	*smallest*
	B, ~Early Formative								
7-8	most populous	867	753	379	225	195	129		
7-9	largest (ha)	49.527	38.48	21.64	14.4	11	7.34		
	E/F, ~Middle Formative								
7-10	most populous	1980	1287	874	599	490	368	315	227
7-11	largest (ha)	91.57	73.53	52.8	38.45	32	23.2	22.88	18.8
	G/H, ~Late Formative								
7-12	most populous	16,575	16,575	5974	4875	3225	1620	1504	972
7-13	largest (ha)	442	130	86	59.7	49.7	27.7		
	I, ~Terminal Formative								
7-14	most populous	15,600	15,600	3065	1553	1452	1050	951	690
7-15	largest (ha)	416	416	175.11	90	75.7	60	54.3	35
	L, ~Early Classic								
7-16	most populous	158,055	158,055	17,813	6923	4950	3129	2564	1504
7-17	largest (ha)	2107.4	2107.4	475	173.35	115.1	92.3	80	59.9
	Q, ~Epiclassic								
7-18	most populous	20,040	14,000	9625	2702	1998	1073		
7-19	largest (ha)	800	400	229.06	125	107.1	64.69	54.2	42.1
	V, ~Late Postclassic								
7-20	most populous	43,278	43,278	20,250	9357	7875	4884	4449	2275
7-21	largest (ha)	1134	577.03	450	355.8	289.25	237.65	215	145.7

Oaxaca researchers have combined settlement data in this manner, to reflect "an actual sociological entity—a community" (Blanton et al. 1982:40). Such an endeavor, however, is beyond the scope of this study.

I have incorporated qualitative and impressionistic data from areas for which I lack systematic data to generate a well-rounded discussion of population clustering and the distribution of the most populous settlements across the study area. Given the way some of these data are published, comparability can be difficult to assess.

Period B (~Early Formative)

During this early period, settlement hierarchies and social inequality had already emerged. There were sedentary communities with some evidence of central place functions; most, however, seem to have been small undifferentiated hamlets. The starred settlements on the most populous and largest settlements maps (Figures 7-8 and 7-9) in the Basin of Mexico are, north to south, Azcapotzalco, Tlatilco, and Tetelpan. These sites are highlighted by Sanders et al. (1979) on Map 6 as important or excavated ~Early Formative (Early Horizon Phase One) settlements. I can find no settlement sizes for these occupations in even in recent summaries of work at Azcapotzalco, (Castillo Mangas et al. 1993) Tlatilco (García Moll et al. 1989), and Tetelpan (Reyna Robles 1981).

In the mapped areas, the most populous and largest early settlements were predominately in the Mixteca Alta region (both maps show the same settlements), and the two most populous Rank I settlements were also there. Seventy percent of the population of these 20 ranked settlements resided in the Mixteca Alta region (3974 of 5608 inhabitants in the ranked settlements), based on average CALC POP, as did 70 percent of the entire ~Early Formative period B population (6178 of 8776). Spores' (1972) Nochixtlán Valley survey recorded over a dozen Cruz phase settlements. Later surveys logged even more contemporaneous settlement to the west and north. This is a clear nexus of period B habitation in the Mixteca Alta. Indeed, three high-ranked populous settlements cluster at the boundary of the Nochixtlán and Achiutla survey areas. The Rank I and II population

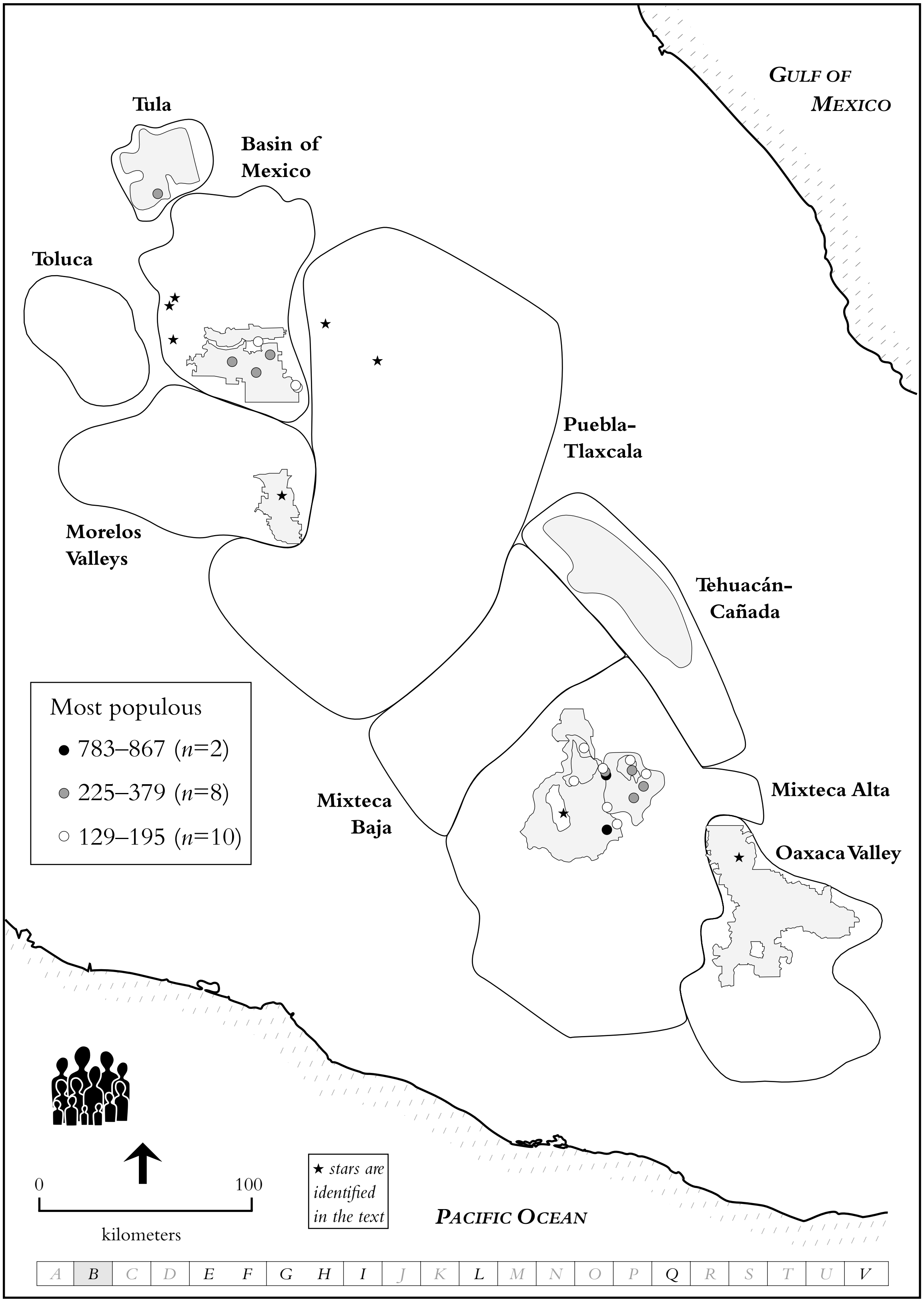


Figure 7-8. Most populous period B settlements based on average CALC POP (*n*=20 of the 150 period B sites), in three ranks.

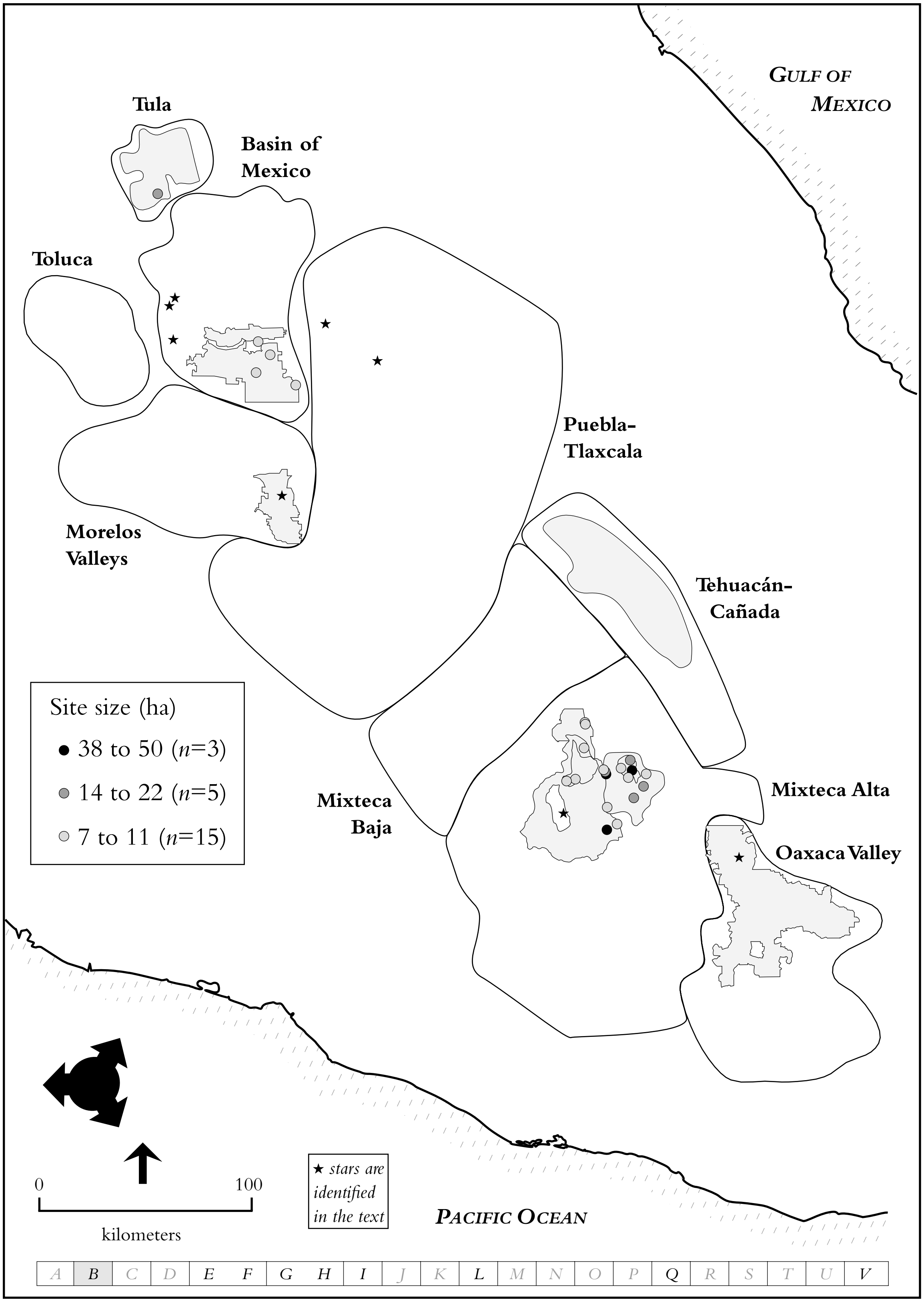


Figure 7-9. Period B settlements larger than 7 ha (*n*=23 of the 150 period B sites).

centers are spaced across the eastern portion of the surveyed area, but are not all in the Nochixtlán Valley. There's another population cluster in the Mixteca Alta region in the Huamelulpan survey area at Tayata (marked with a star). Together, these suggest four period B polities in the Mixteca Alta (Balkansky et al. 2002), far more than is known for any other region for which we have systematic survey data. Note that in contrast to this extensive occupation of the Nochixtlán Valley and Achiutla areas of the Mixteca Alta, the Peñoles survey area, on the eastern edge of the region in the mountains just west of the Valley of Oaxaca, had no ~Early Formative sites (Kowalewski 1991:14).

The Basin of Mexico region had 19 percent of the total database population in period B and 16 percent of the population of the 20 ranked settlements shown on the map. They are spaced across the landscape. Their average size is 4.05 ha, or slightly larger than the 3.4 ha average for all period B settlements. This suggests that either ~Early Formative settlements in the Basin of Mexico were larger on average than in other highland regions, or that some small settlements have not been identified. Occupations seem to focus on riverine or lake edge environments.

The Amatzinac study of the eastern Morelos Valleys region focused on early occupations, and recorded 10 settlements that date to the ~Early Formative; the largest of course was Chalcatzingo (star), at 6 ha (maximum). The average settlement size was 2.1 ha, or about 58 percent of the period average (sites were smaller than average). The Amatzinac survey data suggests period B occupation was spread across the highlands, although settlement density and population density was low.

Periodization of the Tula occupations is provisional; Mastache and Crespo Oviedo (1974) designate early settlements only as "Formative," here considered period B, although it might be more accurate to place them with a later Formative period. The single Tula region settlement may be larger or smaller than as ranked here; settlement size is a guess, as surveyors did not report settlement size or population.

Settlement sizes are problematic for the Tehuacán study, which focused on early settlements (including many pre-ceramic occupations), but they only recorded two period B sites, both of them very small.

In the Oaxaca Valley region, 26 period B settlements have been identified, and most continued to be occupied over the following two periods. Nine cluster in the San José Mogote site (starred), and extend across 6.8 ha (the largest at 1.2 ha), with an estimated population of 125.

Twenty-three period B settlements were larger than 7 ha. That the Rank I settlements were more than twice as populous as the Rank II settlements is evidence of a settlement hierarchy, and supports the interpretation of the two-level hierarchy many researchers have advanced. Indeed, in the Mixteca Alta region, there may have been a three-level hierarchy. Three of the settlements shown here were larger than 38 ha; two are the Rank I settlements, and the third is Yucuita. They form a nicely spaced triangle in the western Nochixtlán Valley, and are surrounded by smaller settlements.

González de la Vara (1999) has summarized data for the Formative in the Toluca Valley, but his earliest period corresponds to my period C (the Ayotla phase, or Late Early Horizon One), so I have no period B data for the Toluca region.

In the Tlaxcala-Puebla survey area, García Cook (1989a:164) reports 27 settlements dating to the Tzompantepec phase, which is equivalent to the ~Early Formative period B. He describes them as "concentrated settlements, usually of 10 to 25 residences in a linear arrangement" (García Cook 1981:245), although he later revised that to as many as 50 houses, with the largest settlement having 100 or more houses (García Cook and Merino Carrión 1989a:164). The largest settlements were 15 ha, or Rank II in size compared to period B sites across the highlands, and they averaged 3–5 ha. García Cook gives a total population of 4375 for these 27 settlements, for an average population of 162, with two settlements having more than 500 inhabitants (García Cook and Merino Carrión 1989a:167). Settlements at this latter population level would probably best fit into my

Rank I, and add a significant demographic cluster outside the Mixteca Alta. The Tlaxcala-Puebla period B settlements were concentrated in southern Tlaxcala, west of Malinche and north of the modern cities of Puebla and Cholula. The two largest settlements (starred in the Figures) were about 24 km apart, judging by the published map (García Cook and Merino Carrión 1989a:166); although some settlements were nearby, many were farther away, so they do not make a tight cluster.

Period B is analogous to the ~Early Formative and sometimes referred to as the pre-Olmec Formative. Settlement was sparse across the highlands, although three settlements in the surveyed areas covered more than 38 ha. I could not find size or population estimates for ~Early Formative occupations of three excavated settlements in the western Basin of Mexico, outside the surveyed areas upon which this quantitative database is based. This early period is identified by red-on-buff and red-on-brown ceramics known from a large area west of the Isthmus of Tehuantepec, and across the entire study area. The largest concentration of population and large settlements was in the Mixteca Alta, but the southern Basin of Mexico region also had a small concentration. Smaller settlements are reported from all surveyed areas, suggesting varying levels of occupation across the entire study area.

Period E/F (~Middle Formative)

Period E/F corresponds to the ~Middle Formative, or the "Olmec" horizon. The distinctive incised and carved "Olmec" designs on ceramics are known from a broad area, encompassing and larger than the study area. Period E/F ceramics generally were locally made; "white" or *engobe blanco* surface treatments are a common period E/F marker. Overall, populations and total settlement area increased substantially. Settlement hierarchies and civic-ceremonial architecture are well documented from all regions for which ~Middle Formative artifacts are known.

The most populous ~Middle Formative period E/F settlements (Figure 7-10) were more than twice as large as those of the ~Early Formative. So were the largest settlements

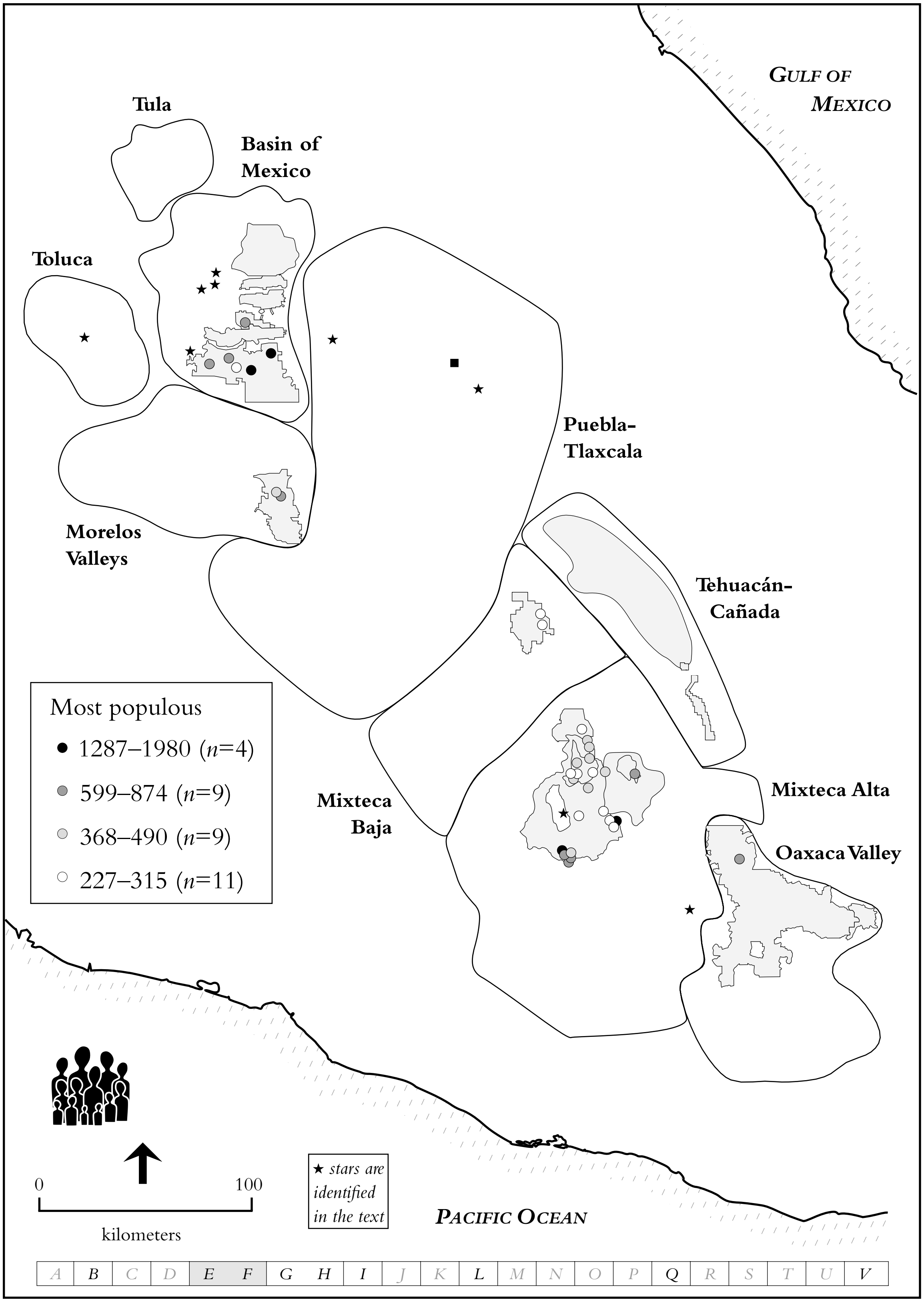


Figure 7-10. Most populous period E/F settlements based on average CALC POP (n=33 of the 473 period E/F settlements), in four ranks. See text for more explanation.

(Figure 7-11). The dense clustering noted in period B in the Mixteca Alta region continued, but the focus moved from the north and west of the Nochixtlán Valley to the southern valley and the highlands above and to the south, at the edge of the Achiutla survey area. The region still had relatively small polities, but they shifted locations. In the Mixteca Alta region, the maps show five demographic clusters. Counterclockwise, they are in the Teposcolula survey area and nearby, in the Huamelulpan survey area around the Tayata site (starred), in the southern Achiutla survey area, in the southeastern Achiutla survey area and the Tilantongo-Jaltepec survey area, and at Yucuita.

The southern Basin of Mexico continued to have populous settlements, and the largest maintained a relatively even spacing. Chalcatzingo, in the eastern Morelos Valleys, became large enough to be a Rank II settlement, and nearby was a second populous settlement. In addition, some populous centers emerged in the Mixteca Baja region. San José Mogote was by far the most populous settlement in the Valley of Oaxaca, although other Oaxaca Valley settlements were too small to be ranked when compared to the larger settlements farther north.

The most settlement-rich of the Mixteca Alta region period E/F settlement clusters is a demographic center of gravity in the upper Tejupan and upper Teposcolula Valleys and the highland divide between them around the modern communities of Yucunama and San Juan Teposcolula, although individual settlements have Rank III and IV populations. While these data do not indicate a single significantly larger settlement, public architecture existed at a site in the north of this cluster (SPP-TDU-YBA-2, Achiutla survey, also previously recorded by Byland [1980]), and probably at Loma Mina in the Teposcolula Valley (Stiver 2001) in the southern part of this cluster. The other populous ~Middle Formative settlements in this area range between these two. This area may have been attractive to residents because it lies on natural access routes between the Mixteca Baja to the northwest, overland routes through the Coixtlahuaca area to the Cañada and the Gulf to the northeast, and southeast to the Nochixtlán Valley and Oaxaca Valley and the

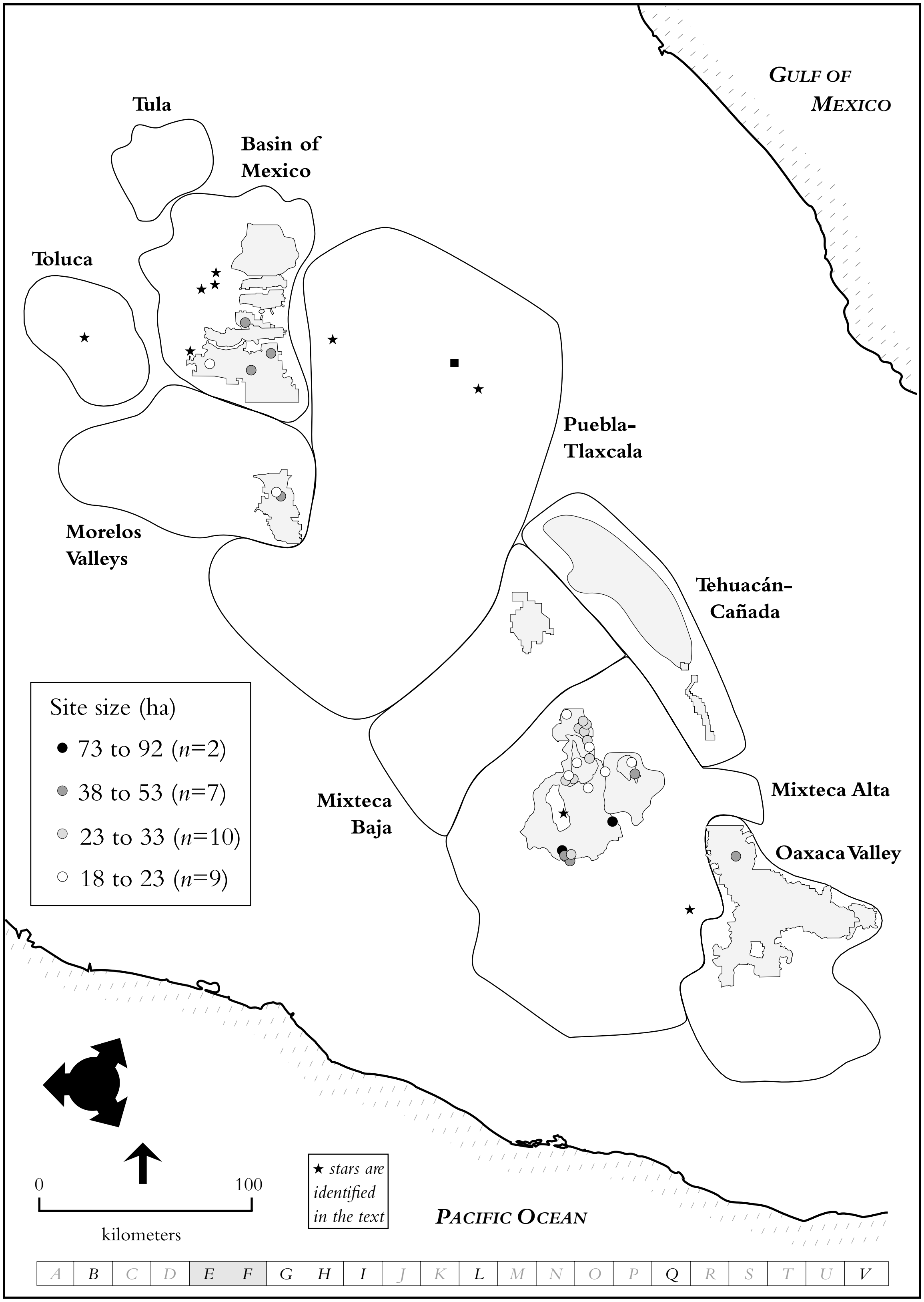


Figure 7-11. Period E/F settlements larger than 18 ha (n=28 of the 473 period E/F sites), in four ranks. See text for more explanation.

Isthmus of Tehuantepec beyond, as well as southwest to the Pacific Coast. Indeed, the Pan-American highway's junction with the road that goes southwest to the coast via Tlaxiaco is smack in the center of this period E/F population nexus.

These two figures do not show a cluster in the Huamelulpan survey area around the Tayata site (Balkansky 1998). Tayata had four mounds and spanned more than 50 ha in period E/F, so it would have been a Rank II settlement, based on area.

Another sizable period E/F demographic center of gravity was at the southern edge of the Achiutla survey area about 30 km to the south, between the modern communities of San Agustín Tlacotepec, Yosojica, and San Mateo Peñasco. This cluster includes a Rank I settlement, three Rank II settlements, and a Rank III settlement, along with smaller occupations. Areas to the south remain systematically unexplored, but perhaps a chain of period E/F settlement clusters continued to the Pacific Coast.

In the northern Nochixtlán Valley, around the site of Yucuita, a Rank II settlement, was another cluster of period E/F ~Middle Formative sites. They totaled just under 150 ha in size, with an estimated total population of 1734 on 16 settlements. This is about 4.7 percent of the total E/F population.

In the southern Nochixtlán Valley another cluster of period E/F settlement was near the modern community of Tilantongo. Byland and Pohl (1994:49–50) recorded about 10 settlements east of and apparently part of this cluster. No settlements are as large as the largest settlement in this cluster, recorded by the Achiutla survey (NO-TIL-TIL-7, 91.57 ha), but taken together, this is another significant cluster of period E/F occupation.

Two Rank IV population centers emerged in the Tequixtepec survey area. These settlements may be part of a more populous cluster outside this survey area, or a less densely peopled area between the Mixteca Alta region and centers to the north.

Period E/F correlates with the Tetelpan and Zacatenco phases of the Toluca Valley. González de la Vara (1999:108–109) reports 53 Zacatenco settlements, averaging 13–15 ha in size, with the largest extending across 30 ha (the general location of this largest

Zacatenco site is marked with a star). This size site would be near the upper limits of Rank III in my schema. Perhaps 15 or so settlements averaged about 24 ha in extent (González de la Vara 1999:109), or approximately at the Rank III–IV threshold. This suggests a significant population cluster in this region.

Data from the Peñoles survey area (Kowalewski 1991:14) also show a lack of occupation in the southeastern Nochixtlán Valley area. ~Middle Formative settlement concentrated around Peras, marked with a star on the map.

I see the ~Middle Formative as correlating with the Early Texoloc and Early Texoloc del Valle of the Tlaxcala-Puebla survey area, as the ceramics resemble those of the Tehuacán Valley in the Early Santa María phase. García Cook and Merino Carrión (1989a:177) map several dozen sites as dating to Early Texoloc. Twenty-five were large enough to be considered towns and cities (*pueblo*, *pueblo grande o ciudad*), and some had 20 or more mounds and multiple plazas (García Cook and Merino Carrión 1989a:174, 176); the two *pueblos grande*s are starred on the Figures (for reference, Malinche volcano is marked with a square). The total number of settlements in the Tlaxcala-Puebla survey area for period E/F was 191, with an estimated population of 121,648, although how that was calculated is not described (García Cook and Merino Carrión 1989a:176). This means the average population was about 637 individuals per settlement, or within Rank II. If the Tlaxcala-Puebla data are comparable to the estimates from other sites and regions, then this area had more inhabitants than any other in the highlands (for comparison, I calculate 22,145 people lived in the surveyed areas of the Mixteca Alta region in this period). The settlement density, given that the survey area is 6000 km^2, is between the settlement densities of the Oaxaca Valley and the Basin of Mexico regions in period E/F.

At least one larger settlement and a few smaller settlements are recorded in southern Puebla and date to period E/F. They are near the modern town of Chinantla in the northeastern part of the survey area (García Cook and Merino Carrión 1989b:106). Settlement sizes are unpublished.

The southern Basin of Mexico had a suite of ~Middle Formative settlements, with the largest communities spaced along the waterline of Lakes Chalco and Xochimilco, along with another center to the north in the Texcoco survey area. Like the settlements in the Mixteca Alta region, these too are arranged in clusters of settlements (Parsons et al. 1982:320–321); the most populous may have exceeded 2000 inhabitants. Just west of the Chalco survey area was Cuicuilco, marked with a star and shown as an important contemporaneous site by Sanders et al. (1979) on Map 10. Three additional stars are on the lower flanks of the Guadalupe Range in the Tenayuca survey area; these are shown as large nucleated villages on Map 10, along with Rank I and II settlements in the southeastern Basin. Relative to period B, period E/F populations were spreading north, especially along the west side of the Basin.

To the south, the San José Mogote settlement cluster (eight sites with a total area of 5.7 ha and an estimated population of 105) remained the largest in a cluster of settlements in the Oaxaca Valley. Small settlements were spread across the valley, although Blanton et al. (1999) believe buffer zones divided the settlement clusters of each valley arm, which would have resulted if each of these clusters were competing polities. Winter (2000), however, disputes the presence of these unoccupied buffer zones. While San José Mogote has been extensively mapped, excavated, and discussed in the literature, it was not among the largest of its contemporaries, judging by the data gathered here.

Along the Gulf Coast and Isthmus of Tehuantepec, east of the study area, numerous ~Middle Formative settlements are known, some quite large. Laguna Zope, in the Isthmus near modern Juchitán and Tehuantepec, covered almost 90 ha and was much larger than any nearby settlements (Zeitlin 1993:86); at this size, Laguna Zope would have been a Rank I settlement in this macroregional schema. On the Gulf Coast, across 400 km^2 surveyed in the Tuxtlas area, researchers found two Middle Formative "large villages," but no settlements with mounds (Arnold 2000:124).

The high populations and large settlements continued in the Mixteca Alta region in the ~Middle Formative period E/F, but the Basin of Mexico also had relatively large, populous settlements. A summary article about the Tlaxcala-Puebla survey area suggests even more people lived there, however, and in larger settlements than in the regions for which we have quantitative data. The highland sites are not the only large settlements known for this period, however; Love (1991:57) reports that La Blanca, a site 11 km from the Guatemalan coast, was about 100 ha and had at least four Middle Formative mounds.

We know ~Middle Formative peoples in the study area maintained a trade network across a large area, including from the northern Isthmus and Gulf and Pacific coasts, and routes of communication must have extended throughout and beyond the study area. While ~Middle Formative peoples did live in sedentary communities, they maintained links, at least through intermediary communities, to distant locales. Therefore, it is not surprising that there would have been residential development along favored long-distance transportation routes, and across the study area.

Period G/H (~Late Formative)

In contrast to the ~Early Formative, the most populous settlements of the ~Late Formative period G/H (Figure 7-12) were much larger, and Monte Albán became the largest by far (Figure 7-13), at 442 ha, which is more than four times the size of the largest period E/F site. The low end of the period G/H Rank III settlements, by population, are at the same scale as the largest sites of period E/F, so the demographic scale has increased. This period is sometimes referred to as encompassing "the urban revolution." Along with these larger communities, considerable period G/H civic-ceremonial architecture was constructed in communities as small as less than 1 ha. All this is evidence of the considerable reorganization of people across the landscape, which may have resulted from heightened regional and macroregional sociopolitical tensions. Indeed, regional integration accompanied the centralization of population in the Valley of Oaxaca (Blanton et al. 1999:66).

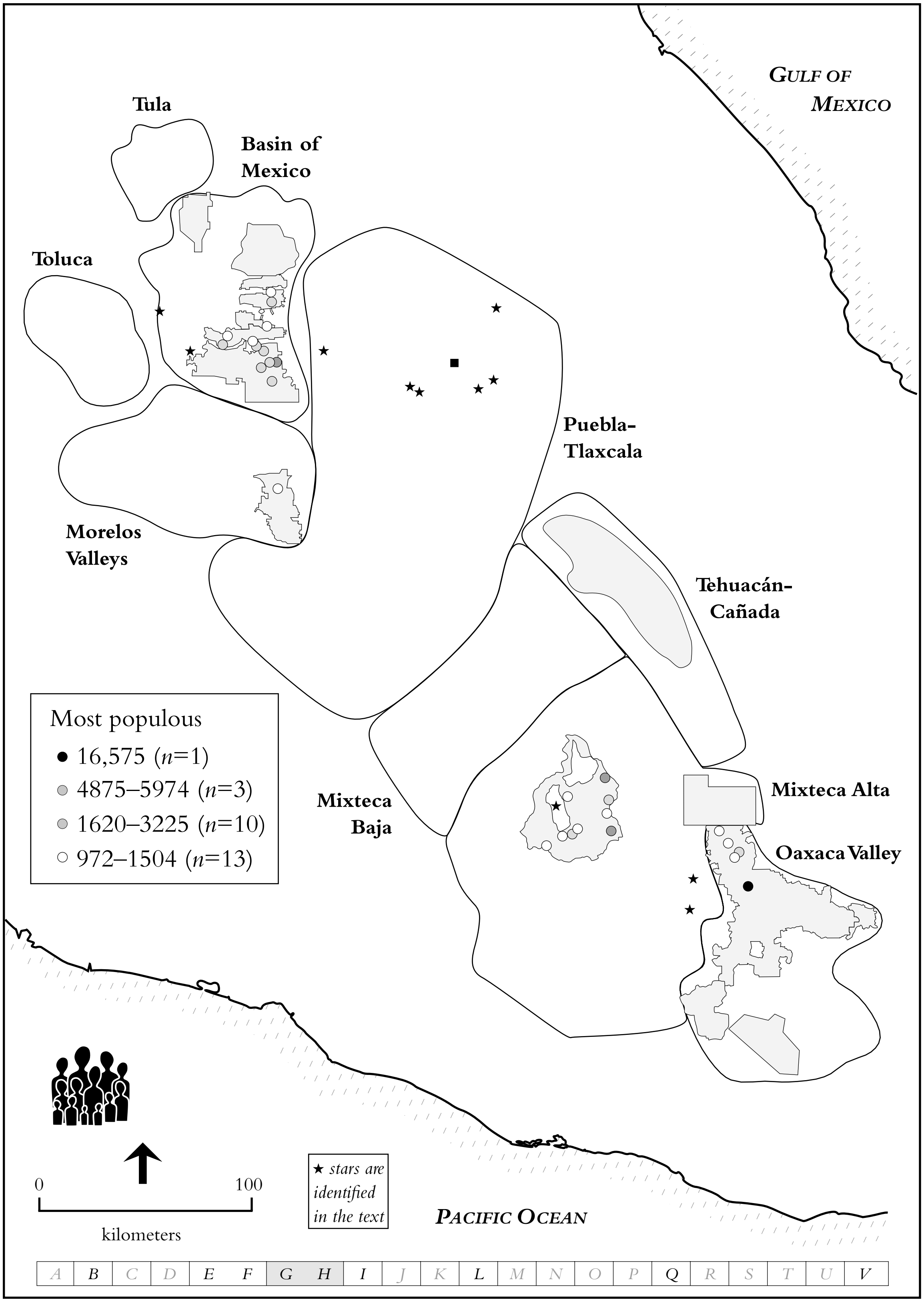


Figure 7-12. Most populous period G/H settlements, according to average CALC POP (*n*=27 of the 1092 period G/H settlements), in four ranks.

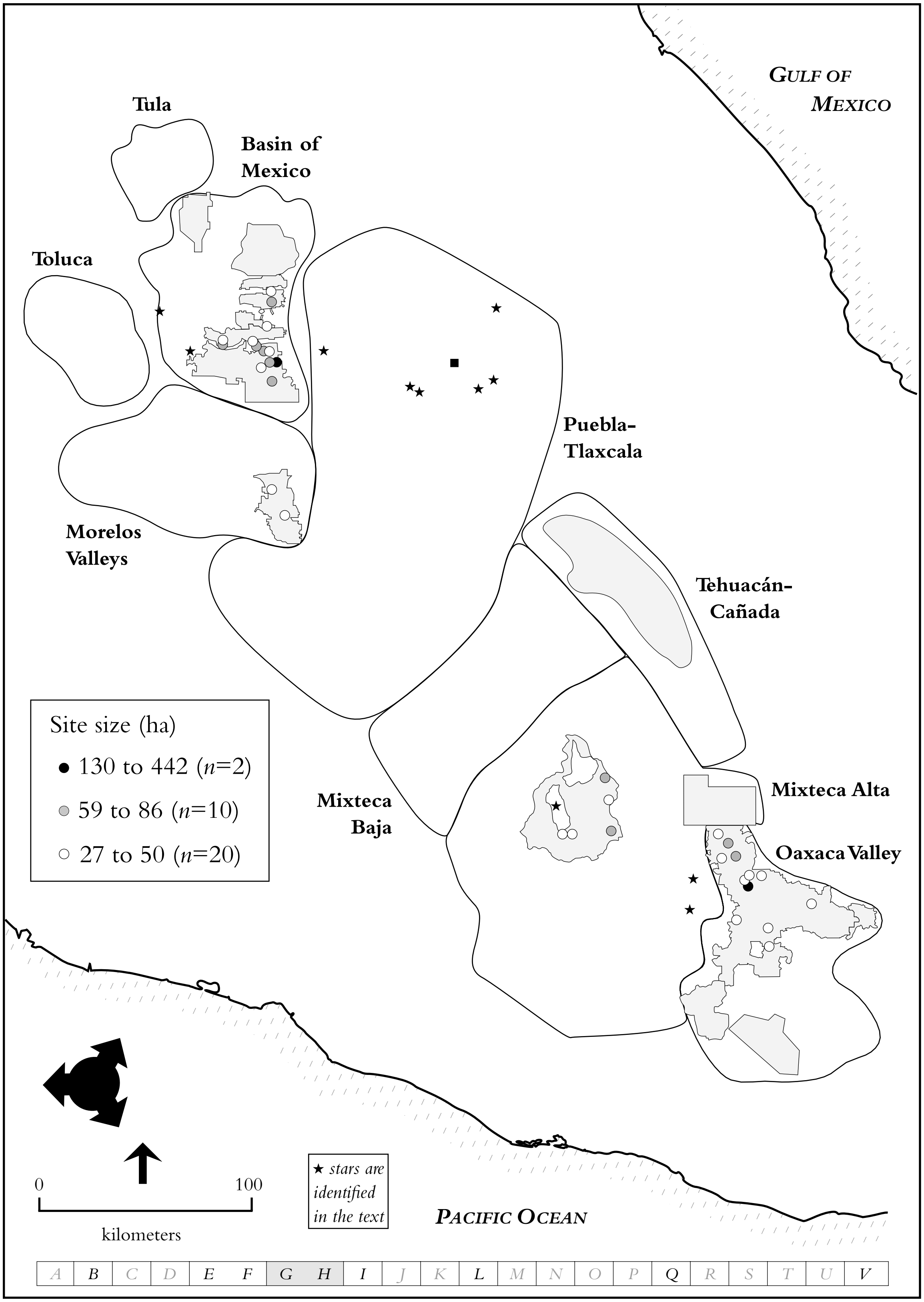


Figure 7-13. Period G/H settlements larger than 27 ha (*n*=35 of the 1092 period G/H sites), in three ranks.

Beginning in the south, Monte Albán dominated the Valley of Oaxaca, although a cluster of larger settlements, all much smaller than Monte Albán, continued to be occupied around San José Mogote. In this periodization scheme, the Oaxaca Valley data from period G Monte Albán Early I are ignored, and only the period H, or Monte Albán Late I, data are included. Thus, to those familiar with the archaeology of the Oaxaca Valley, this chronology skips the emergence of Monte Albán in Early I. By Late I, Monte Albán was much larger than the next largest centers, not only in the valley, but across all quantitative survey areas used in this study.

Nine of the 27 most populous ~Late Formative settlements in the database were in the Mixteca Alta region (even though we only have period G/H data from the Achiutla survey), indicating relatively high numbers of people continued to occupy that mountainous region, although many of them moved to settlements in new locations. The Mixteca Alta period G/H settlements range in rank from II through IV, and include massive defensible terraced sites, many with adjacent *lama-bordo* terrace systems. The main centers in the Mixteca Alta show diversity in architectural planning, suggesting a rather different overall system existed here compared to the Oaxaca Valley. It also suggests an increasing regionalization of independent polities in the Mixteca Alta. The largest cluster surrounding Huamelulpan (starred on Figures) may have comprised a single polity, along with a series of larger centers are along the western edge of the Nochixtlán Valley (ranging from Yanhuitlán in the north to Monte Negro in the south), and a scattering of locally larger communities. Monte Negro and Yanhuitlán were almost the same size, just under 80 ha; Monte Negro was both built and abandoned in this period. Early Ramos ceramics from the Mixteca Alta include those of the Valley of Oaxaca grayware tradition (Plunket 1983), indicating communication between these two regions continued.

Researchers found more Late Formative settlements in the Peñoles survey area (Kowalewski 1991:14), with settlement concentrated between Peñoles and Peras, starred on the Figures (Peñoles is the northern star). The Peñoles ceramics resemble those of the Valley of Oaxaca (Monte Albán) more than Nochixtlán Valley types.

One Rank IV population center was in the Amatzinac Valley in the Morelos Valleys region, and Hirth (1987a:362) reports that scattered period E/F (Delgado phase) settlements had civic-ceremonial architecture, and some linear arrangements of settlements may have been in zones particularly good for diversion irrigation from small barrancas. The population cluster around Chalcatzingo became more dispersed, and overall settlement size is too small to register at the multi-regional scale.

The Basin of Mexico presents a more complex pattern with settlements of every rank concentrated in the southern Basin, with a few in the Texcoco survey area on the eastern edge of the Basin. Some populous settlements were also along the Ixtapalapa peninsula. As in other regions, these settlements are much larger than previous occupations, are more distinctly clustered (Blanton 1972:183), and have more civic-ceremonial architecture and thus more "internal complexity" (Parsons et al. 1982:327–328). The starred sites are Cuicuilco in the south and El Tepalcate on the western edge of the Basin in the foothills of the Sierra de las Cruces; the importance of these settlements is drawn from Sanders et al. (1979) Map 11, First Intermediate Phase Two. Cuicuilco's population was 5000–10,000 individuals (Sanders et al. 1979:97), which in my ranking system would make it either a Rank I or II center (depending on where it was in that range). Cuicuilco had about half Monte Albán's population, but was much larger than any other ~Late Formative Basin settlement. The most obvious change from the ~Middle Formative, as in the other regions, was of tremendous growth in population.

In the Toluca region, period G/H corresponds to the Ticomán phase. Settlement counts dropped from the previous Zacatenco period (53 settlements), as only 30 Ticomán sites have been identified; sites were also much smaller. They show a strong tendency toward nucleation, and 30 percent were on ridge crests (*crestas montañosas*), or more defensible locations (González de la Vara 1999:109). This is a serious reduction in population;

settlement counts also dropped in the Mixteca Alta in this period, but overall population increased, so the Toluca region shows a different period G/H pattern than the other regions examined here.

The ~Late Formative correlates with the Late Texoloc and Late Texoloc del Valle of Tlaxcala-Puebla survey area. Across the 6000 km^2 area, there were 269 settlements, including six *pueblos grandes* (starred on map; westernmost star is a fortified site), which are probably large enough to have been ranked along with the largest settlements of the other regions, with an estimated population of 174,180 (García Cook and Merino Carrión 1989a:178–179). These largest settlements partly ring the base of Malinche volcano (square on Figures). Researchers estimate that another 100 sites with an estimated population of 60,000 are unrecorded; this would yield a total of 369 settlements and 234,180 inhabitants (García Cook and Merino Carrión 1989a:178). The settlement density is approximately the same as that of the Basin of Mexico, and one-quarter that of the Oaxaca Valley region. More enigmatic is a report by Fowler (1968) that Amalucan, a site near the modern village of Chachapa (the southernmost star in the Puebla-Tlaxcala region), covered 10 km^2 (1000 ha) in the ~Late Formative; it is not mentioned in García Cook's later publication, however. Interestingly, Hirth (1984:129) says Amalucan is "a minimum of 60 hectares, and could well be twice that size," which seems comparable to large contemporaneous settlements (the smallest Rank I or a Rank II settlement, by size). If Amalucan was indeed 10 km^2 in the ~Late Formative, then it would have been more than twice the size of the next largest ~Late Formative settlement, Monte Albán, at 442 ha. Amalucan had a "main pyramid group and plaza" including one mound with multiple stages (Fowler 1968), and is in the midst of a cluster of ~Late Formative settlements.

In sum, during the ~Late Formative period G/H populations and settlement size in the highlands grew enormously. These increases were accompanied by changes in architecture, including larger and different civic-ceremonial architecture with perhaps more exclusivity. Settlements occupied new places on the landscape, and some were fortified or in defensible positions. The largest settlement in the database, Monte Albán, was far larger than any other settlement, and had almost three times the population of the next largest settlements, Yanhuitlán (Cerro Jazmín) in the northwest Nochixtlán Valley, Tilantongo in the southwest Nochixtlán Valley, and Ch-TF-5 in the southeastern Basin of Mexico. Note that the Rank I and II settlements comprise one each in the Basin and Valley of Oaxaca, with two in the Nochixtlán Valley, where settlement clusters with populous prominent settlements are known for all previous periods. Blanton et al. (1999:62–66) conclude that the dramatic growth of Monte Albán, overshadowing all other settlements in scale, was a defensive maneuver to unite the people of the three arms of the Valley of Oaxaca, and perhaps beyond, under a single disembedded capital. A by-product, they argue, of establishing a new capital in a politically neutral location was the intensification of regional integration and intraregional interaction. Monte Albán continued to be a dominant community in this region for many centuries.

Period I (~Terminal Formative)

Although Monte Albán decreased about 6 percent in size and lost population from period G/H to I, it remained the most prominent center in the Oaxaca Valley region, and larger than any other center in the surveyed areas. Rank II centers were much smaller in all regions, with the largest about half the population of the largest period G/H Rank II settlements (Figure 7-14). The ~Terminal Formative in the database had 13 Rank II settlements, while the ~Late Formative had only three Rank II settlements. This represents a drop in overall population (discussed above), and a re-organization into more mid-level communities. Note that in terms of settlement size, however, ~Terminal Formative Rank II sites were as much as twice as large as Rank II ~Late Formative sites, and the threshold for mapping shifted from a low of 27 ha in ~Late Formative to 35 ha in the ~Terminal Formative (Figure 7-15). This shows that the hierarchy was deepening across the study area.

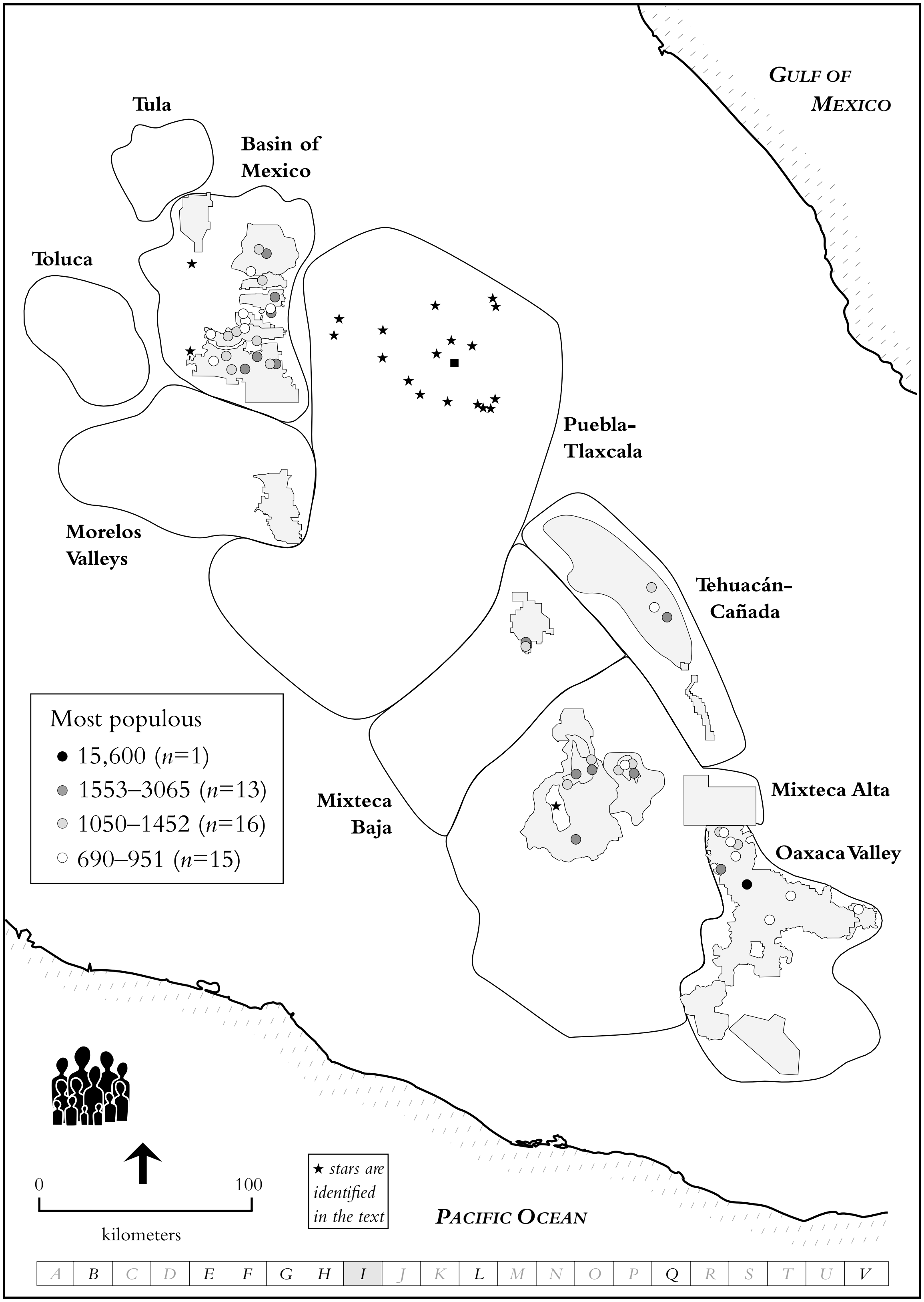


Figure 7-14. Most populous period I settlements, based on average CALC POP (n=45 of the 1141 period I settlements), in four ranks.

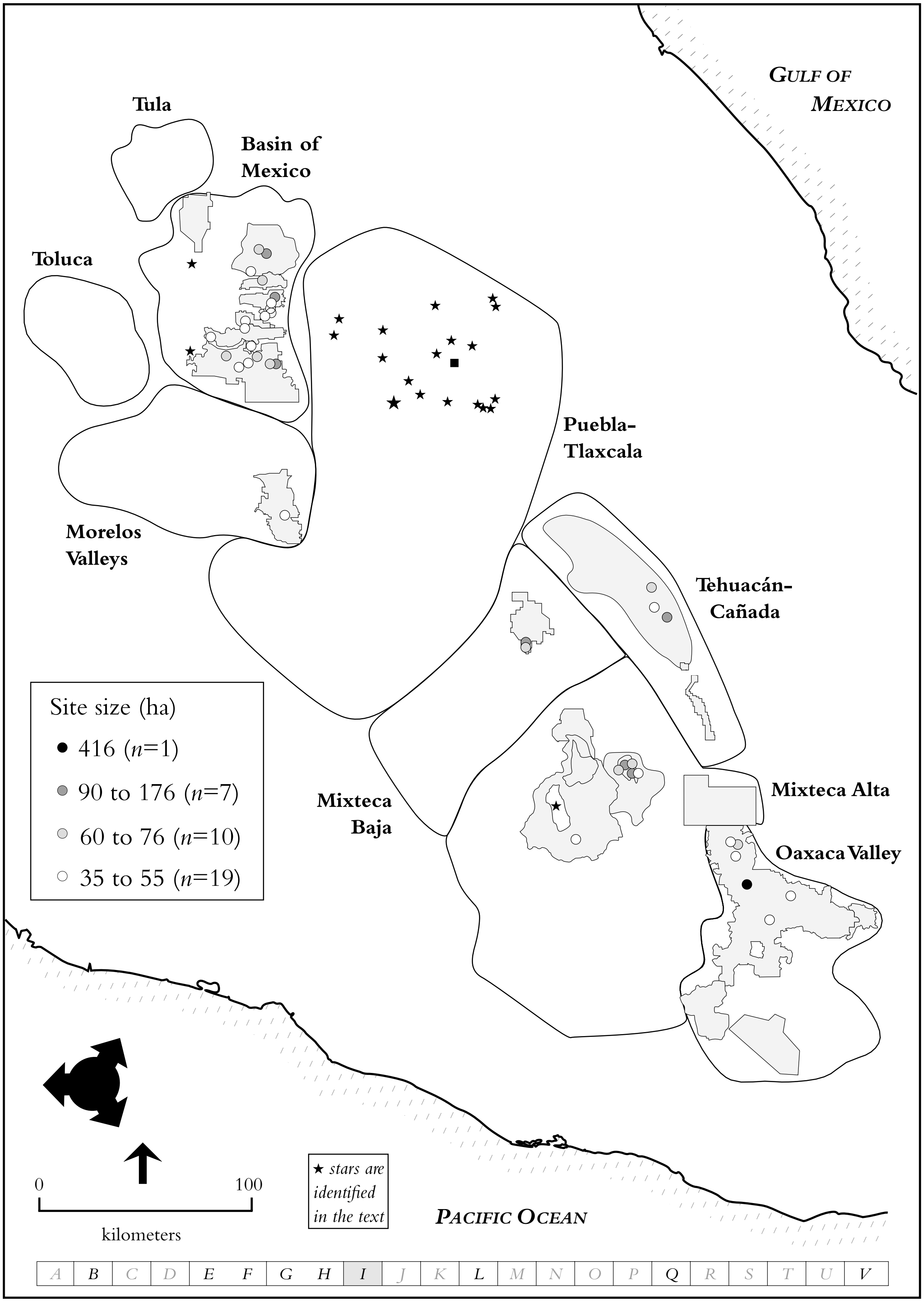


Figure 7-15. Period I settlements larger than 35 ha (n=37 of the 1141 period I sites), in four ranks.

While overall the Oaxaca Valley population shrank from the ~Late to ~Terminal Formative (or from Monte Albán Late I to Monte Albán II), not all parts of it did (Kowalewski et al. 1989:159). Settlements near Monte Albán tended to be abandoned, as did those without mounds and those situated higher up the valley walls. Significant numbers of new settlements were established, but they tended to be small and distant from Monte Albán; some sites were high-density terraced sites and there was a general increase in population nucleation. The overall effect was an unsettled territory separating Monte Albán from each valley arm (Kowalewski et al. 1989:161), although the general form of the hierarchy remained the same as in period G/H (Kowalewski et al. 1989:198). Thus, the largest and most populous period I settlements were at a distance from Monte Albán.

The prominent centers of the Mixteca Alta region were once again mostly in new locations, including the 175 ha Yucuita, two Teposcolula sites, the 36 ha Huendio farther south, as well as the 212 ha Huamelulpan (Gaxiola González 1984). Huamelulpan (starred) would be both the largest and most populous period I Rank II settlement if it were included in the database, and there would have been a Rank IV center at Yucusavi (56 ha), about 4 km to the south (no star). Again, the Mixteca Alta region continued to have multiple settlement clusters, each with a prominent center. In this period, these centers have dramatic civic-ceremonial construction and often defensive architecture (walls).

It appears that in the ~Terminal Formative, some people continued to inhabit sites in the Peñoles-Peras area (marked on the period G/H Figures), and for brief times also lived in settlements near the northern edge of the Peñoles survey area (Kowalewski 1991:15), although this conclusion is somewhat tentative. The Peñoles ceramics were similar to and included local imitations of Oaxaca Valley types.

The Mixteca Baja region includes two high-ranked settlements about 500 m apart on hills overlooking the modern community of Tequixtepec. Both have ball courts and other CCA, and are in dramatic hilltop locations, as are many of the most populous ~Late Formative sites elsewhere. Mixteca Baja ceramics resemble those of the Mixteca Alta, indicating interaction between the two regions (Rivera Guzmán 1999), and include gray-wares similar to those of the Valley of Oaxaca (Winter 1994a:208; 1996:33).

To the west in the Tehuacán-Cañada region, for the first time settlements were large and populous enough to appear among the multi-regionally high-ranked occupations. This lag may relate to how I estimated settlement size and population for the Tehuacán Valley survey area (see Chapter 4). The three marked settlements shown here range from 45 to 90 ha, and are along the eastern side of the Tehuacán Valley; two have civic-ceremonial architecture dating to this period.

As in the other regions, occupation in the Basin of Mexico intensified compared to the previous period. Almost half the most populous ranked settlements were in the Basin, and they contributed about 38 percent of the population of the mapped settlements, indicating more large settlements in the Basin than other regions. Teotihuacán (TF-12), at 175 ha (estimated population 4375), covered almost the same area as Yucuita and dominated the Teotihuacán Valley; its settlement cluster included a Rank II site.

Not included in the database is the important ~Terminal Formative site of Cuicuilco, just west of the Chalco-Xochimilco survey area (starred on the Figures). Cuicuilco had massive civic-ceremonial architecture, including a stepped circular pyramid, and is estimated to have extended across 400 ha (population approximately 20,000), although it may have been larger (Sanders et al. 1979:99). Indeed, Cuicuilco was larger and more populous than Monte Albán, and had perhaps five times the population of Teotihuacán (based on average CALC POP, but see below). The actual size of Cuicuilco remains unknown because it was covered by lava from the volcano Xitle in ca. 50 B.C. (Martín del Pozzo et al. 1997), or ca. A.D. 245–315 (Siebe 2000). Today, much of the site is also obscured by modern development. Sanders et al. (1979), on Map 12 First Intermediate Phase Three, show Teotihuacán and Cuicuilco as the largest settlements in this period, followed by San José in the northwest (starred) and a series of settlements along the eastern side of the Basin and on the Ixtapalapa peninsula. In essence, there was a large settlement vacuum around the two principal centers, with 10 regional centers along the eastern Basin, and one in the northwestern Basin. Along the foot of the Guadalupe and Patlachique Ranges, Sanders et al.'s map shows a series of Tezoyuca hilltop centers, fortified settlements along what may have been contested ground between the south-central Basin (Lake Texcoco and south) and the northern Basin (Lakes Zumpango and Xaltocan, and the Teotihuacán Valley).

The Basin's Tezoyuca hilltop centers, which were in defensible locations and had well-defined civic-ceremonial architecture, also remain an archaeological enigma, as their dating is suspected to be Late Cuanalan or early Patlachique (Sanders et al. 1979:104), but is generally considered to date to the Patlachique phase, which is how I've defined them here. This is also consistent with Parsons' treatment of Tezoyuca sites in the Texcoco survey report.

The varied reporting history of the Teotihuacán Valley data apparently has lead to some enigmatic discrepancies, and the size and population of First Intermediate Phase Three Teotihuacán is one of the most glaring. In the Formative report, Sanders et al. (1975a:172), drawing upon Millon's data for the Patlachique phase site, allocate site number TF-12 to Teotihuacán of this period, and give TF-12's area as 175 ha. They also note that to the south and east of their site TF-36 (65 ha), they found "virtually no occupation of any kind," although Millon had reported a separate site there that "must have covered the same size area as TF-36"; they tentatively number Millon's site TF-110 (1975a:172). I used the later size assessment, and included TF-12 and TF-36 in the database, but not TF-110, consistent with the archaeological field observations of later researchers. That's not the only discrepancy, however. In the single summary volume of the Teotihuacán Valley data published to date, Sanders et al. (1979:101) state that the First Intermediate Phase Three Teotihuacán's population was 20,000–40,000 spread across 6–8 km^2. Referring back to the 1975 report, the total Patlachique occupation in the Teotihuacán Valley covered just over 500 ha, with most of it at TF-12, the core part of Teotihuacán as identified by Millon. I cannot reconcile these two drastically different figures, and have chosen to prioritize the survey report data. Thus, the demographics reported here are significantly different than those in the Sanders et al. (1979) summary volume, although more similar to the pattern shown on their Map 12.

Perhaps in response to tensions in the Basin or a relative attractiveness of living in Cuicuilco, occupation in the Toluca Valley contracted to only 19 settlements, all very small (2–8 ha) and possibly with short occupations. They also tend to be clustered close together and in relatively rugged areas. The ~Terminal Formative Period I is the Cuicuilco phase in the Toluca Valley (González de la Vara 1999:122, 124).

In the Tlaxcala-Puebla area, the ~Terminal Formative correlates with Early Tezoquipan and Early Tezoquipan del Valle; Tezoquipan, sometimes called Protocholula, is the Puebla-Tlaxcala period when Cholula began to became the most prominent regional center and "*un sólo Centro Macroregional*" (the lone macroregional center) in this region (García Cook and Merino Carrión 1989a:180). Cholula's main regional competitors included Coapan, Tlalancaleca, and Atlantepec (García Cook and Merino Carrión 1989a:182). The Figures have stars for 17 *pueblo grande o ciudad* settlements identified by García Cook and Merino Carrion (1989:183–184); although they note that 19 were in the surveyed area, I could only find these 17 on their map (plus Cholula, the large star, for a total of 18). Note that the two westernmost ones were fortified (the northwesternmost is Gualupita las Dalias [García Cook and Rodríguez 1975]). This continues the pattern noted for Tezoyuca hilltop sites in the Basin region; they are also just below the main pass through the north-south range that separates the Basin from the Puebla Valley, and thus in very strategic locations. That Cholula is on the southern edge of the Tlaxcala-Puebla survey area suggests, if it was at all centrally located within the region it controlled, that the Cholula polity must have extended to the south outside the surveyed area. The Tlaxcala-Puebla survey area recorded 334 ~Terminal Formative settlements, for a settlement density about one-half that of the Basin of Mexico, and about one-third that of the Oaxaca

Valley region. Researchers estimate the population at 229,560 for the 6000 km^2 examined, and project a total of 319,560 individuals may have lived across the entire 9000 km^2 valley (García Cook and Merino Carrión 1989a:184).

Period I, or the ~Terminal Formative, was when the large Classic centers of Teotihuacán, Cholula, and Monte Albán were urbanizing. Cuicuilco, in the southwestern Basin, was another urbanized center, but it was largely blanketed by a lava flow, and removed from competition. Populations increased substantially across the Basin and Puebla-Tlaxcala regions, yet decreased slightly in the Oaxaca Valley and Mixteca Alta. All big three regions, as well as the Puebla-Tlaxcala region, had fortified and defensible sites in greater numbers than in previous periods, suggesting this was a time of instability and disruption. Rank II centers, based on population, were scattered throughout all regions except for the Amatzinac Valley, and were especially dense in the Mixteca Alta region.

Period L (~Early Classic)

Period L corresponds to the ~Early Classic in the Basin and Monte Albán IIIA in the Oaxaca Valley region. Teotihuacán was so populous that no other sites in the Basin region had a large enough population to be high-ranked, either based on population (Figure 7-16) or settlement size (Figure 7-17). Indeed, the second largest center in the Basin region, based on these survey data, had an average CALC POP of only 1418, or less than one-tenth that of Teotihuacán. Sanders et al. (1979) map 11 centers in the tier below Teotihuacán—see Map 14, Middle Horizon, although this map portrays Late Xolalpan occupation (Sanders et al. 1979:108), or my period O—three in the Teotihuacán Valley, three in the northwestern Basin, three along the foot of the Guadalupe Range, and two on opposite sites of Lake Texcoco. While they plot numerous Middle Horizon sites around Lakes Xochimilco and Chalco in the southern Basin, they considered none of them Late Xolalpan centers.

The Tula region had a Rank III center, Chingú, which has been described as both Teotihuacán's trading partner (Diehl 1989:15) that supplied Teotihuacán with lime and

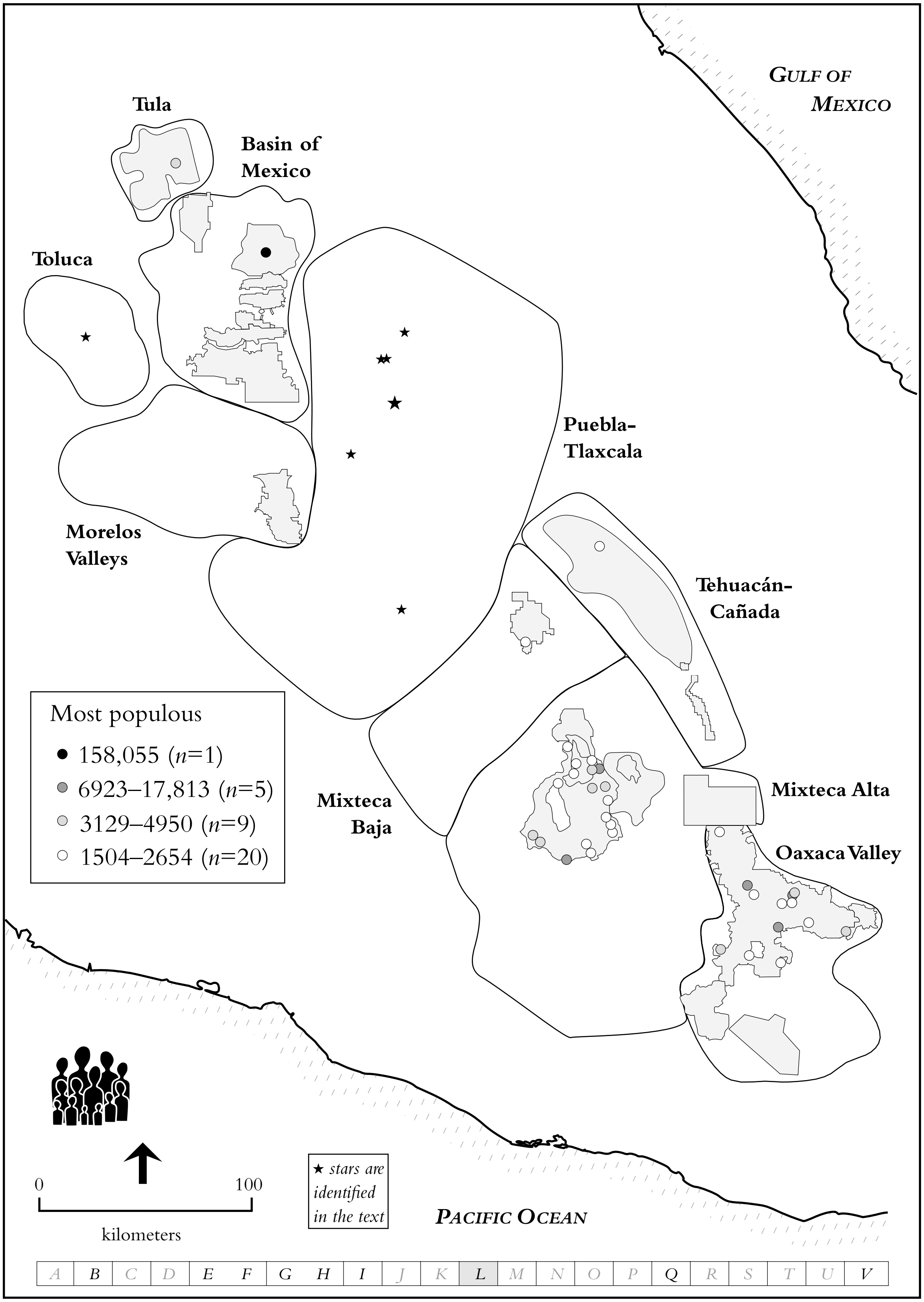


Figure 7-16. Most populous period L settlements based on average CALC POP (*n*=35 of the 2338 period L settlements), in four ranks.

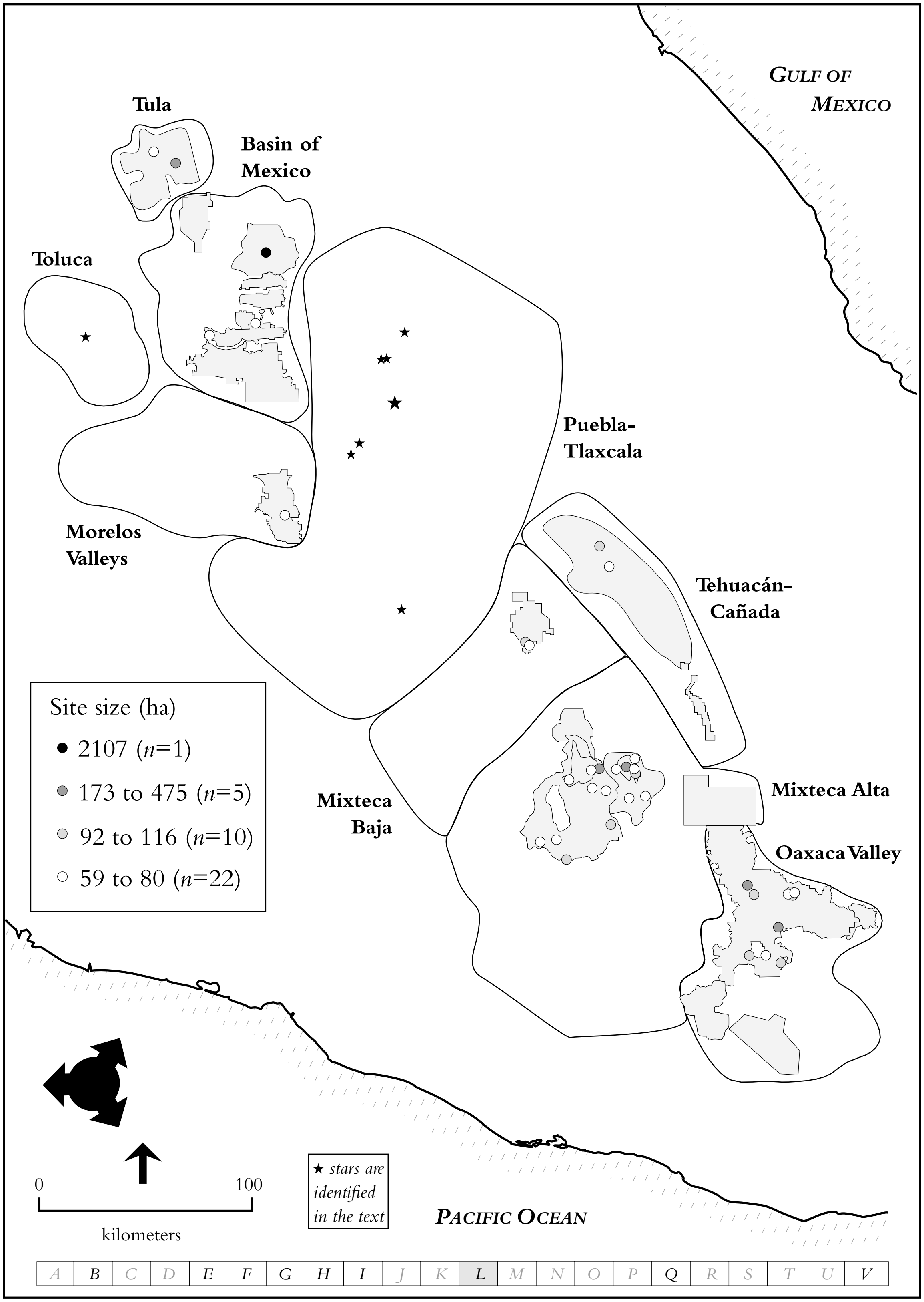


Figure 7-17. Period L settlements larger than 59 ha (*n*=38 of the 2338 period L sites), in four ranks.

food products (Díaz Oyarzabal 1981:110), and as a secondary center established by Teotihuacán (Marcus 1998a:72). Chingú is Rank II in size (254 ha), with a Rank IV 80 ha center (Julián Villagrán) only 10 km distant. Chingú had Oaxacan-influenced pottery on one mound, however, and was itself a ceramic production center (Díaz Oyarzabal 1981:108), suggesting it had far-flung contacts or a foreign barrio similar to those recorded at Teotihuacán. If Chingú was a secondary center within the Teotihuacán system, it was much larger and had more civic-ceremonial architecture than any contemporaneous center in the eastern Basin of Mexico.

In a somewhat earlier and less complete report than referenced in the above ~Formative discussions, García Cook (1981:263) notes that the Tlaxcala-Puebla survey area shows a declining population in the Late Tenanyecac, which is contemporaneous with period L. He says there were only 10 large cities, three of them fortified, and a total of about 200 settlements; at the same time, groups from the Mixteca Baja and Gulf Coast immigrated into the region (1981:264). The Tenanyecac settlements occupied an elongated area north of Malinche mostly in the state of Tlaxcala, between settlements to the north with Teotihuacán-style artifacts, and those to the south with Cholula-style materials (García Cook 1981:268). García Cook (1981:269) describes the northern Tlaxcala-Puebla Valley peoples as organized into smaller polities that were subordinate to Teotihuacán in the ~Early Classic. Perhaps the fortified site of Tetepetla (lone star), in the northern survey area on the escarpment above modern Tlaxcala (García Cook and Mora López 1974), lay along the Puebla-Teotihuacán boundary. Cholula (large star) dominated the central Puebla Valley area, and the sites of Xochitecatl and Cacaxtla (adjacent stars) were also important centers. Southwest of Cholula, excavations at the 8 ha Hacienda San Lorenzo site (starred), found plenty of Teotihuacán ceramics, disproportionate to the size of the settlement. Plunket and Blanco (1989) postulate that this site, although only a small village having at least six mounds and two plazas, administered and maintained a Teotihuacáno trade route.

The southern Puebla-Tlaxcala region has only been preliminarily surveyed and reported (García Cook and Merino Carrión 1989b); however, it has a large fortified settlement in the Piaxtla–Chinantla area, called El Cuanextle (starred). Other settlements across this rugged area in southern Puebla range in size from *pueblos* to *estancias*.

Hirth (1980:67, 70) noted a great increase in the numbers of small settlements in the southern Amatzinac survey area in this period, a pattern he interprets as dispersing farmers to increase agricultural production. These villages were administered through larger communities, all subordinate to Teotihuacán. The role of Teotihuacán as overlord to this area is reflected in the presence of Thin Orange pottery, a Teotihuacán hallmark, on virtually every ~Early Classic site. Indeed, the Amatzinac area had more Thin Orange than the western Morelos Valleys region and the Tlaxcala-Puebla Valley to the northeast (Hirth 1980:70), and may have been settled in part by immigrants from the Basin of Mexico (Hirth 1980:73).

Following a two-century period in which the Toluca Valley was abandoned, in Early Tlamimilolpa, or period L, 19 new settlements were occupied (González de la Vara 1999:122–123), with the largest starred in the Figures. Its ~Early Classic size is unreported, but in period M it had grown to 103 ha.

The Tehuacán-Cañada region had one Rank IV center in the ~Early Classic period L, and the lowest population densities of all seven regions for which I have systematic survey data. Thus, the region seems to have been relatively depopulated, although this may only be a reflection of how I estimated the populations. The region had fortified centers and sites in defensible locations, and the ceramics changed from being more similar to those of Monte Albán to being more similar to those of the Puebla Valley and Teotihuacán (Drennan 1997:55).

The Tequixtepec survey area in the Mixteca Baja also seems to have been depopulated in the ~Early Classic; that survey area, however, may be on the edge of a regional core more central to the region. The Mixteca Baja peoples could also have been organized into smaller polities, with none of those polity centers being large enough to rank high in this multi-regional analysis.

In the Mixteca Alta, Rank II centers were Yanhuitlán and Yucuñudahui, hilltop sites about 3.5 km apart in the northern Nochixtlán Valley. The region also has a Rank II center at the southern edge of the Achiutla survey area, and two Rank III centers clustered above modern Tlaxiaco in the southwest corner of the Achiutla survey area. The largest community in the Huamelulpan survey area was the fading Huamelulpan itself, which was 45 ha in size, and would have been below Rank IV in this macroregional ranking of largest settlements. The Peñoles survey area had many Classic period sites, generally long skinny settlements following sinuous narrow ridge crests, with over 20 of them longer than 1 km (Kowalewski 1991:15). Large Peñoles sites had dozens of residential terraces (Smith 1993) , but none of the *lama-bordo* terracing of the Nochixtlán Valley (Spores 1969) and Achiutla (Balkansky et al. 2002) survey areas. Overall, the Mixteca Alta in period L had many small cores, a distinctly different pattern than in the Basin and the Oaxaca Valley regions.

The Oaxaca Valley region had two other Rank II centers, Jalieza and Tlacochahuaya, and the three were relatively evenly spaced around the central valley. Tertiary centers were also at a distance from Monte Albán. Rank IV centers were sometimes clustered; the largest cluster was around Tlacochahuaya. Ranked centers in the Oaxaca Valley region however, are not as densely clustered as in the Mixteca Alta region. This same peer-polity pattern also seems to have been true for the northern Puebla-Tlaxcala region. If, however, we remove the special status allocated to Monte Albán because of its civic-ceremonial architecture, the Oaxaca Valley region exhibits the peer-polity pattern, too (Balkansky et al. 2002). This pattern may also have been adopted by the inhabitants of the Tehuacán-Cañada and Mixteca Baja regions.

Across the Mesoamerican highlands, we see two different settlement patterns in ~Early Classic period L: one is of larger centers dominating fairly large regions, as did

Teotihuacán and Monte Albán; the second pattern is of smaller centers dominating smaller regions, or resembling a peer-polity pattern, as evidenced in the Puebla-Tlaxcala and Mixteca Alta regions (and perhaps the Mixteca Baja). Macroregionally, Monte Albán was the largest Rank II center in these surveys, but it was dwarfed in size by the Rank I Teotihuacán, which was almost nine times more populous than Monte Albán.

Period Q (~Epiclassic)

Overall, population decreased significantly from the ~Early Classic to the ~Epiclassic, and the patterns of populous centers shifted as well, although the sites of Teotihuacán and Monte Albán remained large enough that both are among the most populous settlements (Figures 7-18 and 7-19). Teotihuacán was still a Rank I site, along with other centers, but Monte Albán fell to be the smallest Rank II settlement. Each of the big three regions had a Rank I center, however, and all Rank I centers had been populous centers in the ~Early Classic. Note that the smallest Rank III most populous center had approximately 5–8 percent of the population of the Rank I centers, so the ranked settlements shown in the Figures encompass a large range in populations.

In contrast to the ~Early Classic, the Basin of Mexico in the ~Epiclassic had smaller centers spaced about the eastern Basin, with more in the Texcoco area than the southern Basin. The largest of these centers was only about half the size of Teotihuacán, which remained populous. Perhaps the Basin region was falling into the same peer-polity pattern that developed in other regions in the ~Early Classic.

To the northwest, Tula became a Rank II center. Unfortunately, I do not have contemporaneous Tula area survey data to better describe the demographics of that region.

The larger Mixteca Alta settlements of period Q clustered in the Nochixtlán and Tamazulapan Valleys, but the mountainous portions of the Achiutla survey area lost all high-ranked population centers. In the southwestern Nochixtlán Valley, the Rank IV settlement is at Tilantongo, which is described in ethnohistoric materials as having a long occupation (Byland 1994; Byland and Pohl 1990, 1994).

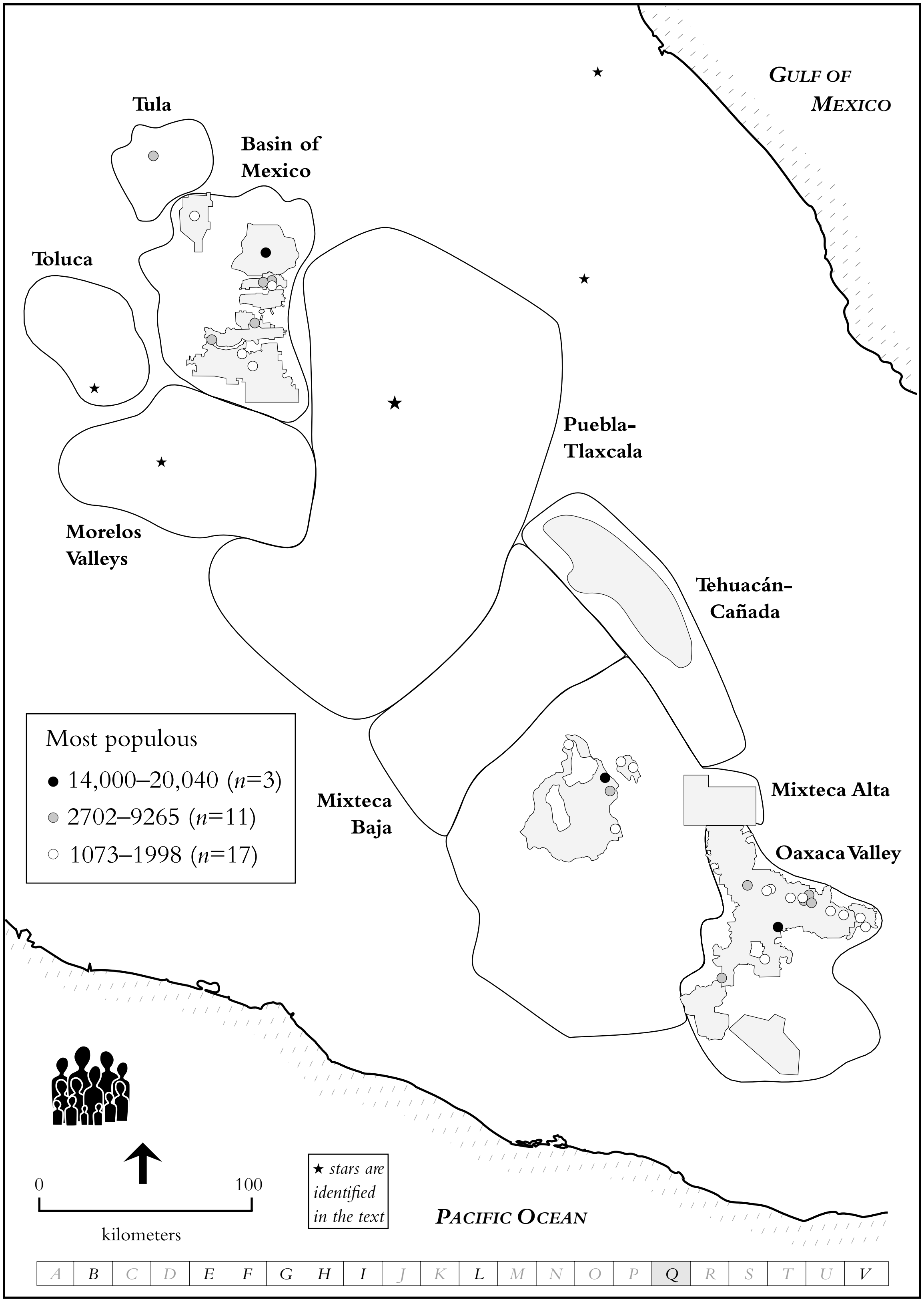


Figure 7-18. Most populous period Q settlements based on average CALC POP (*n*=31 of the 992 period Q sites), in four ranks.

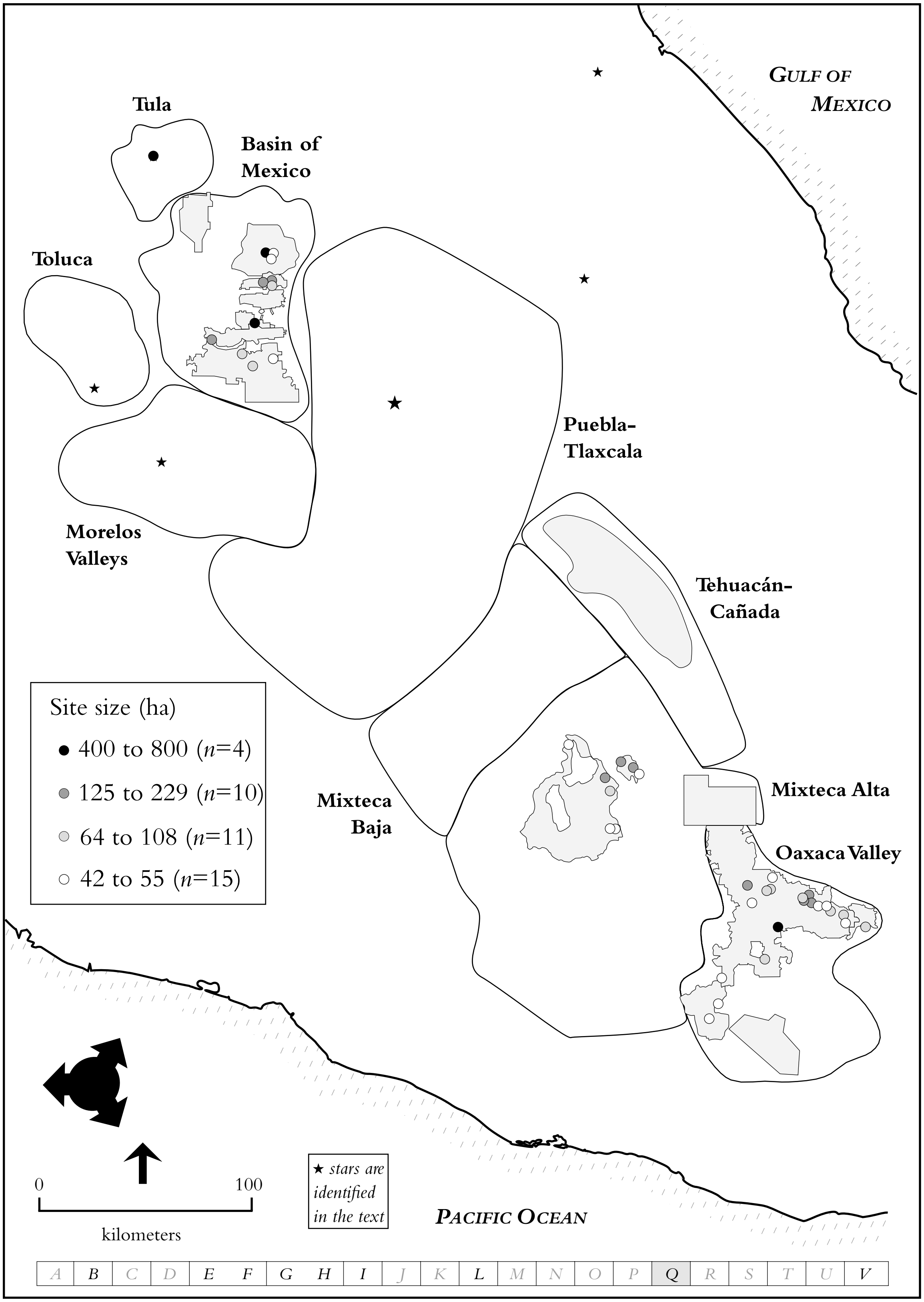


Figure 7-19. Locations of period Q sites larger than 42 ha (n=40 of the 992 period Q sites), in four ranks.

Preliminary data from the Peñoles survey area suggest that a group of Late Classic settlements may have continued to be occupied in the mountains just west of Monte Albán (Kowalewski 1991:16), although final analysis may alter this interpretation.

The Oaxaca Valley region centers were dispersed around the valley, except for a prominent cluster that included Lambityeco, Macuilxochitl, and other relatively large settlements. Although there was an overall pattern of dispersed centers, the eastern arm of the valley had more large settlements, especially along its northern edge.

The period Q ~Epiclassic had much lower population and settlement density than in the ~Early Classic, and a general pattern of dispersed centers, signaling a reorganization of previously less-occupied areas, and a continuation of the peer-polity patterns that were evident in some regions in the ~Early Classic. This pattern shifted again in the ~Late Postclassic period V.

Period V (~Late Postclassic)

For the survey areas in this database, the demographic center of gravity was in the Basin of Mexico (Figures 7-20 and 7-21), with a Rank I site in terms of population at Texcoco, and a scatter of nearby centers. Five Rank II centers dominated the eastern edge of the Basin and the Teotihuacán Valley (including Teotihuacán). Map 18, Late Horizon, from the collection of Basin settlement maps published by Sanders et al. (1979), relies on both archaeological and ethnohistoric data, and shows settlements peppering the entire Basin. The large star in the Basin is Tenochtitlán, and the star to the west is Tlacopan. The large star in the Puebla-Tlaxcala region is Cholula, and the smaller one to the north is Tizatlán, the palace of a ruler of ethnohistoric Tlaxcala (García Cook and Merino Carrión 1996).

Yanhuitlán (Cerro Jazmín), in the Mixteca Alta, was twice the size of the next largest centers in my database in terms of population in period V, although not in terms of area; thus is it the sole Rank I settlement. Yanhuitlán was not the only center in the Mixteca Alta region, but the next largest centers were only Rank III, with the largest only about

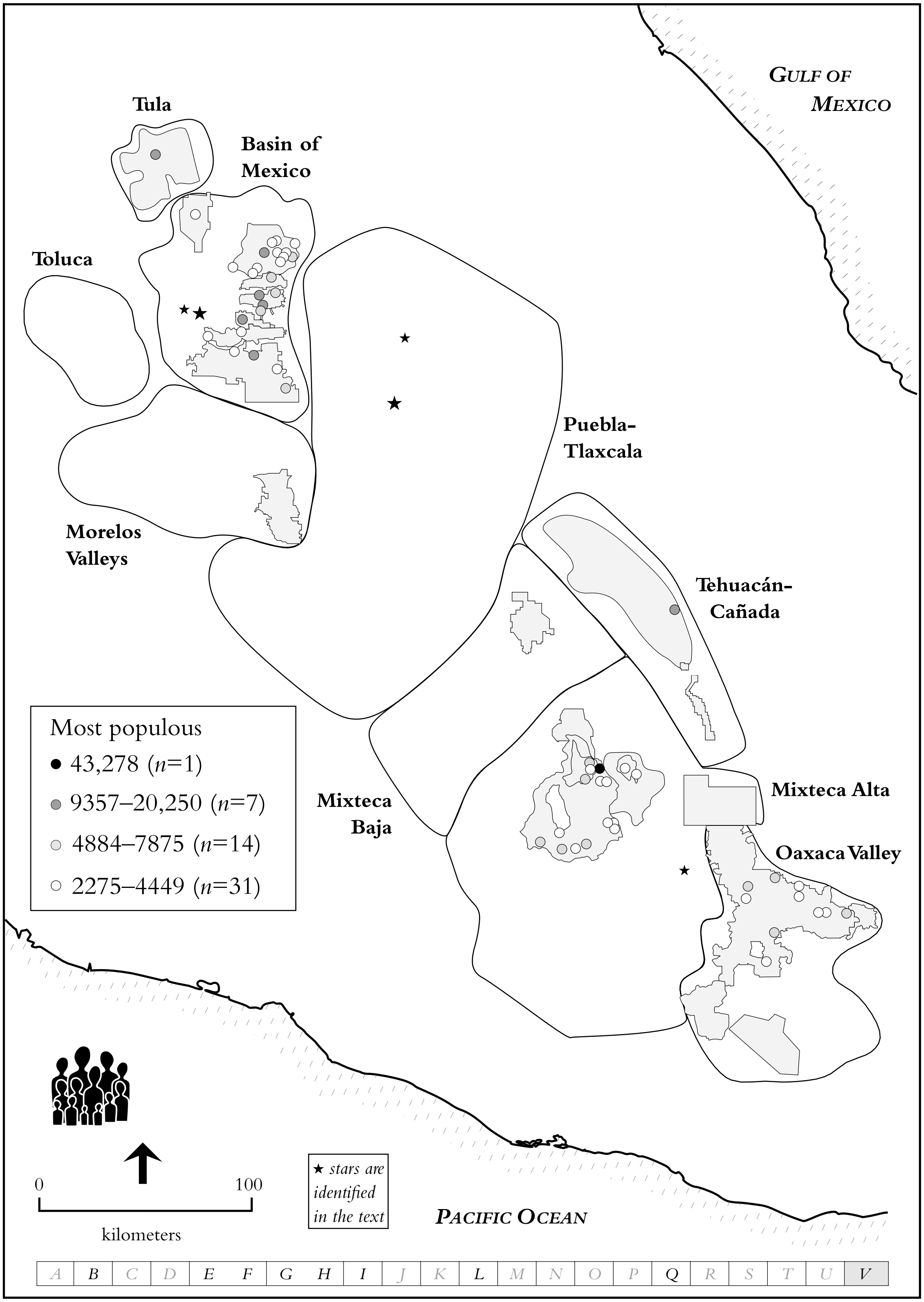


Figure 7-20. Most populous period V settlements based on average CALC POP (*n*=53 of the 5246 period V sites), in four ranks.

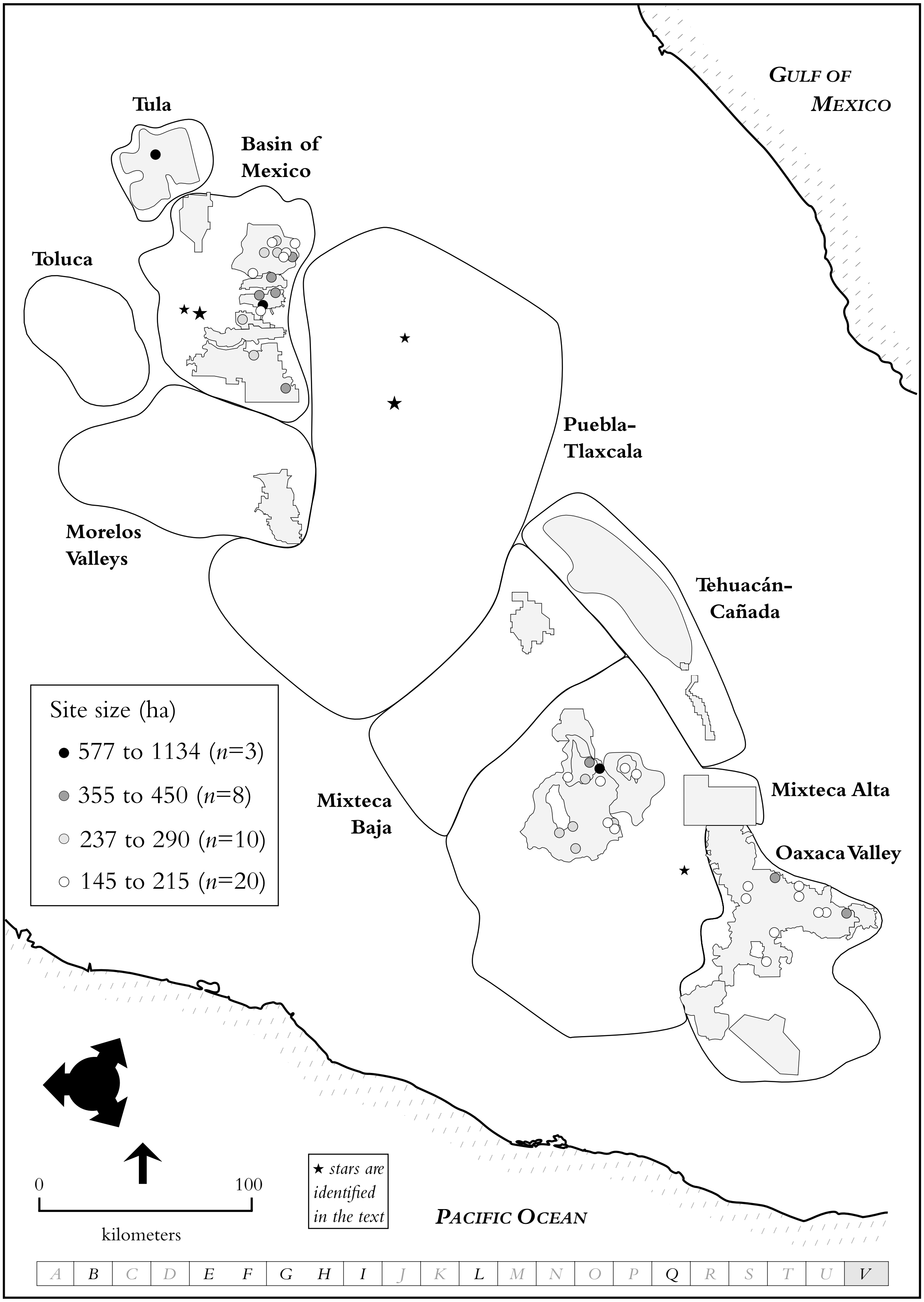


Figure 7-21. Period V settlements 145 ha and larger (₸41 of the 5246 period V sites), in four ranks.

18 percent of Yanhuitlán's population. Again, as happened in some earlier periods, lower ranking centers dominated the southern edge of the Achiutla survey area.

The Peñoles survey area included a major cluster of settlements around Ixquintepec (Finsten 1996; Kowalewski 1991; Smith 1993) in the eastern Mixteca Alta region, starred on the maps. Postclassic settlements continued to be along the narrow ridges characteristic of the area, and 15 were longer than 2 km, with Ixquintepec about 3.6 km long. Several other population-rich settlement clusters were identified in the Peñoles area. Kowalewski (1991:17) estimates the Peñoles Postclassic population was 5000–15,000.

Tula was a major center in periods R, S, and T, apparently commanding a large region. Its ethnohistoric name is Tollan, and it was the principal city of the Toltecs. Its regional dominance continued in the ~Late Postclassic.

The Tehuacán-Cañada region had a Rank II center at the multi-mound site of Teotitlán del Camino (starred). This relatively arid region may have engaged in long-distance trade with communities on the Gulf Coast, and some resource extraction and raw material processing.

Although the Tequixtepec survey area had more ~Late Postclassic settlements than those dating to the ~Early Classic, its estimated population dropped about 25 percent, from 10,943 to 8150. Based on this small portion of the Mixteca Baja, populations dropped in that region, unlike the other regions. On the other hand, the survey area may just be a depopulated area within the Mixteca Baja. We must also acknowledge these factors with respect to the Tequixtepec data: site areas are only rarely given as different for different periods—thus poorly reflecting change over time, plus I used a constant population density multiplier, as the Tequixtepec population estimates are unpublished.

The Amatzinac survey area did not have any sites large enough to register on this multi-regional ranking, either. Its population, unlike that of Tequixtepec, increased by just over one-third (from 5864 to 9329) in the ~Late Postclassic, although the settlement count dropped by almost 30 percent (from 103 in the ~Early Classic to 71 in the ~Late Postclassic period V).

For the ~Late Postclassic we can augment our archaeological data, albeit judiciously, with colonial and precolonial settlement information. Both data streams show patterns of large urbanized settlements rather densely clustered in the Basin of Mexico, with the largest centers at Tenochtitlán (large star), Tlacopan on the western shore of Lake Texcoco (small star), and the city of Texcoco, on the eastern side of Lake Texcoco. Tenochtitlán was the Mexica capital built atop a manufactured island in western Lake Texcoco (the central civic-ceremonial architecture is under and around the Plaza Mayor and cathedral of modern Mexico City). By A.D. 1430, the polities headed by these three cities joined to form the Triple Alliance, which lasted just under a century, its trajectory turned abruptly by the arrival of Spanish plunderers and priests in 1519. The Triple Alliance organized much of the highlands not only politically, but also economically, since it obtained tribute from both nearby and far-flung provinces. Blanton (1996:49) describes the tribute and market system as encouraging craft production in areas more marginal for agricultural intensification (analogous to the production optimization obtained by development of cottage industries in northern Europe), as well as extracting locally produced resources, goods, and foodstuffs.

The Amatzinac survey area lies almost entirely in the Huaxtepec tribute province; the Aztecs demanded cotton, maguey, cacao, rock crystal, lime, paper, slaves, warriors, and captives for sacrifice from Huaxtepec (Berdan 1996:127, 130), suggesting Huaxtepec fit the cottage industry model. In a strategic move, the Aztec core also demanded non-local items (Berdan and Smith 1996:210), which forced tributary provinces to trade among themselves and with areas not yet incorporated into the Aztec system, and enhanced stability.

The small polities of the Postclassic equate with tribute provinces or portions of them, and have been referred to as *señoríos* (e.g., Hodge 1996), *cacicazgos* (e.g., Redmond and Spencer 1994), petty kingdoms (e.g., Kowalewski 1990), and "local ethnic states" (Terraciano 2001:24). These polities generally included several communities, with royalty or high-ranking administrators in the head town and perhaps other principal towns (e.g., Pastor 1987; Spores 1984). This settlement pattern is visible archaeologically in that major centers were scattered across the landscape, and is most pronounced in the rank-size graph for the Oaxaca Valley region in Figure 7-7.

Figure 7-22 shows many ~Late Postclassic named settlements and Aztec provinces mapped by Smith and Berdan (1996) and Hodge (1996:18), plotted against a backdrop of the survey areas used in this database. These are not by any means all the known named settlements. Comparing the archaeological and the historical data in Figures 7-20 and 7-22, we see more historically known settlements in the Tula and Morelos Valleys regions than were large enough to be high-ranked and mapped here. Settlement in these regions often continued in the same places after the conquest; thus, sometimes prehispanic communities were not recorded archaeologically because they are beneath modern occupations, and therefore difficult or impossible to survey (and I did not include them in this archaeologically oriented database).

Five unconquered zones are of special interest here; they are evident in gaps in the provincial outlines in Figure 7-22. The largest was Tlaxcala, the Aztec's eastern neighbor. To the north was the Metztitlán Valley, separated from the Basin by a narrow but rugged mountain chain. The Tehuacán Valley also remained separate from the Aztec empire. Along the Pacific coast, even more distant and farther across rugged terrain, were the Tututepec empire and the Yope polity. Precolonial Tlaxcala was not part of the Aztec empire, and the two groups were enemies. Indeed, the Tlaxcalans allied with the Spanish after several decisive battlefield defeats. Xicoténcatl, a Tlacalan ruler, received Cortés at his palace at the site of Tizatlán, just northwest of Tlaxcala. The Tlaxcalans provided important advice, warriors, and intelligence about the Aztec empire that aided the Europeans in their subjugation of Puebla Valley and then Basin of Mexico peoples (Berdan 1982:166–167). A sec-

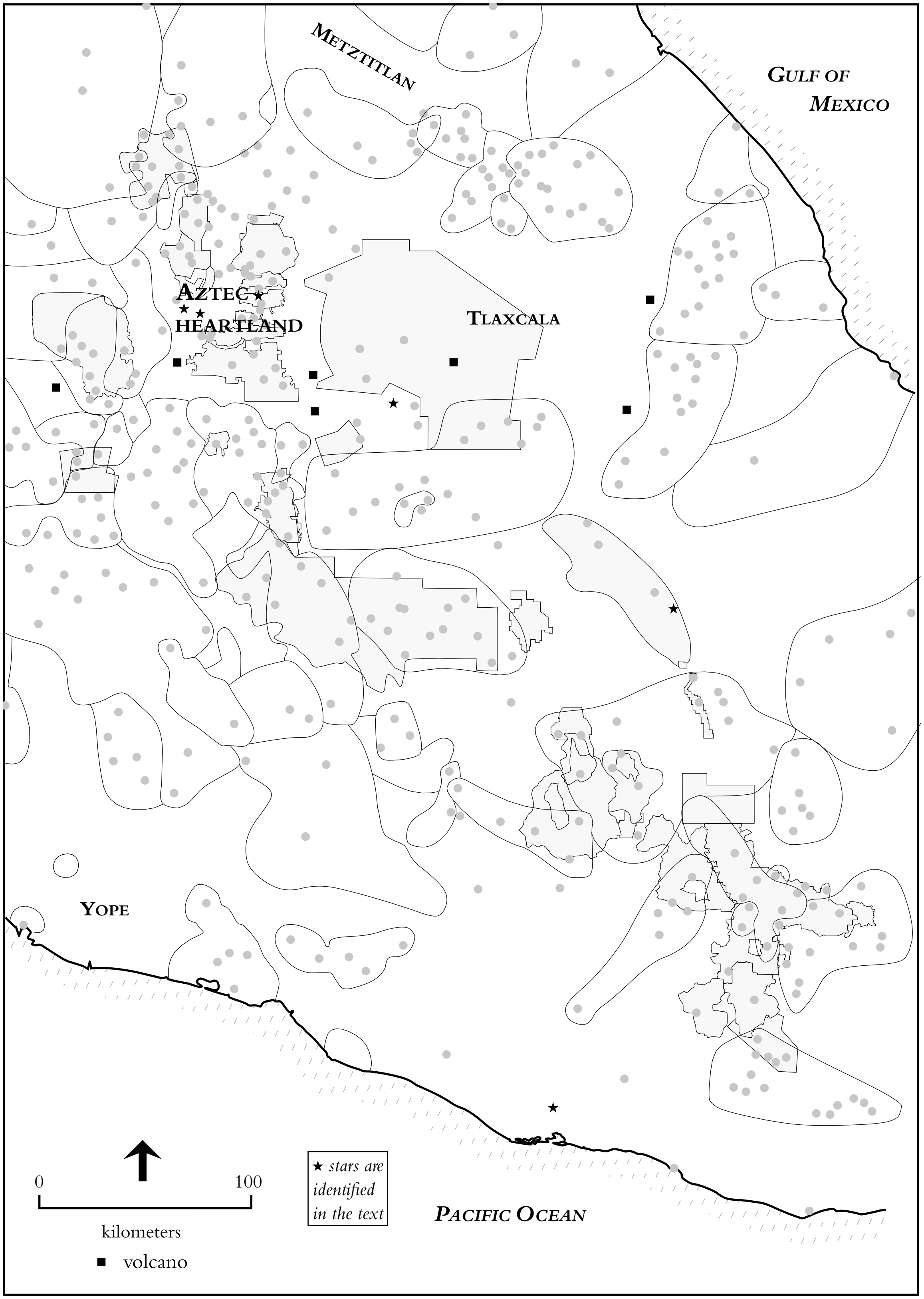


Figure 7-22. Aztec provinces and some towns known historically (central province sites from Hodge 1996:18; province boundaries and settlements from Smith and Berdan 1996).

ond independent area was the Metztitlán Valley, which had few resources of interest to the Aztecs, and was fairly easy to defend (Smith 1996:141), and the groups there successfully maintained independence from the Aztecs. The third area includes what Barlow (1949) has called the Teotitlán del Camino *señorío* (Berdan et al. 1996:113). Teotitlán del Camino (starred on Figure 7-22) is the Rank II settlement in the Tehuacán-Cañada region in Figure 7-20. The dearth of archaeologically known, large settlements in period V in the Tehuacán Valley and Tequixtepec survey areas are consistent with the ethnohistorical data in Figure 7-22. The Coayxtlahuacan province, which encompassed the Nochixtlán Valley and Cuicatlán Cañada, had been allied with Tlaxcala for several hundred years and possibly had been settled by Tlaxcalan and Pueblan immigrants (Pohl 1994:103). It managed to remain independent of the Aztecs. The fourth unconquered zone lies south of the Mixteca Alta and southwest of the Oaxaca Valley region; its center was Tututepec (starred). Tututepec had tributary provinces from which it obtained cloth, minerals, servants, and slaves (Spores 1993:171). Spores (1993:170) describes the Tututepec empire as less-centralized than the Aztec empire, as it was more compact. Certainly, travel was more difficult in the higher elevations of the Tututepec region due to the rugged terrain. Perhaps its distance from the Aztec heartland and the difficulty of travel across intervening mountains was a factor in Tututepec's continued independence. Farther west along the Pacific Coast was the Yope (Yopi) territory, outside the study area; it includes modern Acapulco, on the west edge of Figure 7-22. The Yope *señorío* remained independent of both Aztecs and Mixtecs in the fifteenth century, although its inhabitants included many Náhuatl speakers (Dehouve 1994:37); today many residents are Chatino-speakers (Romero Frizzi 1996:37–38).

The Puebla-Tlaxcala region also seems to have included larger and smaller centers along with rural communities; Cholula is starred in Figure 7-22. García Cook (1981:275) notes that there were differences within the Tlaxcala-Puebla Valley sites, which he correlates with historically mentioned polities. Plunket's (1990:11–12) work in the Atlixco area shows that two spheres of pottery types exist in the survey area, more or less correlating with the Aztec provincial boundaries indicated on Figure 7-22. Lind (1994b:99), based on the ca. 1560 Cholula codex, notes that the southwestern boundary of the protohistoric Cholula empire cut through the Atlixco area, which matches Plunket's archaeological data.

Although the ~Late Postclassic communities of the Cuicatlán Cañada were too small to be ranked, the head town of the Cuicatec cacicazgo had a population of just over 1000 people (Redmond and Spencer 1994:219). It had been conquered by the Aztecs by 1470 (Redmond and Spencer 1994:217) and sent cloth and cacao, among other products, for tribute, with the cacao obtained by trade, rather than being produced within the Cañada (Redmond and Spencer 1994:216).

Settlement patterns in the Oaxaca Valley and Mixteca Alta regions are consistent with our understanding of the cacicazgos that thrived there in the ~Late Postclassic. They included people who spoke languages from various linguistic groups. Oaxaca Valley and Mixteca Alta elites traded in exotic goods including polychrome ceramics, yet most people were subsistence farmers.

The entire Basin of Mexico may have had 1,000,000 people in the ~Late Postclassic (see population estimate comparisons below). The region had intensive agriculture, including *chinampas* along the lake edges especially near Texcoco and extensive irrigation systems and agricultural terracing that produced food and materials to support this massive resident population, which was not again matched until the mid-1900s (Blanton et al. 1993:153). Perhaps relocating a huge urban population to artificial land in Lake Texcoco, at Tenochtitlán (Calnek 1976) and its paired market center of Tlatelolco (González Rul 1996), helped reduce settlement on the fine, productive lands between the lake edge and the mountain slopes encircling the Basin.

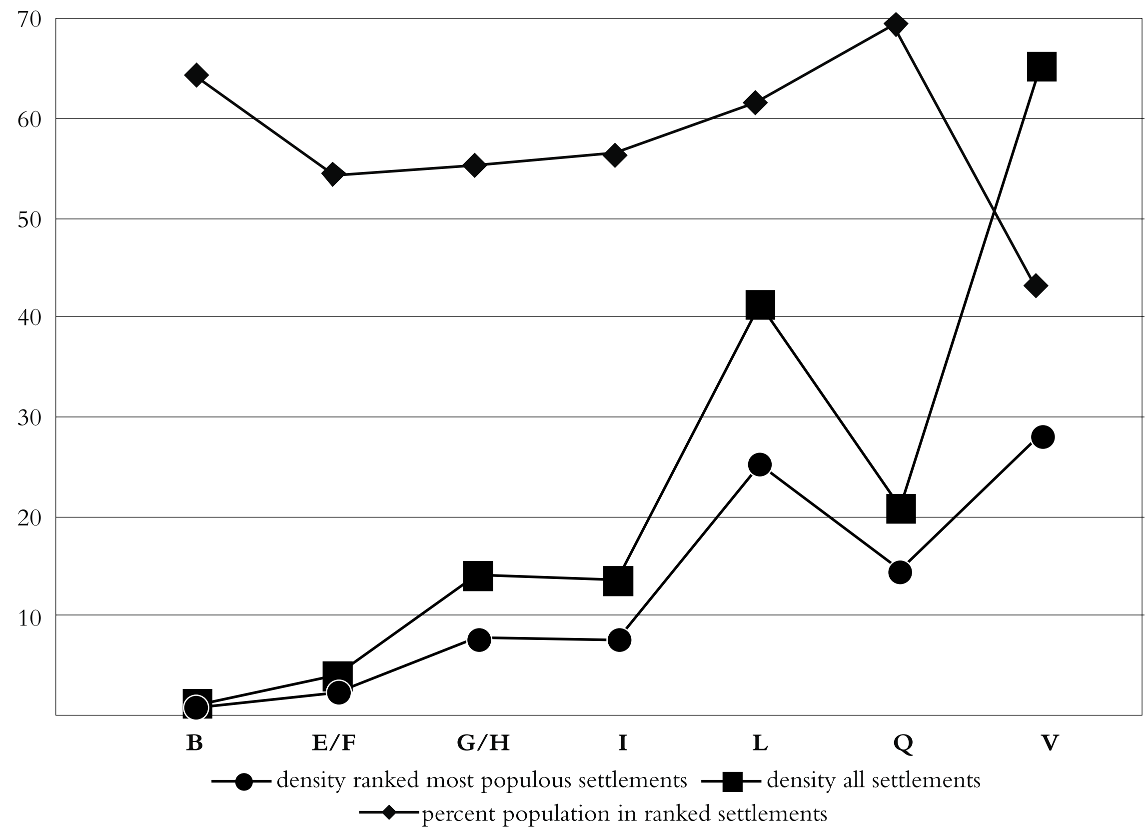
In sum, diversity was the hallmark of the ~Late Postclassic, in settlement patterns as well as land tenure and marketing (Smith and Hodge 1994:28). Overall, the period V pattern is one of much higher populations than any previous period, yet without the huge primate centers of the ~Early Classic (except for Tenochtitlán, which is not in the database), meaning substantial numbers of people lived in large- and mid-sized settlements as well as small farming villages. With the farmers dispersed in small settlements near the fields, the agricultural system was more efficient (Drennan 1988:285). The archaeological data suggest a very different sociopolitical organization in the ~Late Postclassic than previous periods, consistent with the pooled pattern noted previously for period V rank-size graphs. Rank II, III, and IV period V centers were more populous than those of period L, with those of Rank III and IV about twice the populations of the period L high-ranked centers. The landscape was one of scattered larger centers and an infilling of smaller, yet populous, settlements.

Most populous settlements: general comparisons

Figure 7-23 includes two graphs that summarize characteristics of the ranked settlements shown in the maps in previous Figures in this section. The diamond line in both graphs is the percentage of the population (using average CALC POP) in the mapped high-ranked settlements.

The upper graph shows the density, or number of people divided the area surveyed, for all settlements (squares), and for the ranked settlements (dots). This graph shows that more than half the total population lived in the ranked settlements. This bolsters the significance of distributions shown in the most populous settlement maps presented above. The two density lines in the upper graph track closely, with a high percentage of the total population in the high-ranked settlements.

The triangle line in the lower graph is the number of ranked settlements per 100 km^2 across the study area. The higher density in periods I and V contrast to period L when there were fewer high-population centers in the Basin of Mexico and Oaxaca Valley regions, which overwhelm the slightly different patterns of the Mixteca Alta region, as well as the other regions, for which data are fewer. The low density of mapped ranked



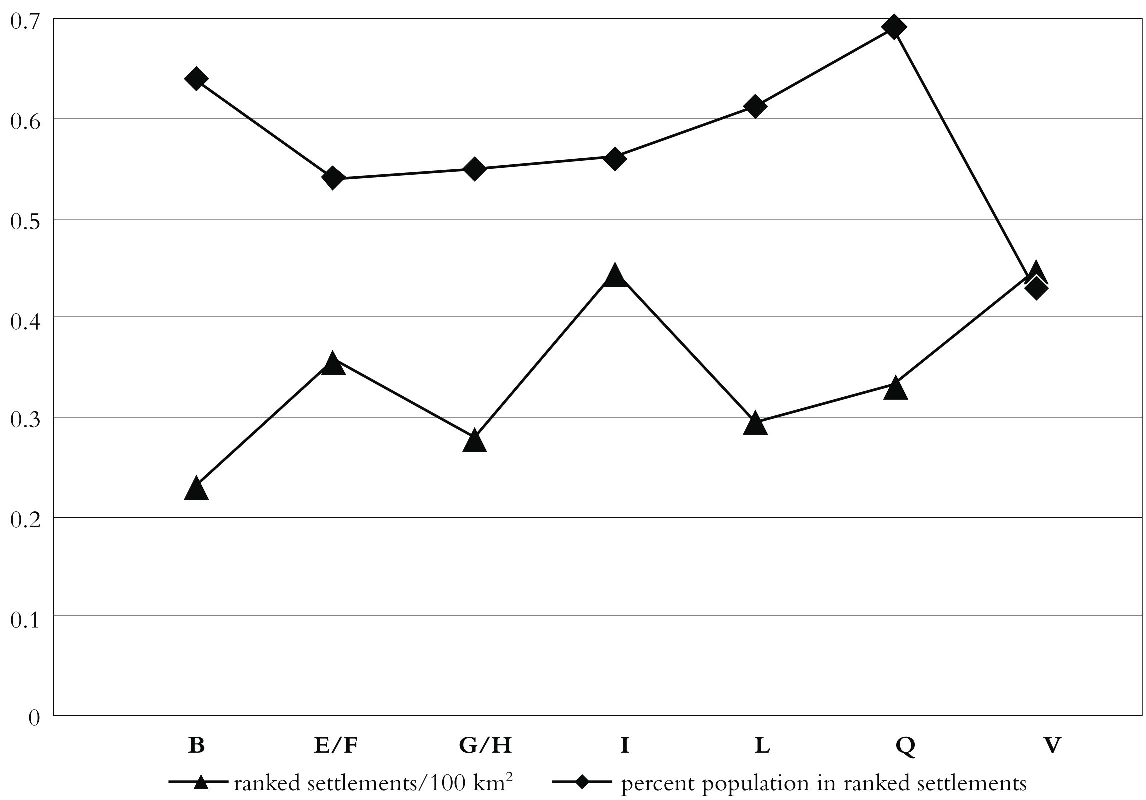


Figure 7-23. Characteristics of most populous settlements shown on maps in this section. Data are for all regions, combined. See text for additional explanation.

settlements in period Q contrasts with the *higher* average site size shown in Figure 7-4. This graph shows that the density of high-ranked settlements varied more over time than the percent of population in them.

Figure 7-24 zeroes in on the diamond plot of Figure 7-23, breaking down the percentage of the population in each rank shown on the maps in this section. The total height of each column matches the percentages shown in the diamond lines. Note the high percentage of population in Rank I centers in period L, matching the ~Early Classic patterns described above. In contrast, in period V, the four ranks of centers have a lower percentage of the entire population, suggesting more mid-range and smaller settlements, which is consistent with the ~Late Postclassic multi-polity pattern. Also in period V, almost identical percentages of the population lived in Rank II to Rank IV centers, indicating the multiple levels of central places of the polities. Note that the progression from period B to I (throughout the ~Formative) is of a decreasing total population across all Rank I centers, although from period E/F to I the percentage of the population in the high-ranked centers remained nearly constant.

In this section, I've presented data on the most populous and largest settlements included in the dataset. I've also plotted the locations of both sets of sites, and discussed the settlement patterns they reveal. I've included in these discussions qualitative data from other regions and sites to flesh out our understanding of settlement patterns and macroregional population dynamics in the Mesoamerican highlands. In the next two sections, I discuss the ends of the settlement hierarchy—the largest, most populous settlements and the smallest, least populous settlements.

Large-settlement dynamics

Having analyzed settlement systems and aggregate populations above, including rank-size analysis, this section examines the settlements that comprise the top of the rank-size graph. The largest settlements are those that contribute the most people to the settlement hierarchy, and are thus very important to understanding regional demographics, and shifts

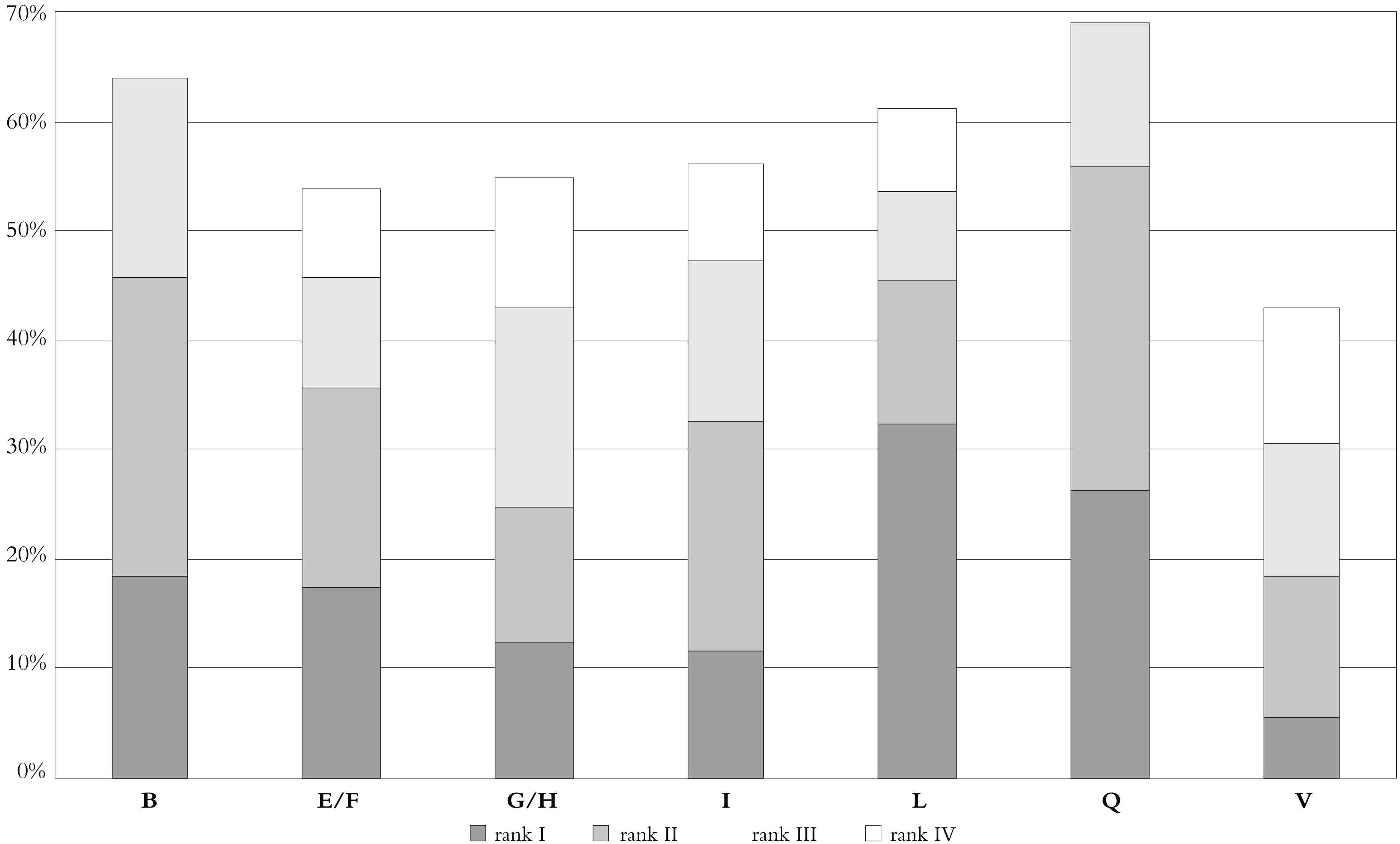


Figure 7-24. Percent population in ranked settlements shown on maps in this section, by rank. Column heights match diamond plots in Figure 7-23. See text for more explanation.

in social organization. This section includes discussion of large-settlement population histograms, urbanization, and population density.

Histograms

Figure 7-25 shows population histograms for settlements with populations of 500 or more, based on average CALC POP. The much larger populations of the Basin of Mexico, Mixteca Alta, and Oaxaca Valley regions—the big three—dwarf those of the other four regions, all of which have somewhat compromised population estimates (mostly lacking population density variation, as the authors generally did not make estimates, and I used an unvarying density of 10–25 persons/ha; see Chapter 4). To highlight these three regions, I've made a second graphic with just the histograms of the big three regions, the Basin of Mexico, Mixteca Alta, and Oaxaca Valley regions—Figure 7-26. Note that, in contrast to the previous section which discussed the largest and most populous settlements when compared macroregionally, in these histograms the data are from a single region, allowing interregional comparison, as well as comparison of change over time (because there's a separate histogram for each period).

At first glance, it can be difficult to grasp what a set of population histograms like those in Figure 7-25 shows. The vertical, x-axis, is the number of settlements, and the maximum, reached in the first column of period V Mixteca Alta, is 50. The y-axis is broken into discrete population ranges, based on average CALC POP (see Chapter 4). These histograms focus on large settlements, those with populations of 1000 or more. For comparison, I have added the somewhat smaller range of 500–1000. Thus, from left to right, the population ranges are: 501–1000, 1001–2500, 2501–5000, 5001–10,000, and above 10,000. In sum, the left column of each histogram shows the number of settlements with a population of between 501 and 1000 individuals, the second column shows the number of settlements with a population between 1001 and 2500 individuals, etc. (Note that in the next section I discuss urbanization, defined as settlements with greater than 1000 population.) In addition, those shown to be primate in the rank-size analysis in Figure

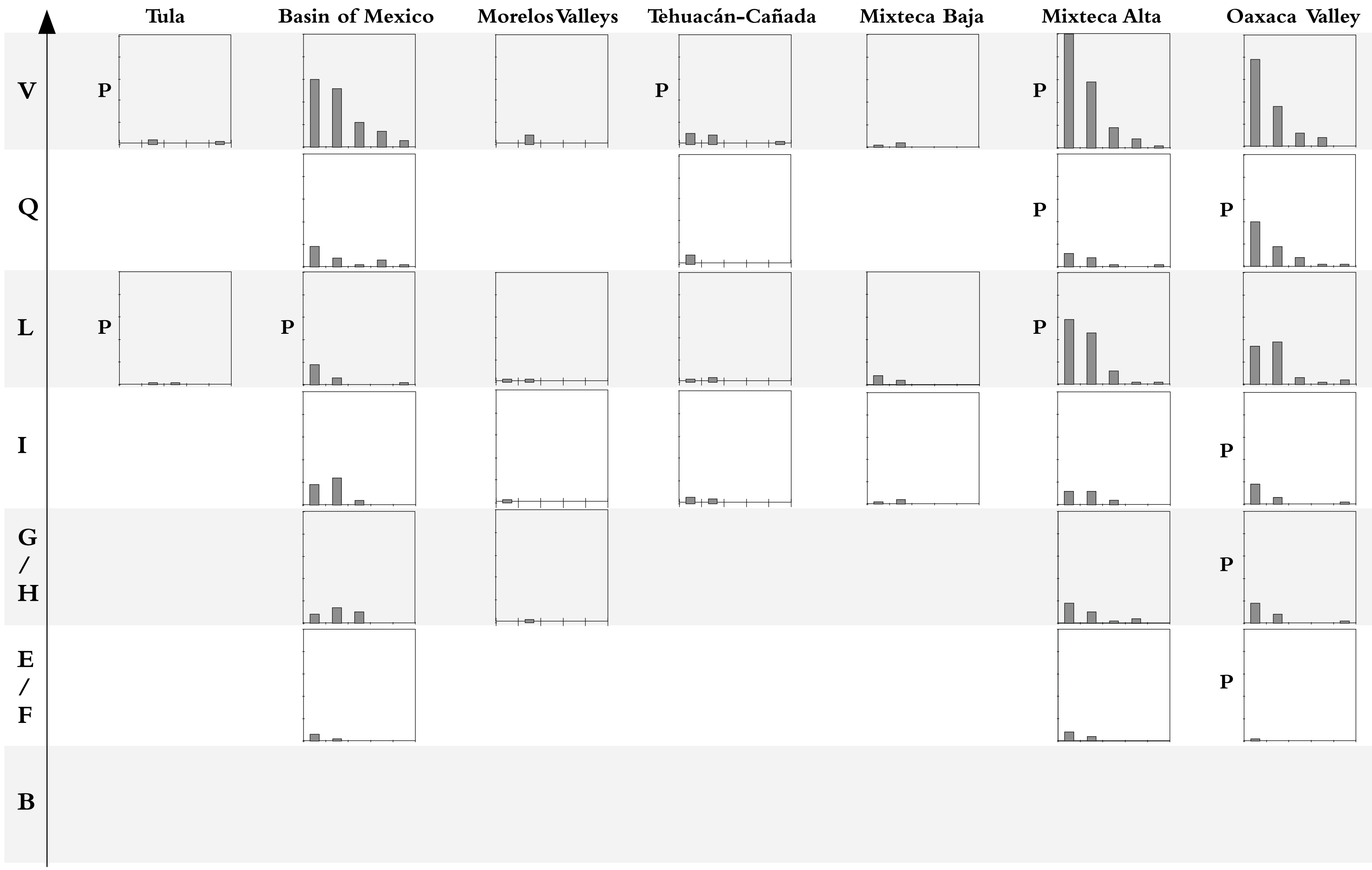


Figure 7-25. Population histograms for settlements with 501 or more inhabitants. The *y*-axis maximum is 50 settlements. *X*-axis is in these population ranges, from left: 501–1000, 1001–2500, 2501–5000, 5001–10,000, and above 10,000. See text for more explanation.

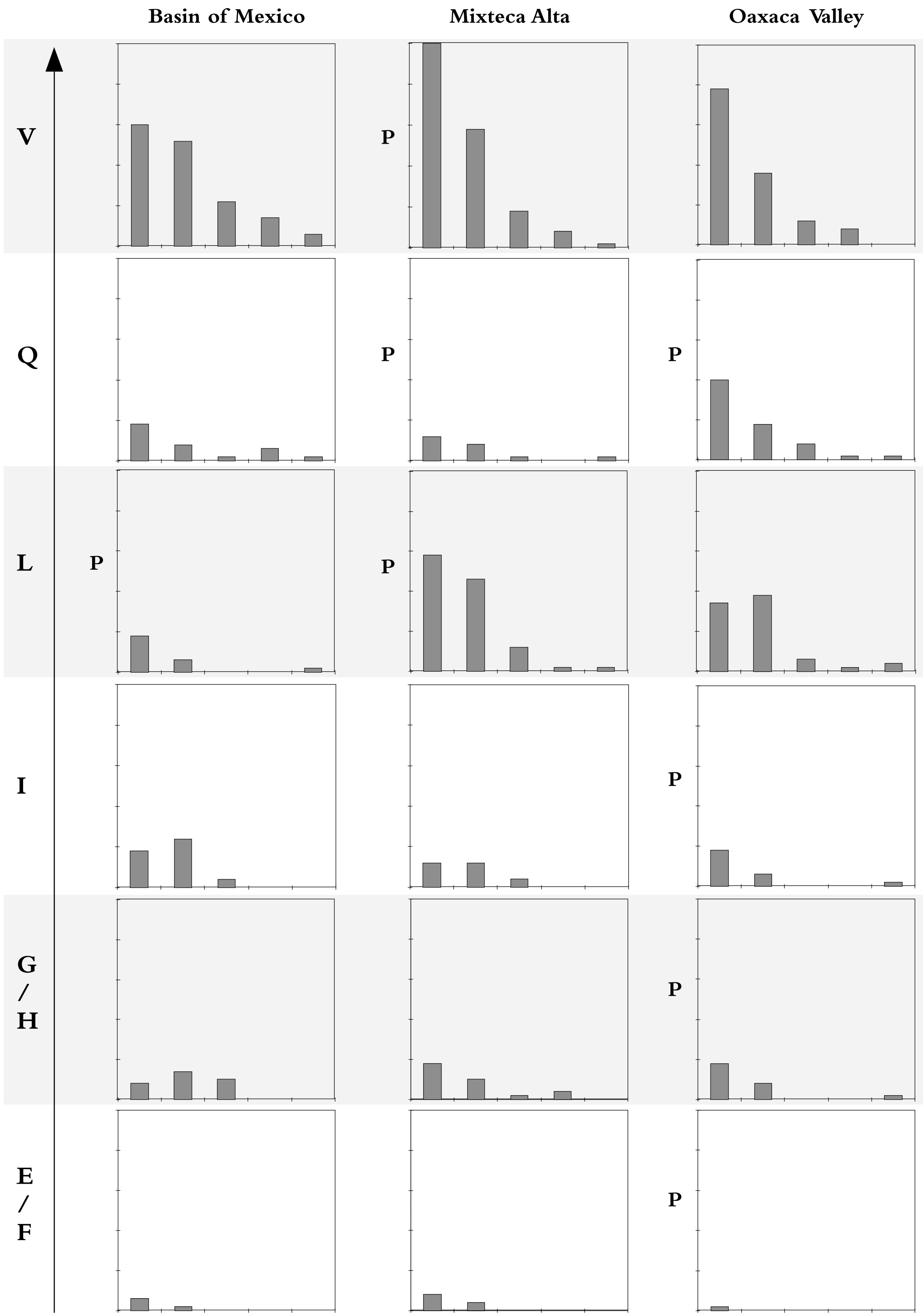


Figure 7-26. Population histograms for large settlements with 501 or more inhabitants, the big three regions only. See text for more explanation; compare to Figure 7-25.

7-7 are marked with a "P;" the primate settlement is often in its own group in a column to the right. The histograms are arranged by period, with the earliest at the bottom of the graphic, with time marching upwards. The histograms of each region are in each column.

What do these Figures show? I begin by discussing the earliest period and move forward in time. In the ~Early Formative period B, no settlements in any region, based on data from the 11 surveys for which I have period B population data, had populations over 500 individuals. Had I analyzed settlement clusters rather than individual sites, these histograms would include some clusters with more than 500 people from the Mixteca Alta region.

In period E/F, the ~Middle Formative, settlements became populous enough to be included in these histograms, but only in the big three regions. Only the Basin of Mexico and Mixteca Alta regions, however, had settlements greater than 1000 in population (the second column from the left), and the Mixteca Alta had more of these settlements than the Basin of Mexico. Although less populous than the Basin of Mexico and Mixteca Alta regions, the Oaxaca Valley system was different—a primate system organized around San José Mogote.

In the ~Late Formative period G/H, the situation was more complex. Four regions had settlements greater than 1000 in population, the big three and the Morelos Valleys region. Note that both the Mixteca Alta and Oaxaca Valley regions had about the same numbers of 501–1000 settlements, while the Basin of Mexico had fewer, yet more settlements 1001–2500 than the other regions, indicating different settlement patterns in the big three regions. The most obvious difference among the big three regions is that the Oaxaca Valley had a primate settlement, Monte Albán.

Six of the seven regions in the database had settlements greater than 500 in population in ~Terminal Formative period I, with five regions having settlements greater than 1000 in population. Perhaps the seventh region, Tula, did also, but period I data are not published. In period I the ratio between 501–1000 and 1001–2500 population settlements varied among regions once again. However, in contrast to period G/H, the Basin of Mexico had more of the larger settlements, the Mixteca Alta had about equal numbers, and the Oaxaca Valley had more of the smaller settlements. Thus, regional patterns had shifted from period G/H, and none of the big three regions had the same profile.

For period L, the ~Early Classic, looking at the leftmost two columns, the Tehuacán-Cañada and Oaxaca Valley regions show more 1001–2500 population settlements than 501–1000 settlements, while the Basin of Mexico and Mixteca Alta show the opposite. For the big three, this is the opposite of the period I pattern. Note that although the Mixteca Alta and Oaxaca Valley regions had more settlements large enough to be plotted on these graphs, we know that Teotihuacán's population was huge.

In the ~Epiclassic period Q, the pattern of more 501–1000 than 1001–2500 settlements is evident in all the big three regions, but less marked in the Mixteca Alta region than the other two. The Basin of Mexico region also had more 5001–10,000 settlements than the ranges larger and smaller than that, suggesting settlements in this size range were important in the functioning of the hierarchy. Note that of the three Early Toltec settlements in this range, all in the Texcoco survey area, one (the largest, Cerro de la Estrella) continued to be fairly large in the succeeding Late Toltec period, but none of the three was later a large Aztec-period occupation. This suggests that the system in place in period Q was, in spite of Teotihuacán continuing to be the region's largest and most populous settlement, far different than that of both the preceding period L and the later period V.

The high ~Late Postclassic period V populations contribute to the high settlement counts shown for the big three regions, and the settlements in the other regions. In the big three regions, the settlement counts in all ranges decrease gradually as the populations increase, with no size range more prominent. In the Oaxaca Valley region, however, no settlements had more than 10,000 inhabitants. Had I combined sites as Kowalewski et al. (1989) did, three combined settlements, Macuilxochitl, Monte Albán/Sa'a Yucu, and Mitla would have had more than 10,000 inhabitants, and three would have had 5001–10,000 inhabitants. Note that the Mixteca Alta had more 501–1000 and 1001–2500 settlements than the other the big three regions.

Now, synthesizing these rank-size graphics of the largest settlements for cross-regional comparisons, we see that each of the big three regions had different trajectories, although the overall pattern of population increase from the early to the late periods along with the ~Epiclassic period Q dip, is apparent. Of import, I think, are the variations in patterning of the 501–1000 and 1001–2500 population range settlements, the period Q patterns, and those of the largest settlement ranges; I discuss them in the following paragraphs.

The two columns on the left in each histogram, those of populations 501–1000 and 1001–2500, show important variation. In period E/F, although data are scanty, the smaller of the two were more frequent. In period G/H, they continued to be more frequent in the south, but not in the Basin of Mexico region. In period I, both the Basin of Mexico and Mixteca Alta regions had more population 1001–2500 settlements than those of 501–1000, but the Oaxaca Valley region continued with the opposite pattern. In period L, that pattern reversed, with the Oaxaca Valley region having more of the larger settlements. In periods Q and V, the original pattern of more population 501–1000 settlements returned. So, what does this diversity of middle range settlement size mean? In the earlier periods, the regions defined here contained pooled polities, as discussed in the section on rank-size analysis, which would boost the counts in these categories. The prominence of mid-sized settlements in these systems indicates that they were important in the hierarchy.

For the ~Epiclassic period Q in the Basin of Mexico region, the irregular pattern implies pooled systems, or only a portion of a larger system; the rank-size graph (Figure 7-7) is somewhat enigmatic, but suggests the same. This is consistent with the pattern that Basin researchers (e.g., Sanders et al. 1979:129–137) describe for this period: settlements in clusters, with regional centers (at the scale of the entire basin). Indeed, based on ceramics (Sanders et al. 1979:134), the eastern basin populations may have been aligned with Cholula, in the Puebla Valley, which has huge civic-ceremonial architecture dating to this period. Period Q in the Mixteca Alta and Oaxaca Valley regions were much different. Overall population declined greatly in the Mixteca Alta (see Figure 7-5), compared to period I, although a primate system centered at Yanhuitlán continued. That decline is the most dramatic feature of the period I to period Q shift there. In the Oaxaca Valley region, however, while populations did decline overall in period Q, the relative counts of 501–1000 and 1001–2500 population settlements shifted back a more normal rank-size pattern. This suggests a different organization across the landscape; as in the Basin, Valley of Oaxaca researchers (Kowalewski et al. 1989:286–298) describe multiple regional centers (e.g., Jalieza, Macuilxochitl, Monte Albán, and El Choco), and thus pooling at the scale of this analysis.

Settlements larger than 5000 people, judging from the population histograms, seem to have maintained uneven proportions relative to smaller settlements, indicating the changing nature of the hierarchical importance of settlements with many residents. In primate systems, they are lone settlements far to the right on the histograms. In other systems, they are accompanied by middle range settlements in varying proportions.

Examining rank-size dynamics of the larger settlements in the system, as I have in this subsection, provides important background for the remainder of this section, which focuses on the most populous settlements in the settlement hierarchy.

Urbanization

Urbanization is a complex concept, rarely carefully defined even by social scientists who use it frequently, and there is no a single population threshold at which a settlement becomes urbanized. Urbanization encompasses the high end of settlement hierarchy, and was a development so dramatic that it has been called "the great transformation" (Blanton et al. 1999). Here, urbanization is used in the context that previous Mesoamerican researchers have used it: when rural populations are drawn to centers in profound regional reorganizations associated with shifting patterns of commerce and craft production. The dramatic demographic changes of the great transformation were accompanied by equally dramatic changes in other spheres; for example, the solid hand-made figurines used across the Valley of Oaxaca prior to the growth of Monte Albán were replaced by period L with mold-made figurines (Marcus 1998b:305–306).

Table 7-3 is arranged with each region, from northwest to southeast, listed separately, and with the data from each period on a separate line, with the most recent at the top (period V). The first column is total population, using average CALC POP. Next to it is the density of inhabitants. The four columns on the right show the percentage of the population that is urbanized, if urbanization is considered to occur at one of four levels. The standard low-end threshold for urbanization has been populations of 1000 or more, which is the leftmost of these four columns. Each column reflects the number of people living in settlements of that size and larger. Thus, these do not match the population ranges of the Figure 7–25 and Figure 7-26 histograms discussed above.

In the next few paragraphs, I discuss the implications of the highland data at the four population levels. They begin with a threshold of 1000, conforming to the levels Kowalewski (1990:45) used in examining urbanization in the Valley of Oaxaca. Kowalewski used data from the Valley of Oaxaca survey area only, so his figures differ from these, which include areas more distant from the central valley and the Monte Albán core. For the Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions, the data are too scanty to present consistent patterns. This is of course due to settlement size, but also to the small areas surveyed relative to the region size as a whole, and thus that these regions did not contribute in every period to the large-settlement dynamics at a macroregional scale. This discussion focuses first on the big three regions; then I give a macroregional summary.

In the Basin of Mexico in the ~Middle Formative period E/F, when the first settlements grew to over 1000 inhabitants, people gravitated to those centers (42 percent). That pattern increased in the ~Late Formative period G/H, when almost three-quarters of the population lived in centers of 1000 people or more, and about the same percentage lived

Table 7-3. Indexes of urbanization using average CALC POP for each region, at the 1000, 2500, 5000, and 10,000 population levels, and total population, population densities.

region	total population	density/km²	period	1000	2500	5000	10,000
	30,314	3630	**V**	75%	65%	65%	65%
			Q				
Tula	8305	995	**L**	70%	54%		
time			**I**				
			G/H				
	299	36	**E/F**				
			B				
	256,788	11,916	**V**	72%	54%	40%	18%
	59,497	2761	**Q**	74%	64%	59%	24%
Basin	186,938	8675	**L**	87%	85%	85%	85%
of	43,912	2330	**I**	54%	13%		
Mexico	38,230	1774	**G/H**	74%	43%		
	8461	449	**E/F**	42%			
	1639	76	**B**				
	9329	2135	**V**	45%			
			Q				
Morelos	5864	1342	**L**	18%			
Valleys	2447	560	**I**				
	3091	707	**G/H**	38%			
	2534	580	**E/F**				
	321	73	**B**				
	32,119	1602	**V**	66%	47%	47%	47%
	6761	337	**Q**				
Tehuacán-	8022	400	**L**	35%			
Cañada	8786	438	**I**	30%			
	812	43	**G/H**				
	976	49	**E/F**				
	16	1	**B**				
	8150	2638	**V**	40%			
			Q				
Mixteca	10,943	3541	**L**	30%			
Baja	6597	2135	**I**	49%			
			G/H				
	974	315	**E/F**				
			B				
	259,462	8858	**V**	56%	39%	26%	17%
	44,301	2230	**Q**	65%	50%	39%	39%
Mixteca	140,462	4796	**L**	60%	36%	18%	12%
Alta	28,695	1256	**I**	52%	20%		
	34,757	1749	**G/H**	62%	41%	34%	
	22,145	969	**E/F**	13%			
	6178	270	**B**				
	179,7963	5580	**V**	40%	25%	15%	
	85,652	2658	**Q**	62%	46%	29%	23%
Oaxaca	129,643	4024	**L**	61%	40%	31%	26%
Valley	45,560	1414	**I**	43%	34%	34%	34%
	57,616	1788	**G/H**	38%	29%	29%	29%
	1936	83	**E/F**				
	23	15	**B**				

in centers larger than 2500 as in centers greater than 1000 in the preceding period. In the following period, the ~Terminal Formative, the proportion dropped to 54 percent; this represents a distinct change. The Basin of Mexico in the ~Early Classic period L was dominated by Teotihuacán; virtually none of the population lived in centers of 1000 people or more, unless they lived at Teotihuacán (or outside the survey areas used here). In the following period, the ~Epiclassic period Q, the top end of the hierarchy shifted substantially, and proportionally more people lived in centers below 1000 in population. Even in the ~Late Postclassic period V, the proportion at the high end was low; however, I think this figure is distorted because some population-rich Aztec-period centers known from colonial records were not recorded archaeologically, and so are not included in these data. In addition, the surveyed areas upon which these data are based do not include the large populations of the western Basin lake edge zone (including Tlacopan and Azcapotzalco; see Sanders et al. [1979] Map 19, Greater Tenochtitlán), and Tenochtitlán, in Lake Texcoco.

The Mixteca Alta region began in the ~Early Formative with a much higher population density than the other regions (3.5 times the density of the Basin of Mexico, and 18 times the density of the much less populated Oaxaca Valley region). Not surprisingly, this pattern continued in the ~Late Formative period G/H, with 34 percent of the population living in settlements with more than 5000 people. While the region's population density (and total population, for the surveyed areas) was similar to that of the Basin of Mexico region in period G/H, the distribution was quite different, with more large settlements in the Mixteca Alta (populations greater than 5000 inhabitants). This pattern diminished in the ~Terminal Formative period I, with only 52 percent of the population in settlements greater than 1000 people, and none in centers with populations greater than 5000. In the ~Early Classic period L, 60 percent were living in settlements of more than 1000 people, and the total population increased dramatically (this was "the great transformation"), while more than 12 percent of the people lived in centers of 10,000 or more. While it suffered a much greater population drop than the Basin of Mexico region and had a lower percentage of people in settlements of 1000 or more in the ~Epiclassic period Q, the Mixteca Alta region had a greater percentage of the population living in settlements of 10,000 or more. The population density in the ~Late Postclassic period V substantially increased, but only 56 percent of the population lived in settlements of 1000 or more, or a much higher percentage than in the Tula and Basin of Mexico regions.

The Oaxaca Valley region shows a different pattern than either the Basin of Mexico or the Mixteca Alta regions, with lower percentages of the population in settlements of 1000 or more for periods G/H through V. Even so, in periods G/H and I (the ~Late and ~Terminal Formative) only Monte Albán had more than 10,000 inhabitants, and neither other big three region had a settlement in that population bracket. Nevertheless, Monte Albán in those two periods did not capture more than 34 percent of the population of that region. Note that the population density of the Oaxaca Valley region in period G/H, however, was very nearly *the same as* that of the Mixteca Alta and the Basin of Mexico in that same period. As with the Mixteca Alta region, the Oaxaca Valley region population densities dropped in period I, but unlike the Mixteca Alta, the Oaxaca Valley region continued to have a settlement exceeding 10,000 in population (Monte Albán). Interestingly, while total population and population density dropped significantly in the ~Epiclassic (the L-Q-V pattern), the distribution of the population in sites of 1000 and larger stayed very similar to that of the ~Early Classic, though this was not true for either the Basin or the Mixteca Alta. Although the populations were significantly reorganized from the ~Early Classic to the ~Epiclassic, apparently settlements of all sizes lost proportionally similar numbers of people. In the ~Late Postclassic period V, the Oaxaca Valley region's population density doubled, but only 40 percent of the population lived in centers of over 1000 people (and none in centers of 10,000 or more), meaning the preference was for smaller settlements. This matches the *señorío* pattern of the Late Postclassic.

Looking at the percentages of population in centers of various sizes greater than 1000 people, highland Mesoamerica displays considerable diversity. Higher densities of people inhabited larger settlements earlier in the Mixteca Alta region than in the big three regions, and the Mixteca Alta maintained a different pattern than either the Basin of Mexico or Oaxaca Valley regions, although the scale of its system decreased in period I (the ~Terminal Formative). As with other analyses, we see that while the L-Q-V pattern is obvious at the macroregional scale, it obscures the diversity of settlement patterning that occurred regionally. The Basin of Mexico became more urbanized than the Mixteca Alta and Oaxaca Valley regions in ~Early Classic period L, and remained that way until the Spanish arrived—and beyond through the present. At the same time, in ~Epiclassic period Q a greater proportion of inhabitants of the Mixteca Alta region than of the other big three regions resided in settlements of 10,000 or more inhabitants.

Density of urbanized settlements

Figure 7-27 is a graph of the density of settlements with populations greater than 1000 per 100 km^2 in each of the big three regions. For this graphic, I display only the big three regions because the data for the other regions are scanty or inconsistent.

Figure 7-27 shows that in the Oaxaca Valley region having many urbanized settlements was a later phenomenon (in period G/H, the ~Late Formative) than the other two regions, although it had slightly more settlements with more than 1000 residents that the other two regions in the less integrated period Q. While the Basin of Mexico and Mixteca Alta regions had similar population densities in period G/H (see Table 7-3), the Basin had a higher urbanized settlement density, which it maintained in ~Terminal Formative period I, when urbanized settlement density decreased slightly in the other two regions. In the ~Early Classic period L, however, consistent with the large settlement dynamics discussed in the last two subsections, the Basin of Mexico had few urbanized settlements. In contrast, the Mixteca Alta region had no single hugely prominent center, yet many settlements with populations greater than 1000; thus, the increased population

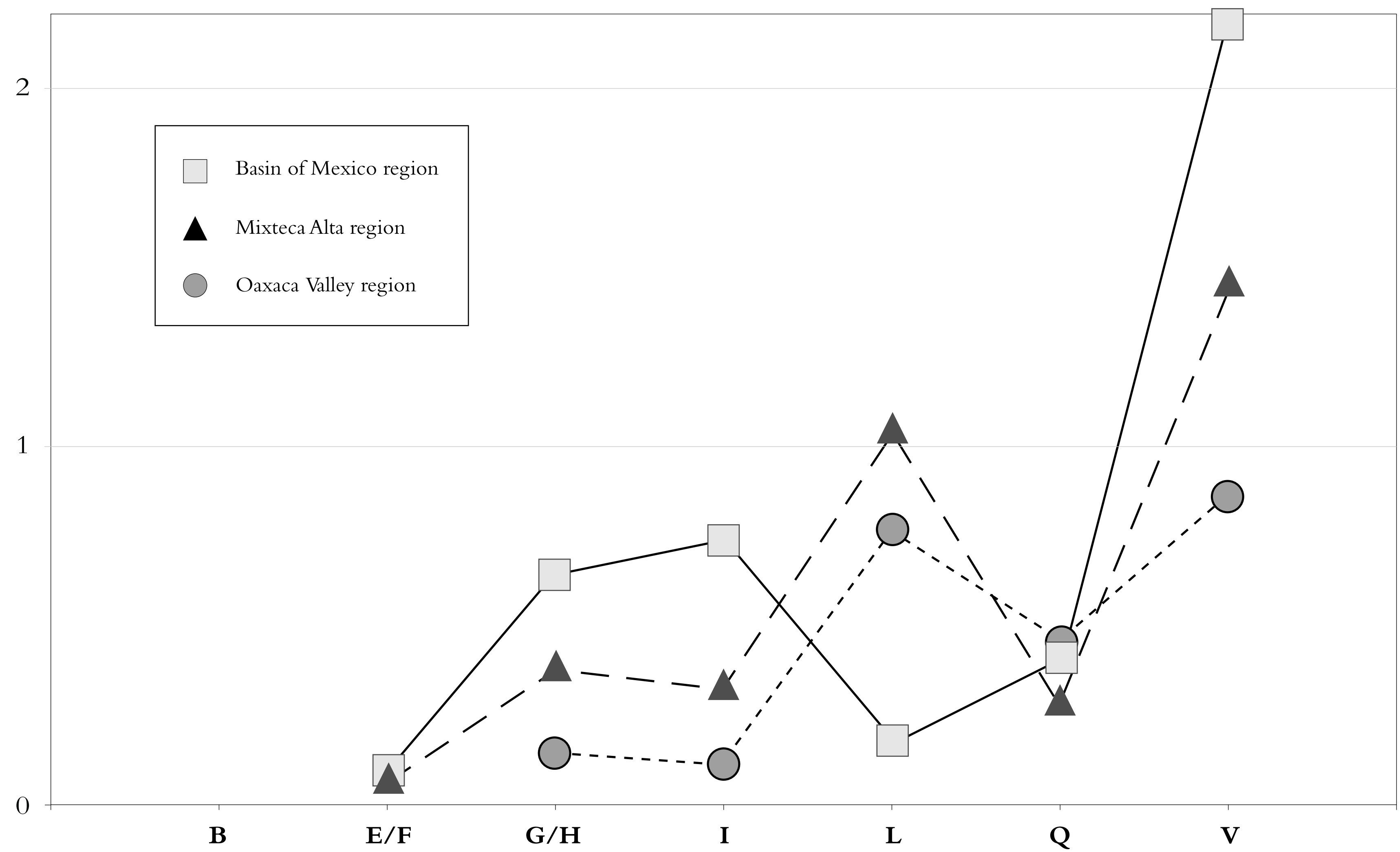


Figure 7-27. Number of settlements with populations of 1000 or more per 100 km^2 of surveyed area for the big three regions: Basin of Mexico (squares), Mixteca Alta (triangles), and Oaxaca Valley (circles).

was spread in more, albeit smaller, settlements. The Oaxaca Valley region in the ~Early Classic period L shows an intermediate pattern, skewed downward in count when compared to the Mixteca Alta because of the primacy of Monte Albán. In period Q, the density of large settlements dropped dramatically for all periods, yet the Oaxaca Valley region had a few more urbanized settlements although its overall population density was similar to that of the Basin of Mexico. The ~Late Postclassic period V shows more centralized populations in the Basin of Mexico and Mixteca Alta than in the Oaxaca Valley region; this is consistent with the high population densities shown in Table 7-3 for the Basin of Mexico.

The density of urbanized settlements (with populations of 1000 or more) per 100 km^2 supports conclusions drawn in the previous large settlement dynamics subsections above. Next, I discuss small settlement dynamics.

Small-settlement dynamics

Archaeologists seek to understand patterning in the smallest sites because shifts in settlement hierarchy also can occur in the ratios of small communities, sometimes in ways quite different than in settlements at the top or middle of the settlement hierarchy. By putting settlements in the one- or two-household range (population less than 10 using average CALC POP) in a single category, I highlight this smallest occupation unit. As numerous researchers have pointed out (e.g., Cherry et al. 1991:463), if people are agriculturalists and dispersed across the land, they are closer to their fields and their productivity is increased.

We cannot know to what extent variations in field methods, post-depositional land use, and whether individual surveys ignored low-density artifact scatters may have affected the number of small habitation sites recorded. For the purposes of this analysis, however, I assume that the smallest settlements were recorded equally by all projects, and that no survey area suffered more extensive post-depositional small site destruction, nor did more sites disappear for any one period.

Histograms

Figure 7-28 is a histogram of small settlements, below 1000 in population, using average CALC POP. The population ranges intentionally overlap with those of the large sites histogram (Figure 7-25), which also includes the population 501–1000 category. The population ranges for all columns, from left to right are: 1–10, 11–50, 51–100, 101–150, 151–200, 201–500, and 501–1000. Given the vagaries of the population estimation of most settlements in the Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions and the fact that they are overshadowed by the higher settlement counts of the big three regions, I focus in this discussion on the big three regions. Note that the disproportionately high one-household settlement counts of the Tehuacán-Cañada region are result of my assumption that all "indeterminate" sites were .5 ha in size, with a population of 5–10 individuals; I suspect that the indeterminate category includes some settlements that really should distribute in larger population ranges, although I had no way to assess this.

For Figure 7-28, the vertical axis is 400 settlements, and three counts exceed that (Oaxaca Valley region in periods L and V). Settlement counts of three sites or less are difficult to decipher in this graphic, so I provide the site count data on which the Figure is based in Table 7-4. The table is organized by region, then by period. This discussion will be by period, beginning with the earliest.

Early Formative Period B settlement counts are so low that interpretation is difficult at this scale on Figure 7-28, and it is easier to consult Table 7-4. The settlement counts of the Mixteca Alta region are noticeably higher than in any other region. The two settlements in the largest range, 501–1000, may indicate pooled systems. These most populous settlements, NO-SJD-SJD-7, and NO-YAN-XAC-4, are the Rank I settlements of Figure 7-8.

In the ~Middle Formative period E/F, the higher populations of the Mixteca Alta region continue. The slightly higher number of 201–500 than 151–200 or 501–1000 settlements may indicate the importance of settlements in that population range in the set-

Figure 7-28. Histograms of population, small sites only. The *y*-axis maximum is 400 settlements. The *x*-axis is in these population ranges, using average CALC POP: 0–10 (one household), 11–50, 51–100, 101–150, 151–200, 201–500, 501–1000.

Table 7-4. Small site counts in the following ranges: 1–10, 11–50, 51–100, 101–150, 151–200, 201–500, and 501–1000.

region	period	1-10	11-50	51-100	101–150	151–200	201–500	501–1000
Tula	**V**	57	16	0	0	0	26	0
	Q							
	L	1	0	0	0	8	4	0
time ↑	**I**							
	G/H							
	E/F							
	B	0	2	0	0	0	1	
Basin of Mexico	**V**	314	308	112	54	25	72	30
	Q	32	48	34	11	5	11	9
	L	81	107	54	16	7	26	9
	I	58	72	28	18	9	18	9
	G/H	21	56	21	8	2	10	4
	E/F	7	25	11	5	1	2	3
	B	6	0	3	1	2	3	
Morelos Valleys	**V**	36	0	18	0	0	13	0
	Q							
	L	57	24	8	4	3	5	1
	I	27	19	2	3	1	2	1
	G/H	34	15	5	0	0	3	0
	E/F	22	14	5	4	1	1	1
	B	5	2	2	1			
Tehuacán-Cañada	**V**	178	35	22	4	1	8	5
	Q	172	13	10	2	3	4	
	L	160	23	13	3	4	3	1
	I	91	17	13	3	1	5	3
	G/H	31	9	0	0	1	1	
	E/F	16	11	2	2	1		
	B	2						
Mixteca Baja	**V**	19	22	21	7	2	4	1
	Q							
	L	6	20	25	10	2	4	4
	I	3	9	18	4	2	2	1
	G/H							
	E/F	0	2	1	1	1	2	0
	B							
Mixteca Alta	**V**	324	270	146	88	67	123	50
	Q	9	24	15	9	8	24	6
	L	114	116	67	35	26	55	29
	I	26	27	15	7	6	19	6
	G/H	21	16	10	3	3	13	9
	E/F	85	62	45	19	14	18	4
	B	38	27	14	5	4	4	2
Oaxaca Valley	**V**	1515	683	162	71	43	83	39
	Q	1330	124	43	19	6	22	20
	L	601	346	80	31	20	35	17
	I	271	183	45	11	8	24	9
	G/H	374	253	70	18	19	37	9
	E/F	48	31	3	1	2	1	
	B	15	11					

tlement hierarchy. Population increased significantly in the Oaxaca Valley region, also with a slight preference for 201–500 settlements. In the Basin of Mexico region, the pattern was different, with few of the smallest one- or two-household settlements. Here, too, though, the counts for settlements of 151–200 inhabitants were below the counts for the next larger ranges.

In the ~Late Formative period G/H, the settlement counts for the Mixteca Alta region dropped, but the preference for settlements in the 201–500 range continued, and the low counts extended to settlements in both the 101–150 and 151–200 ranges, as well as in the larger 501–1000 range. The Oaxaca Valley region shows a similar pattern, but with lower settlement counts for three ranges, from 51–100, 101–150, and 151–200, as well as the 501–1000 range. This contrasts with the high counts of the smallest settlements, with population ranges of 1–10 and 11–50. The Basin of Mexico continued to have higher counts in the 151–200 range than in the ranges just below that, but also low counts for the smallest sites, with populations from 1–10. Although I do not have much data from those regions, it looks like there also were relatively higher counts of settlements in the 201–500 population range in both the Morelos Valleys and Tehuacán-Cañada regions. This suggests a widespread ~Late Formative period G/H pattern in highland settlement size preferences that has not previously been identified.

In period I, the ~Terminal Formative, the higher counts for settlements in the 201–500 range continues, when compared to the 150–201 and 501–1000 ranges. In period I, population densities in both the Mixteca Alta and Oaxaca Valley regions dropped, while it increased some in the Basin of Mexico. Perhaps this range of settlement size was important to local redistribution networks or for local administration. For the smallest two population ranges, the big three regions show the full range of variation: the Basin of Mexico had lower counts in the smallest range; the Mixteca Alta had almost equal counts in both ranges, and the Oaxaca Valley region had about one-third more 1–10 settlements than 11–50 settlements.

In the ~Early Classic period L, the Basin of Mexico continued to have lower one-household counts than 11–50 settlements, and a preference for 201–500 settlements over settlements in the 151–200 or the 501–1000 range. The Mixteca Alta continued to have almost the same numbers of settlements in the smallest two ranges, and also the bulge of 201–500 settlements, in preference to the next two smaller ranges. And, the Oaxaca Valley continued its period I pattern of more 1–10 than 11–50 settlements, along with more 201–500 than 151–200 and 501–1000 range settlements.

In the ~Epiclassic period Q, population densities dropped in the L-Q-V pattern, and, as I discussed above, the preference was for a large percentage of the population (over 60 percent in each of the big three regions) to live in settlements with populations greater than 1000 people. Thus, the low counts of small settlements in the big three regions are consistent with previous observations. The Oaxaca Valley region, however, suffered the smallest drop (62 percent), yet kept the previously observed pattern of more 1–10 population settlements than 11–50, and more 201–500 than 151–201 or 501–1000 settlements. The pattern of fewer 151–200 and 501–1000 settlements and more 201–500 settlements also continued in the Basin of Mexico and Mixteca Alta regions. These two latter regions also had more 11–50 than 1–10 settlements.

For the ~Late Postclassic period V, all regions for which we have data show more 1–10 than 11–50 settlements, except for the Mixteca Baja (admittedly, the counts are nearly equal for the Basin of Mexico at 314 and 308, respectively). This is a reversal of long-standing patterns in the Basin of Mexico, and the period I and L patterns of the Mixteca Alta. The Oaxaca Valley region, on the other hand, had more of the smaller settlements in all periods examined here. The relatively low counts for 151–200 and relatively high counts for 201–500 settlements evident for the last few periods continued in the ~Late Postclassic period V, in not only the big three regions, but in *all* regions. The settlement counts in the 501–1000 range are less easy to assess, but they also may be below expectations.

To compare small settlement dynamics for all regions, I first discuss the apparently high numbers of settlements with 201–500 residents. Then, I discuss the very smallest settlements examined here, those with populations of 50 people or fewer.

The preference for 201–500 sized settlements may relate to the important functions that sized settlement could perform. This preference could also be described as a disinclination to live in settlements of 151–200 inhabitants (and possibly also in settlements of 501–1000 inhabitants); these settlements were more likely to have used the standard 10–25 multiplier to estimate populations, but not exclusively. It is also possible that this apparent preference is somehow an artifact of how population was estimated. I have checked, however, and the settlements in this range have populations estimated using several different multipliers (although as with the dataset as a whole, the range of 10–25 predominates), and they were recorded by the full range of projects. Because this pattern is evident in all big three regions and for many periods and survey projects, I lean to a social explanation for the prominence of settlements of this size (and the disinclination to settle in 151–200 settlements), that these settlements performed significant functions, probably at the local level. Of course, the range 201–500 encompasses a grater range (299 individuals) than the range 151–200 (only 49 individuals), so perhaps it is more valid to compare the ranges 1–200 and 201–500; I do this with population percentages in the next subsection.

The Oaxaca Valley region shows a very high proportion of the smallest sites, population 1–10 and 11–50, compared to every other region (except possibly Tehuacán-Cañada, except that its counts in those groups may be inflated). This suggests households and small groups were free to establish homesteads and small communities—and stay in them; this also would have put them closer to their fields and increased their agricultural productivity. This pattern of high counts of settlements of population 1–10 is more widespread in the Oaxaca Valley region than in the Basin of Mexico or Mixteca Alta regions. With respect to the larger social system, this means such behavior was possible, permitted (visà-vis land tenure), and common. The Oaxaca Valley data also seem to show a slight preference for settlements in the 201–500 group, except for in period Q. This size center may have performed important market activities for the inhabitants of far-flung smaller settlements, regardless of what happened in larger or smaller settlements. Note that the Basin of Mexico region also shows an increase in this category in periods I, L, and V (and possibly G/H), perhaps for the same reason.

Percent population in small settlements

In contrast to the previous section, which addressed settlement counts, Table 7-5 and Figure 7-29 are based on the *percent* of the population in settlements with fewer than 1000 inhabitants. This subsection highlights the changing ratios of different sizes of small settlements, including those of single-households, across regions in the same period. In Figure 7-29, I have grouped the ranges of populations less than 50 and from 51–150 together, based on differences discussed in the above subsection on histograms. These groupings are intended to highlight the two patterns identified in the previous subsection, with respect to the smallest settlements (less than 50 inhabitants), which showed different patterns by region and through time, and the 201–500 settlements, which predominated over settlements somewhat smaller (151–200), and perhaps somewhat larger. As with the above discussions, this subsection also focuses on the big three regions.

In ~Early Formative period B, when, as I've already discussed, the Mixteca Alta region differed from the other regions in having more larger settlements, the diversity of settlement sizes is evident. One hundred percent of the settlements had fewer than 1000 people in them. For the Oaxaca Valley, all settlements had 50 or fewer inhabitants. The Basin of Mexico and Mixteca Alta show larger settlements and more diversity of settlement size.

In ~Middle Formative period E/F, the Basin of Mexico had a lower percentage of its population in these small settlements than the Mixteca Alta, and in other regions, the entire population lived in settlements of less than 1000 people. The Oaxaca Valley region had a high percentage in the smallest two ranges, filled with white in Figure 7-29.

Table 7-5. Small settlement data: percentage at each population level and below (or cumulative percentages).

region	period	1-10	below 50	below 100	below 150	below 200	below 500	below 1000
Tula	V	2%	2%	2%	2%	2%	25%	25%
	Q							
	L	0%	0%	0%	0%	17%	30%	30%
	I							
	G/H							
	E/F							
	B	12%	12%	12%	12%	100%	100%	
Basin of Mexico	V	1%	4%	7%	9%	11%	20%	28%
	Q	0%	3%	6%	8%	10%	16%	26%
	L	0%	2%	4%	5%	6%	10%	13%
	I	1%	5%	9%	14%	18%	30%	46%
	G/H	0%	4%	8%	10%	11%	19%	26%
	E/F	1%	7%	17%	24%	26%	32%	58%
	B	3%	3%	15%	24%	45%	100%	100%
Morelos Valleys	V	3%	3%	13%	13%	13%	55%	55%
	Q							
	L	8%	16%	26%	34%	43%	66%	82%
	I	9%	24%	29%	45%	52%	75%	100%
	G/H	9%	19%	32%	32%	32%	62%	62%
	E/F	7%	19%	32%	49%	56%	70%	100%
	B	12%	34%	67%	100%	100%	100%	100%
Tehuacán-Cañada	V	4%	7%	11%	13%	13%	21%	34%
	Q	20%	27%	36%	39%	47%	64%	100%
	L	16%	23%	34%	39%	48%	59%	65%
	I	8%	14%	24%	28%	30%	49%	70%
	G/H	31%	53%	53%	53%	74%	100%	100%
	E/F	13%	44%	59%	84%	100%	100%	100%
	B	100%	100%	100%	100%	100%	100%	100%
Mixteca Baja	V	2%	8%	24%	34%	38%	54%	60%
	Q							
	L	0%	5%	20%	30%	33%	45%	70%
	I	0%	4%	23%	29%	34%	43%	51%
	G/H							
	E/F	0%	6%	14%	26%	42%	100%	100%
	B							
Mixteca Alta	V	1%	4%	8%	12%	16%	32%	44%
	Q	0%	1%	4%	6%	10%	27%	35%
	L	1%	3%	6%	9%	12%	25%	40%
	I	1%	3%	7%	10%	14%	36%	48%
	G/H	0%	2%	4%	5%	6%	18%	38%
	E/F	3%	10%	25%	35%	46%	72%	87%
	B	5%	17%	33%	43%	54%	74%	100%
Oaxaca Valley	V	4%	13%	20%	25%	29%	42%	58%
	Q	2%	6%	9%	12%	13%	21%	38%
	L	4%	10%	15%	18%	20%	29%	39%
	I	5%	15%	21%	24%	27%	42%	57%
	G/H	5%	16%	24%	28%	34%	52%	62%
	E/F	20%	56%	66%	73%	89%	100%	100%
	B	37%	100%	100%	100%	100%	100%	100%

(Arrow labelled "time" points upward from B to V in each region.)

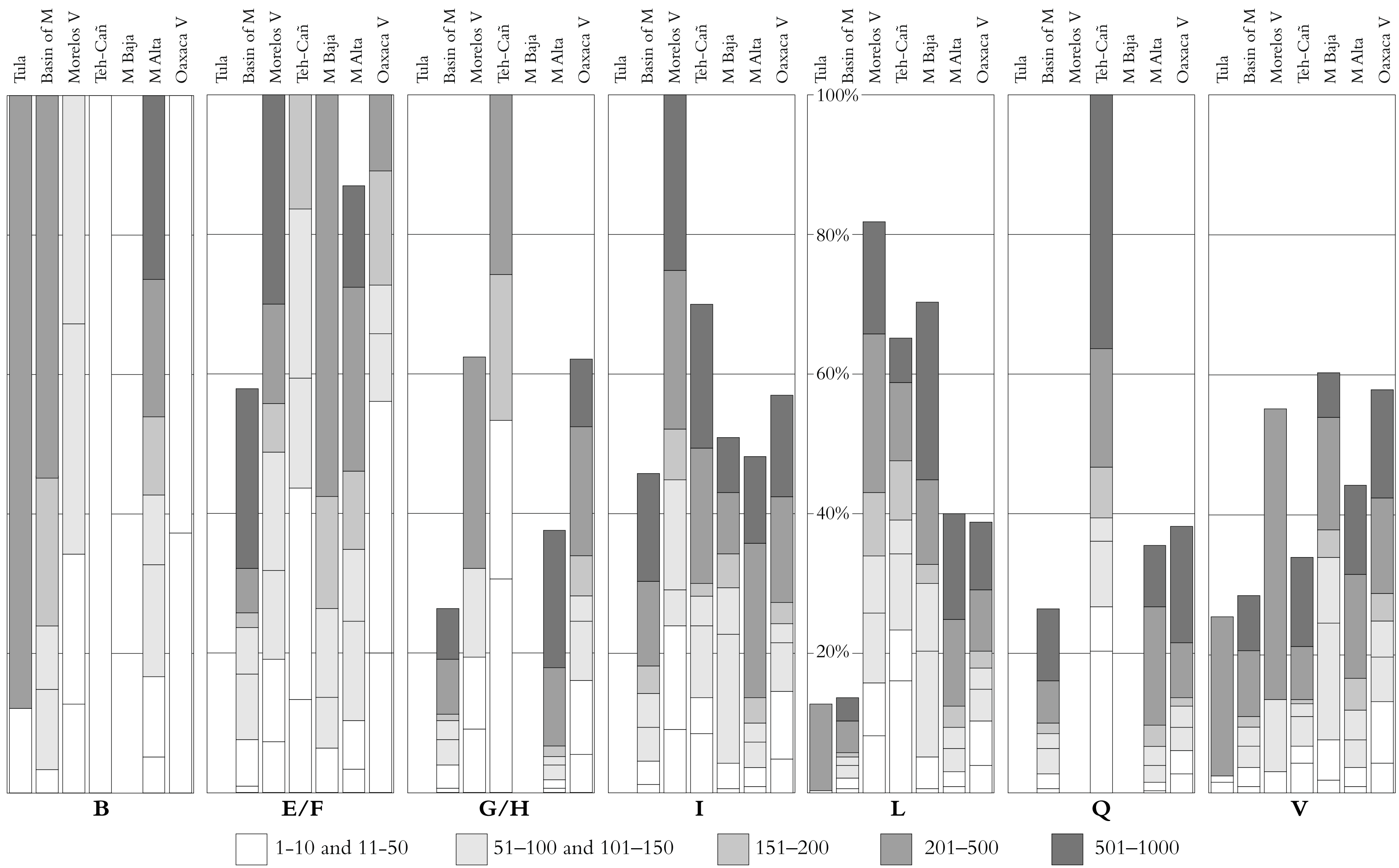


Figure 7-29. Percent population in settlements smaller than 1001 individuals, using average CALC POP, emphasizing within period comparisons. Columns to the top of the scale show the entire population resides in settlements of 1000 individuals or fewer.

In ~Late Formative period G/H, site counts of settlements with 201–500 population seemed high relative to the next smaller range, the percentage of the population in them also seems high. Indeed, the percentage of the population in 201–500 settlements does exceed that of the 151–200 range, and smaller, but it seems consistent with a general pattern of more people living in larger settlements. The preference for smaller sites in the Oaxaca Valley as compared to the Basin of Mexico is also evident, but the proportion of the population in the smallest range, compared to period E/F, dropped.

In period I, or the ~Terminal Formative, the proportion of the population in small settlements rose 20 percent in the Basin of Mexico and 10 percent in the Mixteca Alta, but dropped 5 percent in the Oaxaca Valley region. The proportion in the smallest ranges increased slightly in the Basin and Mixteca Alta, and decreased slightly in the Oaxaca Valley. In all regions, the proportion of the population residing in settlements of 201–500 is much higher than the proportion living in the next smaller range, 151–200. Compared to the proportion in all settlements of all smaller ranges (population 1–200), however, the percent population in 201–500 settlements does not seem remarkably high, except perhaps for the Mixteca Alta region. Indeed, settlements in the range 51–150 seem to contribute a higher proportion of the population instead.

The prominence of Teotihuacán in the ~Early Classic period L, and the low populations in small settlements is evident, with only 13 percent of the population in these small settlements. Teotihuacán, it seems, not only sucked the people from the smaller settlements, but the smallest settlements were not preferred places to reside among the non-Teotihuacán settlements in the Basin region. In contrast, in the Oaxaca Valley region, when Monte Albán had been prominent for centuries, the preference for residing in small multi-household communities of less than 50 people continued (relative to the other big three regions). More dramatically than the residents of the Oaxaca Valley region, Mixteca Alta peoples preferred to live in 201–1000 sized settlements, rather than smaller settlements.

In the ~Early Classic period L, both the Mixteca Alta and Oaxaca Valley regions have about the same proportion of the population in small settlements, and, of those, both regions show a preference for communities of 200 or larger. Perhaps this size community balanced people's needs for both social and economic (marketing) activities, and access to their fields. Although he has not published systematic data for surveys in the Tlaxcala area (the northern part of the Puebla Valley), García Cook (1981:256) notes that settlements of 200–250 people were very common there, and few dispersed occupation areas were found. The preference for this size community, then, may be a widespread pattern.

The ~Epiclassic period Q was a long period with very different dynamics than the Classic. Overall population was lower, and the Oaxaca Valley region continued to have a larger percentage of the population in settlements of less than 50 people, compared to the Basin of Mexico and Mixteca Alta regions. The Mixteca Alta and the Oaxaca Valley had similar proportions of the population in settlements smaller than 1000 people, but in the Mixteca Alta proportionally more lived in settlements smaller than 500.

Although total populations were higher in the ~Late Postclassic period V than in the ~Early Classic period L (and obviously period Q), the percent of the populations in small settlements were higher in period V than period L. This is consistent with the Aztec settlement patterns of the eastern Basin of Mexico, and with the cacicazgo patterns of the Mixteca Alta and Oaxaca Valley regions, when many people lived in larger settlements. However, perhaps to increase efficiency, considerable numbers of people lived in small settlements. In terms of percentages, a larger proportion lived in settlements in the largest two ranges. Although the counts were high for settlements with fewer than 50 people in the Oaxaca Valley region (see Figure 7-28), Figure 7-29 shows that the *proportion* of the population living in these small settlements was small. The Mixteca Baja region had the highest proportion living in settlements with less than 100 people, which indicates a somewhate different settlement hierarchy in that region. Indeed, the western edge of the Tequixtepec survey area just overlaps the Acatlan province of the Aztec empire (see Figure

7-22), and most of it is outside the provinces identified by Smith and Berdan (1996:324, 340). Thus, the surveyed area may have been seen by the Aztecs as a bit of a hinterland or otherwise not worth the effort involved in incorporating it into their system.

With respect to the two population groups identified based on counts as having patterns worth remarking upon, settlements with 50 people or fewer, and settlements with 201–500 occupants, in this section I showed that: 1) the proportion of the population in the smallest settlements (50 residents or fewer) show considerable variability from region to region and period to period, with the Oaxaca Valley region tending to have more of those smallest settlements than other regions; and 2) the proportion of the population in settlements of 201–500 inhabitants did not seem remarkable for most periods and regions (in contrast to the counts).

In the next section, I examine continuity of occupation in settlements of all sizes.

Continuity of occupation

To help pinpoint when dramatic changes in settlement pattern happened, which is often linked to extensive sociopolitical reorganization, I examine the continuity of occupation on settlements in the study area. Continuity is an indicator of multi-period stability. If settlements do not continue to be occupied, then they have become unimportant, and, if they were large settlements, they lost central place functions. Similarly, looking backwards, if during a period there are many settlements in new locations, this suggests increased populations (and thus an infilling of settlements), or perhaps new settlement patterns. I look at continuity on all settlements, then at continuity on settlements with populations greater than 1000. Note that to determine continuity, I use whatever periods were identified in that survey report, and not merely the seven periods I discuss elsewhere in this study (B, E/F, G/H, etc.).

All settlements

Table 7-6 and Figure 7-30 derive from the same data—continuity of all settlements in the database for the seven periods I analyze here. They present them, however, quite dif-

Table 7-6. Continuity counts and percentages: occupation in previous and next periods. **P** = previous; **N** = next, **both** = PP and P, or N and NN. See text for more explanation.

both	**P**	**PN**	**N**	**both**			**both**	**P**	**PN**	**N**	**both**
10	48	0	0	0	**Tula**	V	10%	47%			
1	1	1	2	1		Q	50%	50%	50%	100%	50%
0	4	2	9	9		L		27%	13%	60%	60%
						I					
						G/H					
						E/F					
0	0	0	3	1		B				100%	33%
81	290	0	0	0	**Basin of Mexico**	V	8%	29%			
46	59	28	87	60		Q	28%	36%	17%	53%	36%
59	139	113	238	119		L	19%	45%	36%	77%	38%
15	52	14	64	24		I	7%	23%	6%	28%	10%
10	43	20	46	14		G/H	7%	32%	15%	34%	10%
0	9	7	42	18		E/F		16%	13%	75%	32%
0	0	0	8	4		B				53%	27%
21	28	0	0	0	**Morelos Valleys**	V	30%	39%			
						Q					
18	32	23	47	21		L	17%	31%	22%	46%	20%
15	28	19	32	23		I	27%	51%	35%	58%	42%
11	22	16	29	20		G/H	19%	38%	28%	50%	34%
7	19	11	22	15		E/F	15%	40%	23%	46%	31%
0	0	0	8	7		B				80%	70%
88	130	0	0	0	**Tehuacán-Cañada**	V	34%	50%			
35	126	82	114	0		Q	17%	61%	39%	55%	
17	66	50	151	77		L	8%	32%	24%	72%	37%
6	29	20	72	54		I	4%	21%	15%	53%	40%
2	14	6	19	10		G/H	5%	33%	14%	45%	24%
1	2	2	25	14		E/F	3%	6%	6%	78%	44%
0	0	0	1	1		B				50%	50%
26	50	0	0	0	**Mixteca Baja**	V	33%	64%			
						Q					
5	37	29	55	0		L	7%	51%	40%	75%	
0	6	5	36	29		I		15%	12%	88%	71%
						G/H					
0	0	0	6	5		E/F				86%	71%
						B					
133	404	0	0	0	**Mixteca Alta**	V	12%	36%			
34	46	43	84	2		Q	34%	46%	43%	83%	2%
42	90	77	307	107		L	9%	19%	16%	65%	23%
25	52	41	87	74		I	22%	46%	36%	76%	65%
3	16	2	10	6		G/H	4%	19%	2%	12%	7%
12	58	24	50	34		E/F	5%	23%	10%	20%	14%
0	15	14	69	34		B		16%	15%	73%	36%
47	311	0	0	0	**Oaxaca Valleys**	V	2%	12%			
40	83	57	321	0		Q	8%	16%	11%	62%	
157	271	65	118	49		L	14%	23%	6%	10%	4%
103	260	144	293	60		I	19%	47%	26%	53%	11%
55	166	106	272	156		G/H	7%	21%	14%	35%	20%
24	29	27	72	55		E/F	30%	36%	34%	90%	69%
			22	20		B				85%	77%
both	**P**	**PN**	**N**	**both**			**both**	**P**	**PN**	**N**	**both**

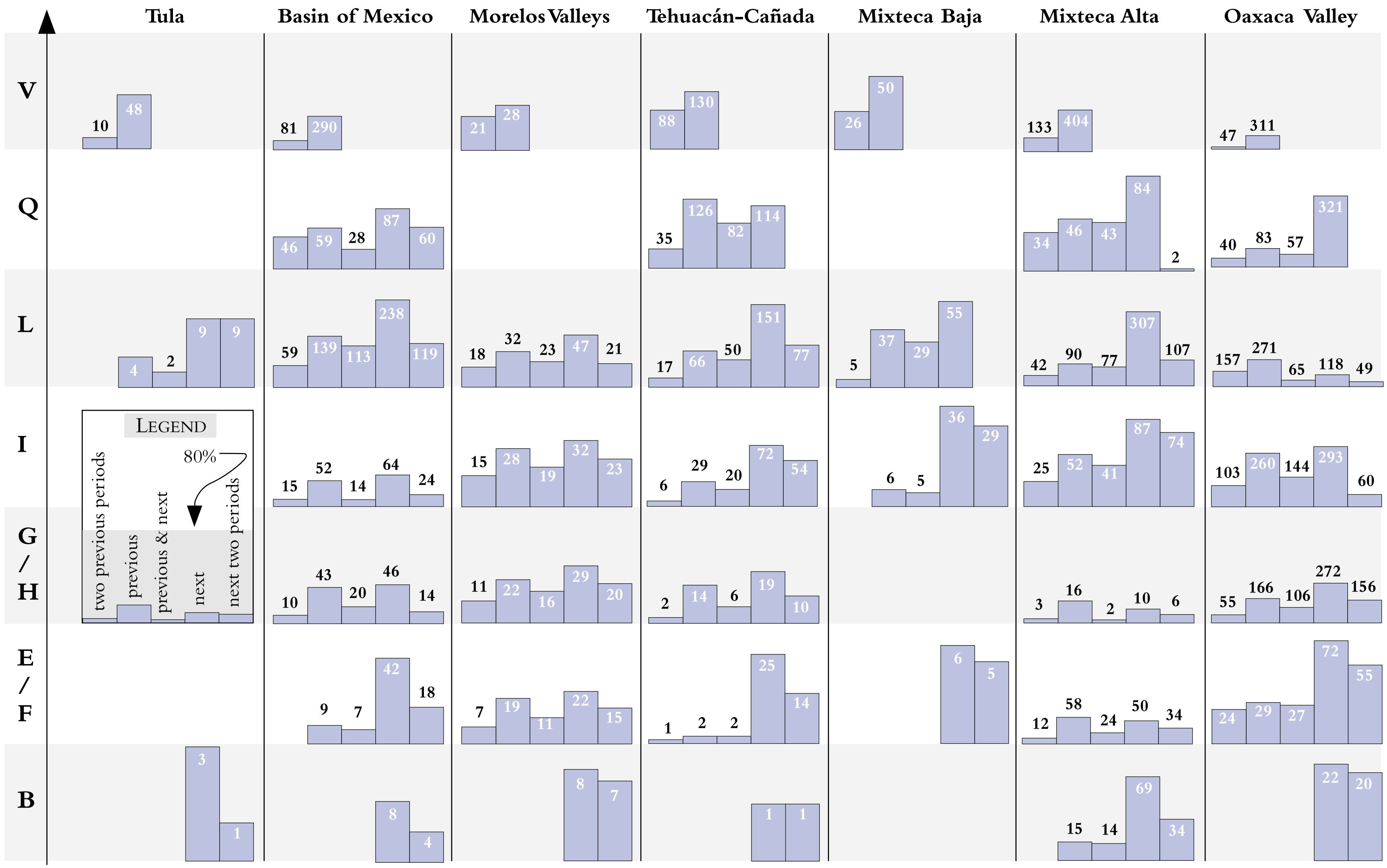


Figure 7-30. Settlement continuity. Column heights show percent of settlements that remained in the same location; numbers are settlement counts. Columns 1, 3 and 5 show occupation over three periods; columns 2 and 4 over only two. See text for more explanation.

ferently. In the table, each region is in a separate band across the page, with the periods arranged with the earliest at the bottom; time, then, goes from bottom to top within each band. On the left side of the table are settlement counts, and on the right, the percentages those counts are of all settlements in that period in that region. Each of the five columns on each side has data on another aspect of continuity. In order from left to right they are: 2P, or the number/percentage of settlements occupied in the two previous periods; P, the number/percentage of settlements occupied in the previous period; PN, the number/percentage of settlements occupied in both the previous and the next period; N, the number/percentage of settlements occupied in the next period; and 2N, the number/percentage of settlements occupied for both succeeding periods. Thus, the columns 2P, PN, and 2N all represent occupation for three successive periods, while the columns P and N represent occupation for only two successive periods. In other words, columns 2P, PN, and 2N show three-period continuity, and P and N show two-period continuity.

In the Figure, I try to transcend the limitations of a simple table and produce a graphic that clarifies this complex variable. Nevertheless, it takes a bit of study to "read" this graphic. Figure 7-30 presents a series of column blocks, with the blocks arranged by period (horizontally, with earliest at the bottom), and region (in columns). From left to right, the five columns of each block represent what in Table 7-4 is termed 2P, P, PN, N, and 2N. The height of each column represents the percentage of settlements that continued to be occupied (the inset legend shows the level that is 80 percent), and the integer is the settlement count. Note that the periods used for continuity are the periods used in the survey report from which I obtained the data; therefore, the continuity data rely on periods other than the seven I focus on in this study.

With the exception of the Mixteca Alta and the Oaxaca Valley regions, the ~Early Formative period B data are difficult to interpret because the site counts are so low. The Oaxaca Valley data unequivocally suggests that early settlements continued to be occupied in later periods, not only in the next period, but on into the following period. While the

Mixteca Alta shows a fair degree of continuity from the previous period, many new settlements were established in period B. Period B Mixteca Alta settlements continued to be occupied in the next period, but less so on into the following period.

The ~Middle to ~Terminal Formative periods E/F, G/H, and I are perhaps easier to evaluate, because the data are more continuous than for the other periods. For period E/F, the Mixteca Alta shows low previous continuity due to having many settlements in new locations, relative to the two previous periods. The Oaxaca Valley shows higher previous continuity, and very high levels of continuity into the following periods. The Basin of Mexico is intermediate between the continuity rates of the Mixteca Alta and Oaxaca Valley regions.

For period G/H, the Mixteca Alta shows even lower levels of three-period continuity than in E/F, and only two settlements were occupied both in the previous and in the next period (PN), suggesting many new settlements. The other four regions show approximately similar patterns, although the Tehuacán-Cañada three-period previous continuity is lower than the other regions. The Oaxaca Valley region, although its PN is fairly low, shows higher 2P, with G/H settlements continuing to be occupied a higher rate than in the Basin of Mexico. In general, period G/H shows low prior occupation, and low rates of three-period occupation.

In period I, the Basin of Mexico shows the lowest percentages of three-period continuity, similar to that of the Mixteca Alta in both periods E/F and G/H. The Mixteca Alta has the highest rates of three-period continuity, a total switch from the previous periods. The Oaxaca Valley data are intermediate, suggesting moderate stability. Thus, the big three regions show variability throughout the Formative. In period I the Basin of Mexico's low continuity suggests a break with previous settlement patterns. The Morelos Valleys and Mixteca Alta regions show higher rates of settlement continuity, suggesting more stability.

In the ~Early Classic period L, this flip-flops. Although all continuity levels were relatively low, the Basin of Mexico levels were higher than the other two big three regions.

Continuity in the Oaxaca Valley region was very low, suggesting not only significant shifts from previous periods, but marked shifts in the succeeding periods. Both the Basin of Mexico and Mixteca Alta show a high percentage of sites were occupied in the next period, although the numbers were not so high for two succeeding periods.

In the ~Epiclassic period Q, once again the big three regions show different patterns. The Mixteca Alta has the highest levels of continuity from the previous periods, and the lowest for two succeeding periods, although continuity to the next period was high. The Basin of Mexico shows moderate levels of continued occupation from previous periods, and a higher percentage for two succeeding periods. The Oaxaca Valley data show very low levels of occupation from preceding periods, and that a high percentage of settlements continued to be occupied into the next period (there's no data for two succeeding periods).

In the ~Late Postclassic period V, populations were dramatically higher, even higher than in the ~Early Classic period L. This is consistent with the many new settlements and the low previous continuity rates of the ~Late Postclassic. All big three regions follow these expectations, with the Mixteca Alta having the highest rates of occupation from previous periods. The higher rates in the Tehuacán-Cañada and Mixteca Baja regions may be significant. The few periods used in dating the Tequixtepec survey area sites, however, means continuity assessments for the Mixteca Baja are difficult to compare to the other regions. The Oaxaca Valley region shows the lowest continuity from previous periods, which in this case indicates not so much abandonment of settlements occupied in previous periods, but settlement of new locations.

The most populous settlements

The top settlements of the population hierarchy include most of the people and provide a strong indicator of the character of the system in which they operate. Figure 7-31 draws data from a subset of all settlements discussed in the previous subsection; it focuses on the largest settlements. The Figure includes both the settlements with more than 1000

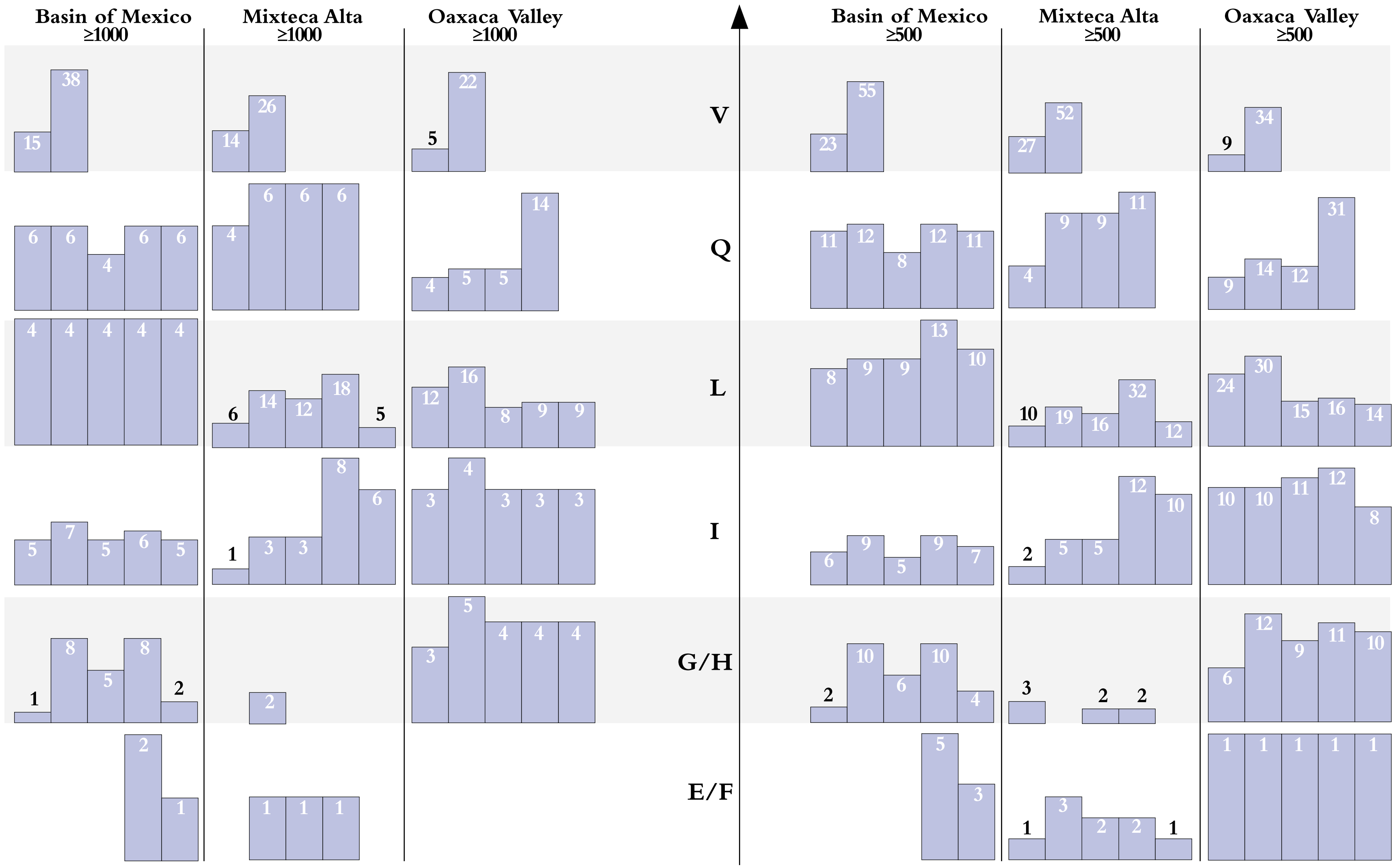


Figure 7-31. Settlement continuity: largest settlements (1000 or more people, left; 500 or more people, right) in the big three regions. Column heights are percentages; the numbers are settlement counts. See Figure 7-30 for legend and text for more explanation.

people (left side), which was the minimum threshold used in the urbanization analysis, and those settlements with more than 500 people (right side), to give comparative data about settlements that could be considered either large or small, at the scale of settlement from the prehispanic highlands. This Figure only includes data from the big three regions, because systematic data from the other regions are too scanty for this analysis. Figure 7-31 is set up the same way as Figure 7-30, summarized in the previous subsection.

One way to begin to grasp the import of Figure 7-31 is to look for a preponderance of tall columns. For settlements with more than 1000 people, this is in periods G/H and I of the Oaxaca Valley and L and Q of the Basin of Mexico, as well as Q in the Mixteca Alta. These are regions and periods for which the continuity of occupation was high both in previous and succeeding periods. The opposite, low continuity is evident in period G/H and I in the Basin and Mixteca Alta, and in the Mixteca Alta and Oaxaca Valley in period L. In period V in all regions, and in period Q for the Oaxaca Valley, settlement was high in the previous period, but not for the two previous periods. If we include somewhat smaller settlements (those with populations of 500 or more), the Oaxaca Valley shows high continuity for the E/F, G/H, and I periods, and the Basin of Mexico has high continuity for periods L and Q. The Mixteca Alta also has pretty high continuity for period Q. Low continuity is evident in the Mixteca Alta for periods E/F and G/H, and for the Basin of Mexico in period I. Thus, the expanded data in the right side of Figure 7-31 amplifies patterns evident in the settlements with more than 1000 residents. Thus, the remainder of this discussion focuses on the settlements urbanized at the level of 1000 inhabitants.

For the early periods, E/F and G/H, few settlements were this populous, so conclusions are difficult to generate. That said, at the 1000 population level, the Oaxaca Valley region seems to show more continuity than the Basin of Mexico region, while the Mixteca Alta region shows very little continuity. The three regions definitely show different continuity patterns for G/H.

In period I, the Basin of Mexico and the Mixteca Alta show low continuity from previous periods, and the Oaxaca Valley shows high continuity, continuing its period G/H patterns. In the periods following period I, the Basin of Mexico shows low continuity (few settlements important in period I continued to be occupied in the following periods). In contrast both the Mixteca Alta and Oaxaca Valley regions show strong continuity in the periods after period I. This suggests that new patterns were adopted in the Basin of Mexico and Mixteca Alta regions in period I, and period I patterns continued into the following periods in the Mixteca Alta and Oaxaca Valley, but not the Basin of Mexico.

In period L, the Basin of Mexico shows all largest settlements (Teotihuacán, of course, and Techachal de San Martín de las Pirámides Este, El Tlatel de Rancho Tlalan, and Tlaltenco de Santa María Maquixco el Alto) had continued occupation, both before and after period L. The Mixteca Alta and Oaxaca Valley regions had similar moderate levels of occupation from the previous periods and into the succeeding periods, with the Mixteca Alta having somewhat lower occupation rates than the Oaxaca Valley region.

In period Q, the extreme continuity rates of the Basin of Mexico drop somewhat, but the Mixteca Alta shows the highest rates, especially for the previous and next periods. (The six PN settlements are Yanhuitlán, Yucuita, Yucuñudahui, SPP-TOP-TOP-1, NO-TIL-TIL-24, and SPP-SAL-SIL-1; four are mound sites.) The Oaxaca Valley shows low rates of previous continuity, but a high rate of continued occupation into the ~Late Postclassic.

For the high-population period V, I ignore continuity data into the colonial period and focus on the prehispanic occupation. All regions show relatively low continuity from the preceding period. This is in contrast to the all-settlements graphs in Figure 7-30, which showed very low continuity levels for all sites. This suggests that the important settlements of the previous periods continued to be occupied, but there were so many new settlements that this continuity was eclipsed. Perhaps the large settlements of the previous period just tended to get larger, although many locations were newly occupied.

In general, comparing Figures 7-30 and 7-31, the patterns are similar, but large settlements tended to have more continuity of occupation than all settlements. This suggests that larger settlements were able to retain their importance and central place functions. Larger settlements lost importance in periods E/F, G/H, and I in the Basin of Mexico and Mixteca Alta, but not in Oaxaca, in period L in the Mixteca Alta and Oaxaca Valley, but not the Basin, and in Oaxaca in period Q, but not in the Basin and Mixteca Alta. Large settlements with three-period continuity also tended to have civic-ceremonial architecture dating to that period: over 73 percent of those occupied in the two previous periods had mounds dating to that period; 70 percent of those with previous and next period occupations had mounds; and 69 percent of those occupied in the two succeeding periods had mounds.

Continuity: summary discussion

If continuity of occupation in settlements helps us understand the stability of the settlement hierarchy in a region, the overall conclusion we can draw about the study area is that there was considerable variability among the regions, including among the three regions for which we have the most data: the Basin of Mexico, Mixteca Alta, and Oaxaca Valley. For example, in period E/F, the Mixteca Alta had about twice the population density of the Basin of Mexico, and far less settlement continuity than either that region or the Oaxaca Valley region, which had about the same population density, both for the largest settlements and for all settlements. Thus, as with other measures of population and settlement dynamics, continuity also shows that the well-known regions of the Mesoamerican highlands had variable trajectories of stability and change. In the next sections, I examine another hierarchy, that of civic-ceremonial architecture.

Three Basin of Mexico population estimates compared

In 1979 Sanders et al. published *The Basin of Mexico*, which summarized the region's prehistory, including Basin-wide population estimates, and a series of large-scale maps showing settlement patterns for each period. The area Sanders et al. defined as the Basin corresponds to the area I have included in the Basin of Mexico region. Table 7-7 shows three estimates of the Basin population. Estimate 1, on the left, is the total population Sanders et al. give in the text of the volume. Estimate 2 is based on the population estimates published in the various separate Basin survey reports. Estimate 3 is based on average CALC POP. (See Chapter 4 for details on how I derived Estimates 2 and 3.)

Sanders et al. never detail how they derived the nice round figures that are their Basin-wide population estimates. I derived Estimates 2 and 3 by figuring the population density for the surveyed areas, then extrapolating that for the whole Basin region (estimated at 6100 km^2, including lakebed areas). The difference is that Estimate 2 is based on the population estimates given in the various Basin survey area reports, and Estimate 3 is based on CALC POP (see Chapter 4 for details on CALC POP).

Estimates 2 and 3 are based solidly on archaeological data, and it is my assumption that the population densities derived from the surveyed areas in all periods except period L are representative of the region. Indeed, I would argue that they might be expected to be somewhat high, since the whole Basin region includes more low-density areas than the surveyed areas. Comparing each period, the three estimates are about the same for

Table 7-7. Three Basin of Mexico population estimates. Note that the figures for Estimate 1 periods E/F and G/H are period E (First Intermediate 1-B) and period G (First Intermediate 2) estimates, which I would expect to be low for the combined periods I analyze.

period	**period**	**book Estimate 1**	**reports Estimate 2**	**CALC POP Estimate 3**
V	~Late Postclassic	1,000,000	588,450	726,871
Q	~Epiclassic	135,000	145,854	168,414
L	~Early Classic	250,000	532,101	529,152
I	~Terminal Formative	145,000	148,241	142,102
G/H	~Late Formative	80,000	128,321	108,215
E/F	~Middle Formative	25,000	30,613	27,380
B	~Early Formative	4000	9584	9613

period I, and Estimate 1 diverges from Estimates 2 and 3 (which are similar except for periods Q and V) in all other periods.

Skipping period B for the moment, I expect the divergence in periods E/F and G/H are because the Estimate 1 figures are for periods E and G, and thus are somewhat lower than would be expected if they were for F and H.

I am not surprised that Estimates 2 and 3 are more than twice the size of Estimate 1 for period L, the ~Early Classic, because the population densities upon which they are based include Teotihuacán, which was the largest settlement in the Basin and probably had about half the Basin's total population. Thus, its high population has boosted the extrapolated Basin-wide population to more than twice the estimate that Sanders et al. (1979:145) published.

The lower figure for Estimate 1 in period Q may also be driven by the fact that Teotihuacán's population (Teotihuacán was still the largest settlement in the surveyed areas) is included in the surveyed areas, thus inflating the population densities upon which Estimates 2 and 3 are made. Thus, if adjusted, all three period Q population estimates are probably similar.

In period V the divergence among the three estimates is probably because the western Basin population centers of Tenochtitlán, Tlacopan, and other major population centers are not within the survey areas, meaning that Estimates 2 and 3 should be low. Also, the survey area data do not include the populations of several Late Aztec communities that are within their limits, as noted elsewhere, and I expect that these were larger rather than smaller communities, which constitutes another factor in making Estimates 2 and 3 low for period V.

Period B seems a bit more enigmatic. It is based on 15 sites ranging from .5 to 9.0 ha in size. Since there are no data to suggest that the period B Basin surveyed areas had any sites remarkably larger or consistently smaller than contemporaneous sites across the region, I believe Estimates 2 and 3 might be a truer reflection of the total region population than the much lower Estimate 1.

In sum, I find the population estimates Sanders et al. gave in 1979 to match the population estimates based on individual surveys, except for the ~Early Formative period B. In that case, I believe the 1979 estimate is too low.

What are the implications of this comparison for the whole study? First, I think it supports the general accuracy of site-by-site population estimates, at least in aggregate—or at least their general consistency. Indeed, all three population estimates are based on the same set of assumptions: 1) they rely on the same set of site size estimates; 2) they rely on the same general range of population densities correlated to those site sizes; and 3) they assume approximately the same range of variations in population densities for settlements in different periods (e.g., higher density in the larger settlements of the Classic and Postclassic than in small settlements of any period and ~Early and ~Middle Formative centers).

Summary

In this chapter, I have presented settlement pattern data from surveyed areas in the study area, combining both the quantitative data from the database and qualitative data from other survey areas, and augmenting them with excavation data. While settlement size comparisons are important, I developed more variables that address population. For example, I separated out large settlements and small settlements, setting the threshold at 1000 people. With the largest settlements, I could examine the proportion of the population that was urbanized. These variables address issues of scale, integration, and complexity. I will look at the implications of these variables in Chapter 9.

Chapter 8

Civic-Ceremonial Architecture: Data and Analysis

In this chapter, I examine the data on mounds and ball courts, their distribution, concentrations, etc., using variables that augment our understanding of scale, integration, complexity, and boundedness. I had hoped to look at the civic-ceremonial architecture in aggregate (e.g., size of civic-ceremonial architecture zones, their area in proportion to residential areas of a site, etc.), and also to examine plaza counts and size, plus configurations of mound-plaza complexes; however, few survey reports include data on the civic-ceremonial architecture (CCA) in sufficient detail for me to do so. Thus, in this chapter I address only mound and ball court counts and distributions. Even so, mound counts from some survey reports are unspecific, saying for example "several mounds" or "several mound complexes," making the mound counts for those areas undercounted, as I could only attribute the smallest possible count that would satisfy the description to that site (see Chapter 4).

The importance of the civic-ceremonial architecture is twofold: 1) it provides a second means for hierarchicalizing sites since settlements rich in mounds or having a ball court can be considered nodes of ritual and administrative activity, even if we do not know the details of the activities that occurred at them; and, 2) it shows sociopolitical change and continuity at regional and macroregional scales. In Chapter 7, I examined settlement size and population, and described settlement pattern hierarchies. Together, Chapters 7 and 8 provide insights into the highland macroregional system, the implications of which are discussed in Chapter 9.

This chapter has two main sections, one on mounds and one on ball courts (see Table 8-1 for counts of each, and counts of sites with each type of civic-ceremonial architec-

Table 8-1. Mound and ball court counts, including mound site and mound counts; ball court and ball court site counts.

Period	B	E/F	G/H	I	L	Q	V	Totals
All components (sites)								
Tula	3				15	2	102	122
Basin of Mexico	15	56	135	230	310	165	996	1907
Morelos Valleys	10	48	58	55	103		71	345
Tehuacán-Cañada	2	32	42	135	209	208	258	886
Mixteca Baja		7		41	73		78	199
Mixteca Alta	94	249	72	125	473	101	1111	2225
Oaxaca	26	81	785	555	1155	516	2630	5748
Total	150	473	1092	1141	2338	992	5246	11,432
Mound site count								
Tula	1				5	1	9	16
Basin of Mexico	0	4	8	26	23	24	236	321
Morelos Valleys	1	3	3	7	20		11	45
Tehuacán-Cañada	0	9	8	53	53	29	60	212
Mixteca Baja		0		2	47		13	62
Mixteca Alta	5	29	32	36	150	44	219	515
Oaxaca	4	26	194	164	215	107	243	953
Total	11	71	245	288	513	205	791	2124
Mound counts								
Tula	2				14	5	21	42
Basin of Mexico	0	18	21	75	336	79	518	1047
Morelos Valleys	2	4	14	32	132		51	235
Tehuacán-Cañada	0	17	34	274	300	309	966	1900
Mixteca Baja		0		4	114		28	146
Mixteca Alta	15	73	135	157	500	174	719	1773
Oaxaca	13	64	797	760	1016	747	823	4220
Total	32	176	1001	1302	2412	1314	3126	9363
Ball court site counts								
Tula	0				0	1	0	1
Basin of Mexico	0	0	0	0	0	0	1	1
Morelos Valleys	0	0	0	0	4		0	4
Tehuacán-Cañada	0	0	0	15	14	5	13	47
Mixteca Baja		0		0	5		1	6
Mixteca Alta	0	0	0	2	6	2	7	17
Oaxaca	0	1	10	16	18	13	10	68
Total	0	1	10	33	47	21	32	144
Ball court counts								
Tula	0				0	2	0	2
Basin of Mexico	0	0	0	0	0	0	1	1
Morelos Valleys	0	0	0	0	4		0	4
Tehuacán-Cañada	0	0	0	16	16	8	15	55
Mixteca Baja		0		0	5		1	6
Mixteca Alta	0	0	0	2	6	2	8	18
Oaxaca	0	1	13	19	21	15	13	82
Total	0	1	13	37	52	27	38	168
Period	**B**	**E/F**	**G/H**	**I**	**L**	**Q**	**V**	**Totals**

ture). In each section, I first examine regional and macroregional patterns based on aggregated data from the database. Then, I examine the distributions of the most architecture-rich settlements by period, to evaluate change over time as well as variations among regions across the study area. Although mound counts are underreported from sites not in the surveyed areas, I attempt to include discussion of important sites not in the quantitative dataset. This is easier for ball courts, as they have been discussed in ball court-specific articles; nevertheless, we do not have systematic data for ball court counts on a site-by-site basis. The mound section closes with a discussion of the continuity of occupation at mound sites.

Mounds

In this section, I describe the density and distributions of mound architecture on the regional scale, and compare it macroregionally. In the project reports I base this study on, CCA data are irregularly reported, even for those with more detailed site data (see Figure 7-1 for a map showing all survey areas). For the survey areas for which I have qualitative data, CCA data are not consistently reported. Thus, unlike in Chapter 7 in which I was able to integrate considerable qualitative data into the period-by-period discussions of site size and population, I lack the CCA data to do so for the Toluca and Puebla-Tlaxcala regions. I do have some incidental reports on multi-mound sites, and distribution data on ball courts, but no quantitative data. (For a summary of CCA detail in the survey reports, see Chapter 4.)

This section begins with discussion of four regional variables. For the regional variables, data are aggregated by region by period. I examine the proportion of settlements with mounds, mound component density, mound density, mound density per person, and mound distribution by period. The next eight subsections address mound distributions by period, or sites with the most mounds for each of the seven periods I highlight in this study, followed by a summary subsection.

Proportion of settlements with mounds

Figure 8-1 shows the proportion of settlements with mounds, by region. The inset shows the average proportion across all survey areas. This variable indicates if people built mounds on more sites in some regions at some periods, and suggests the relative importance of having many central places with mounds—or a widespread ritual and administrative hierarchy.

The average curve is most strongly affected by the high settlement counts of the Mixteca Alta region in the ~Early and ~Middle Formative, and by the high counts from the Oaxaca Valley for other periods. Nevertheless, the average shows a gradual rise to just over 25 percent in the ~Terminal Formative, then a gradual decline. The average for all regions for all periods is almost 19 percent.

Considering first the big three regions, the Basin of Mexico shows a general trend for more sites to have mounds over time, although the levels are at or below average for all periods except the ~Late Postclassic period V. Contrast this with Figure 8-2, showing mound density, which indicates the Basin's density remained below average for all periods across the study area, and far below average for the ~Epiclassic period Q.

In the Mixteca Alta, the percentage of settlements with mounds was below average for the ~Early and ~Middle Formative, then above average for all succeeding periods, and approximately double the average in the ~Late Formative period G/H and ~Epiclassic period Q. This pattern is unlike that of any other region.

The Oaxaca Valley region has above average ratios of settlements with mounds for the first three periods (~Early through ~Late Formative), then average or slightly below average rates for the succeeding periods. The general trend from the ~Middle Formative on is for decreasing ratios of settlements with mounds.

For the other regions, the Tula data are enigmatic, probably due to the few periods used for dating the settlements. The Morelos Valleys data show generally low ratios of sites

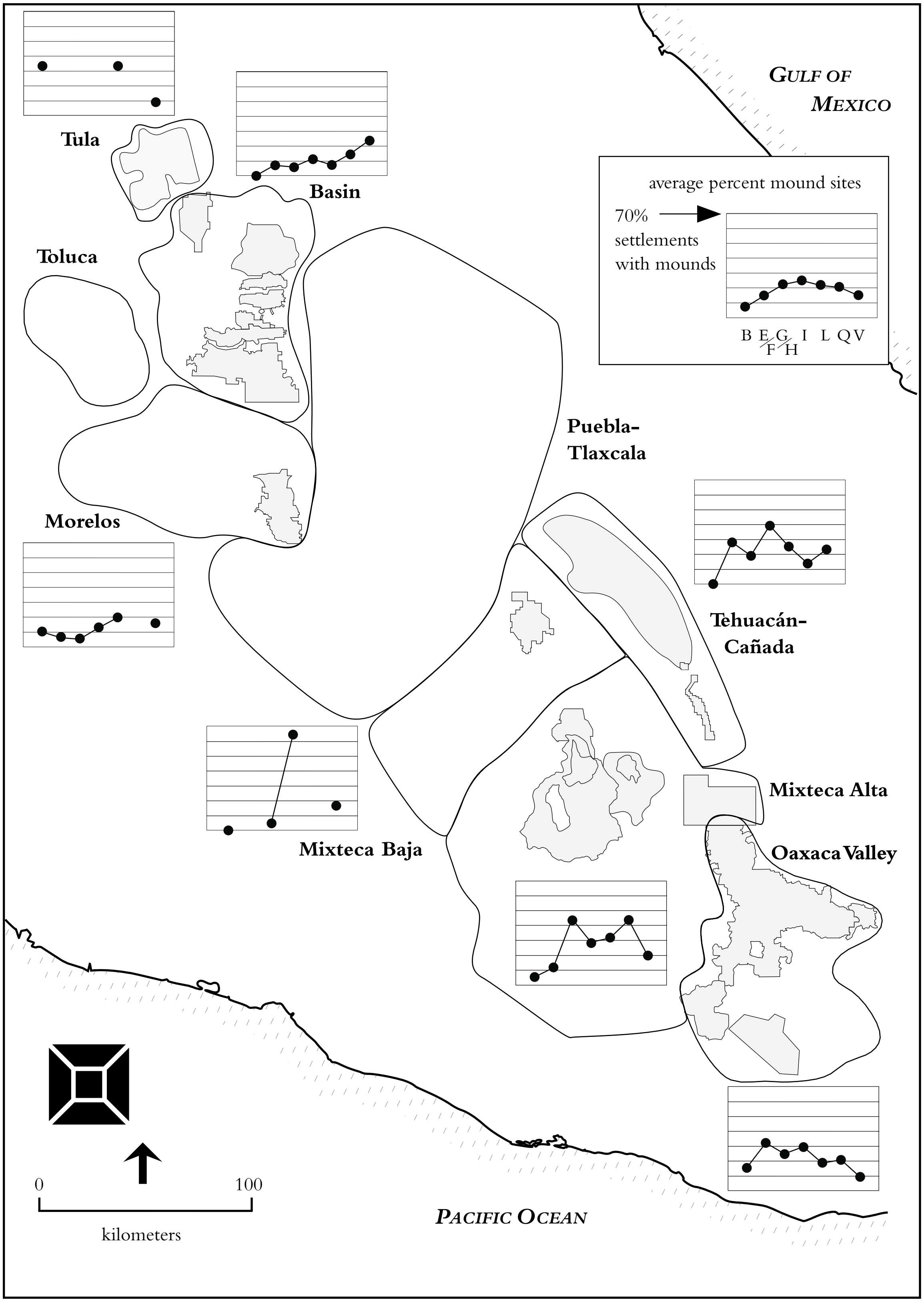


Figure 8-1. Proportion of settlements in each region with mounds. Each graph is at the same scale as the average percent graph in inset.

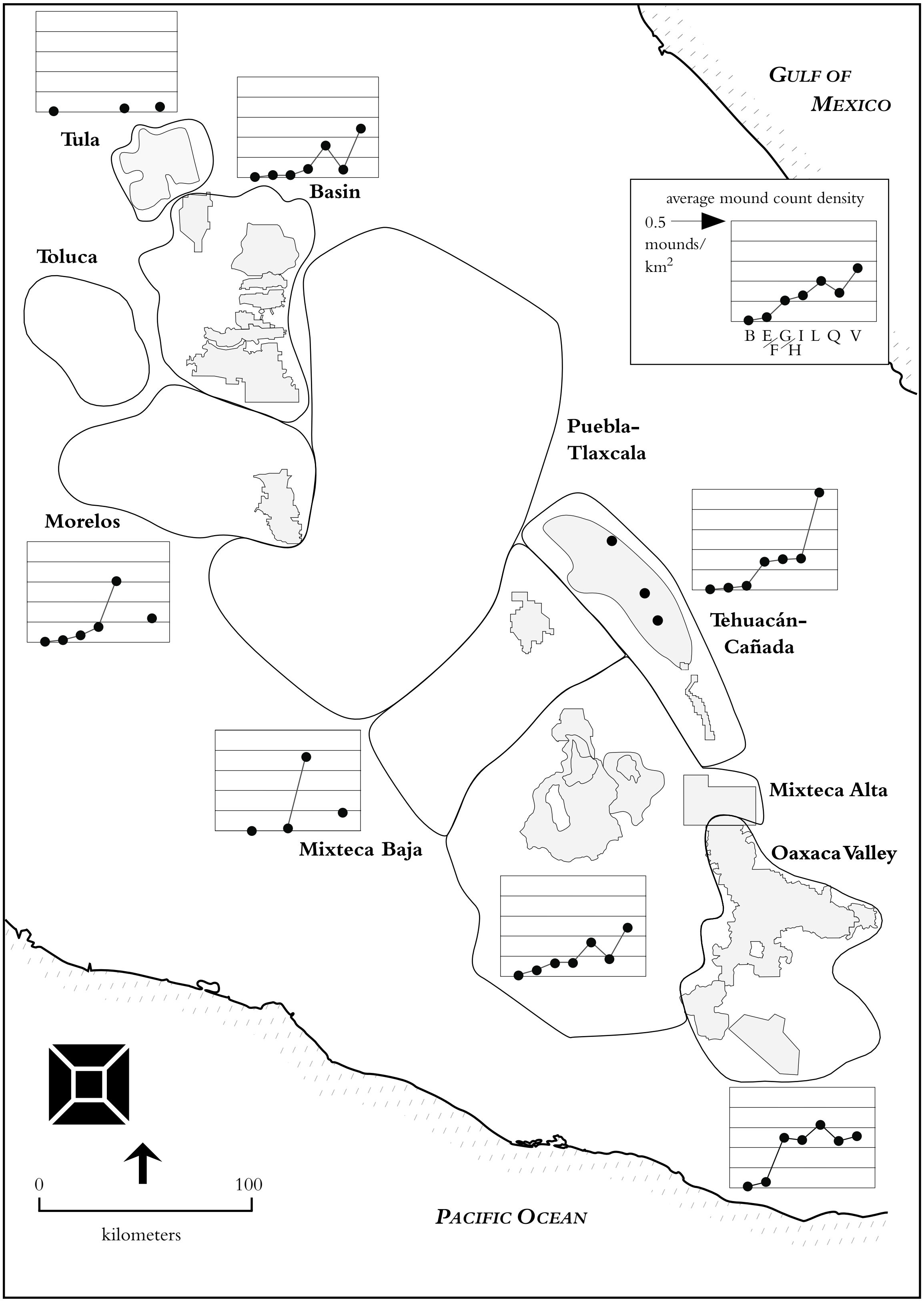


Figure 8-2. Mound count densities for each region, by period. Each regional graph is at the same scale as the average density graph in inset.

with mounds, with decreases from the ~Early to ~Late Formative, then an upward trend through the ~Early Classic, and ~Late Postclassic just slightly above average.

As with some other variables, the Tehuacán-Cañada region ratios resemble those of the Oaxaca Valley, in general, although the low period Q (~Epiclassic) rates of mound use are in contrast to the Oaxaca Valley. Ratios of settlements with mounds in use are higher than average for the ~Middle and ~Terminal Formative, ~Early Classic, and ~Late Postclassic periods in the Tehuacán-Cañada region. For the Tequixtepec survey area (Mixteca Baja region), ratios of settlements with mounds are very low for the earliest two periods for which I have data, then the highest of any region in any period in period L at over 64 percent. Either there was a tremendous preference in this area for settlements to have mounds in the ~Early Classic, or perhaps there is a bias in mound dating.

The data in Figure 8-1 show considerable region-by-region and period-by-period diversity across highland Mesoamerica. None of the big three regions show the same patterns, and data from the other regions suggest further diversity as well.

Since this variable is the proportion of mound sites divided by all sites, any region that has more little sites with few mounds (that is, sites low on the mound site hierarchy)—e.g., the Oaxaca Valley in the ~Late Postclassic—or fewer—e.g., the Basin of Mexico in the ~Early Classic—has a large impact. The next variable negates those influences, and therefore indicates which regions exhibit mound site counts that indicate increased social importance.

Density of mounds

Figure 8-2 shows the density of mounds by period in each region, for the area surveyed that period (mound count divided by area surveyed). This variable is indicates the relative density of mound use by region; because the areas surveyed varied immensely from region to region, this variable is best understood paired with the next two variables, mound count per settlement with mounds (Figure 8-3), and mound counts per person by region (Figure 8-4).

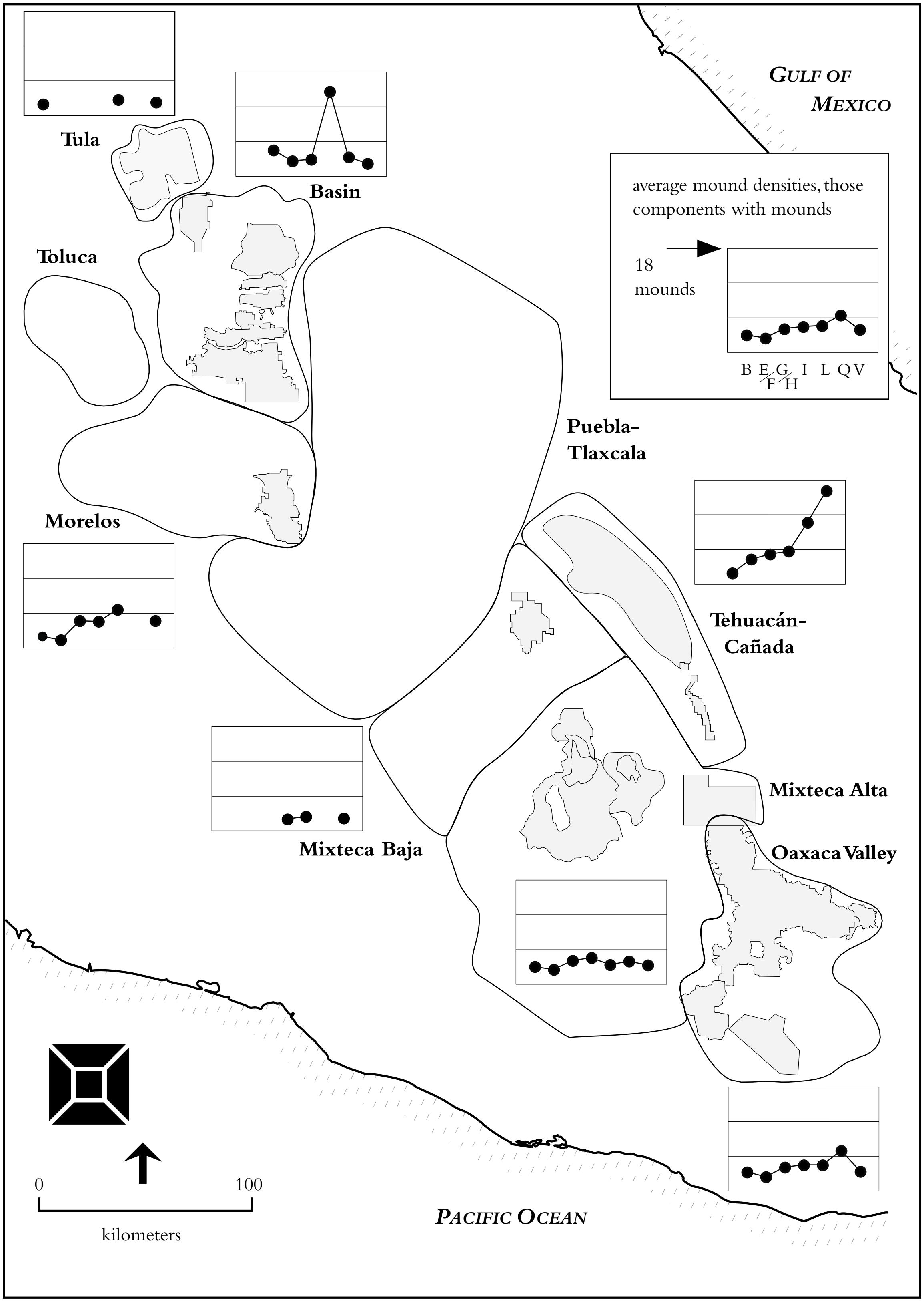


Figure 8-3. Mound densities for settlements with mounds. Each graph is at the same scale as the average density graph in the inset.

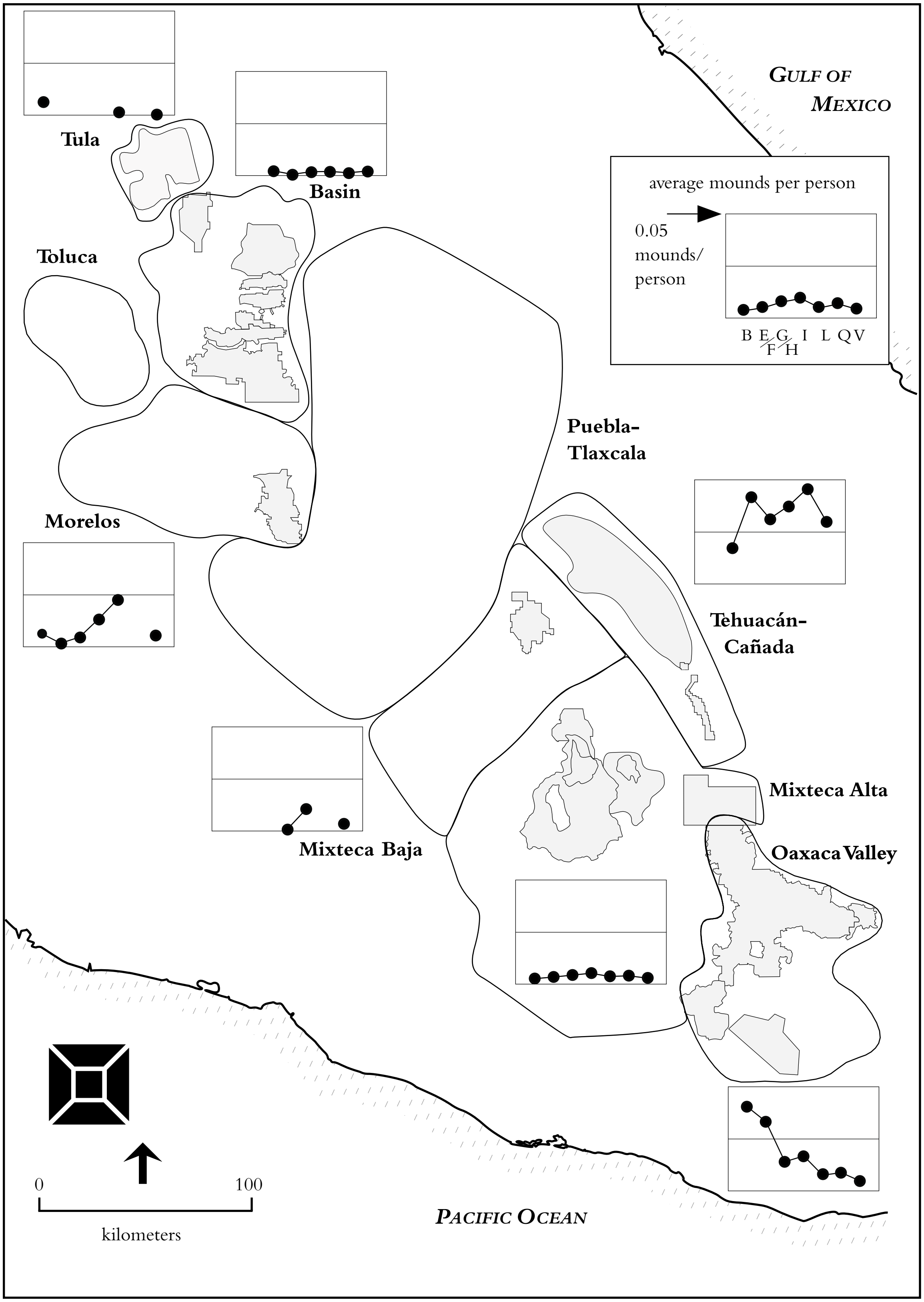


Figure 8-4. Mound density per person. Average density graph in inset shows scale of each graph.

The inset shows the average gradually increased, except during period Q, or the ~Epiclassic (the L-Q-V pattern). The Basin of Mexico was the only region that followed the average pattern. The Mixteca Alta region was similar, but had a decline in mound construction in period I (~Terminal Formative).

Both the Morelos Valleys and Mixteca Baja data show dramatic increases in mound construction in period L (~Early Classic); the period L data may represent an over-attribution of mounds to period L, however. If not, those regions diverge from trends shown elsewhere.

Unlike any other region, the Tehuacán-Cañada shows similar rates of mound use in periods B through G/H, then a jump to higher level for periods I through L, then a jump again in period V. This is enigmatic if it does not relate to poor periodization of the mounds. If this interpretation is archaeologically correct, the high density of period V mounds is unlike that of any other region. Some 520 of the 996 period V ~Late Postclassic mounds, or approximately 52 percent of the Tehuacán-Cañada region mounds, are from three sites: Tr 1 (Tehuacán Viejo), Tr 57 (Venta Salada), and Tr 135; the mound counts are estimates (MacNeish; Peterson et al. 1975:475–478, 486). These three high-mound count sites are shown on Figure 8-2.

In the Oaxaca Valley region, the mound density curve is different than in the other two big three regions (the Basin of Mexico and Mixteca Alta), which it often matches when population parameters are considered. It had lower rates of mound use in periods B and E/F (the ~Early and ~Middle Formative) than the Mixteca Alta did, which is consistent with the lower populations it had. Then unlike any other region, mound construction boomed in period G/H (Late Formative), dropping only slightly in period I (Terminal Formative), although it was far higher than any other region. In period L, the ~Early Classic, it had higher rates of mound use than all regions except Morelos Valleys and the Mixteca Baja. The L-Q-V pattern decline in period Q (the ~Epiclassic) corresponds to that of other regions, but it was less dramatic. Likewise, the increase in period V, the ~Late Postclassic, was less dramatic as well.

In sum, mound construction, like population, began earlier in the Mixteca Alta region. Then, in the ~Late Formative period G/H, mound use boomed in the Oaxaca Valley region, and continued to stay high until the conquest, unlike the patterns any other region. Even the dramatic mound construction boom at ~Early Classic Teotihuacán does not match that for across the contemporaneous Oaxaca Valley (in numbers of mounds, not size). I cannot tell if data from the Tula, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions are anomalous because of how mounds were dated or if those regions actually had somewhat different trajectories of mound construction intensity.

Mound count per settlement with mounds

Figure 8-3 shows the average number of mounds on those settlements with mounds in use in a given period; this variable indicates how clustered mound use was in those settlements with mounds. The inset shows that this variable remained consistent across all survey areas; and, on average, those sites with mounds had only a few mounds used in that period. Of note is the slight drop after the first period for which we have evidence of mound construction in the big three regions (the ~Middle Formative for the Mixteca Alta and Oaxaca Valley regions, and the ~Late Formative for the Basin of Mexico). These same three regions also show a slight drop from period Q to V (a reverse of the L-Q-V pattern), suggesting that in the ~Epiclassic period Q mound activities were more centralized than in the ~Late Postclassic period V. (This pattern is evident in the Oaxaca Valley region even though no period Q mounds are reported at Monte Albán.) Later, in the ~Late Postclassic period V, mounds use became less centralized. Indeed, all big three regions show lower densities and less centralized mound use in the ~Late Postclassic. Perhaps, in that time of large population increases, it became important merely to have a couple of mounds in the community, rather than to have many mounds.

Note how flat the curves are for the Mixteca Alta and Oaxaca Valley regions. The Basin of Mexico also is fairly flat except for during period L (Early Classic), when Teotihuacán had 241 mounds, increasing the regional density. Even with that high figure incorporated, the average number of mounds on a Basin of Mexico settlement with mounds in period L was 14.6, meaning that many sites with mounds had very few mounds. If we take Teotihuacán out of the average mound count per settlement for period L in the Basin region, the average mound count per settlement with mounds was 2.5 (55 mounds on 22 settlements), which is just over half the average for all the regions (4.6), or far lower than average.

The trajectory of the Tehuacán-Cañada graph is unlike that of any other region. One possibility is that house mounds were reported as civic-ceremonial architecture by the Tehuacán survey (MacNeish; Peterson et al. 1975), and thus their counts are falsely skewed upward. If, however, these are true CCA counts, then the people of the Tehuacán-Cañada region, after period B, built more mounds per settlement on average than the inhabitants of any big three region.

Likewise, the trajectory of mound construction in the Amatzinac survey area (Morelos Valleys region) started slowly in ~Middle Formative period E/F, then remained higher than average. Perhaps mound construction was undertaken more fervently in less-populated regions than in the demographic cores—suggesting the peripheries were emulating the cores.

Although the average pattern is flat, showing relatively consistent levels of mound use, the areas in the transition environmental regions (the Morelos Valleys, Mixteca Baja, Tehuacán-Cañada, and the Oaxaca Valley in the early periods) that stand out with higher densities. This, too, suggests a pattern of peripheries emulating cores.

Mound density per person

Figure 8-4 shows mound counts divided by population, and reported by region. Higher or lower densities of inhabitants per mound indicate the relative importance of the ritual and administrative activities carried out on and around them. While mound counts could certainly be affected by later land use (e.g., destruction by plowing), and poor periodization, the figures seem sufficiently accurate for this comparison.

Across all regions, the average mound count per person was fairly low and constant for all periods. The Basin of Mexico and Mixteca Alta regions both follow that pattern, although the Mixteca Alta levels are very slightly higher than that of the surveyed areas in the Basin. In contrast, the Oaxaca Valley region began with very high ratios of mound construction to population, due to the high mound count from San José Mogote (6 mounds) in period B (~Early Formative), and San José Mogote (10) and Yegüih (8) in period E/F (~Middle Formative). The Oaxaca Valley density remained higher than the average for periods G/H (~Late Formative) and I (~Terminal Formative), suggesting mound construction remained a more important activity.

The Tehuacán-Cañada region follows a different pattern entirely, with much higher than average mound density per person for all periods for which we have data (from period E/F on). If the mound counts are not skewed by inclusion of house mounds (see previous subsection), then the people of this region engaged in far more mound construction than those of other regions, except in the earliest periods. We know the people of this dry region built many irrigation structures, including substantial dams, so maybe expending the energy on construction of other structures, including mounds, also seemed appropriate to them.

It may be important that the peripheral areas of the transition environmental region I defined above have higher mound densities per person, as well as the Oaxaca Valley in the two earliest periods I examine here. The residents of these peripheral areas (at least after the earliest Formative) may be imitating the Mixteca Alta and southern Basin cores. Had mound size data been more consistently reported, I could have compared mound sizes to see if the peripheral areas had significantly smaller mounds, which might also have been a hallmark of constructions in the peripheries that imitated the architecture of the cores.

Mound distribution: Period B, ~Early Formative

Mound construction began early in highland Mesoamerica. All mounds dating to the ~Early Formative are shown on Figure 8-5 (see Table 8-2 for data on mound counts for all ranked sites shown on this and succeeding figures). The mounds cluster in the southern part of the study area, but are not exclusively there. This correlates with the patterns for the period B population data reported in Chapter 7.

The Figure shows that multi-mound ~Early Formative sites cluster in the southern part of the study area: in the northern arm of the Valley of Oaxaca, the Nochixtlán Valley, and across the divide in the upper Tamazulapan Valley. This is consistent with the relatively high populations in this area, discussed in Chapter 7; indeed, the northern Valley of Oaxaca had more high-ranked mound sites (clustered around San José Mogote), than it did high-ranked populous sites. In the Morelos Valleys region, the well-known early site of Chalcatzingo had two period B mounds.

Two mounds in the Tula region, on the La Loma site, are dated "Formativo" (Mastache and Crespo Oviedo 1974:98), which actually may be later than period B. I have no ~Early Formative mound data for the Toluca or Puebla-Tlaxcala regions.

Judging by mound counts, when mounds were built, they generally were not built singly, but in multiples, suggesting that if they decided to build CCA, ~Early Formative

Table 8-2. Numbers of mounds on highest ranked mound sites. Listed by period.

		Rank I		**Rank II**		**Rank III**		**Rank IV**	
Figure		***largest***	***smallest***	***largest***	***smallest***	***largest***	***smallest***	***largest***	***smallest***
8-5	period B, ~Early Formative	8	6	3	1				
8-6	period E/F, ~Middle Formative	13	8	6	3				
8-7	period G/H, ~Late Formative	40	24	19	11	10	9		
8-8	period I, ~Terminal Formative	31	25	22	18	17	15	14	10
8-9	period L, ~Early Classic	281	281	46	37	30	26	23	14
8-10	period Q, ~Epiclassic	129	46	27	23	19	16	13	10
8-11	period V, ~Late Postclassic	300	120	70	69	46	35	27	13

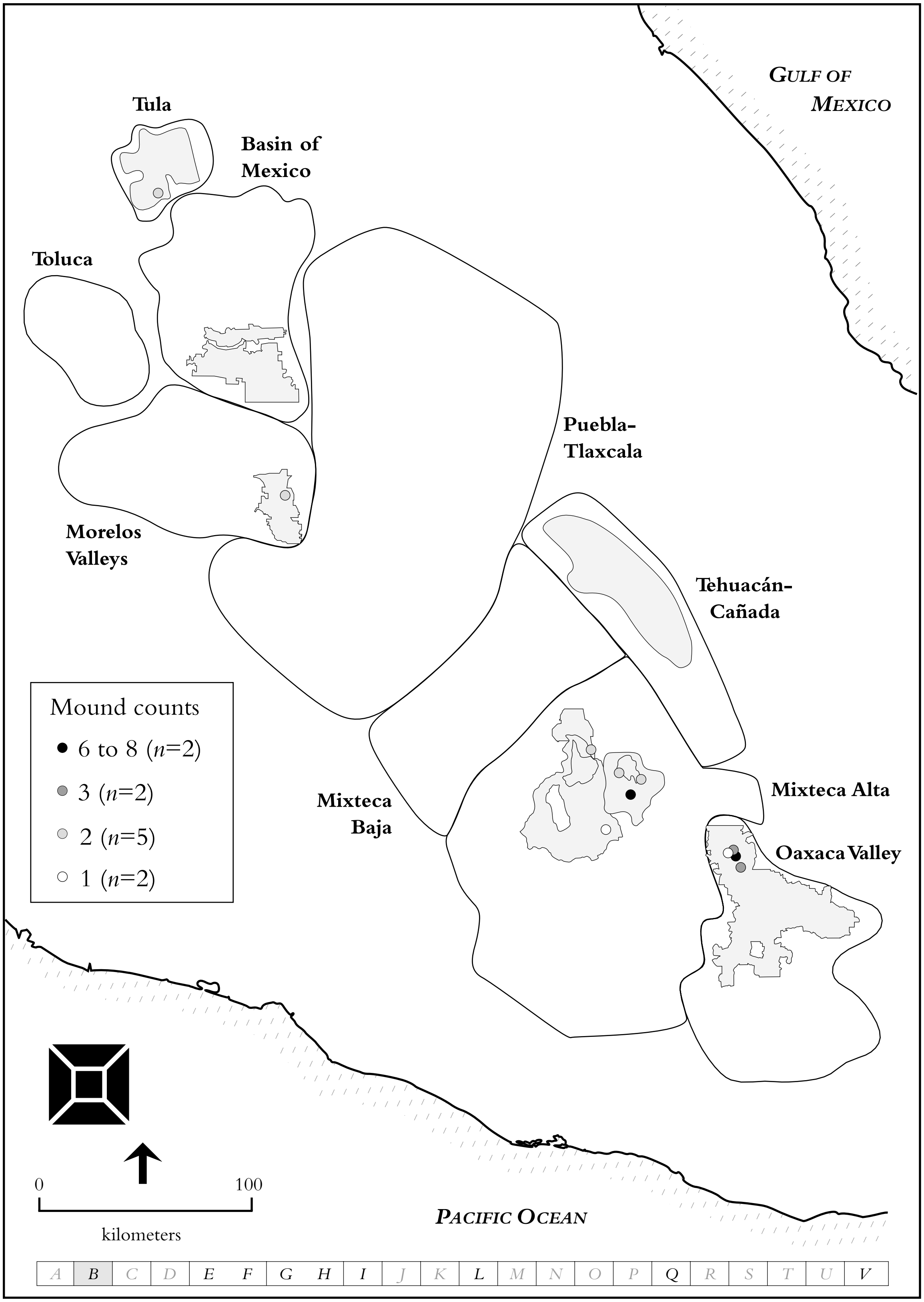


Figure 8-5. Period B settlements with mounds (*n*=11 of the 150 period B sites). Period B mound sites have two ranks: Rank I, 6–8 mounds; Rank II, 1–3 mounds.

people tended to construct more than one mound. In other words, they tended not to build single mounds, but mound groups. This is not inconsistent with our understanding of the cosmology of that period—and the patterns of the better-known Valley of Oaxaca San José period that followed (e.g., Blanton et al. 1999; Flannery 1983; Flannery and Marcus 2000). Spatially, mound building in ~Early Formative period B tended to be a southern phenomenon, although not exclusively.

Mound distribution: Period E/F, ~Middle Formative

Mound construction had spread throughout the study area by ~Middle Formative period E/F (Figure 8-6), and the settlements with the most mounds also spanned the area, with Rank I mound centers in the southeastern Basin of Mexico, the Mixteca Alta, and two arms of the Valley of Oaxaca.

Ch-MF-9, in the southeastern Basin, had 13 mounds. Only three other sites in the Basin region survey areas had period E/F mounds—for a total of only five mounds. Thus, while Ch-MF-9's 13 mounds were the most for any period E/F site in the surveyed areas, few nearby settlements had mounds. This is a very shallow mound settlement hierarchy. The starred settlement just west of the Chalco-Xochimilco survey area is Cuicuilco; its ~Middle Formative character is unknown because of the lava that later covered much of the site, and the dating of "early" materials that been uncovered is suspect (Grove 1987b:435), although it may have had ~Middle Formative CCA.

The Basin pattern contrasts with the pattern in the Mixteca Alta region, where 29 settlements had multiple mounds. The Rank I and Rank II mound settlements were scattered throughout the surveyed areas west of the Nochixtlán Valley (only a few period E/F mound settlements have been recorded in the Nochixtlán Valley), with a high of nine mounds at Vista de El Arcón, in the Teposcolula survey area. This indicates a slightly deeper hierarchy than in the Basin. Missing from these data are the Tayata site (starred) in the Huamelulpan survey area, which had four ~Middle Formative mounds.

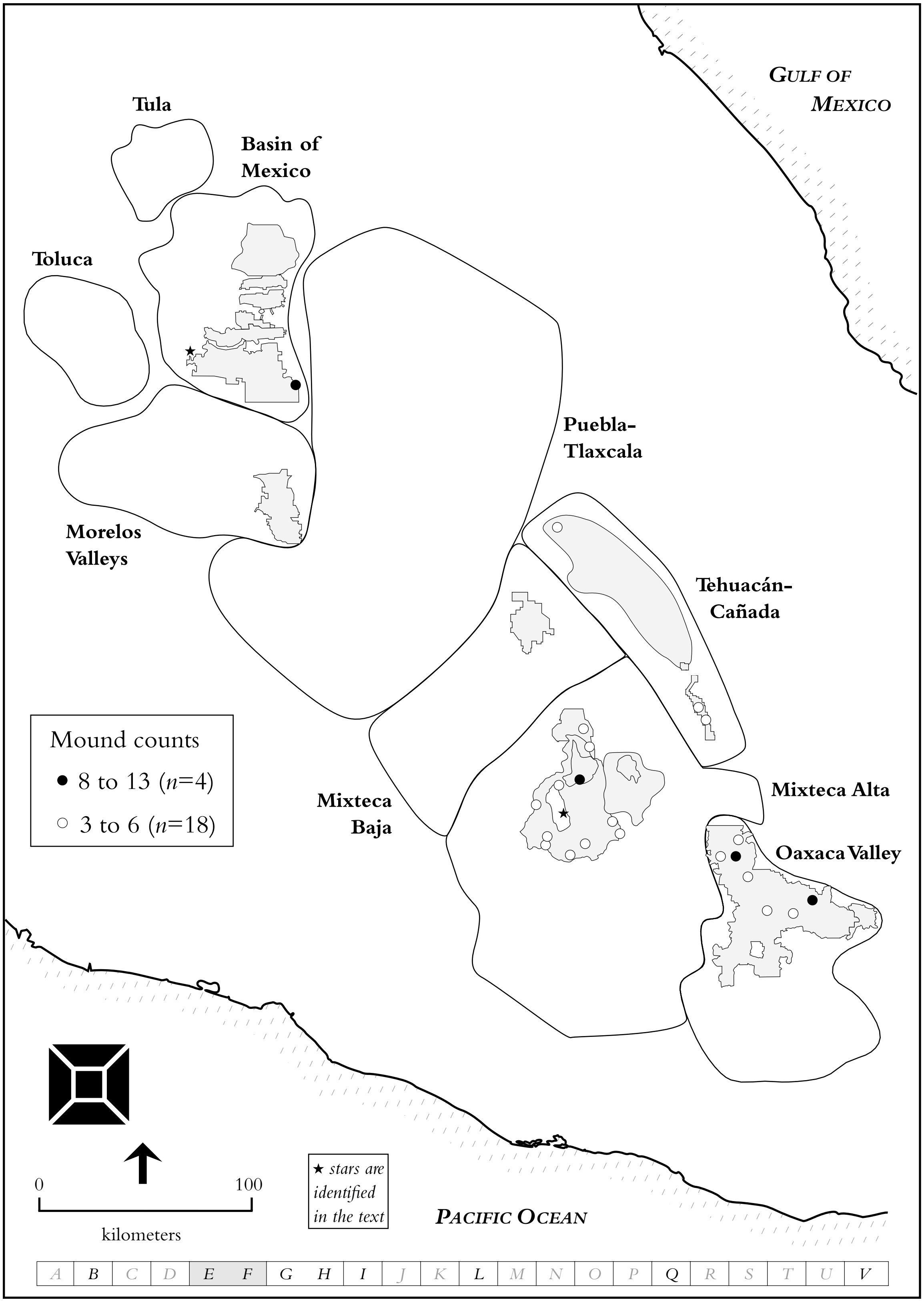


Figure 8-6. Period E/F sites with three or more mounds (*n*=22 of the 473 period E/F sites). Rank I is 8–13 mounds; Rank II is 3–6 mounds.

Farther south in the Oaxaca Valley region, San José Mogote had 10 mounds and Yegüih had eight mounds, and 20 settlements with one or two mounds were scattered across the valley; this distribution resembles the dispersed Mixteca Alta pattern.

The Tehuacán-Cañada region had three Rank II mound centers, two in the Cuicatlán Cañada, and one at the northern end of the Tehuacán Valley, and six settlements with one or two mounds. Although scattered across the region, the mound centers were somewhat more concentrated in the southern Cuicatlán Cañada survey area.

Compared to the ~Early Formative, mound architecture had spread throughout the study area by the ~Middle Formative, although some settlements had far more mounds than other settlements. This was part of a broad trend across Mesoamerica that includes the famous site of San Lorenzo (Coe 1981; Coe and Diehl 1980), in the Isthmus to the east. In addition, the 100 ha La Blanca site in Guatemala had at least four Middle Formative mounds (Love 1991:5). Also, whereas in period B, the ~Early Formative, only 18 percent (2 of 11) of the mound settlements had a single mound, in the Middle Formative period E/F, 34 of 72 mound settlements, or 47 percent, had a single mound. Thus, if ~Early Formative people had preferred to construct more than one mound if any at all were constructed, by the ~Middle Formative, single mounds were built on almost half the sites with mounds. This indicates a deepening hierarchy and increasing integration of central places for ritual and administrative activities.

Mound distribution: Period G/H, ~Late Formative

Rank I period G/H ~Late Formative mound sites (Figure 8-7) had many more mounds than in previous periods, indicating a deepening of the mound settlement hierarchy, especially in the Oaxaca Valley region. Indeed, three of the four Rank I mound sites were in the Oaxaca Valley region, at the sites of Monte Albán (40 mounds in use—my estimate, and probably conservative), Yegüih (39 mounds), and Reyes Etla (24 mounds). The fourth Rank I site is at Tilantongo in the southwestern Nochixtlán Valley. As before, mound construction was more intense in the southern study area. Had that data been

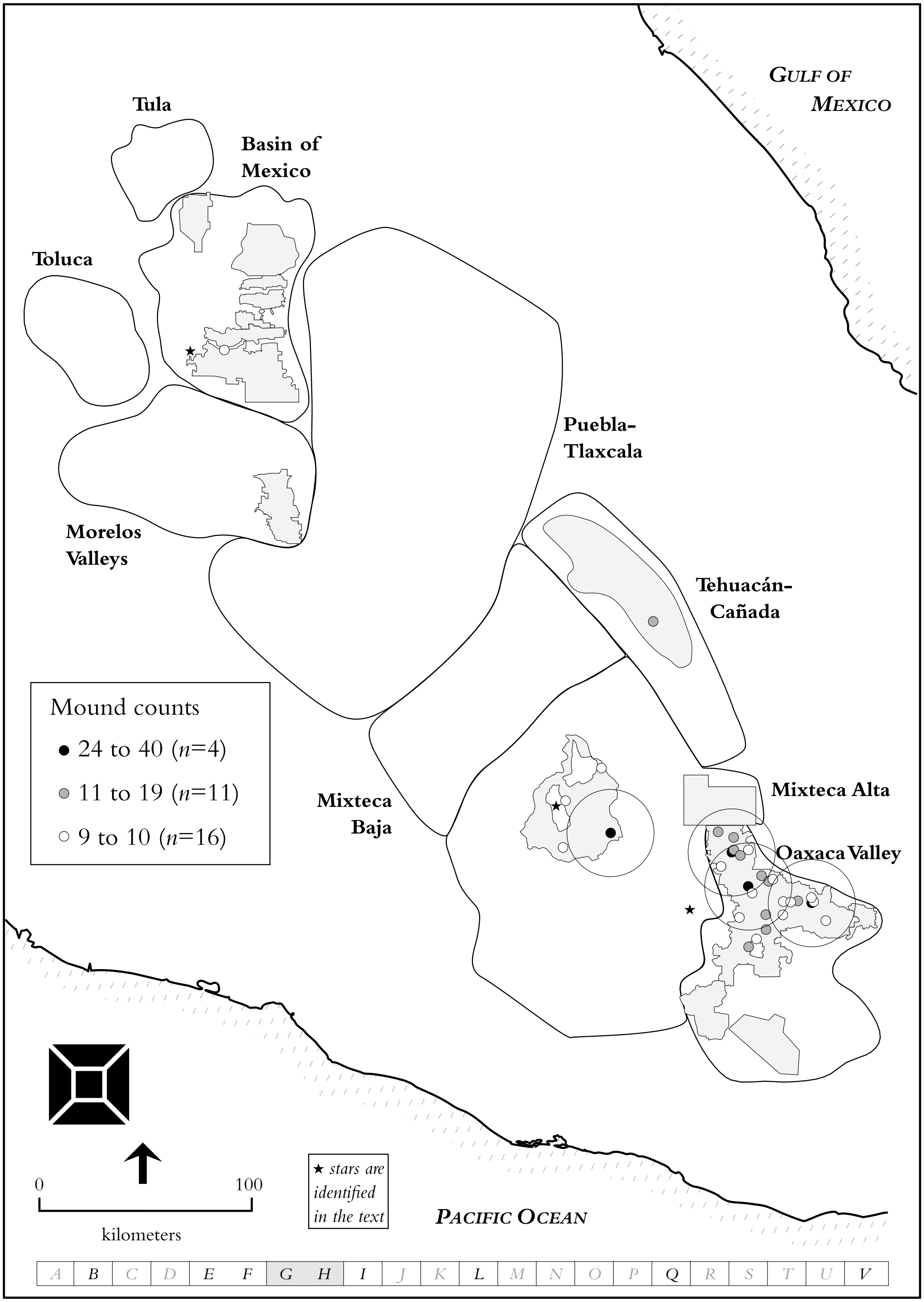


Figure 8-7. Period G/H sites with nine or more mounds (n=31 of 1092 period G/H sites). Forty km in diameter circles are centered on the four sites with the most mounds.

available, the Huamelulpan survey area would contribute a ranked mound center at Huamelulpan (starred), although the number of ~Late Formative mounds are not reported (Balkansky 1998). We know that there was another cluster of settlement around Peras (starred) in the Peñoles survey area (Finsten 1996:80), in the eastern Mixteca Alta region, but mound counts are not yet published.

The largest mound centers of the Oaxaca Valley region were surrounded by many sites that also had mounds, including 10 of the 11 Rank II centers. This is a clear boom in mound construction, unmatched in any other region, indicating an increase in the mound settlement hierarchy (Blanton et al. 1999:72–74). Indeed, the Oaxaca Valley region had 194 settlements with mounds in the ~Late Formative, and the Mixteca Alta had 36, with the other regions having eight or fewer (also see Figure 8-1 and Table 8-1).

Figure 8-7 also includes 40 km diameter circles centered on the Rank I sites. Hally (1993:163; 1999:105–106) argues that 20 km is the distance that people might walk, on relatively flat terrain, on a day-long return trip. These circles, then, outline the territory from which residents might come to these major mound centers for an activity, and return home, in one-day excursion. Note that these territories have considerable overlap in the Valley of Oaxaca, suggesting parties from each of the Rank I mound centers might have visited each other, perhaps for activities at the mounds. In addition, most of the Rank I through III mound centers in the Valley of Oaxaca are within these 40 km in diameter circles.

From period E/F to G/H, the number of mounds on sites with mounds rose dramatically, so that Rank I period E/F settlements would have been Rank III and very low Rank II settlements in period G/H; this is an increase in the depth of the mound site hierarchy. The ~Late Formative period G/H settlement with the most mounds had more than three times as many mounds as the ~Middle Formative settlement with the most mounds. In the big three regions, the Basin of Mexico continued to have few mounds compared to the other regions, and only one settlement with enough mounds to rank in the top three ranks, and it was a Rank III site; indeed, only 6 percent of the Basin of Mexico period G/H settlements had mounds in use. In the Mixteca Alta, there were fewer high-ranking mound settlements in this period compared to the previous period, and the site with the most mounds shifted from the southern Nochixtlán Valley to the more rugged Teposcolula-Tamazulapan divide area. Most of the top three ranks of ~Late Formative mound sites were in the Valley of Oaxaca and had about the same distribution as the ~Middle Formative, but were far more numerous (including all but one of the Rank II centers). Clearly, mound-use activities were very important to Oaxaca Valley region dwellers, with almost 25 percent of the ~Late Formative settlements having mounds.

Mound distribution: Period I, ~Terminal Formative

In the ~Terminal Formative period I, the ranked mound settlements still clustered in the southern study area (Figure 8-8), however, high-ranked multi-mound centers also occurred in the Tehuacán-Cañada region, as well as the Oaxaca Valley. Note that although the minimum threshold for ranking is about the same as in the previous period (10 vs. 9), the maximum mound counts are much lower (31 vs. 40). Thus, although the maximum number of period I mounds on sites was lower, more period I sites had mounds, and they had more mounds on average than in the ~Middle Formative. This indicates a moderate decentralization of mound activities, similar to that shown for ~Epiclassic period Q.

From the north, the number of sites in the Basin of Mexico with mounds jumped considerably, although the number of sites in the upper ranks, when compared regionally, remained only one (Ix-TF-5). Cuicuilco, starred to the west of the Chalco-Xochimilco survey area in the southern Basin, "reached its maximum size and architectural complexity" with "massive temple platforms, up to 80 m in diameter and 20 m high," and "the monumentality of its Phase Three public architecture was without parallel in the entire Basin of Mexico" (Sanders et al. 1979). Thus, Basin of Mexico mound use rates remained low compared to the other regions examined in this study.

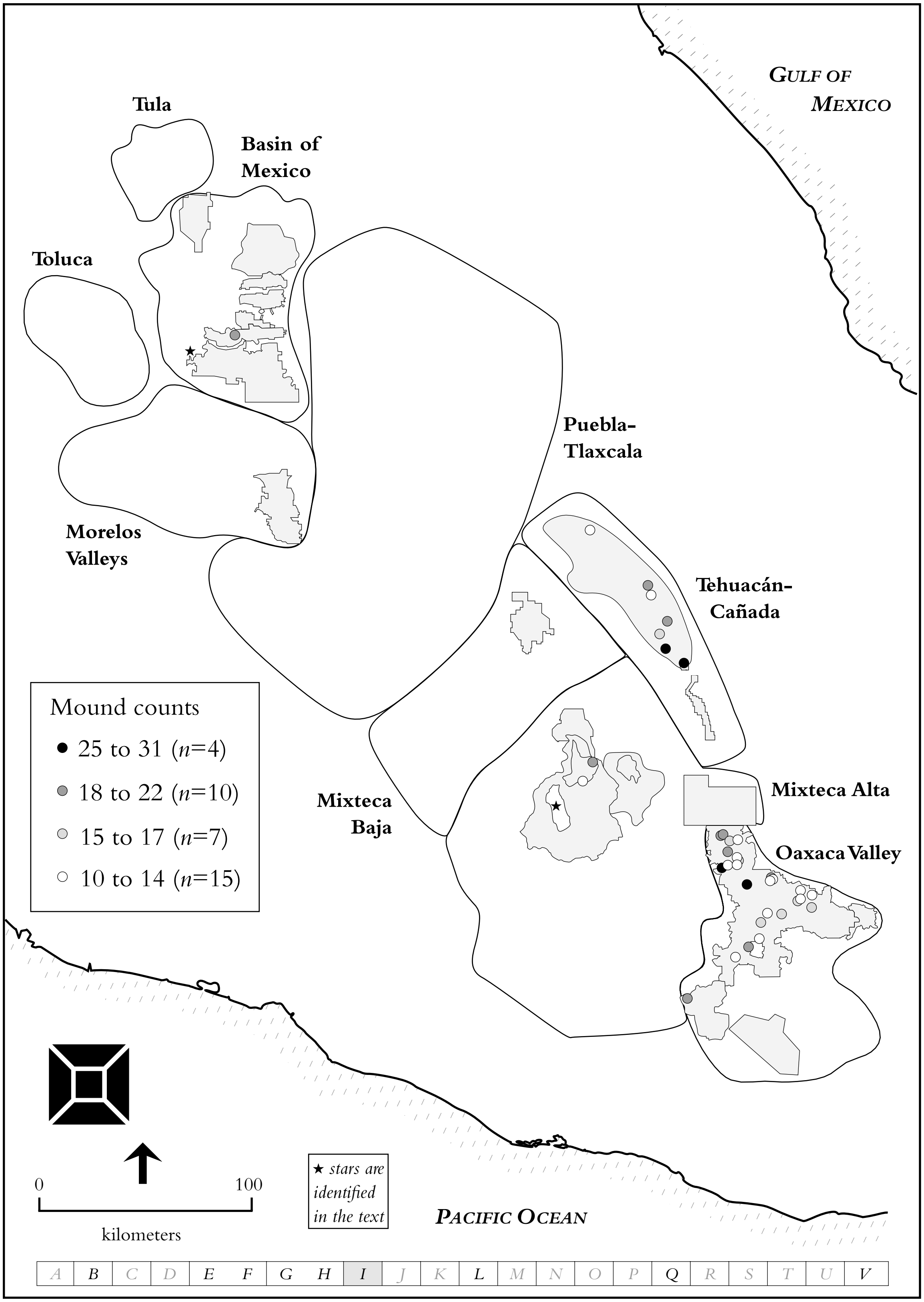


Figure 8-8. Period I settlements with 10 or more mounds (*n*=36 of the 1141 period I sites).

The decline in numbers of high-ranking settlements with mounds in the Mixteca Alta region evident in the ~Late Formative continued in period I, when the Mixteca Alta had only two ranked mound settlements, both in the mountains. In addition, Huamelulpan (starred in Figure) and Yucusavi, just 4 km to the south, both had Late Ramos mounds, and would have been in the top four ranks.

In the Oaxaca Valley region, the ranked mound centers were mostly in the northern and eastern arms of the valley, but more centers were in the southern arm, and also one was established on the western edge of the Sola Valley. Interestingly, the ranked mound settlements were not in the central valley near Monte Albán. I have no Monte Albán II, or my ~Terminal Formative period I, mound count for the site of Monte Albán, and have estimated the mound count at 31, which is likely conservative, although it is more than any other site in the dataset.

In the other regions, no Rank I through IV settlements based on mound count were in any region but the Tehuacán-Cañada. The high-ranked mound centers in the Tehuacán-Cañada region tended to be closer to the southern end of the Tehuacán Valley, but not in the Cuicatlán Cañada, and were not widely spaced.

Thus, once again, as in period G/H, each of the big three regions had very different patterns in sites with mounds. Far more period I, or ~Terminal Formative, mounds were built and used in the Oaxaca Valley and Tehuacán-Cañada than any other region for which I have quantitative data. Unlike the earlier Formative periods, the Mixteca Alta had far less mound construction and use, though high-ranking centers did continue there. While period I had the highest percent of settlements with mounds (see Figure 8-1) and the highest mound density per person (see Figure 8-4) of any period examined in this study, the average number of mounds per settlement with mounds was not high compared to later periods (see Figure 8-2).

Mound distribution: Period L, ~Early Classic

The highlands-wide period L population boom discussed in Chapter 7 (beginning the L-Q-V pattern) was accompanied by a mound construction boom, most dramatically at Teotihuacán. Cuicuilco, the large settlement in the southern Basin in period I was mostly covered by a lava flow from the volcano Xitle, and Teotihuacán, in the northeastern Basin, grew substantially after Cuicuilco's demise. The Teotihuacános also turned to mound construction. The most period L mounds were at Teotihuacán, the only period L Rank I mound settlement (Figure 8-9); in comparison, the high threshold of the Rank II mound sites is a mere 46 mounds. Note however, that 46 is my estimate for the Monte Albán mound count for this period (Monte Albán IIIA), as none have been published (e.g., see Kowalewski et al. 1989:227, 236). The estimate is probably rather low, but Monte Albán's mound count was still not in league with Teotihuacán's Rank I status. Also, Kowalewski et al. (1989:236) note that they can not make a mound count for Zaachila (starred) either; apparently, it would have ranked high enough to be shown on Figure 8-9.

Mound construction at Teotihuacán far overshadowed construction at any other site in the Basin region in ~Early Classic period L. Los Cuecillos de San Cristóbal Colhuacán is the only other period L Basin site with mounds that is in the top four ranks; it is on the north side of Cerro Gordo, the mountain just north of Teotihuacán. That separation from Teotihuacán may have been a very important factor in its mound construction.

The Morelos Valleys region had three settlements in the top four ranks, including the Rank II San Ignacio, with 37 mounds. The mound counts from the Tonatico-Pilcaya survey area are low, and I have none from the Yautepec survey area. Thus, the relatively high per site mound counts from the Amatzinac survey area may be unusual for the region.

Although 47 of the 73 period I Mixteca Baja settlements had mounds (or 64 percent, which is high—see Figure 8-1 and Table 8-1), the two sites with the most mounds had only six mounds. The Tequixtepec survey area mound counts are thus too low for the Mixteca Baja settlements to be among the top four ranks shown on the Figure.

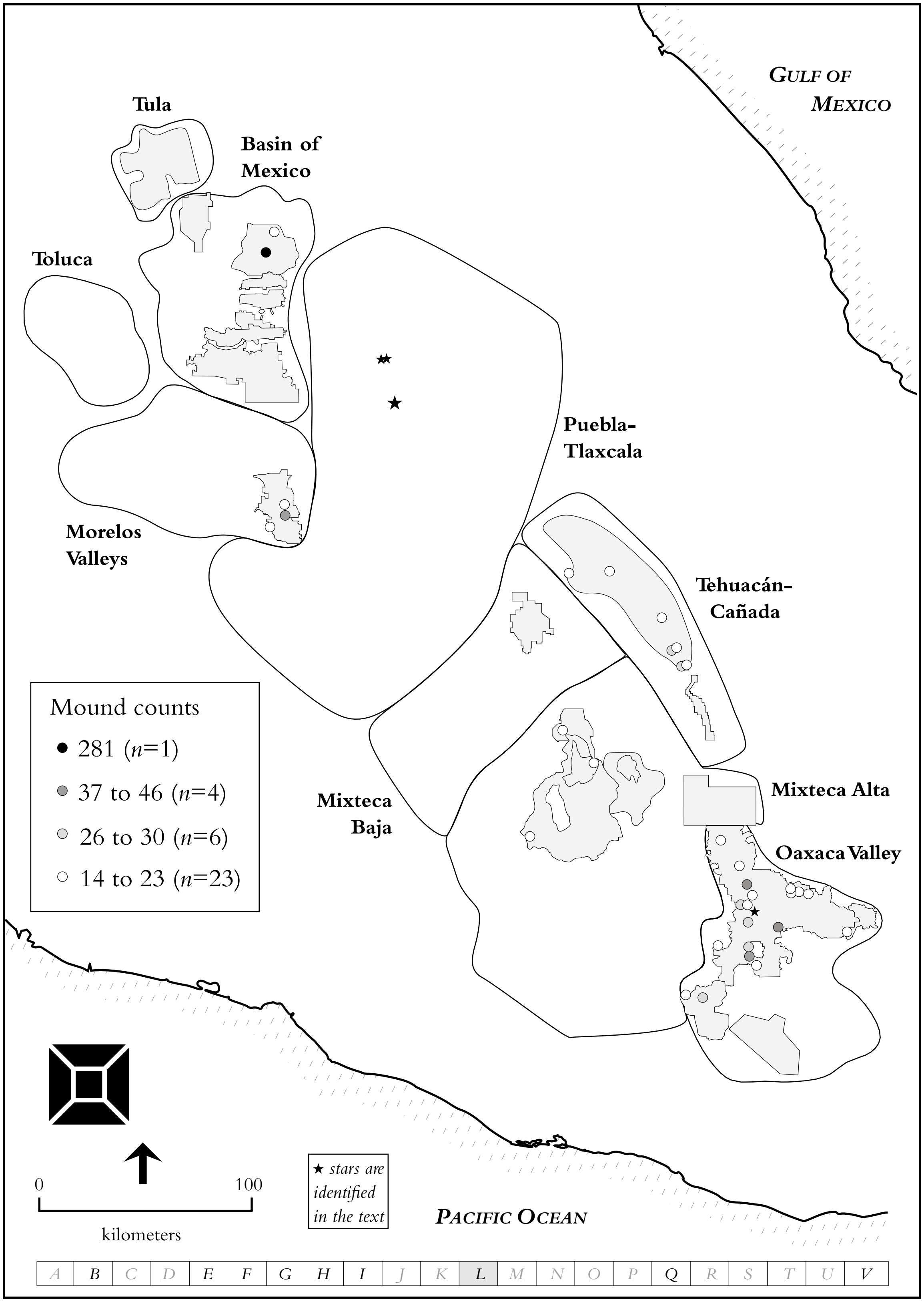


Figure 8-9. Period L settlements with 14 or more mounds (n=34 of the 2338 period L sites, 513 with mounds) .

The Tehuacán-Cañada region continued to have mound settlements in the top ranks, but they are lower ranked in period L. All but one of the settlements in the top four ranks were in new locations in period L, which suggests substantial reorganization in the Tehuacán-Cañada area, in that new locations were developed as mound centers. This shift may relate to the shift in ceramic styles from more like those of the Valley of Oaxaca in period I to more like those of the Puebla region in this period (Drennan 1997:55). The one settlement that continued to have many mounds from the previous period, Tecomovaca Viejo (Tr 19) or Llano de los Mogotes (Cs-1), was recorded by both the Tehuacán and the Cuicatlán-Cañada surveys. The site's mound counts are from the Tehuacán survey data for the previous period (MacNeish; Peterson et al. 1975:Table 31), and applied to this period based on Spencer and Redmond's note that "the description of the site during the Late Palo Blanco phase is the same as that for the previous Early Palo Blanco phase" (1997:532).

High-ranked mound settlements in the Mixteca Alta region were scattered, and none were in the Nochixtlán Valley. Instead, mound construction occurred in settlements with fewer mounds than the preceding period I. Also, the Mixteca Alta had a much higher percentage of settlements with mounds in period L the other two big three regions (see Figure 8-1).

In the Oaxaca Valley region, ranked mound settlements tend to be clustered, especially near Monte Albán and at Tlacochahuaya and Santa Ana del Valle in the eastern arm. The settlements with the most period L mounds are near the central valley and in the southern arm, but were dispersed around the valley, including in the Sola Valley. The starred settlement is Zaachila; its mound count is unknown, but probably would be high enough to be in the top four ranks.

I have no good mound count data for this period from the Puebla-Tlaxcala region, but believe considerable mound construction occurred in this period at Cholula, the large star, and at Cacaxtla and Xochitecatl, the pair of stars. Probably other settlements with more than 10 mounds dating to this period are elsewhere in this region.

While Teotihuacán and Monte Albán dominated their regions in terms of populations, making the two regions seem similar, the regional hierarchies are quite different mound construction patterns. Monte Albán's hinterlands have mounds, and many of them, while Teotihuacán's had few. The other regions show considerable period L diversity, both in terms of overall counts, and in terms of numbers of settlements with mounds.

Mound distribution: Period Q, ~Epiclassic

Period Q ~Epiclassic populations decreased significantly (see Chapter 7), but mound construction continued, in some regions at a greater pace than previously. At the macroregional scale, the proportion of settlements with mounds stayed about the same as in the previous period (Figure 8-1), while the number of mounds built or in use decreased (Figure 8-2), but the density of mounds on those sites with mounds increased (Figure 8-3). Thus, even among the big three regions, the mound distribution patterns are variable for period Q.

Period Q Rank I through IV mound settlements cluster in the Tehuacán-Cañada and Oaxaca Valley regions (Figure 8-10). The Rank I sites are scattered in the Tehuacán Valley and eastern Valley of Oaxaca. Both these areas are more arid, and considered less agriculturally productive than other quantitative survey areas. Nevertheless, mound construction and use in these areas boomed. Demographically, the Tehuacán-Cañada was not a population center in period Q, but it did have many mounds and the highest density of mounds per person of any region in any period studied here (see Figure 8-4). The Rank I through IV settlements in the Tehuacán-Cañada region were spread throughout the valley, with two Rank II settlements in the central valley (Tr 42 and Tr 319). A third cluster was north of those, around the Rank II Tr 236. All three clusters are within 20 km of each other, and probably could be visited in a return trip in a single day (Hally 1993, 1999).

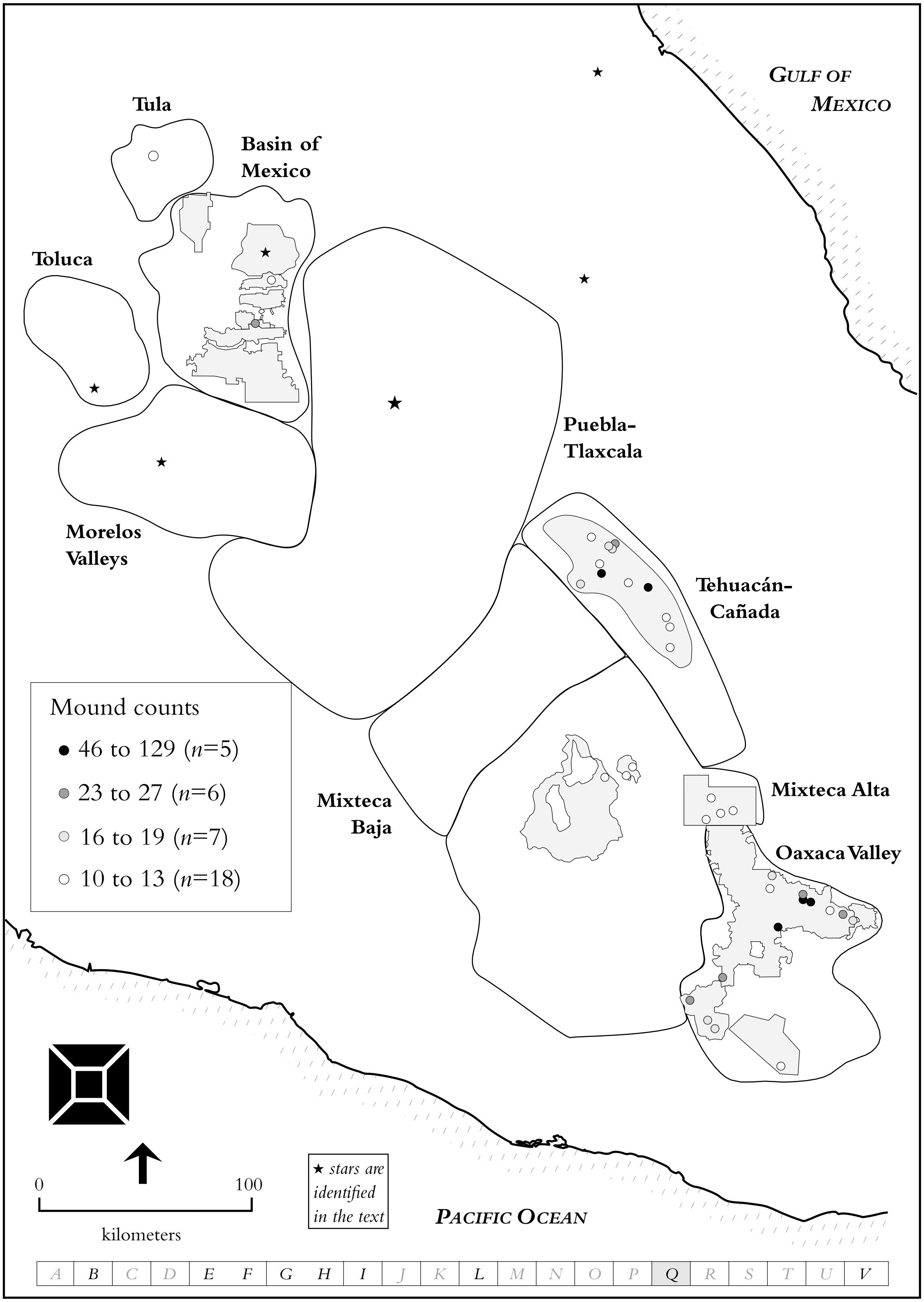


Figure 8-10. Period Q settlements with 10 or more mounds (n=36 of the 992 period Q sites), in four ranks.

Only two period Q ~Epiclassic Rank I through IV mound settlements were in the Basin of Mexico region, and both are in the eastern Texcoco survey area (Tx-ET-7 and Tx-ET-18). Since it is the largest settlement in the Basin region, it might be reasonable to assume that Teotihuacán continued to have the most mounds, as it did in the ~Early Classic. If so, Teotihuacán would be the ~Epiclassic settlement with the most mounds listed in the quantitative database. On the other hand, the mounds and buildings along the Avenida de los Muertos were burned and not rebuilt (Millon 1988:145–155), so mound use probably declined precipitously at Teotihuacán. Indeed, that buildings rather than people were destroyed suggests that mounds (temples) had become undesirable to Teotihuacán's residents. Sugiyama (1998:160–161) concludes that the Ciudadela was destroyed in the Late Tlamimilolpa phase, or period M, at least a century before the site was abandoned, and he argues that the similarity of post-destruction architecture styles suggests cultural continuity, and thus continued occupation by the descendents of those living there at the time of the destruction. Hence, the religious importance of Teotihuacán apparently declined, but at twice the size of the next largest settlement in the Basin region based on these surveys, it continued to be the home of many people (Cowgill 1997:157 estimates the surviving period P or Metepec phase population at 40,000). I favor the interpretation that there was little monumental architecture in Teotihuacán dating to the ~Epiclassic; Rattray (1996:216–217) concurs, maintaining "that Teotihuacán was made up of physically discrete villages with no central organization and large unoccupied zones in between" in the area encompassed by Classic-period Teotihuacán.

Figure 8-10 shows a ring of ~Epiclassic settlements that seem to encircle the Basin of Mexico region. They include Tula in the Tula region (no contemporaneous survey data, unfortunately), Teotenango in the southern Toluca region, Xochicalco in the Morelos Valleys region, Cholula in the Puebla-Tlaxcala region (large star), Cantona just northeast of the Puebla-Tlaxcala regional boundary, and El Tajín on the coastal plain northeast of the Basin. All of these sites had sizeable and apparently extensive period Q architecture, including ball courts (see next section). Although I do not have mound counts for these sites, I consider the mound construction on all four to have been extensive enough that they would be among the top four ranks of Figure 8-10.

The high-ranked mound settlements in the Mixteca Alta region shifted out of the mountains, and were once again in the Nochixtlán Valley. In the mountains along an obvious route from the northern arm of the valley to places farther north like the Cuicatlán Cañada and within the mountain survey area (see Figure 7-1), were several Rank IV mounds settlements. This area is considered part of the Mixteca Alta physiographically, but its sociopolitical history may be more closely aligned with the Oaxaca Valley region.

In the Oaxaca Valley, the Rank I and II ~Epiclassic mound settlements were east and south of the central valley, and the Sola Valley had Rank II and III settlements. Also peripheral to the central valley was a single high-ranked settlement in the southern Miahuatlán Valley. The settlements with the most mound construction and use and the highest populations (Figure 7-18) in ~Epiclassic Oaxaca Valley were not the same or in the same parts of the region, in many cases.

In general, ~Epiclassic mound centers show a different distribution pattern than previous periods, and different distributions than the population centers. There was both some dispersal and some clustering of Rank I through IV mound sites, across the Tehuacán-Cañada, Mixteca Alta, and Oaxaca Valley regions, which had most of the high-ranked mound sites.

Mound distribution: Period V, ~Late Postclassic

We know that in the ~Late Postclassic populations were much higher than any previous period (the L-Q-V pattern), and the Aztecs, with their capital in the western Basin at Tenochtitlán (starred in Figure 8-11), controlled much—but not all—of the study area (see Figure 7-22). Areas outside the central Aztec domain were divided into small polities often called *señoríos* or petty kingdoms.

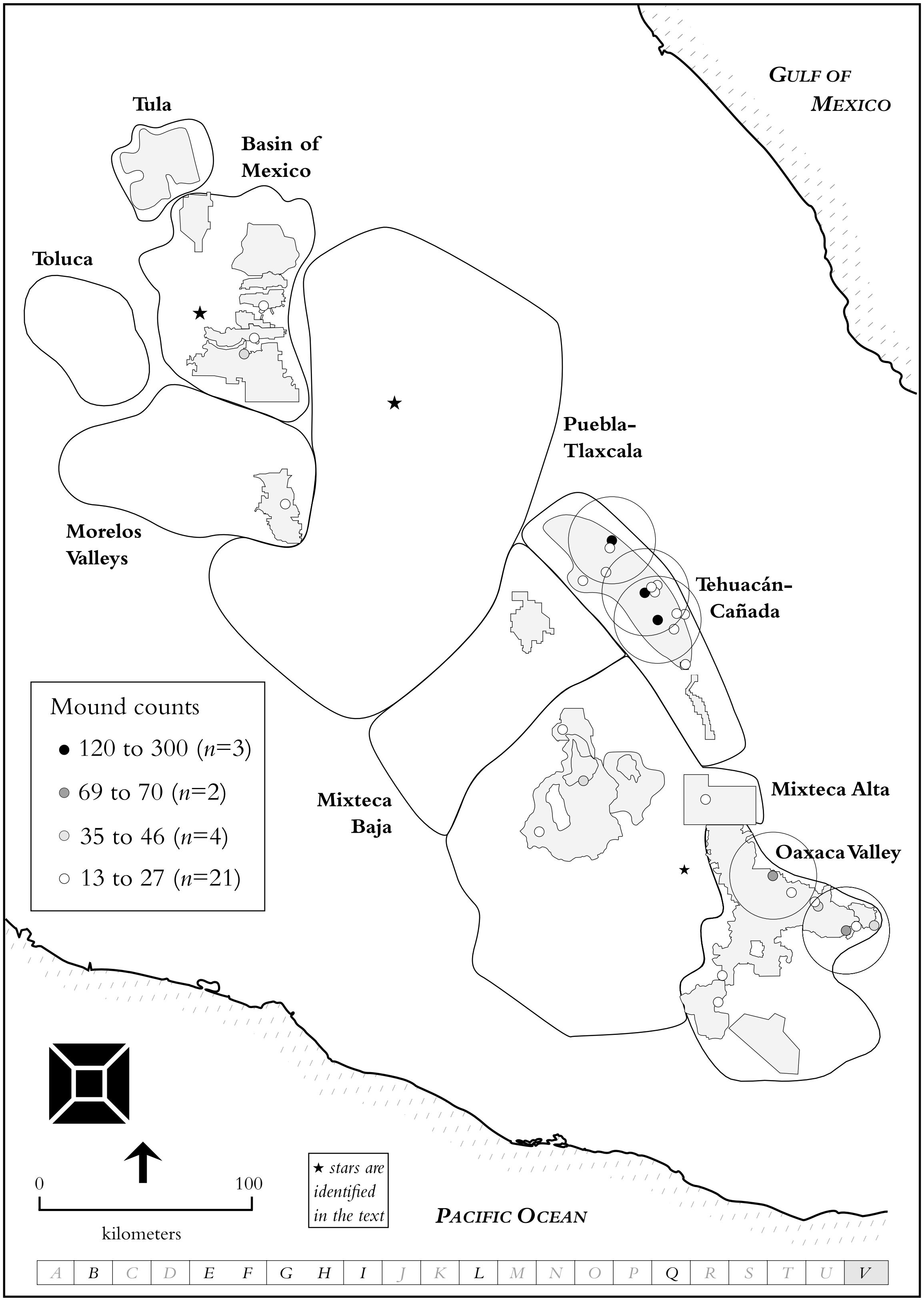


Figure 8-11. Period V sites with 13 or more mounds (*n*=30 of the 5246 period V sites), in four ranks.

The ~Late Postclassic mound settlements map (Figure 8-11) is dominated by the three Rank I settlements in the Tehuacán-Cañada region, Tr 57 (300 mounds), Tr 135 (200 mounds), and Tr 1 (120 mounds). If these are CCA, and not house mounds, then the people of the Tehuacán-Cañada region constructed far more mounds than those of any other region. The Tehuacán survey area is outside the area controlled by the Aztecs (see Chapter 7), and may have had quite different patterns of CCA construction.

The Mixteca Alta data show high-ranked centers in the mountainous areas west of the Nochixtlán Valley. Of the 38 ~Late Postclassic mound sites in the Nochixtlán Valley, one site has eight mounds, one site has six mounds, and the rest have five or fewer. Period V mound construction, then, was low in the Mixteca Alta region on a per person basis (see Figure 8-4). I have also starred the location of Peñoles, which was a Postclassic cluster of settlements, that, had the data been available, probably would have ranked in the top four ranks and been shown in Figure 8-11.

On a per person basis, mound construction rates were even lower in the Basin of Mexico region, which had the same number of high-ranked mound settlements as the Mixteca Alta. We know that Tenochtitlán, in the western basin, had substantial CCA, including mounds and ball courts. We also know that lots of ~Late Postclassic CCA were leveled or used to construct other buildings after the Spanish arrived, so the Basin period V mound settlement counts, and mound counts, are probably rather low. Cholula, the large star in the Puebla-Tlaxcala region, also had considerable period V mound construction, and the Colonial church next to the Great Pyramid was built atop prehispanic architecture dating to the Postclassic and Classic periods.

The Oaxaca Valley region had approximately the average number of mound settlements (Figure 8-1) and mound density, assessed several ways (Figures 8-2, 8-3, and 8-4). Part of the reason it fits the average profile is that it contributes heavily to the period V dataset, with about half the period V settlements and one-third the period V mounds. Once again, a diversity of patterns among the regions is evident.

Mound distribution: all periods

In this section, I summarize the results presented in the previous seven subsections, which discuss mound distributions by period. In general, the sites with the most mounds tended to be in the southern study area, especially in the Oaxaca Valley region. The sole exception was Teotihuacán in the ~Early Classic, which had almost 300 mounds and lead a highly centralized ritual and administrative system. If the quantitative database had included more data from the regions around the Basin of Mexico, there also might have been more mounds in the north in the ~Epiclassic, judging by the construction at several prominent mound centers starred in Figure 8-10.

In general, there was an increase in mound counts on the settlements with the most mounds over time, indicating a deepening of the mound site hierarchy. The most centralized mound use patterns seem to be during periods when populous centers were emerging. Examples include Monte Albán in the ~Late and ~Terminal Formative, Teotihuacán just prior to the ~Early Classic (a period not analyzed here), and possibly the Tehuacán-Cañada in the ~Late Postclassic. MacNeish et al. (1975) report very high mound counts for some ~Late Postclassic Tehuacán Valley sites, but there is not enough detail to tell if the majority are house mounds. If they are civic-ceremonial architecture, then the Tehuacán-Cañada mound hierarchy deepened quickly, and was relatively centralized. The Tehuacán Valley also had a deepened, more centralized hierarchy in the ~Terminal Formative, which was probably in response to the Monte Albán conquest of the Cañada.

Mound settlement continuity

The lack of continuity of occupation indicates times of great change and upheaval by the abandonment of previous mound centers and the settlement of new locations or construction of mounds in new locations. A settlement with mounds has central place functions for ritual and administrative activities. Conversely, if settlement continues over multiple periods in the same location, it suggests stability and the continued importance of that settlement. Figure 8-12 shows the continuity of all mound settlements. (See explana-

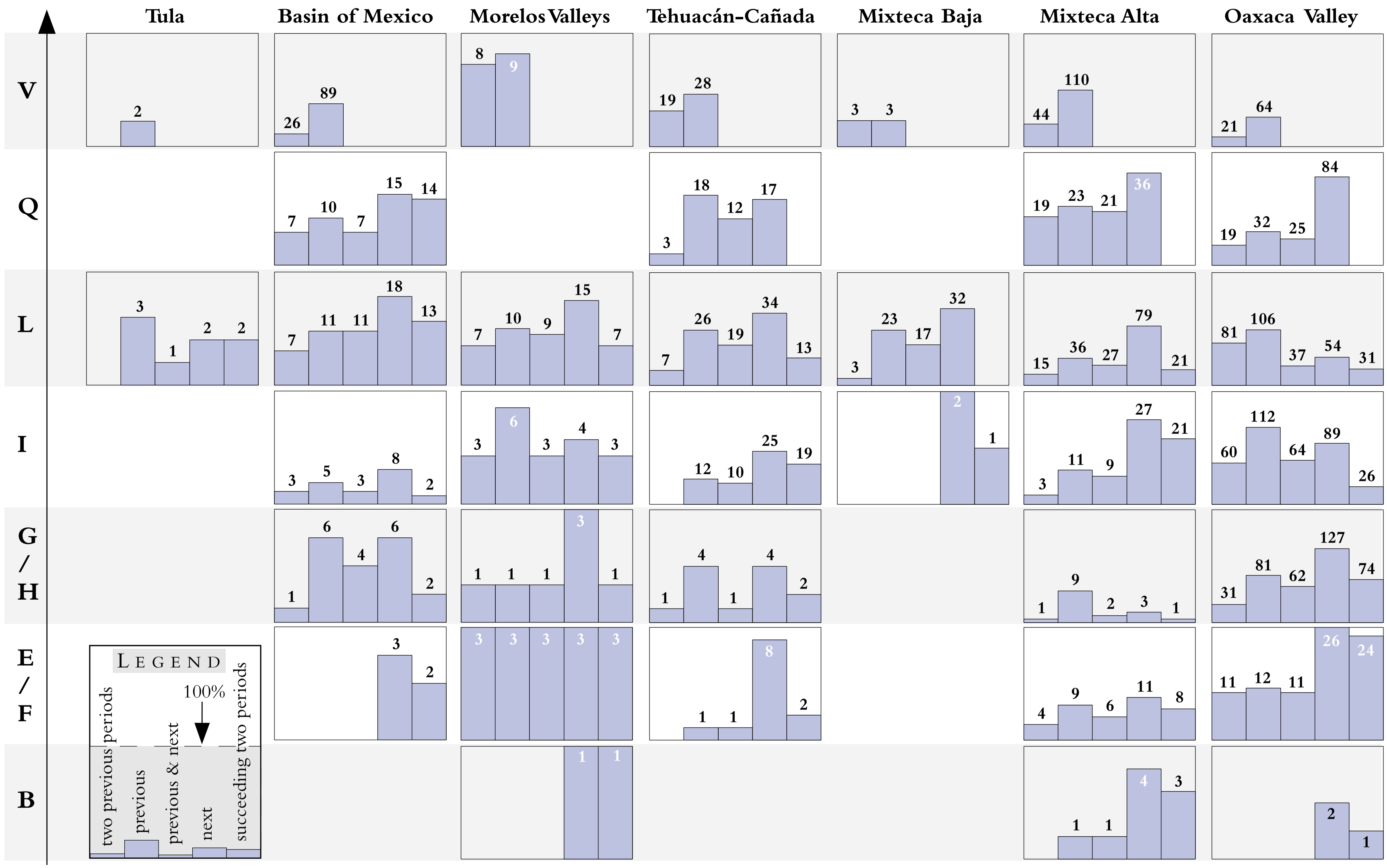


Figure 8-12. Mound settlement continuity. Column heights show percent of settlements that remained in the same location; numbers are site counts. Columns 1, 3 and 5 show occupation over three periods; columns 2 and 4 over only two. See text for more explanation.

tion for Figure 7-30 for details on how to read this chart.) See Table 8-3 for the data graphed in Figure 8-12. I begin discussing these data with period B, and proceed through time. It is useful to contrast mound settlement continuity with the continuity of occupation for all settlements; those data are presented in Figure 7-30.

We have scanty period B mound site data. In general, period B, or ~Early Formative mound sites tended to continue to be occupied in succeeding periods. In the Amatzinac survey area, both period B mound sites were occupied for the next two periods.

In the ~Middle Formative period E/F, mound sites tended to continue to be occupied, especially in the Morelos Valleys and Oaxaca Valley regions. However, less than half were occupied previously in all regions, except for Morelos. Thus, the Morelos Valleys region shows a high degree of continuity on its period E/F mound sites; note, however, that there are only three mound sites there. The high degree of continued occupation of Oaxaca Valley settlements into the succeeding period is consistent with the continued occupation of all settlements.

In period G/H, the ~Late Formative, the high degree of continuity of the Morelos Valleys region mound sites drops, although all the period G/H mound sites continued to be occupied in the succeeding period. Both the Basin of Mexico and Tehuacán-Cañada regions show high and moderate rates of occupation in the previous or next periods, but low rates of three-period continuity. The Oaxaca Valley region, although it had many more mound sites, shows a similar pattern, but with higher occupation in the succeeding period than from the previous period. (This is the opposite of the all-sites continuity patterns.) Continuity ratios in the Mixteca Alta period, however, are quite low; indeed, they match the all-settlements continuity.

In period I, the ~Terminal Formative, continuity rates are lowest in the Basin of Mexico region, relatively low in the Tehuacán-Cañada region, and relatively high for the Morelos Valleys. The Mixteca Alta shows a mixed pattern, with less continuity from prior periods (this is consistent with patterns in periods E/F and G/H), and more settlement

Table 8-3. Mound settlement continuity counts and percentages. **P** = previous; **N** = next, **both** = PP and P, or N and NN. See text for more explanation.

total	both	P	PN	N	both			both	P	PN	N	both
9	0	2				**Tula**	V	0%	22%			
1	0	0	0	1	1		Q	0%	0%	0%	100%	100%
5	0	3	1	2	2		L	0%	60%	20%	40%	40%
							I					
							G/H					
							E/F					
1				1	1		B					
236	26	89				**Basin of Mexico**	V	11%	38%			
24	7	10	7	15	14		Q	29%	42%	29%	63%	58%
23	7	11	11	18	13		L	30%	48%	48%	78%	57%
26	3	5	3	8	2		I	12%	19%	12%	31%	8%
8	1	6	4	6	2		G/H	13%	75%	50%	75%	25%
4	0	0	0	3	2		E/F				75%	50%
0							B					
11	8	9				**Morelos Valleys**	V	73%	82%			
							Q					
20	7	10	9	15	7		L	35%	50%	45%	75%	35%
7	3	6	3	4	3		I	43%	86%	43%	57%	43%
3	1	1	1	3	1		G/H	33%	33%	33%	100%	33%
3	3	3	3	3	3		E/F	100%	100%	100%	100%	100%
1				1	1		B				100%	100%
60	19	28				**Tehuacán-Cañada**	V	32%	47%			
29	3	18	12	17			Q	10%	62%	41%	59%	
53	7	26	19	34	13		L	13%	49%	36%	64%	25%
53	0	12	10	25	19		I	0%	23%	19%	47%	36%
8	1	4	1	4	2		G/H	13%	50%	13%	50%	25%
9	0	1	1	8	2		E/F	0%	11%	11%	89%	22%
0							B					
13	3	3				**Mixteca Baja**	V	23%	23%			
							Q					
47	3	23	17	32	0		L	6%	49%	36%	68%	0%
2	0	0	0	2	1		I	0%	0%	0%	100%	50%
							G/H					
0							E/F					
							B					
219	44	110				**Mixteca Alta**	V	20%	50%	0%	0%	0%
44	19	23	21	36			Q	43%	52%	48%	82%	
150	15	36	27	79	21		L	10%	24%	18%	53%	14%
36	3	11	9	27	21		I	8%	31%	25%	75%	58%
32	1	9	2	3	1		G/H	3%	28%	6%	9%	3%
29	4	9	6	11	8		E/F	14%	31%	21%	38%	28%
5		1	1	4	3		B	0%	20%	20%	80%	60%
243	21	64				**Oaxaca Valleys**	V	9%	26%			
107	19	32	25	84			Q	18%	30%	23%	79%	
215	81	106	37	54	31		L	38%	49%	17%	25%	14%
164	60	112	64	89	26		I	37%	68%	39%	54%	16%
194	31	81	62	127	74		G/H	16%	42%	32%	65%	38%
26	11	12	11	26	24		E/F	42%	46%	42%	100%	92%
4				2	1		B	0	0	0	50%	25%
total	**both**	**P**	**PN**	**N**	**both**			**both**	**P**	**PN**	**N**	**both**

continuity into later periods. The Oaxaca Valley region is the reverse, with higher continuity of occupation from previous periods, and less continuity into succeeding periods. Compared to the continuity of all settlements in the Oaxaca Valley region in the ~Terminal Formative, the continuity of settlements with mounds was higher, especially from the previous period.

In period L, the ~Early Classic, The Tula, Basin of Mexico, Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions had moderate continuity from previous periods, and relatively high rates into the next period. The rates were lower for the Mixteca Alta and Oaxaca Valley regions. In the Mixteca Alta, fewer mound settlements continued to be occupied from the previous period, although more were occupied into the succeeding period. The pattern in the Oaxaca Valley region reversed that, with more continuity from the previous period and less into the succeeding period. The period L mound site continuity patterns are similar to those of all settlements.

In period Q, the ~Epiclassic, mound settlement continuity rates are slightly higher for all regions than the continuity of all settlements. Continuity from previous periods are highest for the Tehuacán-Cañada region; they are lowest for the Oaxaca Valley region. For the succeeding periods, they are highest for the Oaxaca Valley region and lowest for the Tehuacán-Cañada region. This may be a trend of the Classic-Postclassic transition, when secondary centers of the Classic period became the capitals of polities in the ~Epiclassic and ~Postclassic.

In the ~Late Postclassic period V, mound settlements generally were occupied in previous periods at a somewhat higher rate than were all settlements. The Morelos Valleys did not have many mound sites, but most were occupied in the previous two periods. Given that there were so many new settlements in period V that the rates of occupation for mound settlements were higher than for all settlements suggests mound settlements had somewhat more importance than those lacking mounds.

In sum, while mound settlements tend to show more continuity than all sites, they still vary approximately in tandem with all-sites continuity patterns. The continuity of mound sites in the Basin of Mexico in the ~Late Formative and in the Oaxaca Valley region in the ~Late Formative through ~Early Classic, however, do not match the all-sites continuity patterns. In the Basin, they show somewhat less continuity (they lost their ritual and administrative importance), while in the Oaxaca Valley region the mound sites show much higher continuity. This suggests that the mound centers were more stable than other settlements in the Oaxaca Valley region, and the many new settlements did not come at the expense of existing mound sites. In other words, mound settlements continued to be occupied, and probably retained their importance in the social fabric even as the region endured dramatic political changes, including the establishment of Monte Albán. Overall, the Oaxaca Valley shows more mound settlements and less centralization of mound functions than other regions, as well as deeper mound site hierarchies. In the Basin, except for during the ~Late Postclassic, there were proportionally few mound sites, meaning mound ritual and administrative activities were either de-emphasized or centralized, or both.

Average mound settlement size vs. average size of all settlements

This analysis addresses whether settlements with mounds are different from non-mound settlements in size. In this subsection, I compare the sizes of non-mound sites to the sizes of settlements with mounds (Figure 8-13). In all regions in all periods, the average size of settlements with mounds is larger than the average size of contemporaneous settlements lacking mounds. Note that Figure 8-13 does not include data from the Tula region, because those settlement sizes were inexact estimates.

Because of the large size of Teotihuacán, the Basin of Mexico region ratio is very high in the ~Early Classic. Otherwise, the next highest ratio is period E/F in the Morelos Valleys region; mound settlements averaged just over 23 ha, while non-mound settlements averaged just under 2 ha.

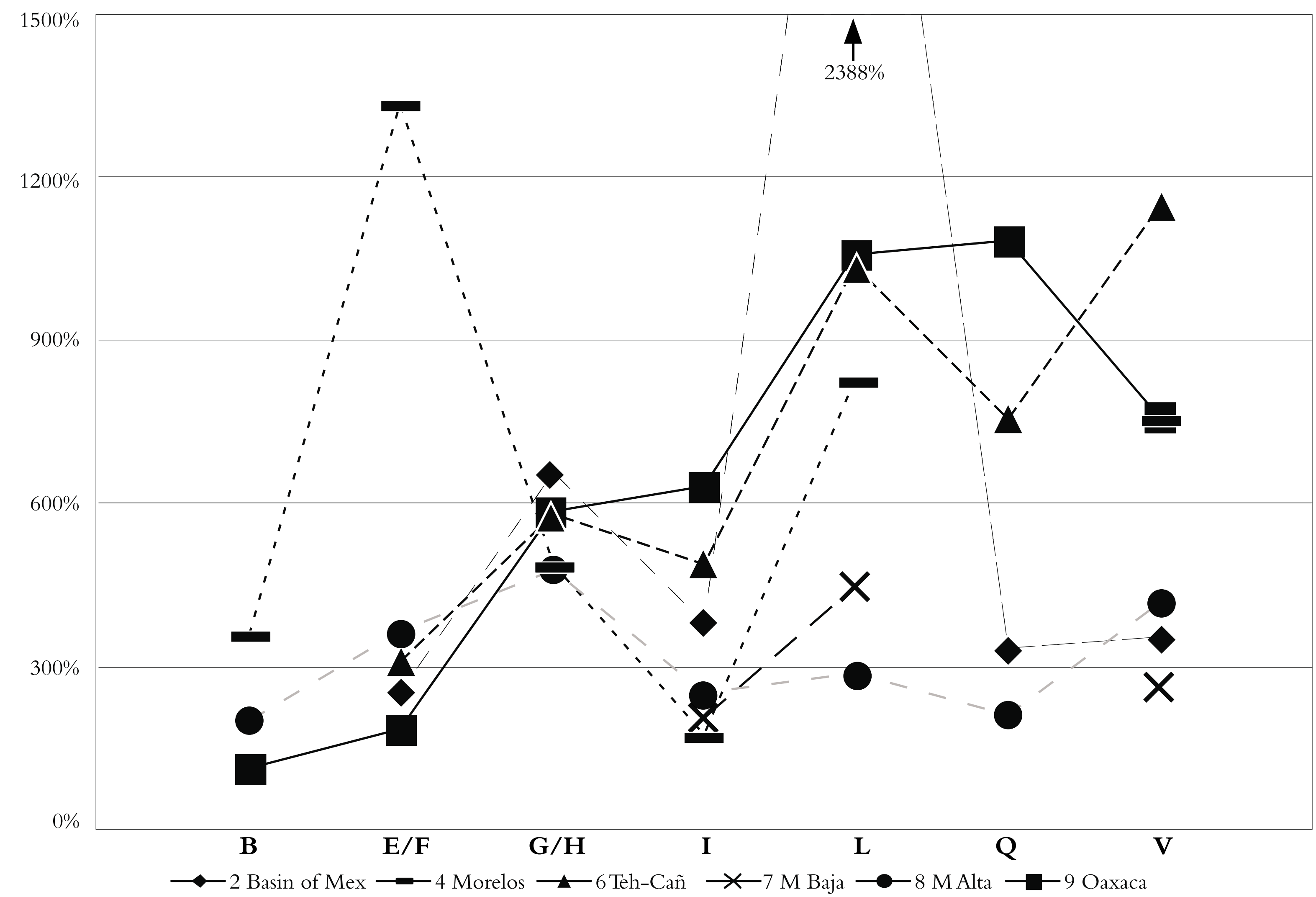


Figure 8-13. Mound site to non-mound site area comparisons. Area of mound settlements divided by area of settlements lacking mounds, expressed in percentage mound settlements are larger than non-mound settlements.

For period B, the ~Early Formative, mound sites were larger in the Morelos Valleys region than in the Mixteca Alta and Oaxaca Valley regions to the south. However, these data are based on only a few sites.

For period E/F, the ~Middle Formative, the Morelos region has a very high ratio, and the other four regions cluster between 180 and 361 percent.

In period G/H, the ~Late Formative, all the regions cluster together, but at about twice the ratios of period E/F. Thus, the ratio of mound site size to non-mound site size in period G/H was about twice that of period E/F, or 478 to 654 percent.

In period I, the ~Terminal Formative, the ratios are more dispersed, but still within the ranges for periods E/F and G/H combined. The ratios for all but the Oaxaca Valley region dropped from period G/H to period I.

Period L, or the ~Early Classic, shows considerable diversity. The large size of the Teotihuacán site, along with the fact that there were few other contemporaneous mound sites, makes the Basin of Mexico ratio so high. All other regions show a jump from period I, also, but none so dramatic as the Basin. The Tehuacán-Cañada and Oaxaca Valley regions have the highest ratios, after the Basin.

In period Q, the ~Epiclassic, the Oaxaca Valley region shows a slight increase, but all other regions decrease.

For period V, the ~Late Postclassic, the Oaxaca Valley ratios decrease, but the other three regions with ~Epiclassic data show increases, though the increase in the Basin of Mexico region ratio is slight.

Region-by-region comparisons of the big three regions show that the Basin of Mexico had varied ratios of mound to non-mound site areas, and was lower than average for all periods except the ~Early Classic, when Teotihuacán was so large. The Mixteca Alta was higher than the Oaxaca Valley for the first two periods (B and E/F), then remained lower for all succeeding periods. Thus, Mixteca Alta mound sites tended to be several times larger than non-mound sites (higher in periods G/H and V), but not to show much variability. The Oaxaca Valley region contrasts with the other two, in that the ratio increased in every period except for the ~Late Postclassic. It also stayed quite a bit higher than the other two regions in the ~Epiclassic.

As with the mound settlement continuity discussed in the previous subsection, the mound to non-mound site area comparisons show considerable diversity among the regions in the study area, although, in general mounds tend to have been built on larger sites. Two anomalies are marked: the high figures for the ~Middle Formative Morelos Valleys and Basin of Mexico in the ~Early Classic. The latter relates to the high number of mounds concentrated at Teotihuacán. The former indicates the ritual and administrative central place functions were highly concentrated at Chalcatzingo and two other sites in the Amatzinac Valley. Otherwise, the Oaxaca Valley, from the ~Late Formative on, shows consistently high concentrations of central place functions in its civic-ceremonial places, although this declined somewhat in the ~Late Postclassic. The Oaxaca Valley region had many mounds, and mound sites, and the latter tend to have large populations and elevated rates of continuity.

Mound architecture: Summary

In this section, I have summarized patterns of mound construction in various ways. Mound architecture provides an index of ritual and administrative activities on a site and in a region. Generally speaking

- the big three regions show considerable diversity in the percentage of settlements with mounds (Figure 8-1), regional mound density (Figure 8-2), and mound density per person (Figure 8-3);
- the earliest extensive mound constructions were in the southern study area;
- except for Teotihuacán in the ~Early Classic, the Basin of Mexico region had fewer mounds than other regions;
- during the ~Early Classic in the Basin of Mexico, mound use was highly concentrated at Teotihuacán;

- mound sites tended to be larger in the Oaxaca Valley region, indicating a greater centralization and integration of central place functions and the ritual and administrative activities associated with mounds; and
- the Tehuacán-Cañada region had very high mound counts on quite a few sites in the ~Epiclassic period Q and ~Late Postclassic period V (although these data are suspect).

Had I had data that were more consistent from the Puebla-Tlaxcala and Morelos Valleys regions, it is unclear how they would alter these conclusions. Regarding mound settlement continuity and ratios of mound site to non-mound site areas, in general

- mound sites and all sites show similar continuity patterns, and the variation among the big three regions is retained; and
- the size ratios also suggest different trajectories for the big three regions, and perhaps for the other regions, although those data are less extensive and difficult to compare conclusively.

More specifically, the trajectory of mound building in the study area began in the southern region, in the northern Valley of Oaxaca and the eastern Mixteca Alta, especially in the Nochixtlán Valley. In period E/F, mound building spread throughout the study area with Rank I mound centers in the big three regions. In period G/H, mound construction intensified in the Oaxaca Valley, and declined in the Basin of Mexico. That pattern continued in period I, with another area of mound construction added in the middle and upper Tehuacán Valley. In period L, mound construction continued in the Tehuacán-Cañada and Oaxaca Valley regions, but the counts from sites in the southern regions are overshadowed by the huge numbers of mounds at Teotihuacán. In period Q, mound construction once again focused in the Tehuacán-Cañada and Oaxaca Valley regions, but fewer surveys date settlements to this period than other periods. In period V, the data indicate that the most mound construction was in the Tehuacán-Cañada region, in which over 600 mounds are attributed to three settlements; it is also true that post-conquest development may have destroyed or obscured period V CCA in other regions.

Figure 8-12 shows diversity of mound settlement continuity. These patterns are most evident among the big three regions, however, in the Formative, Classic, and Postclassic:

- the Mixteca Alta is more unlike the other two regions in the Formative, although the Mixteca Alta and Oaxaca Valley are more similar in the ~Terminal Formative (period I), with the Basin of Mexico more similar to the earlier Mixteca Alta patterns;
- in the ~Early Classic, the Mixteca Alta and Oaxaca Valley are more similar and lack the high levels of continuity shown for Basin of Mexico mound settlements;
- in the ~Epiclassic, a period of considerable sociopolitical disruption and new settlement patterns, the Basin of Mexico and Mixteca Alta patterns were more similar, and the Oaxaca Valley region shows somewhat less continuity from previous periods, but high continuity into the following period; and
- in the ~Late Postclassic, the three regions vary somewhat along a continuum, with less continuity on Oaxaca Valley mound settlements, and moderate levels of continuity for Mixteca Alta settlements, while the Basin of Mexico was between the two. Thus, settlements from previous periods did continue to be occupied, but there were so many new settlements with mounds that they overshadow the counts of previously occupied settlements.

For mound to non-mound site area comparisons (Figure 8-13), the big three regions also show different patterns; however, they also show more parallels across the three regions for the ~Early through ~Late Formative. For the ~Early and ~Middle Formative, the three are similar, but the Mixteca Alta has larger ratios; we also know it had more mound sites and higher populations, so this fits expectations. For the ~Late Formative, the Mixteca Alta ratios declined, but all three regions are the most similar of any period. In the ~Terminal Formative, the diversity increases, with the Oaxaca Valley having the highest ratios. In the ~Early Classic, the massive Teotihuacán mound count gives the Basin a much higher ratio than any region or any period, although the Oaxaca Valley has the second highest ratio. In the ~Epiclassic, the Oaxaca Valley region is much higher than the other two. Although it drops in the ~Late Postclassic, the Oaxaca Valley ratio stayed higher than the other two regions.

The Oaxaca Valley shows a deeper mound site hierarchy and more centralization of ritual and administrative functions than other regions. However, Teotihuacán in the ~Early Classic was the most populous and most mound-rich center in all periods, although the region tended to have fewer mounds, fewer mound sites, and a shallower hierarchy than the Oaxaca Valley. In the Mixteca Alta, which had considerable resettlement through the first three Formative periods, new mound centers also tended to be established along with the new polity centers; this is a pattern of centralization of mound-site functions, but at a lesser scale than in the Oaxaca Valley region. This pattern is consistent with models of chiefdoms postulated for southeastern North America (Anderson 1996a; Hally 1996, 1999).

The implications of these mound site analyses will be explored more fully in Chapter 9. In the next section, I discuss ball court distribution patterns.

Ball courts

Ball court activities are generally interpreted as relating to interregional conflict resolution, and the obtaining by elites of wealth and perhaps territory. Nevertheless, prehispanic ball courts show diversity in size, configuration, and architectural context, and the games played on them were also spatially and temporally diverse. Relative to mounds, ball courts were rarely constructed, and they were more frequently constructed in the southern study area than in the north, although ball courts were built at many sites far north of the study area. Ball courts are known from the Early Formative—they are very rare—but no ~Early Formative ball courts are reported from the survey areas used for the database (see Table 8-4).

Table 8-4. Average size of settlements with ball courts. No ~Early Formative period B ball courts are in the study area, and the dating of the single ~Middle Formative period E/F ball court is not confirmed.

	E/F	**G/H**	**I**	**L**	**Q**	**V**
number of ball court settlements	1	10	33	47	21	32
number of ball courts	1	12	37	52	27	38
average site size (ha)	.30	57.99	33.27	32.94	60.03	60.65
largest settlement		Monte Albán	Monte Albán	Monte Albán	Tula	Tula
average size without largest settlement (ha)		15.32	21.31	23.33	35.94	51.12

For a more detailed discussion of ball courts and ballgames, see Chapter 6. In the following sections, I discuss the number of settlements with ball courts, the density of ball courts, and their distribution by period. I have included a more extensive analysis in Chapter 9.

Ball court density

Figure 8-14 shows the density of ball courts in the surveyed areas (number of ball courts divided by area surveyed). Ball courts are much rarer than mounds, so these densities are much lower than mound density. Note that although it was a major demographic center, the Basin of Mexico had few ball courts (more are known from sites outside the surveyed areas, e.g., Tenochtitlán, which is starred, in the ~Late Postclassic). In essence, ball courts seem to be a southern phenomenon within the study area, based on data from the survey areas, although many sites north of the Basin of Mexico, and north of the study area, did have ball courts. However, if we consider sites outside the surveyed areas, this conclusion is less obvious, at least for the ~Epiclassic and ~Late Postclassic.

The Tula site has two ~Epiclassic ball courts, but I have no survey data for that period from the Tula regional survey, so these two are not included in this figure; it is possible that there were more ball courts in that region.

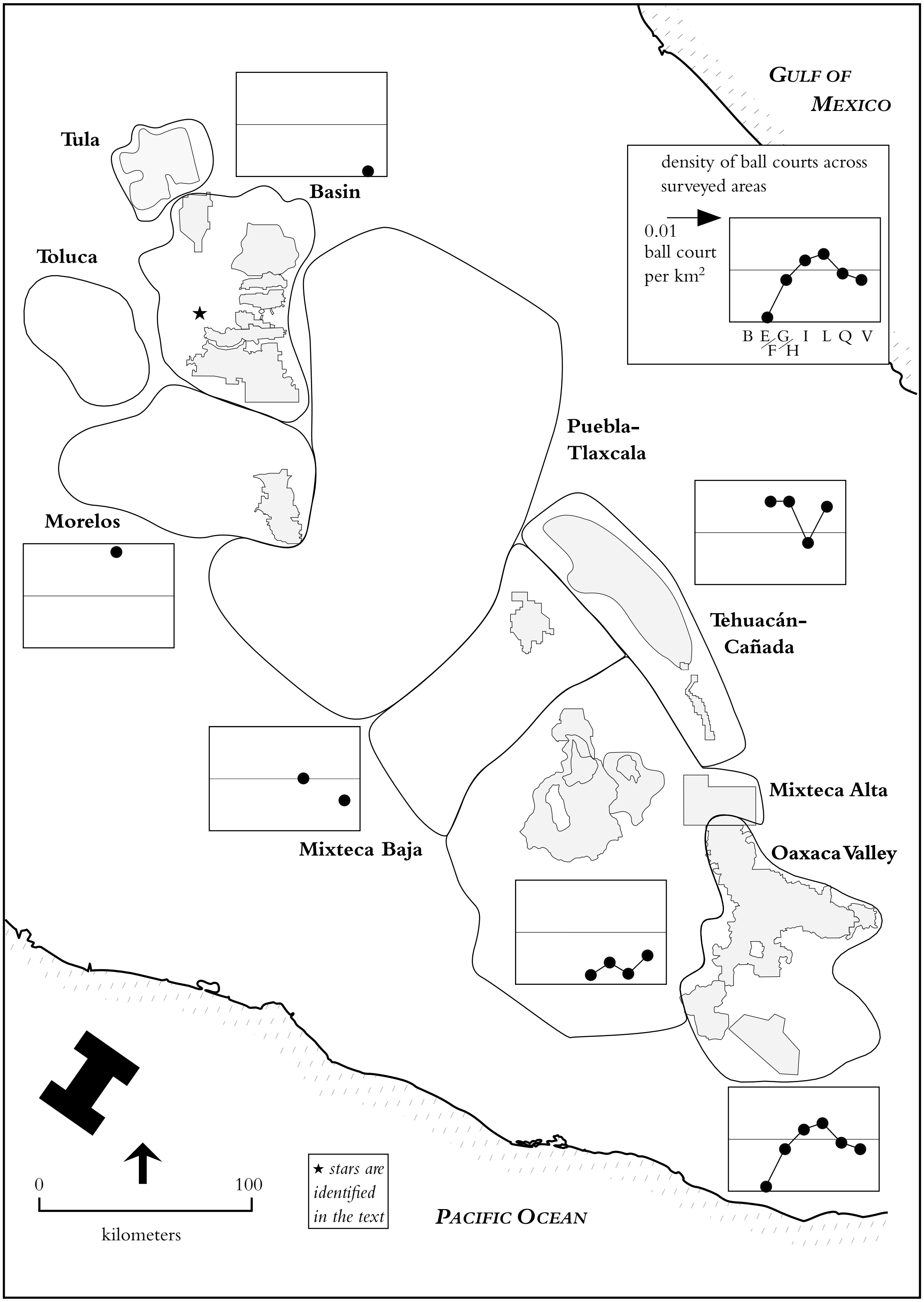


Figure 8-14. Density of ball courts in surveyed regions. Each graph is at the same scale as the graph in inset.

In the Morelos Valleys region, four ~Early Classic ball courts are reported from the Amatzinac survey area. The Tonatico-Pilcaya survey area in the western Morelos Valleys region had no ball courts.

In the Tequixtepec survey area, five ball courts are attributed to the ~Early Classic, and one to the ~Late Postclassic. Unfortunately, the Tequixtepec report uses only a few periods, so the Mixteca Baja are not as narrowly dated as ball courts from other regions.

Ball court use and construction were consistently higher in Tehuacán-Cañada region than in any other region from the ~Terminal Formative, when the first ball courts were built there, through all later periods.

In the Mixteca Alta region, ball court densities remained low, but persisted from the ~Late Formative on. Only one ball court was recorded in the Peñoles survey area, so if data from that survey area were included, the Mixteca Alta ball court density figures would be lower.

Construction began earliest in the Oaxaca Valley region, in the ~Middle Formative, and the ball court must have remained important because construction continued for all the rest of the periods.

Ball court density across a region suggests the relative importance of ball court activities. These data suggest ball court rituals were more important in the southern study area, especially in the Tehuacán-Cañada and Oaxaca Valley regions, which are closest to the Gulf Lowlands where the earliest ball courts were constructed and where the rubber balls with which the game was played originated.

Ball court settlement counts

Figure 8-15 shows the number of settlements with ball courts. Because most settlements with ball courts have only a single ball court dating to a particular period, these curves closely follow those of the previous figure, and show a bias toward ball court use in the Tehuacán-Cañada and Oaxaca Valley regions.

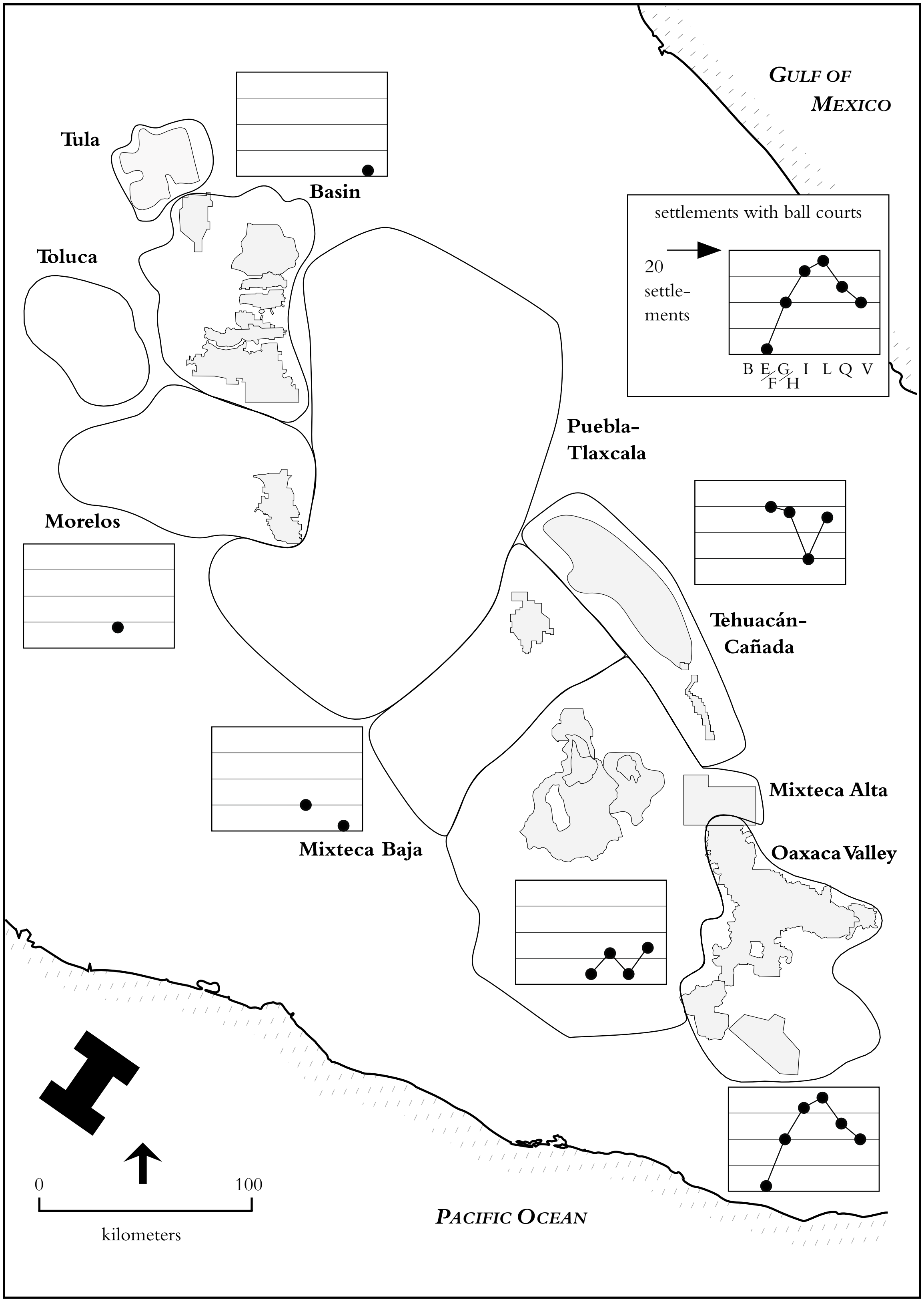


Figure 8-15. Number of settlements with ball courts. Graphs are at the same scale as inset.

Ball courts per person

Figure 8-16 shows the density of ball courts per person for the surveyed areas used in the database. The average shows there were no ball courts in period B. The three regions with enough data to show patterns were the Tehuacán-Cañada, Mixteca Alta, and Oaxaca Valley regions. All the regions except for Tehuacán-Cañada had low ratios of ball courts to population. In the ~Terminal Formative and ~Early Classic, the Tehuacán-Cañada had the highest numbers of ball courts per person recorded anywhere. However, Tehuacán Valley population estimates are probably disproportionately low, which raises the density of ball courts per person. In the ~Epiclassic and ~Late Postclassic, the rates dropped, but remained higher than in any other region.

Ball court distribution: Period E/F, ~Middle Formative

The Oaxaca Valley region's CE-SBC-SBC-9, in the central valley, is the only settlement with a ball court possibly dating to the ~Middle Formative. This settlement is in the southern part of the study area, and thus closest geographically to the earliest known ball courts of southern Chiapas (Agrinier 1991).

Ball court distribution: Period G/H, ~Late Formative

Ball court construction remained a Oaxaca Valley region phenomenon in period G/H (Figure 8-17), when Monte Albán had four ball courts. At least seven other ball courts are within 20 km of Monte Albán, or a one-day return trip for someone making a short visit (Hally 1993:163; 1999:105–106). This suggests the activities held at ball courts were becoming increasingly important, and the residents of more communities built them.

Ball court distribution: Period I, ~Terminal Formative

For the first time more than one ball court was in use on a single site in the study area other than Monte Albán. These multiple ball court settlements are in the southern study area, but at a distance from Monte Albán (Figure 8-18); this pattern suggests the spacing was not accidental. The Tehuacán-Cañada site of Tecomovaca Viejo (Tr 19) or Llano de los Mogotes (Cs-1) was recorded by both the Tehuacán and the Cuicatlán-

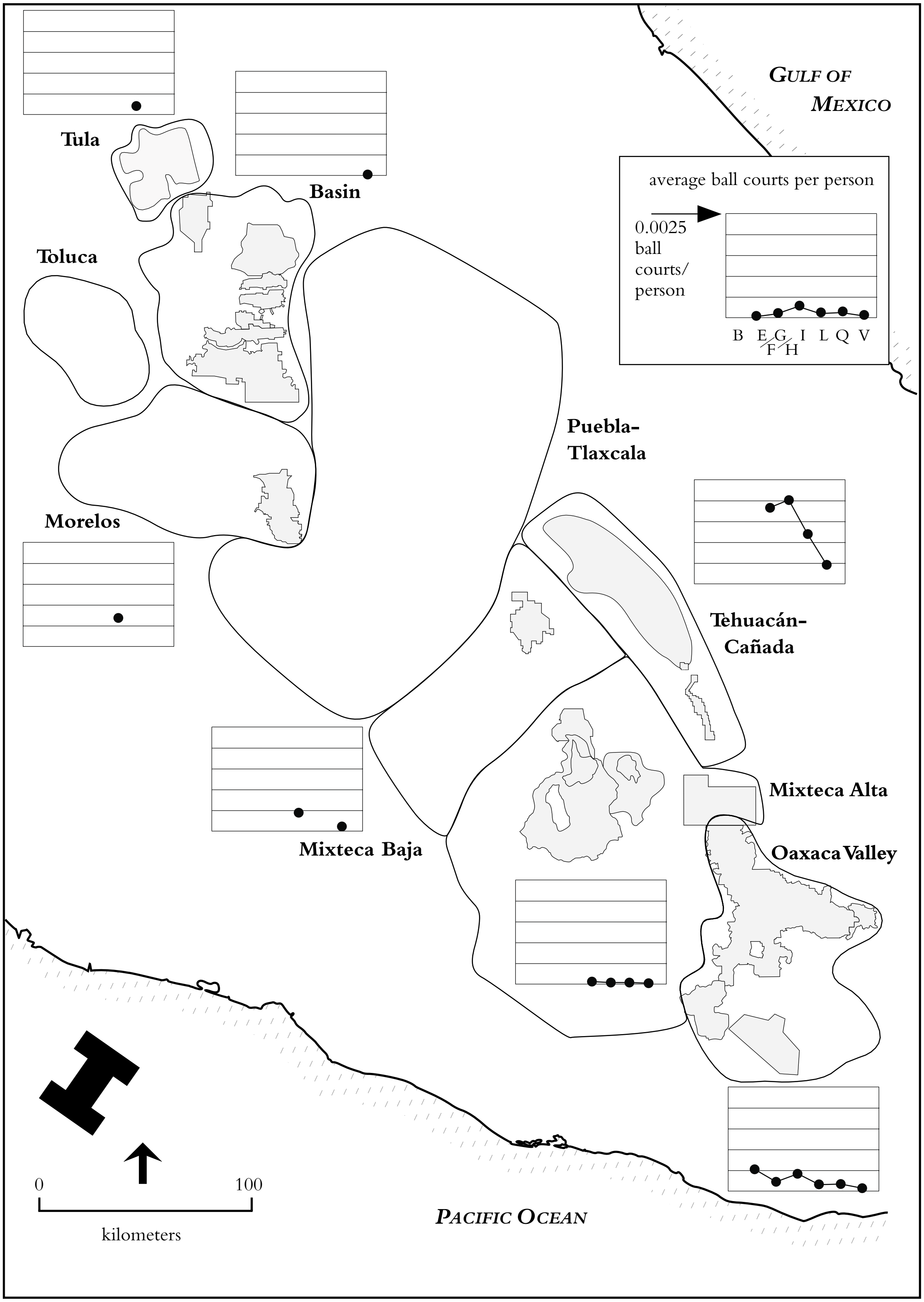


Figure 8-16. Number of ball courts per person in surveyed regions. Each graph is at the same scale as the graph in inset.

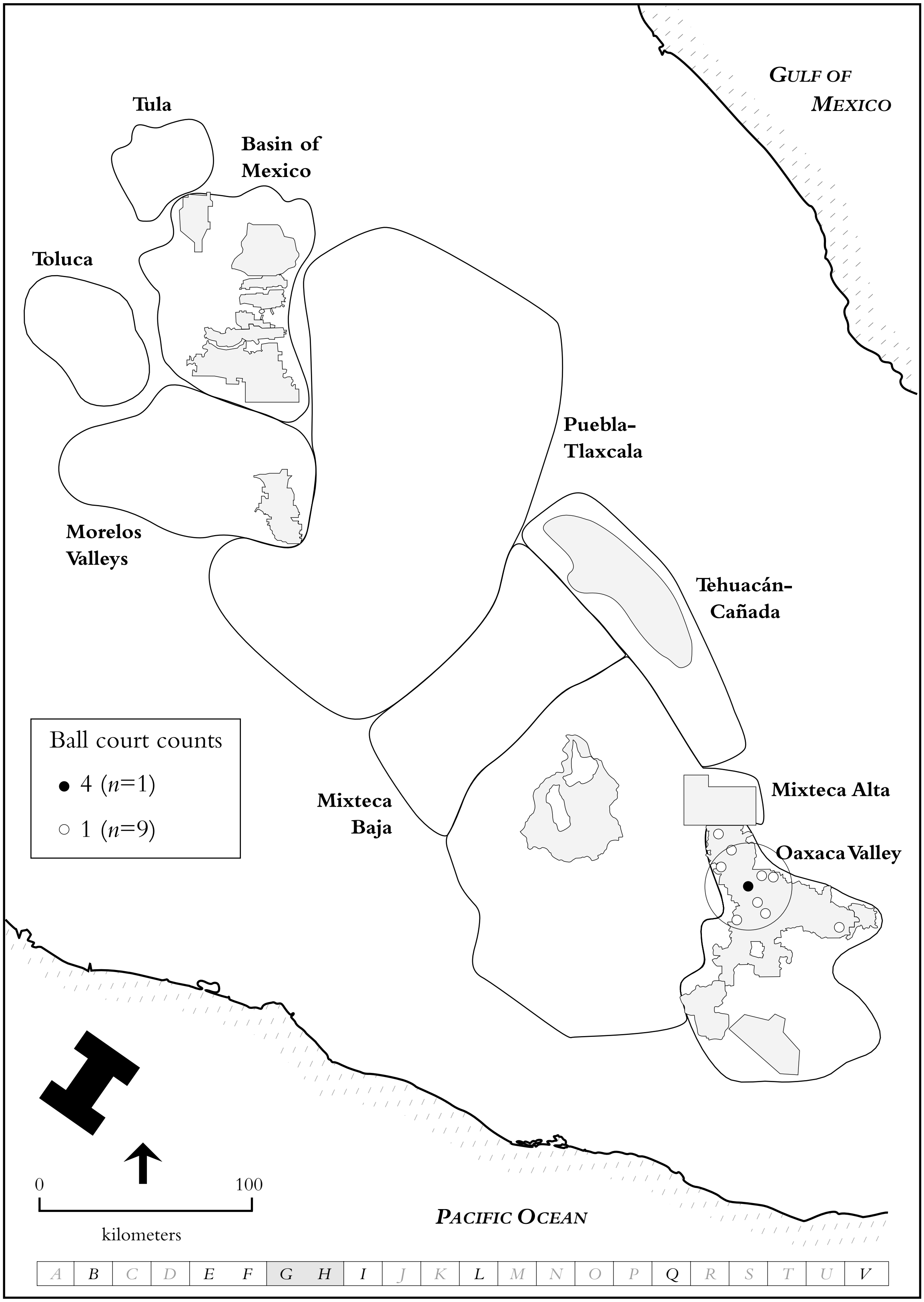


Figure 8-17. Period G/H ball court settlements (*n*=10 of the 1092 period G/H sites). Circle, centered on Monte Albán, is 40 km in diameter.

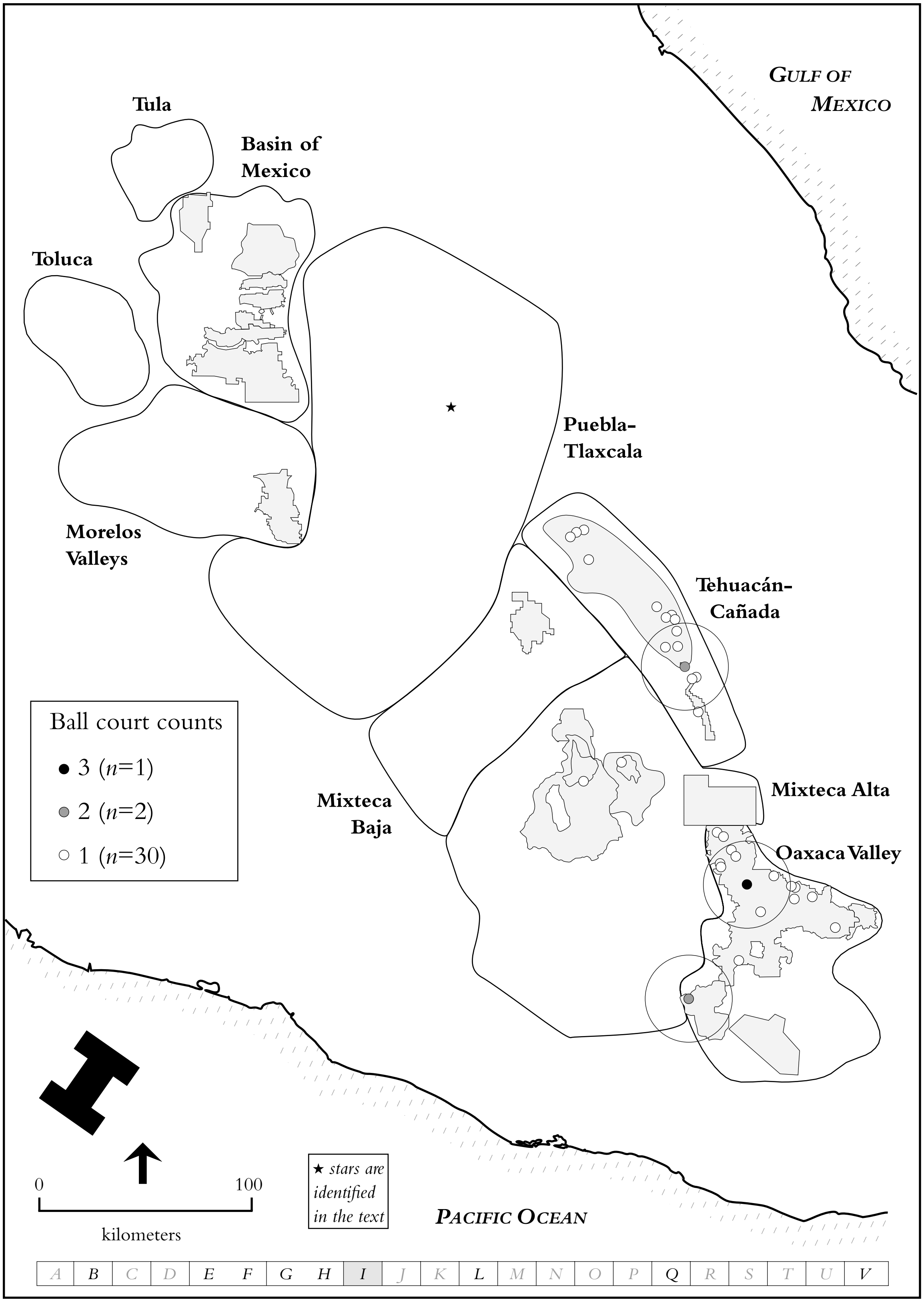


Figure 8-18. Period I ball court settlements (n=33 of the 1141 period I sites). Forty-km in diameter circles are centered on the multiple ball court sites.

Cañada surveys; it has two Lomas-period ball courts. In the Sola Valley, site 39 also had two ball courts.

Single ball court settlements were scattered across the surveyed areas of the Tehuacán-Cañada, Mixteca Alta, and Oaxaca Valley regions. In addition, García Cook (1981:257) reports a period I ball court at Capulac Concepción (starred) near Amozoc in the Tlaxcala survey area in the northern Puebla-Tlaxcala region. This site is essentially downstream (northwest) of the ball court-rich sites of the Tehuacán-Cañada region.

Nevertheless, the ball court phenomenon had spread north from the previous period. Their spacing throughout the Oaxaca Valley and Tehuacán-Cañada regions suggests the activities performed on ball courts became more important during this period. Perhaps, also, it was important for settlements with ball courts to be more than a one-day walk from multiple ball court centers.

Ball court distribution: Period L, ~Early Classic

Ball court use increased from 37 in the ~Terminal Formative to 52 in this period, a jump of 40 percent. Their distribution increased to extend into the Morelos Valleys region, with several ball court centers across the Mixteca Baja and Mixteca Alta regions (Figure 8-19). This is a considerable spatial spread from the previous period.

Multiple ball court centers continued at the same Oaxaca Valley centers, and at one more center in the Tehuacán-Cañada region. There is a ring of sites lacking ball courts around Monte Albán, suggesting it served as a center for ballgame rituals for the area within a day's return trip.

With single ball court communities scattered across most of the study area, although notably not in the Basin of Mexico, the activities conducted at ball courts must have continued to be important from when they first began early in the Formative. That multiple ball court centers continued only in the southern region may be a result of the longer history of ball courts in the southern study area or the stronger importance of ball court activities in that area.

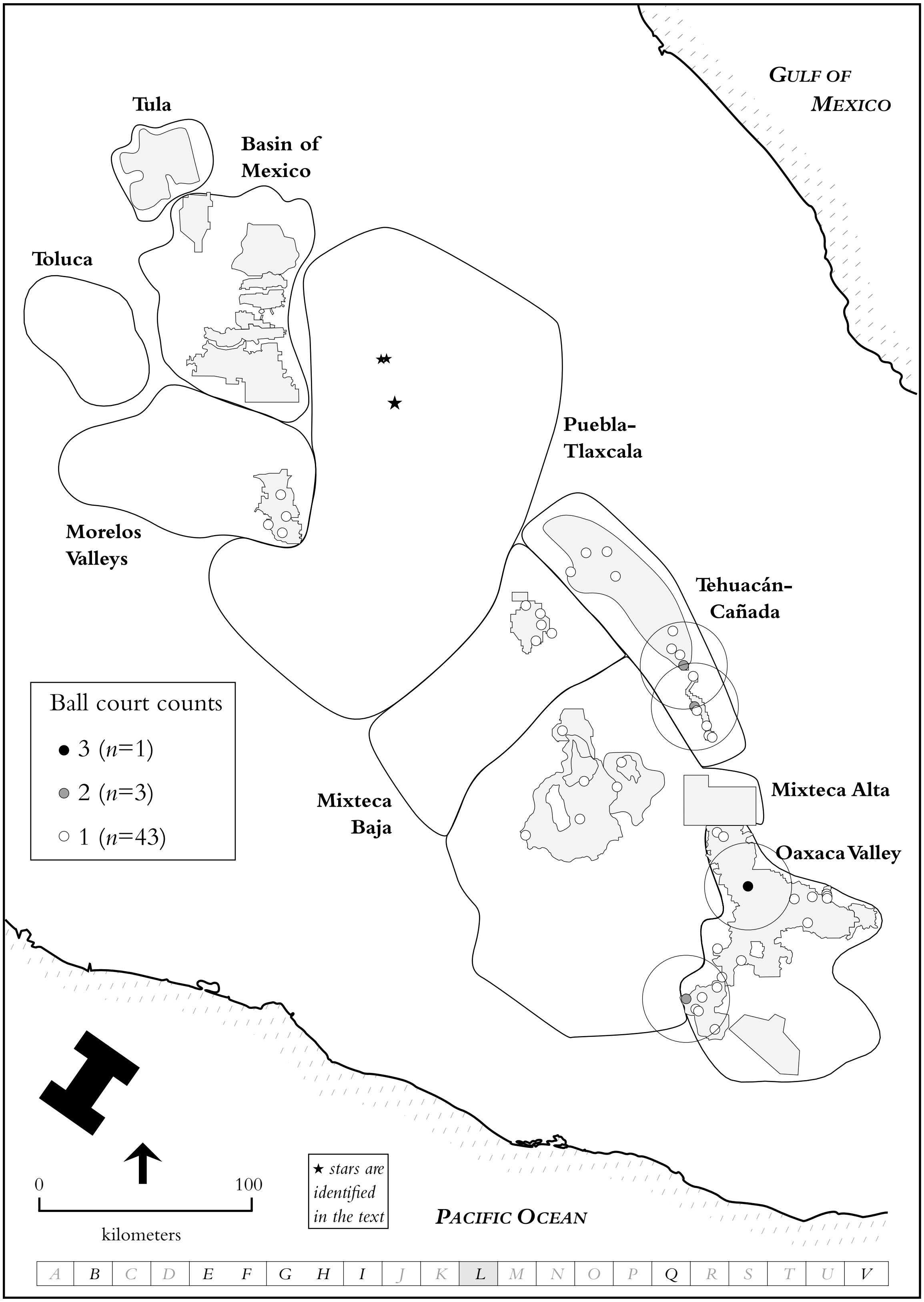


Figure 8-19. Period L ball court centers (*n*=47 of the 2338 period L sites). Forty-km circles are centered on the multiple ball court sites.

As I mentioned above in discussing ~Early Classic mound architecture, the Puebla-Tlaxcala region sites of Cholula (large star), Cacaxtla, and Xochitecatl (paired stars) had considerable ~Early Classic architecture, which may have included ball courts. Teotihuacán, the largest site of this period, had no ball courts, although its Tepantitla Palace murals do show two vigorously posed players in an open-ended ball court (Taladoire 2001:113).

Ball court distribution: Period Q, ~Epiclassic

Ball court usage decreased in this period (27 ball courts date to this period) in the surveyed areas, as did population. However, ball courts are known from several sites not in the surveyed areas, and there may have been heavier ball court use in the ~Early Classic than previously. Other ball court sites starred on Figure 8-20 include Teotenango in the Toluca region, Cholula (large star) in the Puebla-Tlaxcala region, Cantona northeast of the Puebla-Tlaxcala region, and El Tajín on the Gulf Coast. Taladoire (2001:108) notes that during the ~Late and ~Terminal Classic, many new forms of ball courts were built across Mesoamerica; some continued to be in use in the ~Epiclassic. So, although no ball court settlements are known from surveyed areas in the Basin of Mexico, the region was ringed at a distance by multiple ball court settlements.

In the surveyed areas, ~Epiclassic multiple ball court centers were in locations peripheral to the multiple ball court settlements of the previous two periods. This represents a significant shift in ball court construction to new locations, and abandonment of many ball courts from the ~Early Classic. Of the starred settlements, Cantona has 24 ball courts and El Tajín has 18 (although a total of at least 27 are known from the immediate area [see Taladoire 2001:98, note 14]).

In the ~Epiclassic, ball court sites shifted from the southern Tehuacán Valley to the central valley, where there were three multiple ball court settlements. In the Oaxaca Valley region, ball courts were not in use in the central valley, but along the northern edges of

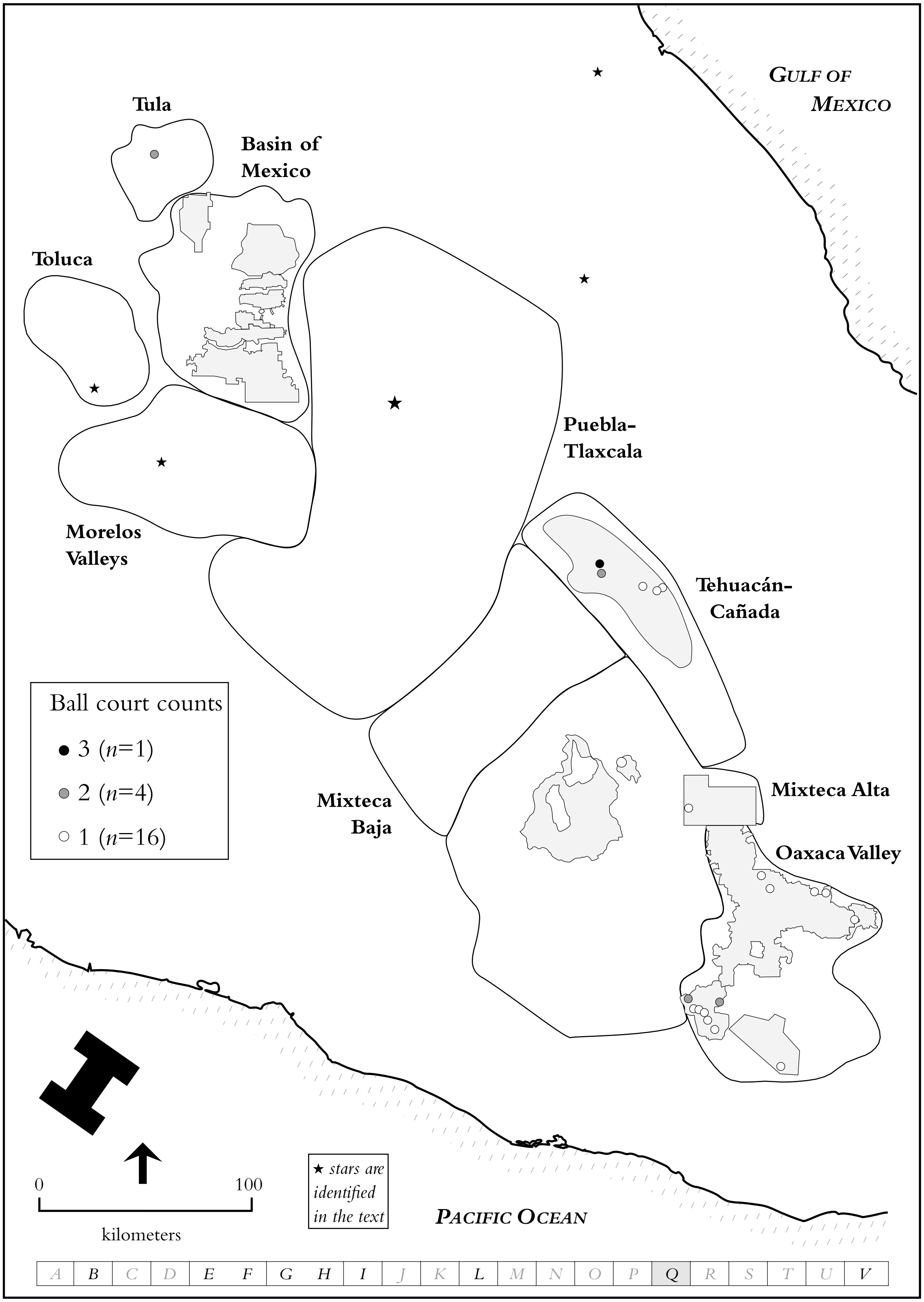


Figure 8-20. Period Q ball court settlements (*n*=21 of the 992 period Q sites). Note Cantona northeast of the Puebla-Tlaxcala region, and El Tajín north of Cantona.

the eastern arm, along with a cluster of ~Epiclassic ball court settlements in the Sola Valley to the south, including two double-court sites.

In the Mixteca Alta region, only one ball court was in use, while in the previous period there had been six.

Although ball court counts and ball court site counts drop for the ~Epiclassic period Q, ball courts continued to be important features of the Mesoamerican landscape. The Basin has few reported ball courts (relative to the rest of the study area), although they were built and used in areas all around the Basin.

Ball court distribution: Period V, ~Late Postclassic

In ~Late Postclassic period V (Figure 8-21), ball court use and construction increased from the previous period to approximately the levels of the ~Terminal Formative. While four multiple ball court centers remained in the Tehuacán-Cañada and Oaxaca Valley regions, the Mixteca Alta region had its first multiple ball court center. ~Late Postclassic single ball court centers are scattered across the southern regions, and for the first time, a ball court was reported in the Basin survey areas.

The Aztecs used ball courts, and Tenochtitlán (starred) had at least one ball court in its central civic-ceremonial architecture, now under the rear of Mexico City's central cathedral on the Plaza Mayor (Matos Moctezuma 2001:90). Cholula (starred), in the Puebla-Tlaxcala region, may also have had a ~Late Postclassic ball court.

I have placed 40-km diameter circles around the multiple ball court settlements. They are fairly evenly distributed in the Puebla-Tlaxcala, Mixteca Alta, and Oaxaca Valley regions. This spacing suggests deliberate distancing that relates to the integration of the southern study area.

Multiple ball court settlements

While most ball court settlements in the surveyed areas have only a single ball court (or a single one in use at any one time), a few sites have multiple ball courts (Figure 8-22). As with the distributions of all ball courts, more multiple ball court settlements are

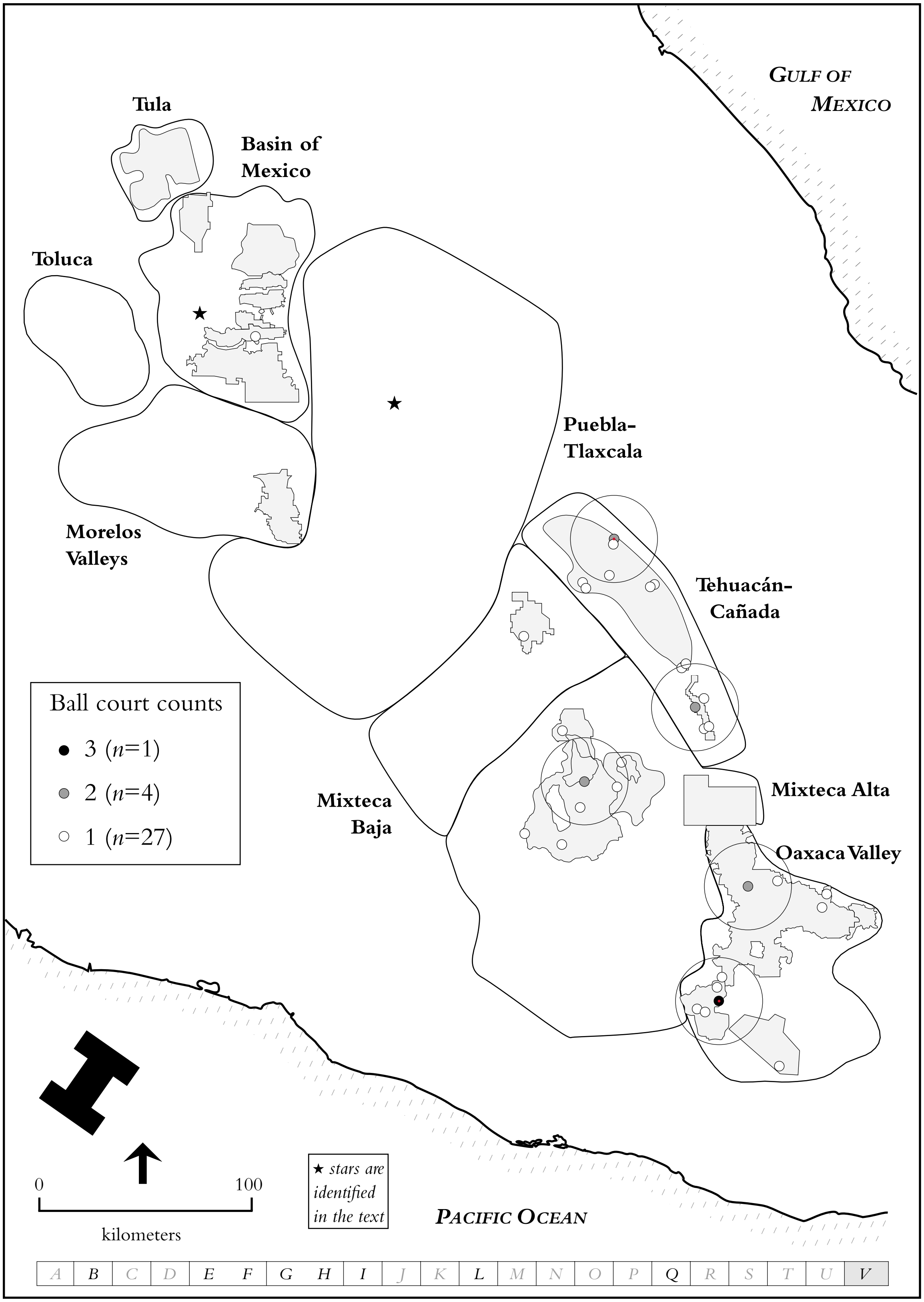


Figure 8-21. Period V ball court settlements (n=32 of the 5246 period V sites). Centers with multiple ball courts have 40-km diameter circles around them.

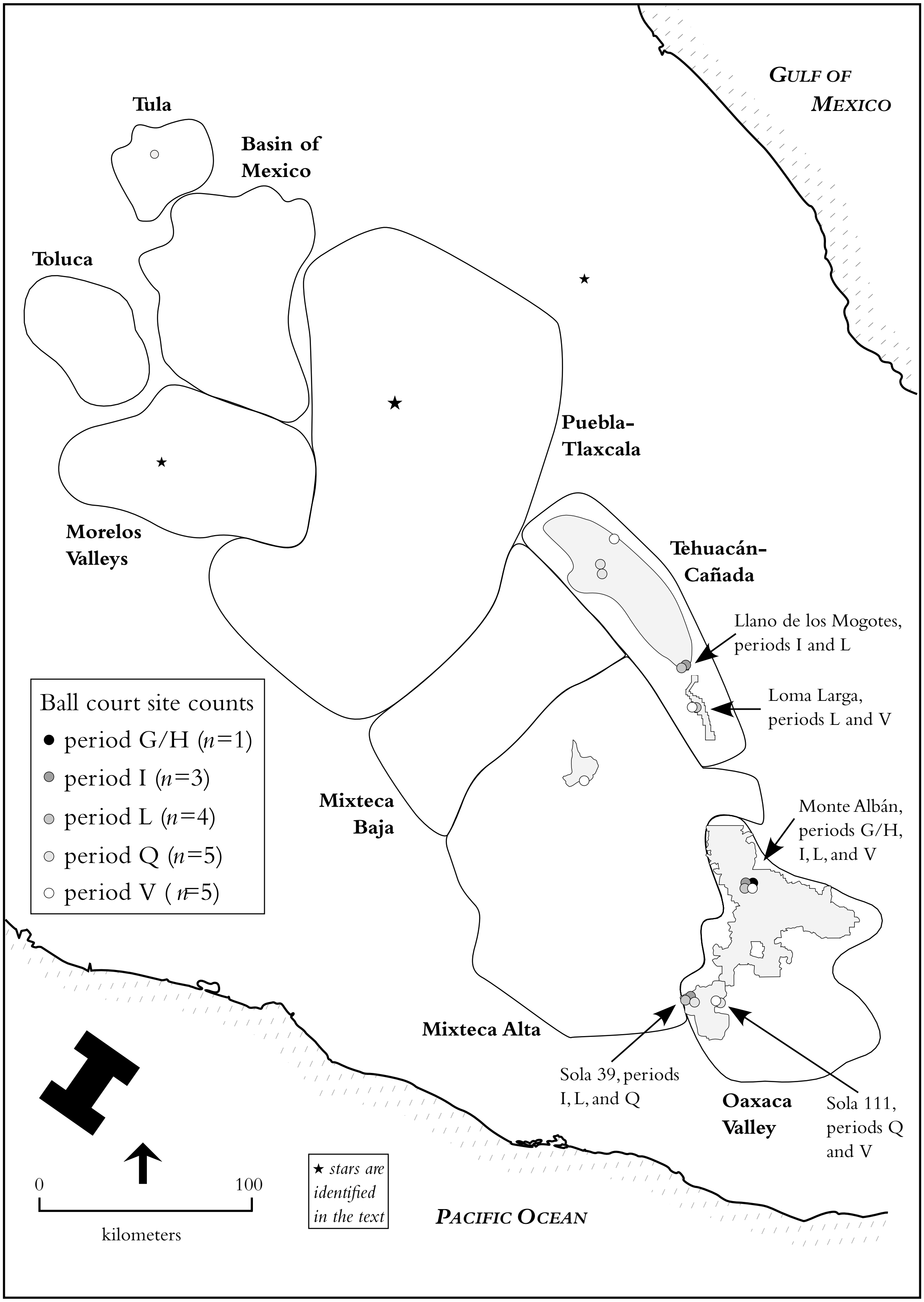


Figure 8-22. Locations of sites with two or more ball courts dating to a single period. Sites with multiple dots are labeled.

in the south. This pattern is probably not representative of the highlands as a whole, as multiple ball courts are known from Xochicalco, in the Morelos Valleys region, Cholula, in the Puebla-Tlaxcala region, and Cantona, northeast of the Puebla-Tlaxcala region (starred, counterclockwise), to name a few. Taladoire (2001:98) reports that as of the year 2000 79 ball courts were known from 66 settlements in Central Mexico, and 100 from 90 sites in Oaxaca, so more multiple ball court settlements are known across the study area than are included in the database or mentioned here.

Ball courts: Summary

Ball courts are distinctive architectural features that have been recorded on settlements large and small. The earliest ball courts in Mesoamerica date to the ~Early Formative, but the earliest one in the dataset dates to the ~Middle Formative. When the Spanish arrived in the Aztec capital of Tenochtitlán, they observed ritual sacrifices, as well as gambling, associated with ballgames (Matos Moctezuma 2001). While most settlements have only a single ball court, some ~Late Classic and period Q ~Epiclassic settlements have many of them; Cantona, northeast of the Puebla-Tlaxcala region, has 24, the most known for a single highland settlement. In the Valley of Oaxaca and Tehuacán Valley, ball courts tend to have been built on regional boundary sites, at least in the early periods (the ~Middle and ~Late Formative), and not necessarily in population centers (Kowalewski et al. 1991).

Data from the surveyed areas show the most ball courts in periods I, L, and V (~Terminal Formative, ~Early Classic, and ~Late Postclassic), although a fair number of ball courts were in use in ~Epiclassic period Q. Certainly, many ~Late Classic and ~Epiclassic ball courts are known from outside the surveyed areas. In general, ball courts seem to be a southern phenomenon in the study area, especially in the earlier periods, and the Basin of Mexico region had few ball courts. The existence of multiple ball court settlements, with Cantona, northeast of the Puebla-Tlaxcala region, having 24 courts, suggests that some settlements were centers for ball court activity, although only 12.5 percent (18 of 144) of the settlements with ball courts had multiple contemporaneous ball courts.

Summary

Mounds and ball courts are obvious structural remains that survive to be recorded by survey archaeologists. They hosted important ritual and administrative activities, and represent the marshaling of a considerable labor force to construct and maintain them. Neither mounds nor ball courts were built exclusively in the largest communities, although they tended to be built on larger settlements; also not all large settlements had either mounds or ball courts. Some sites have a lone mound, but most that have mounds have multiple mounds, generally around a plaza. Sometimes, access to the mound complexes seems to have been controlled by walls or limited by other buildings flanking the civic-ceremonial architecture, although I did not have sufficient data to examine this quantitatively. On sites on ridge crests or spurs particularly in the Mixteca Alta, the largest mounds were generally on the highest summit within the site. I do not know of any settlements with ball courts that did not also have mounds. Ball court settlements were sometimes in peripheral locations, but the ball courts were usually enmeshed in the central civic-ceremonial architecture.

Both mound and ball court use were more intensive in the southern study area, although both types of civic-ceremonial architecture were constructed across the study area and regions far to the north. Other than the huge numbers of mounds (and no ball courts) constructed at Teotihuacán in the ~Early Classic, and the large central architecture known for the Aztec capital of Tenochtitlán, the Basin of Mexico tended to have less civic-ceremonial architecture and a less-developed civic-ceremonial architecture hierarchy than other regions. Cuicuilco, a Formative site, also had significant civic-ceremonial architecture, although mound counts are not published for that site. Even with these exceptions (and the 281 ~Early Classic mounds at Teotihuacán constitute quite an exception), the Basin seems to show a consistent pattern of less civic-ceremonial architecture that is more centralized (on fewer small and mid-range sites), and less hierarchical than it is in regions in the southern study area.

In the Mixteca Alta, mound construction was more hierarchical than in the Basin, and more centralized (except when compared to the ~Early Classic Basin patterns). With the shifting cores of the Formative, this means many new mounds were built in each period, to complement other central place functions.

Other than in the ~Early and ~Middle Formative, the Oaxaca Valley tended to have the highest correlation of mounds in central places, suggesting centralization not only of population but of population with ritual and administrative functions. Ball courts do not entirely follow this pattern, though Monte Albán (in the ~Late Formative, when there were four) is the sole site in the quantitative database dating to the seven periods analyzed here that had more than three ball courts in use in a single period. Ball courts in the Oaxaca Valley in some periods were built on sites in border areas between polities, indicating their function differed from those in populous centers—they probably were to mediate between them. This pattern may also have been true in other regions; in the ~Epiclassic, many of the largest sites that ringed the Basin (e.g., Tula, Xochicalco, Cholula, Cantona—none of which are in the quantitative database) had ball courts, suggesting ball courts became important on the most prominent new centers in the northern study area. In the ~Epiclassic Basin, a period of high sociopolitical disruption in the Basin, populations dropped precipitously, and I have no record of ball courts there. Indeed, the Basin seems to have had no ball courts until the ~Late Postclassic, when we know they were used by the Aztecs for ritual and gambling.

CHAPTER 9

SUMMARY AND CONCLUSIONS

This study seeks to describe and interpret long-term patterns of social evolution by looking at change and continuity in scale, integration, complexity, and boundedness at the regional and macroregional scales. I focus on concordant change and continuity in the political economy, synthesizing 3000 years of highland Mesoamerican archaeological data; I focus on settlement patterns, especially population, and civic-ceremonial architecture, especially mounds and ball courts. Population and settlement distributions serve, like a modern census, as a yardstick for popular places of residency, and thus comprise a hierarchy of most populous communities (settlements that more important in some significant way). Mounds and ball courts are the best preserved and most recognizable of the highland civic-ceremonial architecture; from their counts and distributions, a second hierarchy can be constructed that emphasizes important civic-ceremonial places with more mounds and thus more ritual and administrative functions and importance.

When I planned this study, I outlined over two dozen variables based on standard survey data that I would base my comparisons on; however, the dataset I assembled, which includes well-reported surveys, was not as comparable as I'd hoped. I had to disregard a set of variables that addressed plaza area, the size and configuration of civic-ceremonial architecture complexes, and some spatial plots of settlement clustering. However, I added several settlement and population variables I had not originally planned to use, such as large vs. small settlement dynamics.

In this chapter, I first review the context of this study, or the materials I addressed in Chapters 2 through 6. Then, I emphasize issues of comparability that I had to solve (or sidestep) to generate a quantitative database using basic site data from 20 survey projects.

Next, I summarize the major findings based on the data and analysis presented in Chapters 7 and 8. In the next section, I summarize the broad, macroregional patterns these data show. I close with brief discussions of the significance of this study, comments on future research, and final comments.

Context of this study

In this study, I examine regional and macroregional patterns of change and continuity. In other words, I ask to what degree was the study area a macroregional system and how do civilizations evolve? I use settlement and civic-ceremonial architecture distribution patterns and hierarchies, derived in various ways (e.g., counts, densities, rank-size graphs), to discern both commonalities and variation in the core features of macroregional systems: scale, integration, complexity, and boundedness (Blanton 2000; Sanders 1972; Wright 1986 are similar broad-scale studies). This approach to analysis lends itself to core-periphery models derived from world-systems studies (e.g., Chase-Dunn and Hall 1997; Hall 1999).

The study area extends across 80,000 km^2 of highland terrain that includes large valleys and basins, some with lakes and marshy areas, smaller and larger river valleys in dissected terrain, and rugged sierras with complex geology. For archaeological analysis, I have divided it into nine regions (Tula, Basin of Mexico, Toluca Valley, Morelos Valleys, Tlaxcala-Puebla Valleys, Tehuacán-Cañada, Mixteca Baja, Mixteca Alta, and the Oaxaca Valley), shown in Figure 9-1. The study area is best described as an ecological mosaic that includes considerable high-elevation terrain (the continental divide, volcanic ridges), plus extensive highland valleys and basins; the principal food crops of the highlands can be grown across most of the study area.

To clarify variation in agricultural potential and inter- and intraregional transportation networks, I divided the study area into four environmental regions: the northern basins (the Basin of Mexico and the terrain to the east), the Mixteca Alta, the Oaxaca Valley, and a fourth area, the transition region, that includes the remainder of the survey area. As it

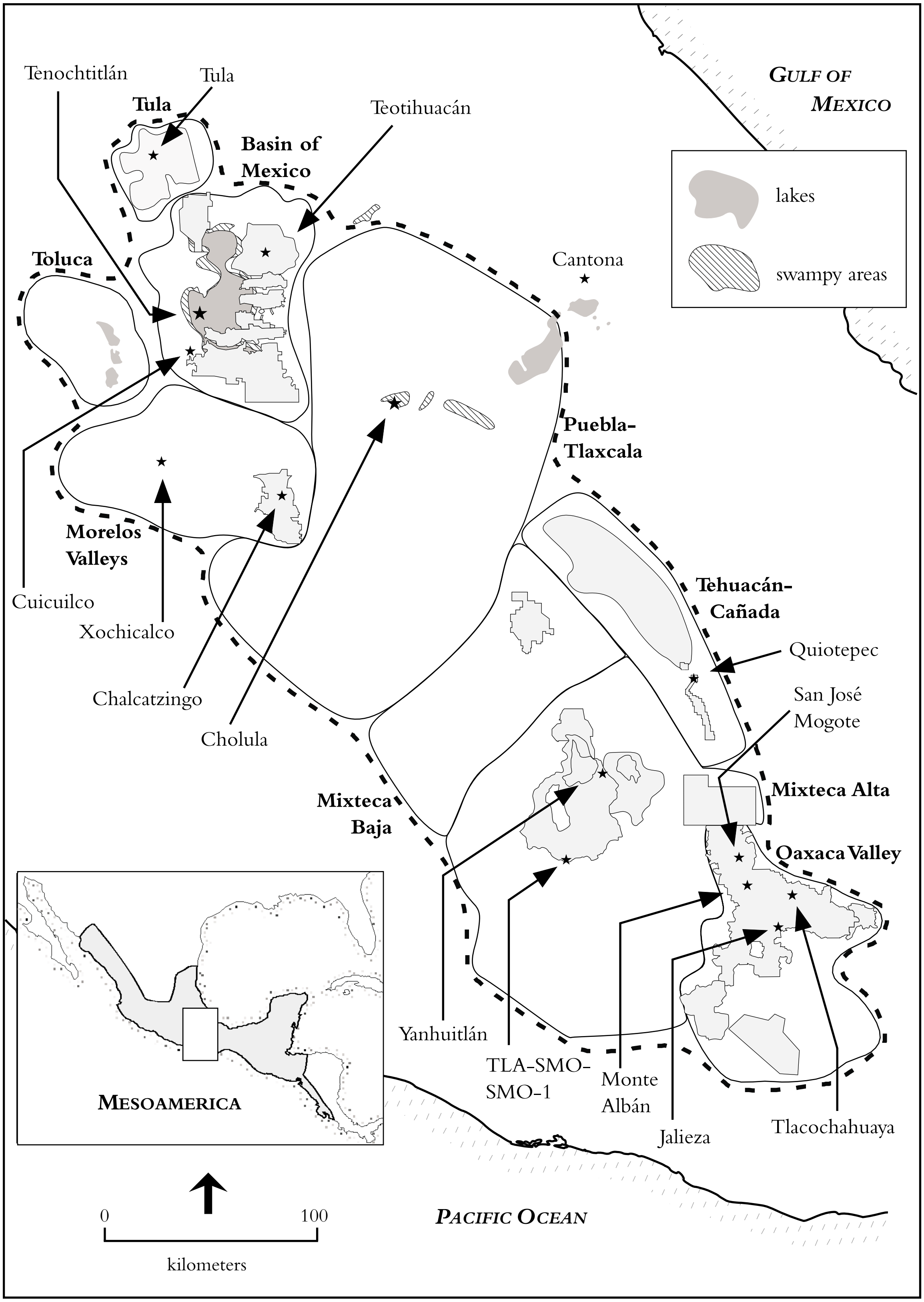


Figure 9-1. Study area (dashed line), regions, and survey areas with quantitative data. Other survey areas, including in the Toluca and Puebla-Tlaxcala regions, report qualitative data.

happens, the transition region includes terrain that was peripheral to the cores in the other regions, in a world-systems model. These four environmental regions are bounded on the northeast, east, south, and southwest by terrain that was difficult to cross because of high elevations or a rugged topography that generally extended for quite a distance from the study area; I term this bounding terrain. Well-traveled routes did cross the bounding terrain (especially to the Gulf Coast), but more routes crisscrossed the study area. This indicates heightened interregional communication and a high potential for market system integration within the study area, and especially within and between the flatter northern basins and Oaxaca Valley environmental regions.

I generated a macroregional chronology that spans the study area based on ceramic crossties, imitations, and trade wares—that is, I derived contemporaneity from ceramics, not from absolute dating. I obtained site-by-site data from 20 survey projects. These surveys are from a single research tradition, founded by Sanders and colleagues in the Basin of Mexico, and therefore generally comparable in method and emphasis. The data are not fully comparable, however, because methods for population estimation varied, and not all recorded civic-ceremonial architecture similarly (see below). Nevertheless, I have been able to generate a sufficiently compatible macroregional database to examine settlement pattern and civic-ceremonial architecture hierarchies.

I have systematic survey data on the archaeology of about 40,000 km^2 from all regions, but detailed, quantitative data from only seven regions, totaling 11,892 km^2 (about 15 percent of the study area). Extensive data from the Basin of Mexico, Mixteca Alta, and Oaxaca Valley (the big three regions) overshadows that of the other regions in much of the analysis. If the Puebla-Tlaxcala region surveys had been reported in more detail, that region would have similar prominence in this synthesis. None of the big three regions are in the transitional environmental region. To accomplish the quantitative analysis, I created a database in which the basic unit is the component—a spatially and temporally defined occupation—for which I noted settlement size, population estimates if given, and mound and ball court counts, along with more descriptive information (e.g., mound base and height, configuration of civic-ceremonial architecture). The database has almost 14,300 records, with 11,432 dating to the seven periods I analyze in this study.

Comparability: developing a macroregional database and its implications

In creating the database that I have used in the analysis of quantitative data from archaeological sites in the study area (especially site size, estimated population, mound counts), I had to solve several issues of comparability including estimating population, minimum populations, and especially periodization. Generating population estimates from archaeological data is hotly debated because of the many assumptions it requires. I review the ones I made and their implications in Chapter 4.

Multi-project databases always must solve issues of compatibility. Some incompatibilities can be eliminated; for instance, a single site numbering system can be applied (in my database, this was the record number). However, some incompatibilities and inconsistencies must be included; for example, site sizes frequently cannot be reassessed based on published data, so later researchers must rely on the reported estimates, even if the original estimates were made by counting squares or other methods later considered too inaccurate. Other incompatibilities can be reduced by implementation of standards on all the included project data; I did this with population estimates. The multi-regional chronology I generated is a second example of a standardization I imposed in order to meaningfully synthesize these data.

Without a doubt, the survey reports on which this study is based represent truly important work, and include data unobtainable today. Mexico's high population growth over the last century means considerable sprawl and urbanization has engulfed previously unoccupied lands, even in relatively remote areas. Modern land use, including erosion of abandoned agricultural lands, construction of roads and buildings, and looting have significantly negatively impacted Mexico's archaeological *patrimonio nacional*. Thus, the data in these reports constitute an extremely important snapshot of the archaeological record.

Unfortunately, many of the reports from which I gleaned data for the database have significant problems ranging from poor copy-editing leading to inconsistencies (e.g., between figures given in both tables and text), a general lack of specifics (e.g., site limits never determined—so no site size data; mound counts not given), poor mapping (e.g., sites given only as dots or other simple geometric symbols), and the absence of published site maps that include site limits and architectural features. Also, later excavations sometimes reveal construction stages that do not match periodizations of architecture made in the original survey (e.g., see Marcus and Flannery 1996:190). I used conservative scholarly judgments to unite these diverse data into a single database.

Because radiocarbon and other absolute dates are poorly reported and because ceramic crossties provide unassailable evidence of contemporaneity, I used ceramic crossties, the presence of trade wares, and, to some degree, imitative ceramic styles to construct a single chronology that incorporated all chronologies used by the 20 projects from which I derived quantitative data. Then, I applied letter designations to each period used in any report, resulting in 22 periods, letters A (the earliest ceramic period) to V (ended by the disruptions of the conquest). After I had entered the archaeological data in the database, making each record correlate with a single component, I found only periods B, E/F, G/H, I, L, Q, and V had sufficient data from across the study area for my analysis. These periods roughly correspond to the Early, Middle, Late, and Terminal Formative, the Early Classic, the Epiclassic, and the Late Postclassic. I use these latter terms because they are commonly understood, and I mark them with a tilde (~) to denote that they are not quite the same in my usage as the conventional designation. Note that these periods do not include the Valley of Oaxaca's San José phase or the Late Classic for the entire study area.

The seven periods for which the most data are reported inherently have important implications for macroregional studies. They represent a series of macroregional conjunctions, or widespread interactions that indicate concordant changes (Kowalewski 1995,

1996) or continuity at the macroregional scale. These patterns correspond to those Willey (1991) describes as alternating periods of horizonal integration (e.g., ~Terminal Formative, ~Early Classic, ~Late Postclassic) and regional diversity (e.g., the ~Middle and ~Late Formative). By horizonal integration, Willey is referring to periods of greater stylistic similarities evident in ceramics, art, and architecture. He argues that ideology was "the primary motivating force in…these horizonal integrations" (Willey 1991:206). They can also be described as periods of concordant change. On the other hand, periods with greater regional diversity, in Willey's hypothesis, show less integration and fewer continuities, and change is more regional than macroregional.

Review of major findings

In this section, I review the data and analysis presented in Chapters 7 and 8, which focus on creating hierarchies. Chapter 7 examines settlement pattern hierarchies, looking at settlement and population distributions, densities, rank-size graphs, continuity, etc. Chapter 8 examines mound and ball court architecture counts, distributions, densities, etc. These quantitative data were derived from reports on 20 survey projects, and I augmented them with qualitative data from other surveys and excavations. Far more of the quantitative data from the database are from the Basin of Mexico, Mixteca Alta, and Oaxaca Valley regions, sometimes overshadowing data from the other regions in the study area. In addition, the periodization of sites from the Tula and Mixteca Baja regions was often too limited to be comparable. I conclude that all of the big three regions varied in important measures of settlement and civic-ceremonial architecture hierarchy, centralization, urbanization, and integration.

Settlement variables

The general pattern demonstrated by the settlement variables is of increasing numbers of settlements over time, across all regions, with the exception of during the ~Epiclassic. This means settlement density also increased. At the same time, average settlement size increased.

The three settlement variables show a higher density of settlements in the Mixteca Alta in the ~Early Formative, the Morelos Valleys region in the ~Middle Formative (including Chalcatzingo), and the Oaxaca Valley region in all succeeding periods. The largest average settlement sizes were in the Mixteca Alta and Basin of Mexico regions; although the Oaxaca Valley had many sites, its sites were not as large as those of the Mixteca Alta and Basin of Mexico. In the early periods, Basin sites are clustered near the lake edges, particularly along the more ecologically rich southern lakes. Likewise, the Mixteca Alta, with slightly higher rainfall and more ecological diversity in small areas probably had a lower risk than the Oaxaca Valley region. I will reserve comments about later periods for discussions below, when I can discuss site size and population data together.

The Mixteca Alta surveyed areas had the highest ***settlement counts*** in the ~Early and ~Middle Formative. The Oaxaca Valley region had the highest for all succeeding periods. This is in part because the Oaxaca Valley region has the largest surveyed area of any region in those early periods.

The Mixteca Alta region had the highest ***settlement density*** (site count divided by area surveyed) in the ~Early Formative, the Morelos Valleys region in the ~Middle Formative, and the Oaxaca Valley region in all succeeding periods. The Tehuacán-Cañada region's settlement density was consistently low (the limits of the Tehuacán survey are not given, and I may well have included enough unsurveyed area that it reduced the settlement density significantly). For residents of the small villages and hamlets of the ~Early Formative, the somewhat higher rainfall of the Mixteca Alta meant a reduced risk and easier access to more ecologically diverse zones probably made it more attractive for settlement. Settlement densities alone leave many questions; they are best understood paired with a population variable.

Average settlement size (total of all settlement area divided by settlement count) also is not biased by the size of the surveyed area. However, I made site size estimates for the

Tula and Tehuacán Valley survey areas based on scanty data, rendering those data incomparable to those of the other regions. The Basin of Mexico and the Mixteca Alta regions had similar trajectories, with much higher average settlement size than other regions, although the Mixteca Alta had a somewhat higher average settlement size in the ~Terminal Formative than the Basin. The Mixteca Baja seems to have average settlement sizes that range between those of the Basin/Mixteca Alta and the Oaxaca Valley, Tehuacán-Cañada, and Morelos Valleys regions. Therefore, while the Oaxaca Valley had the highest settlement densities in five periods, it had much lower average settlement sizes.

Simple population variables and rank-size distributions

These population variables complement the settlement variables discussed above. The population variables demonstrate that, at the broadest scale, population increased over time, except during the ~Epiclassic, as did population densities. Rank-size graphs show increasing centralization and development of the settlement hierarchy across the periods analyzed here. Nevertheless, there was some regional variation in these patterns. For the ~Early and ~Middle Formative, all regions show pooling (multiple polities), with the highest population densities in the Mixteca Alta region, which may have offered less risk due to slightly greater rainfall. Overall there was a slight population dip in the ~Terminal Formative, probably due to disruptions in the Oaxaca Valley region. ~Early Classic populations were much higher and there was a major drop in the ~Epiclassic, which was a disruptive period across the entire study area. ~Late Postclassic populations were the highest ever, consistent with archival data.

Comparing ***total populations*** for each region for each period, the big three regions eclipse the total populations of the other regions, simply because I have data on so many more sites in those three regions. The Basin and Mixteca Alta have similar trajectories, and contrast to that of the Oaxaca Valley; this is similar to the average settlement size variable. Both the Basin and Mixteca Alta regions show huge rises in population in the ~Early Classic, a drop to almost ~Terminal Formative levels in the ~Epiclassic, and dramatic rises to ~Late Postclassic population levels. Although the Oaxaca Valley region shows drops and increases in the same periods, its population is nevertheless more stable. I have referred to this up-down-up trajectory as the L-Q-V pattern. Realize, however, that had I had sufficient ~Late Classic data to add in a fourth period, the pattern for the ~Early Classic to ~Late Postclassic periods might show a different form.

Population densities also show the L-Q-V pattern, most dramatically in the Basin and least noticeably in the Oaxaca Valley, with the Mixteca Alta in the middle. The extremely high Basin population density for the ~Early Classic is a reflection of the extremely high population in Teotihuacán. The drop in population in the ~Epiclassic signals a lack of continuity and a dramatic reorganization of the population, although Teotihuacán remained the largest settlement in the surveyed areas. The high population density of the ~Late Postclassic Basin indicates another discontinuity, and reflect the large Aztec settlements of the eastern and southern Basin.

Briefly, in all ~Formative periods, of the big three regions, the Basin of Mexico and Mixteca Alta show more similar ***rank-size*** patterns than to the Oaxaca Valley region. These two are both convex or somewhat convex (less so for the ~Middle Formative), suggesting the regions encompassed several polities. In the ~Middle Formative, the Oaxaca Valley had the primate settlement of San José Mogote; in the ~Late and ~Terminal Formative, it was Monte Albán. The rank-size graphs reflect the primate centers characteristic of the ~Early Classic in the Basin of Mexico (Teotihuacán) and Mixteca Alta (Yanhuitlán), both showing clear core-periphery patterns, while the Oaxaca Valley was dominated by two similar sized centers (Jalieza and Tlacochahuaya). In both the ~Epiclassic and ~Late Postclassic there was considerable pooling. In sum, the rank-size graphs show different patterns in the big three regions in all periods, with a primate center in at least one of the big three in each period I analyze, indicating varying hierarchical patterns. In those regions in those periods without primate centers, varying degrees of convexity suggest multi-polity pooling.

Most populous settlements, all regions, analyzed by period

In this subsection, I discuss the most populous settlements from the 20-project area database, using the population estimates I made. I augment this with a few comments about similarly large (in area) settlements with lower populations and about sites outside the project areas. For the most part, however, this discussion focuses on the big three and Puebla-Tlaxcala regions. Across the study area, the sizes of the most populous sites increased, with the exception of the ~Epiclassic. In general, they show the development of a settlement hierarchy with secondary and tertiary sites. In the next sections, I discuss regional variation through the seven periods I analyze here.

The most populous (and largest) ***~Early Formative (period B)*** sites were in the Mixteca Alta region, which had 70 percent of the ~Early Formative population of those sites in the database. Another locus was in the southern Basin of Mexico, although many of those sites are outside the database areas. Each of these locales may have had about four settlement clusters. A third locus of population was near Chalcatzingo (the site itself had 105 people across 6.0 ha) in the eastern Morelos Valleys region, which probably comprised another polity. I suspect one or more ~Early Formative polities were also distributed across the northern Puebla-Tlaxcala region, perhaps near the swampy areas by the modern city of Cholula.

In the ***~Middle Formative (period E/F),*** the most populous settlements spread into somewhat less optimal environments, although the largest settlements and the largest clusters of settlements remained in the southern Basin of Mexico and Mixteca Alta regions. That many settlements were in new locations indicates both the growing population and a discontinuity with the previous period. The Puebla-Tlaxcala region probably showed the same pattern. The Oaxaca Valley region also had settlement clusters in each arm of the valley, which were postulated to have been separate polities (Blanton et al. 1999:42–44), but they are smaller in scale than contemporaneous settlements and clusters elsewhere in the study area.

The ***~Late Formative (period G/H)*** showed a deepening hierarchy, including primate settlements far larger than any other settlements in the quantitative database. It had considerable population growth and many settlements in many new locations (especially in the Mixteca Alta), plus the emergence of large regional primate centers in the Oaxaca Valley and Basin of Mexico regions. The Oaxaca Valley included the 442 ha Monte Albán, which was nine times the size of the next most populous settlement in the Oaxaca Valley region, San José Mogote. In the Basin of Mexico, Cuicuilco probably also was a primate center, although not as populous as Monte Albán. The pattern in the northern Puebla-Tlaxcala region seems to resemble that of the Basin, with settlements scattered throughout the region, and approximately the same settlement density, although no primate centers are known.

The big three regions each show different trajectories in the ***~Terminal Formative (period I)***, although both the Basin of Mexico and Oaxaca Valley had primate communities and relatively deep hierarchies. Total populations increased in the Basin of Mexico, but decreased in the Mixteca Alta and Oaxaca Valley. The Mixteca Alta retained the settlement clusters that had characterized it earlier in the Formative, but the other two most populous regions (and probably the Puebla-Tlaxcala region) had primate community patterns, and thus deeper regional hierarchies.

All regions showed dramatic population growth in the ***~Early Classic (period L)***. Cuicuilco had been covered by lava and the very populous Teotihuacán dominated the entire Basin of Mexico region, and beyond, although its settlement hierarchy had few tiers, and so was shallow. Teotihuacán apparently controlled the northern Puebla-Tlaxcala region, with the central part of the Puebla-Tlaxcala region having smaller polities. Cholula had substantial civic-ceremonial architecture in the Early Classic, and it was probably a major population center, although the data are not conclusive. The Oaxaca Valley had three demographic centers suggesting separate polities; it also had hilltop terraced sites, heightened subregional variation, and showed more diversity in peripheral places or less heightened core-periphery differentiation (Kowalewski et al. 1989:245). The Mixteca Alta continued to have at least four polities, based upon settlement clusters, again in new locations, suggesting continued discontinuity, shallow subregional hierarchies, and less integration.

The ***~Epiclassic (period Q)*** shows considerable discontinuities. For example, populations dropped, the largest settlements were much smaller than in the ~Early Classic, but the average settlement size was larger. Each of the big three regions had one of the three largest settlements in the database (Teotihuacán, Yanhuitlán, and Monte Albán). Overall, the pattern was one of dispersed centers, increased defensive architecture, and shallower subregional hierarchies. Teotihuacán remained the largest settlement, although its central civic-ceremonial architecture had been burned so that it was no longer the religious or cosmological center it once had been. Outside the Basin, major ~Epiclassic settlements included Tula (defensible location), Xochicalco (well-fortified), Cholula, and Cantona (defensible location, near a good obsidian source, on good route between northern study area and Gulf Coast). Population and settlement data indicate this period was like none that came before.

Settlement and population data show the ***~Late Postclassic (period V)*** had major discontinuities from the ~Epiclassic. Populations were far higher than ever before, and larger communities were more completely spread across the landscape, including the more marginal areas of the transition environmental region, indicating more developed peripheries. The Basin of Mexico was dominated by Tenochtitlán, the Aztec capital and a primate city, and had other smaller Aztec cities (many not in the database) and a deeper hierarchical pattern. Other populous settlements included Tula, Cholula, and Yanhuitlán. Thus, the Oaxaca Valley had no large population center, as did the Basin of Mexico, Puebla-Tlaxcala, and Mixteca Alta regions, suggesting it was differently organized sociopolitically, with a shallower hierarchy and less integration.

None of the big three regions show the same trajectory through the seven periods I examine here. The Mixteca Alta region had the highest population in the ~Early Formative, in four clusters. The largest settlements in the Mixteca Alta region remained in clusters until the ~Late Postclassic, when Yanhuitlán was much larger than any nearby settlement. The Oaxaca Valley had the lowest average settlement size, but the first large primate settlement when Monte Albán grew to 442 ha in the ~Late Formative. In the ~Terminal Formative, the Basin of Mexico's Cuicuilco was the largest settlement, but it was obliterated by a lava flow, and in the ~Early Classic, Teotihuacán was by far the largest settlement. Whereas secondary settlements in Teotihuacán's domain were only one-tenth its size or smaller, the second tier of settlements in Monte Albán's polity were larger and functioned as administrative centers to a greater extent than did Teotihuacán's. Therefore, the two regions showed different patterns of hierarchy and integration. Both the Basin of Mexico and Mixteca Alta had large primate settlements in the ~Late Postclassic, but the Oaxaca Valley had multiple similar-sized centers.

Large-settlement dynamics

Large-settlement dynamics are important because the largest settlements are at the top of the population hierarchy, sustain the most central place functions, and often had a significant proportion of a region's inhabitants. Large-settlement dynamics show increasing urbanization and centralization through time in the study area. There was also increasing complexity in the settlement hierarchy, and an increase in the density of large settlements. The exception, again, was during the ~Epiclassic.

Change and continuity in large settlements can be a barometer of widespread change across the settlements of the entire population hierarchy. Large, urbanized settlements, with 1000 residents or more, first appeared in the study area in the ~Middle Formative in the Basin of Mexico and Mixteca Alta, spreading to the Morelos Valleys and Oaxaca Valley in the ~Late Formative. The ~Late Formative shows some centralization and hierarchical development, with more in the Mixteca Alta and Oaxaca Valley than in the Basin of

Mexico and Morelos Valleys (an apparent south-north dichotomy). The Oaxaca Valley showed greater centralization in the ~Terminal Formative compared to the other regions (large settlements had emerged in the Tehuacán-Cañada and Mixteca Baja regions, too). The ~Early Classic Basin shows a similar hierarchy to that of the Oaxaca Valley in the ~Terminal Formative, but with the primate community (Teotihuacán) much larger, while the Mixteca Alta and Oaxaca Valley had deeper hierarchies. The ~Epiclassic shows multi-polity pooling with relatively deep hierarchies, as does the ~Late Postclassic. Rates of urbanization are low for the Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions (except for the Tehuacán-Cañada in the ~Late Postclassic), which suggests these regions are peripheries.

Population histograms show the number of settlements in various size ranges and illuminate aspects of centralization and complexity (similar to rank-size graphs). Hierarchies deepened and became more centralized in different periods and regions. In the ~Middle and ~Late Formative, the Mixteca Alta shows multiple polities and a more developed hierarchy, although it is far smaller in scale than later hierarchies. From the ~Middle through ~Terminal Formative, the Oaxaca Valley shows greater centralization, and more depth of hierarchy than the other regions, although the database does not include Cuicuilco, which may have made the Basin more similar to the Oaxaca Valley region in the ~Late and ~Terminal Formative. In the ~Early Classic, the Basin hierarchy was dominated by Teotihuacán, and had a high degree of centralization and a shallow hierarchy, while the Oaxaca Valley had a deeper, more tiered hierarchy. In the disruption of the ~Epiclassic, the Basin of Mexico shifted back to a more tiered hierarchy, although its largest settlements were far smaller than Teotihuacán in the ~Early Classic, and less centralization, to more resemble ~Early Classic and ~Epiclassic patterns in the Mixteca Alta and Oaxaca Valley. In the ~Late Postclassic, the scale increased dramatically, with many more large settlements, but the pattern of a deeper hierarchy continued. It was deepest and had the greatest scale in the ~Late Postclassic Basin of Mexico.

The degree of ***urbanization*** is the percentage of the population living in urban settlements. For all periods from the ~Middle Formative on, the Basin of Mexico is the most urbanized of the big three regions, if we consider the threshold for urbanization at a settlement population of 1000 or more. The Oaxaca Valley showed the lowest rate of urbanization for all periods from the ~Late Formative on except the ~Early Classic, when it had just 1 percent more of its population in urbanized settlements than did the Mixteca Alta. In the enigmatic ~Epiclassic, more people in the Mixteca Alta lived in settlements with more than 10,000 people than in the other two regions of the big three.

As another index of urbanization, I looked at how many urbanized settlements occurred per 100 km^2, or the ***urbanization density*** for the big three regions. The Oaxaca Valley region only had the highest urbanization density in the ~Epiclassic, but the three were closely clustered. The Basin of Mexico had the highest urbanization density in all but the ~Early Classic and ~Epiclassic, and had by far the highest density in the ~Late Postclassic. The Mixteca Alta's high rate of urbanization density in the ~Early Classic is consistent with measures discussed above. Again, this analysis shows the varied trends among the big three regions, although within similar broad trends.

Small-settlement dynamics

I define small settlements as those with fewer than 1000 inhabitants. Small-settlement dynamics reflect the relative lack of central place functions in those settlements. High numbers of small settlements mean the population was dispersed across the landscape. As with the other settlement and population variables discussed above, the small-settlement dynamics show increasing number of small settlements over time, and thus the increasing density of small settlements—and, again, this was true except in the ~Epiclassic. In addition, the overall trend is for a decreasing percentage of the population to live in the smallest settlements, less than 50 or less than 100 people.

The Oaxaca Valley region consistently had more small settlements than other regions, and more extensive development of the lower end of the settlement hierarchy. This may relate to different labor allocation or patterns of land control that prioritized dispersal of agriculturalists close to their fields, or to a higher degree of development in the peripheries. I do not think this variation is a result of differential preservation, post-depositional land use, different fieldwork strategies, or different definitions of what constitutes a site, but instead is a reflection of variation in political economy.

Small settlement histograms show that the Oaxaca Valley region had many small settlements, while the Basin of Mexico had relatively few until the ~Late Postclassic. The Mixteca Alta shows a different pattern; it had very few small settlements in the ~Late and ~Terminal Formative, and the ~Epiclassic and ~Late Postclassic. It had far more small settlements in the ~Early and ~Middle Formative, when its total population exceeded that of the other regions, too, suggesting a more extensive hierarchy than in later periods.

Graphs of the ***percent population in small settlements*** also showed that while the Oaxaca Valley had the most small settlements, the proportion of the population in settlements with fewer than 150 individuals was below 30 percent—except for in the ~Early and ~Middle Formative, when the average settlement size and the size of the largest settlements was very low relative to that of later periods. In the ~Late and ~Terminal Formative both the Basin and the Mixteca Alta had few small settlements, especially those with less than 200 individuals, indicating the population was more centralized in mid-level settlements, rather than those at the very bottom of the settlement hierarchy. In the ~Early Classic in the Basin, only 13 percent of the population in the database lived in small settlements, whereas in Morelos it was 82 percent, 40 percent in the Mixteca Alta, and 39 percent in the Oaxaca Valley region. The Basin consistently had fewer small settlements than the other regions.

Continuity of occupation

The continuity of use of settlements is an indicator of continuity and stability or disruption and instability in residence patterns. If many new locations are settled, it indicates the establishment of new patterns. By continuity, I mean whether a settlement was occupied in one or two previous periods and whether it continued to be occupied over the two succeeding periods (but not including after the ~Late Postclassic). Across the study area, in the ~Middle Formative there was little settlement continuity from the preceding periods, indicating this was a period of new settlement. The ~Late Formative and ~Early Classic both show low levels of continuity from the preceding periods and into the succeeding periods, indicating new settlement once again. There were moderately high levels of continuity for the succeeding periods for ~Epiclassic sites, indicating some stability; however, the ~Late Postclassic had only relatively low levels of continuity in the preceding periods, indicating considerable new settlement. In general, large sites show greater levels of continuity than all sites, with a greater tendency to discontinuity in the ~Late Formative through ~Early Classic, and high levels of continuity occupation of ~Epiclassic sites into the succeeding period(s).

Analysis of continuity shows relative instability in the Mixteca Alta for all early periods, although population increased at rates similar to those of other regions. The ~Late Formative had considerable instability across the study area, which continued into the ~Terminal Formative only in the Basin of Mexico, while the Oaxaca Valley showed more settlement continuity and stability concurrent with the growth of the Monte Albán system. While the Basin of Mexico shows moderate rates of continuity in the ~Early Classic, both the Mixteca Alta and Oaxaca Valley showed less continuity and more instability. In the ~Epiclassic there was more continuity of large settlements than all settlements, suggesting the top of the settlement hierarchy was more stable, and lower tier settlements and the peripheries were more unstable. None of the big three regions show concordant patterns of continuity and discontinuity of site occupations for the seven periods I analyzed, suggesting that the overall similar patterns of population increase and decline mask regional variation.

Analysis of the ***continuity of all settlements*** shows that while many ~Early Formative settlements continued to be occupied into the ~Middle Formative, the Mixteca Alta had many new settlements (low continuities) in both the ~Middle and ~Late Formative. In the ~Late Formative, the Basin and Oaxaca Valley also show considerable discontinuity, which continues in the Basin in the ~Terminal Formative, indicating more disruptions there than in the Oaxaca Valley, which was coalescing under Monte Albán. However, in the ~Early Classic, the Oaxaca Valley had low levels of continuity, suggesting many new settlements, as the peripheries became more settled. Both the Basin and the Mixteca Alta showed more continuities into the ~Epiclassic, suggesting less disruptions than in the Oaxaca Valley. All three regions had very low settlement continuity coming into the ~Late Postclassic, because they had vast numbers of new settlements (the Oaxaca Valley region had the lowest ratios). In the other regions, the Morelos Valleys had similar low-to-moderate levels of settlement continuity through all periods, except that ~Early Formative settlements continued to be occupied in succeeding periods; otherwise, the ratio of settlement continuing into the next period was marginally higher than from the previous period. In the Tehuacán-Cañada region, each succeeding period had enough new settlements that the continuity from the preceding period was lower than into the succeeding period; no other region has this pattern.

Large settlement continuity, as does all-sites continuity, shows the most discontinuities through the ~Early Classic in the Mixteca Alta, as the clusters of settlements shifted within that region, although the Oaxaca Valley region also has low large settlement continuities in the ~Early Classic. The Basin region showed some discontinuities in the ~Terminal Formative, but none in the ~Early Classic, although it had few urbanized settlements, with its truncated hierarchy dominated by Teotihuacán. In the ~Late Postclassic, most large settlements had been occupied in the previous period, but few had in the period before that; this is higher than the all-sites continuity, and suggests that settlements established immediately prior to the ~Late Postclassic remained occupied.

Civic-ceremonial architecture: mound variables

Mounds hosted important ritual and administrative activities, and a hierarchy of mound-rich sites indicates a pattern of centralization of civic-ceremonial activities. Monumental architecture requires labor organization for building and maintenance. The sorts of activities that might have been conducted at mounds would have united community members, resolved disputes, encouraged trade, and distributed information. By looking at the patterns of mound use, I can draw insights into relative importance, centralization, etc., of these activities.

In general, the number of settlements with mounds and the mound density per person gradually increased through the ~Terminal Formative, then steadily declined. Mound count, however, increased over time, except for the ~Epiclassic, as did mound count densities. On the other hand, the numbers of mounds on sites with mounds was relatively constant at between one and two mounds per site, except for during the ~Epiclassic when it jumped to about three mounds per site with mounds.

Average mound density remained steady across the study area, but not in each region. There was a significant peak in civic-ceremonial architecture construction in ~Early Classic Teotihuacán, however, and in the ~Late Postclassic Tehuacán-Cañada region. Mound densities per person show peaks in the ~Early and ~Middle Formative in the Oaxaca Valley, in the ~Late and ~Terminal Formative in the Morelos Valleys, and for all periods in the Tehuacán-Cañada. There may be a bias toward mound construction in the southeastern study area, and civic-ceremonial architecture hierarchies based on mound counts are not isomorphic with settlement hierarchies.

The ***percentage of settlements with mounds*** suggests to what degree ritual and administrative activities were dispersed among settlements. The Basin of Mexico consistently had low percentages, while the Oaxaca Valley ratios were far above average for all periods except the ~Late Postclassic, when they were slightly below the all-region average. The Mixteca Baja was about average for the ~Early and Middle Formative, and higher than average for all succeeding periods. The Tehuacán-Cañada region seems to have higher than average numbers of settlements with mounds for all periods except the ~Early Formative and ~Epiclassic. These ratios suggest that ritual and administrative activities were more centralized in the Basin of Mexico (and the region was more integrated) and more dispersed in the Mixteca Alta, except for in the earliest Formative periods and the ~Late Postclassic, when Yanhuitlán dominated the region.

An analysis of ***mound density*** shows that across the study area mound count densities increased from each period to the next, except for a drop in the ~Epiclassic. The Basin of Mexico and Mixteca Alta regions generally follow the average pattern. In the Oaxaca Valley, however, densities were about average for the ~Early and ~Middle Formative and ~Late Postclassic, but far above average for the intervening periods. This suggests that mound-based activities were more important in the Oaxaca Valley region during the ~Late Formative through ~Epiclassic periods than in the other big three regions. The drop in the Oaxaca Valley ~Epiclassic was much greater compared to the other two regions, suggesting greater disruption and more instability. The Tehuacán-Cañada region shows low mound densities in the ~Early through ~Late Formative, a plateau of moderate densities in the ~Terminal Formative through ~Epiclassic, then a big jump in mound densities in the ~Late Postclassic—a pattern unlike any other region.

To evaluate the degree of clustering of mound use, I analyzed ***mound counts for those settlements with mounds***. On a period-by-period basis, these counts averaged between one and two mounds, except for the ~Epiclassic when the average was about three; thus, even though there were significant disruptions in the ~Epiclassic, mound construction had elevated importance, perhaps as new or growing settlements sought to establish and promote their legitimacy. Otherwise, except for the huge civic-ceremonial architecture construction program at Teotihuacán in the ~Early Classic, and in the ~Epiclassic and ~Late Postclassic in the Tehuacán-Cañada, mound clustering on settlements with mounds tended to be about the same in all regions in all periods.

Mound density per person shows a relatively consistent average for all regions, although the Mixteca Alta and Basin of Mexico were consistently below average. The Oaxaca Valley density was very high for the ~Early Formative, generally decreased through all succeeding Formative periods, and were average for the ~Epiclassic and ~Late Postclassic. The Oaxaca Valley's early nexus of mound construction may relate to its relative nearness to, and interactions with, the Isthmus and other early settlements to the east, leading to competitive displays including mounds. The Morelos Valleys, Tehuacán-Cañada, and Mixteca Baja regions had higher mound densities per person in all those regions, especially in the Tehuacán-Cañada, which may relate to their being peripheries in the highland system.

Settlements with the most mounds, all regions, all periods

Generally, the earliest settlements with mounds in the quantitative database were in the southern study area, which tended to have more mounds and more mound-rich sites, with the exception of Teotihuacán in the ~Early Classic. The southern regions also had a deeper settlement hierarchy. Had the database encompassed some regions surrounding the Basin of Mexico, the southern dominance may have declined in the ~Epiclassic and ~Late Postclassic. Primate centers also tended to have more mounds than other central places. With the exception of the primate centers, the most-mounds sites in each successive period tended to be in new locations (and therefore have low rates of continuity), signaling shifts in the mound site hierarchy. In general, ~Epiclassic mound settlements continued to be occupied in the succeeding periods, although there were many new mound settlements in the ~Late Postclassic.

This analysis mostly supports trends discussed in the previous subsection, but not entirely. There is considerable regional and subregional variation, suggesting mound construction sometimes may have been coordinated with the establishment of new settlements, but not always. The southern study area, especially the Oaxaca Valley region, had a deeper civic-ceremonial hierarchy than the other regions. In the ~Early Classic Basin of

Mexico, the civic-ceremonial hierarchy was shallow, but very centralized, with very few lesser centers below Teotihuacán. In the ~Terminal Formative, explosive growth in high mound count sites in the Tehuacán-Cañada region is linked to Monte Albán's conquest of the region. ~Early Classic high mound count sites were almost all in new locations, as were those of the ~Epiclassic, which suggest significant discontinuities that occurred in CCA patterns along with the concurrent population and settlement discontinuities discussed in the previous section.

Although the ***~Early Formative (period B)*** mound data are scanty (32 mounds on 11 sites), they indicate mounds tended to be built early in the south, with all but four mounds in the Mixteca Alta and Oaxaca Valley regions. Those four were in the Tula (dating problematic) and Morelos Valleys (dating secure) regions. The Mixteca Alta and Oaxaca Valley regions each had a site with the most mounds when ranked across the study area (6 and 8 mounds respectively), suggesting mounds were important features of early village centers. The largest and most populous ~Early Formative settlements do not have securely dated ~Early Formative mounds. I cannot discern whether they lacked mounds or whether the mound dating is faulty. Marcus and Flannery (1996:91) argue that charismatic leaders (self-selected Big Men) attracted the followers and organized the labor to construct Early Formative mounds. If the many larger villages of the ~Early Formative Mixteca Alta region truly lacked mounds, this suggests differences in the ritual and administrative hierarchies in the Mixteca Alta and Oaxaca Valley regions. In the Mixteca Alta, they were important population centers, but lacked (mound-based) evidence of comparable prominence in ritual and administrative activities noted for the Oaxaca Valley.

By the ***~Middle Formative (period E/F)***, more mounds were in use, indicating the increased prominence of the ritual and administrative activities conducted at them. The five ~Middle Formative Rank I mound sites had 8 to 13 mounds; one was in the southeastern Basin of Mexico, one in the Mixteca Alta, and two were in the Oaxaca Valley, or spread across the study area. The Oaxaca Valley Rank I settlements were approximately a day's travel apart. The separation of high-ranking mound settlements suggests they pertained to different polities. The Oaxaca Valley region had more mounds relative to its population, however, than the Mixteca Alta region. The Basin of Mexico had few mounds, and only on four sites. For the first time, the Tehuacán-Cañada had mounds, on three sites. As in the ~Early Formative, mound construction seems to have been more prominent in the south.

~Late Formative (period G/H) sites with the most mounds had three times as many mounds as ~Middle Formative sites with the most mounds, indicating a major increase in the importance of civic-ceremonial architecture, and a deeper ritual and administrative hierarchy. This was especially true in the Oaxaca Valley region, which had an over seven-fold increase in the number of mound sites, and an over twelve-fold increase in the number of mounds. One Rank I center was in the Mixteca Alta, which had not quite twice as many mounds as in the previous period, yet they were on almost the same number of sites (greater density; greater scale of the hierarchy). In comparison, the Basin of Mexico and Puebla-Tlaxcala regions had only one site each with 10 or more mounds. Thus, mound construction spread northward, yet it exploded in the Oaxaca Valley region along with the dramatic growth of Monte Albán.

In the ***~Terminal Formative (period I)***, the most mound-rich settlements continued to be in the northern Oaxaca Valley and central Tehuacán-Cañada region, apparently as a result of Monte Albán's conquest of that area, which included Quiotepec, located at the west end of a narrow drainage that flows east and down to the Gulf Coastal plain. This drainage is the first river north of Monte Albán to cross the rugged terrain along the eastern side of the study area (what I designate bounding terrain in Chapter 3), and Quiotepec probably controlled access to the Gulf Coast from this area of the highlands. The Tehuacán Valley farther north also was a conduit to the northern basins, and perhaps the many high-mound-count settlements here relate to Monte Albán's intensive attempts to control the northern boundary of its territory. The decline in the number of high-ranked mound sites in the Mixteca Alta region continued in the ~Terminal Formative, perhaps also as a result of disruptions due to activities in the Monte Albán polity. Mound sites in the Basin of Mexico did not have monumental architecture at the scale of the southern regions, although Cuicuilco had some very large mounds and platforms dating to this period. The earliest stages of Cholula's Great Pyramid date to the Terminal Formative (McCafferty 1996a, 1996b), but otherwise I have little mound data from the Puebla-Tlaxcala region.

In the ***~Early Classic (period L)***, mound construction concentrated at Teotihuacán (281 mounds); in the rest of the Basin region, only one more settlement had enough mounds to be in the top four ranks of mound settlements (that site had a mere 14 mounds). Classic-period mound sites are known from the ~Early Classic in the northern Puebla-Tlaxcala region, and dramatic enlargement of Cholula's massive Great Pyramid probably occurred in the Late Classic (McCafferty 1996a, 1996b). The Morelos Valleys region had a few high-ranked mound sites; perhaps they were far enough from Teotihuacán to be ritual and administrative centers with their own mounds. Approximately the same numbers of mounds and mound sites were in the Tehuacán-Cañada region in the ~Early Classic as in the previous period; however, with the exception of one site, the Rank I through IV mound settlements were all in new locations, indicating major disruptions to the mound settlement hierarchy, including abandonment of fortified sites. Whereas in the ~Terminal Formative many of the Oaxaca Valley region's sites with the most mounds had been clustered in the northern arm, by the ~Early Classic more were in the central and southern valley, suggesting a shift away from the north (including the Tehuacán-Cañada region), although Monte Albán continued to have many mounds.

Amidst the disruption of the ***~Epiclassic (period Q)***, the Oaxaca Valley sites with the most mounds continued to shift away from Monte Albán and the central valley, although some mound-rich sites are known from just north of the Valley. The Mixteca Alta's sites with the most mounds clustered in the eastern surveyed area. There were other mound-rich settlements across the Tehuacán-Cañada. This may have been part of the same general trend outside the Oaxaca Valley to the north, and emulation may have been a factor. The Basin of Mexico had two high mound count sites in the eastern central valley; although Teotihuacán continued to be the most populous site in the region, no mounds are attributed to Teotihuacán during the ~Epiclassic. Mound-rich ~Epiclassic settlements ringed the Basin, however, and included Tula, Cantona, and Xochicalco. Cholula and nearby Puebla-Tlaxcala sites also may have had many ~Epiclassic-period mounds.

~Late Postclassic (period V) populations were higher than in any previous period, and mound and mound site counts also were higher. This was especially true in the Tehuacán-Cañada region, which had over three times the mound count as it had had previously. High-ranked mound sites in the Oaxaca Valley were in the eastern arm, far from the Tehuacán-Cañada region. The Mixteca Alta region had several high-ranked mound settlements, and at least one or two settlements in the Mixteca Alta region just west of the Oaxaca Valley in the Peñoles survey area probably have similar numbers of mounds. These ~Late Postclassic Mixteca Alta multi-mound settlements correspond to the principal ritual and administrative centers of polities (*señoríos* or *cacicazgos*) known from archival sources. In the Basin of Mexico, the Aztec capital of Tenochtitlán had a large civic-ceremonial architecture district in its center, where modern (and colonial) Mexico City's Plaza Mayor is. In the surveyed areas, three high-ranking mound centers are known from the eastern Basin (most assuredly the civic-ceremonial architecture of others has been obliterated by post-conquest construction, and so can no longer be counted in this kind of study).

Continuity of occupation of mound settlements

Continuity of mound settlements is an indicator of the lack of disruption or relative stability in the region. In general, the patterns noted above for all settlements were duplicated in the continuity of settlement of those sites with mounds, yet each of the big three regions showed a different pattern in continuities of occupation of mound settlements. The southern part of the study area had a deeper mound settlement hierarchy and the most mounds in all periods.

The Oaxaca Valley region showed the deepest mound hierarchy in each period, with the most mounds built there in all periods after initial bursts in the Mixteca Alta in the ~Early and ~Middle Formative. The Mixteca Alta had considerable discontinuity of mound-site occupation through the ~Terminal Formative. The Oaxaca Valley showed high mound settlement continuity, although with many new mound settlements in each successive period. This pattern began to diminish in the ~Terminal Formative, and by the ~Early Classic continuity was relatively low, reflecting marked shifts in the hierarchy generated by the Monte Albán state. The Basin of Mexico region shows a lack of continuity in the ~Terminal Formative (both preceding and succeeding periods), when Cuicuilco and Teotihuacán were jockeying for control of the region. Despite considerable destruction of Teotihuacán's civic-ceremonial architecture in the Late Classic, a high proportion of Basin mound sites continued to be occupied in the succeeding periods. New mound settlements in the Basin of Mexico in the ~Epiclassic lower the rate of continuity from preceding periods.

Comparison: average mound settlement size vs. non-mound settlement size

To examine overlaps between the mound settlement hierarchy and the hierarchy of most populous settlements, I compared the average size of mound sites to the average size of settlements lacking mounds. This variable provides an index of whether ritual and administrative activities were concentrated in the same communities as the central place functions inherent in large communities. The comparison shows a gradual increase over time in this ratio. Across the study area, the ratio is about the same in all regions in the ~Late Formative, with mound sites averaging five times the size of non-mound sites.

This comparison generated two single-period anomalies: the huge size of Teotihuacán and the absence of somewhat smaller settlements indicated an extremely centralized distribution. The Morelos Valleys region was very high in the ~Middle Formative (Cantera phase), confirming the unusual nature of the polity centered at Chalcatzingo, which may have been at the southwestern edge of a region of larger mound sites that extended into Puebla-Tlaxcala (Hirth 1987a:360). Across all periods, the Oaxaca Valley region had consistently high correlations from the ~Late Formative on, except for in the ~Late Postclassic. This indicates a centralization of ritual and administrative functions in the largest settlements. In contrast, from the ~Terminal Formative on, the Basin of Mexico (except for the ~Early Classic) and the Mixteca Alta had far lower ratios, indicating that the ritual and administrative activities were conducted at relatively smaller sites, suggesting lower centralization.

Civic-ceremonial architecture: ball court variables

Ball courts are distinctive architectural features that are often part of complexes of civic-ceremonial architecture, yet are relatively rare. Ball courts are found from northern Mexico to Guatemala, and from the Gulf to the Pacific Coast. As of 2000, 179 ball courts were known from 156 settlements across central Mexico and Oaxaca (Taladoire 2001:98). The database includes many but not all of them. Based on myths, murals, and other images, ball court activities are sometimes interpreted as important to interregional conflict resolution, although apparently large and small wagers were also made on the outcomes of games; thus, it is appropriate to characterize ball courts as civic-ceremonial architecture that was the setting for ritual and administrative activities. Ball courts are rather diverse in form, size, and archaeological context, but in this analysis I only deal with their counts (presence-absence). While Early Formative ball courts are known, none are in the database; only one ball court (possibly) dates to the ~Middle Formative. Ball courts are not consistently located on the most populous sites or those with the most mounds.

In general, ball court construction was more of a southern phenomenon, and few ball courts were built in the Basin of Mexico. Ball court counts increased through the ~Early

Classic, then declined, as did the density of ball courts. If we do not include the size of the largest single community with ball courts for each period, then the average size of sites with ball courts increases over time. The number of ball courts per person was relatively constant, however, with a small peak in the ~Terminal Formative.

Across all periods, ball courts and ball court sites were more common in the southern study area; the database shows they were first widespread in the ~Late Formative (in the Oaxaca Valley region), although ball courts are known from earlier sites east of the study area. Ball court construction in the ~Late and ~Terminal Formative seem linked to territorial acquisition by the Monte Albán polity, when ball courts spread across the Tehuacán-Cañada. In the ~Early Classic the spread continued far beyond the Monte Albán polity, into all regions south and east of the Basin of Mexico. In the disruptive ~Epiclassic, ball court use dropped, although it continued to be most prominent in the Oaxaca Valley region. In the ~Late Postclassic, more ball courts were in use than in any previous period, and even the Basin of Mexico had ball courts, although ball court counts remained highest in the Tehuacán-Cañada and Oaxaca Valley regions. This analysis suggests that our macroregional-scale understanding of ball court use would be improved by using data from a larger area to the north, east, and south of this study area. Ball courts are rare enough and their distribution patterns suggest that the data from the study area are not extensive enough to be understood at this scale. Ballgames were played with rubber balls, which had to be acquired from the Gulf Coast lowlands or Yucatan peninsula, meaning sufficient trade had to be maintained to acquire goods from that region. Indeed, the Aztecs obtained as tribute 16,000 rubber balls twice a year from a single Gulf Coast province (Filloy Nadal 2001:28).

The regional ***ball court densities*** show that, like mounds, ball courts were more of a southern phenomenon, as the Oaxaca Valley and Tehuacán-Cañada regions had the most ball courts. Data from the Middle Formative and Mixteca Baja regions suggest ball court densities might have been higher in those regions also. While the Mixteca Alta region had ball courts from the ~Terminal Formative on, densities were far below those of neighboring regions to the east. The database has only one ball court from the Basin of Mexico region dating to the ~Late Postclassic, although the Aztecs did play the game and a ball court was part of the central civic-ceremonial architecture at Tenochtitlán. Because most settlements with ball courts had only one dating to a particular period (Monte Albán is a prominent exception), graphs of the number of settlements with ball courts are very similar to those of ball court densities.

I begin the period-by-period summary of ball court distributions with the ***~Late Formative (period G/H)*** when Monte Albán had four ball courts and nine other settlements with ball courts were scattered about the Oaxaca Valley region in all but the southern arm of the valley. The earliest ball courts are known from the Isthmus of Tehuantepec and other places farther east, and they seem to have first been adopted in the study area in the Valley of Oaxaca, which was the first major inland valley west of the Isthmus. The sheer numbers of ball courts suggest the importance of ball court activities in the growing Monte Albán polity.

In the ***~Terminal Formative (period I)***, ball court use spread across the Tehuacán-Cañada region. Two were built in the Mixteca Alta, and at least one was built in the Puebla-Tlaxcala region. Ball court use had spread throughout the parts of the study area closest to the Gulf Coast. The concentration of ball courts in the Tehuacán-Cañada suggests they were part of the suite of architectural evidence of the Monte Albán conquest encroaching on that region.

Ball court use spread in the ***~Early Classic (period L)***, although the Tehuacán-Cañada and Oaxaca Valley regions continued to have the most ball courts. ~Early Classic ball courts are also known from the Morelos Valleys, Tlaxcala-Puebla, Mixteca Baja, and Mixteca Alta regions. While ball courts in the Morelos Valleys and Mixteca Baja were relatively clustered, they were relatively dispersed across the Mixteca Alta, which may have been more imitative of Monte Albán core patterns.

The ***~Epiclassic (period Q)*** was marked by political disruption and ball court use declined. In the Oaxaca Valley, more ball courts were used in the far southern valley than ever before, showing shifts in Monte Albán's dominance. Only two ball courts are dated to the ~Epiclassic in the Mixteca Alta. The number of ball court centers dropped by half in the Tehuacán-Cañada, but there may have been a concentration of ball court activities in the central Tehuacán Valley. While the Basin of Mexico continued to lack ball courts, prominent sites encircling the Basin had multiple ball courts, including Tula, Cantona, Cholula, and Xochicalco, providing another marker of the shift in the ~Epiclassic political economy of the northern study area.

In ***~Late Postclassic period V***, five multiple ball court settlements were relatively evenly scattered in the Tehuacán-Cañada, Mixteca Alta, and Oaxaca Valley regions. A very few ~Late Postclassic ball courts are known from the Basin of Mexico, Puebla-Tlaxcala, and Mixteca Baja regions, but the prominent ~Epiclassic ball court centers that had ringed the Basin mostly had been abandoned. This suggests a resurgence of ball court activities, and perhaps that they had taken on a different importance among the small Postclassic polities of the southern and central study area.

I also examined the distribution of ***settlements with multiple ball courts*** in use in the same period. Not surprisingly, those from the database were all in the Tehuacán-Cañada and Oaxaca Valley regions except one site in the Tula region and one in the Mixteca Baja. However, additional sites may meet this requirement from the Puebla-Tlaxcala region, as well as other ball court-rich ~Epiclassic sites that may have been established in the Late Classic.

Conclusions

In this section, I move farthest from the data to generalize considerably and propose an explanation for the empirical patterns I have noted in the data. The most important goal of this study is to examine the evolution of macroregional systems using quantitative and qualitative data from highland Mesoamerica as a case study. The study of evolution in macroregional systems can be reframed as: how does civilization grow? I use civilization as archaeologists have long used it, as William T. Sanders and Barbara J. Price used it in *Mesoamerica: The Evolution of a Civilization* (1968), as Kent V. Flannery (1972) used it in "The Cultural Evolution of Civilizations," and as Richard E.W. Adams used it in *Ancient Civilizations of the New World* (1997). In this sense, civilization refers to a combination of complex sociopolitical organization, high populations, and the particular forms they take in each example. Gordon R. Willey uses the term "complex civilization" (1991:206) to indicate the same concepts.

All reports from which I obtained the systematic data for this study, including the quantitative data that I entered in the database, are from the same research tradition, except perhaps Richard S. MacNeish et al.'s project in the Tehuacán Valley and the German-Mexican project in the Tlaxcala-Puebla Valley. All other projects have been conducted by Sanders, his students, and his students' students. This constitutes a unified body of work—over four decades of field research that has yet to be unified in a single synthesis. This study is not the ultimate synthesis, but it is a systematic attempt to analyze the most comparable data generated by many field projects.

The study area, not by coincidence, is also the heart of non-Maya Mesoamerica. Other areas in Mesoamerica are important, too, but none combine so many nuclear areas in a single geographic unit. It's the thesis of this study that these cores were to a degree (or to degrees) integrated, and that it's the interregional connections of the study area that drove it further and increased its scale and complexity more than the other cores and regions.

This reverses the emphasis Sanders and Price put forward in *Mesoamerica: The Evolution of a Civilization* (1968). Civilization, to Sanders and Price, "is a regularity, a successful adaptive response to certain kinds of pressures" (1968:239). In their case, by pressures, they really mean the population pressure they assume was generated by increasing numbers of people facing limited resources. They emphasize the highland-lowland synergism by stressing highland-lowland integration. To Sanders and Price, the Mesoamerican civilization, or the Mesoamerican "socioeconomic system" (1968:57), centered on the dichotomy between the highlands and the lowlands, their contrasting climates, agricultural systems, and even cities.

I postulate that explanation for the evolution of Mesoamerican civilization lies instead in the market integration of the Mesoamerican macroregion. The concordant change described in this study is the empirical phenomenon, and market integration is the suggested explanation. This is not a new explanation; the importance of the market system in the development of Mesoamerican civilization has been emphasized by Richard E. Blanton and colleagues (Blanton 1996; Blanton et al. 1999; Blanton et al. 1993; Feinman et al. 1984; Kowalewski 1994) and by Kenneth G. Hirth (1998).

In the remainder of this section, I describe at the broadest scale the patterns I have noted above. Then, I highlight the patterns of concordant change I described above and detailed in Chapters 7 and 8, focusing on empirical patterns of sameness or similarity among regions in the study area. In the next subsection, I focus on empirical patterns of differences and regional variations. Finally, I expand on the market explanation for these patterns.

The broadest patterns

The study area and the time scale I've employed make this the case study of a civilization. The study area encompasses approximately 80,000 km^2, and the time span is about 3000 years. At this scale, we can broadly generalize about what happened through time in the highlands. I have highlighted these generalities at the beginning of each subsection above.

In the most basic variables, settlement counts and population increased over time, although not in the ~Epiclassic, which was a period of considerable sociopolitical disruption. The rates of increase were not constant, however. The population increase slowed from the ~Late to ~Terminal Formative, but jumped to a new high in the ~Early Classic, with another huge jump to the ~Late Postclassic maximum. Population density increased through time, although it also dropped in the ~Epiclassic; its rates of increase reflected those of the population in general.

Average site area increased over time, but decreased in the ~Late Postclassic. The rate of increase was more gradual between the ~Middle Formative and ~Late Formative, and between the ~Epiclassic and ~Late Postclassic, however.

The scale of communities also increased, except in the ~Epiclassic. In the earliest periods, the largest communities were villages; in the ~Early Formative the largest villages—there were two in the quantitative dataset—had more than 750 inhabitants. By the ~Late Formative there were large urbanized settlements of over 15,000 people, and the largest ~Early Classic city had over 150,000 inhabitants, signaling a much faster rate of growth. The decline of the ~Epiclassic still left the largest settlements larger than the largest of the ~Late Formative, and in the ~Late Postclassic, the largest settlements were at least twice the size of those of the ~Epiclassic.

Along with the increasing size of communities, the complexity of the hierarchy increased across the seven periods analyzed here. Enough secondary and tertiary-sized settlements were scattered across the landscape to make rank-size graphs markedly convex. This signals the development of mid-range communities with central place functions. Analysis of large-settlement dynamics also shows this pattern of increasing urbanization and centralization. Large settlements increased in density, except for during the ~Epiclassic. Small settlements increased over time, too, although a decreasing percentage of the population lived in them.

In the ~Middle Formative, there were low rates of settlement continuity, indicating communities were established in new locations. This pattern was not entirely due to population growth, but signaled new foci of settlement in the ~Middle Formative, and in the succeeding ~Late Formative. The ~Early Classic also shows low levels of settlement continuity from the preceding periods and into succeeding periods, indicating that it was a period of reorganization, as was the ~Epiclassic that followed it. On the other hand, ~Epiclassic settlements tended to be occupied in the succeeding period.

At the broadest scale, mound use increased through the early periods to a high in the ~Terminal Formative, then decreased in each succeeding period, based on the number of settlements with mounds and mound density per person. The change increments, however, were not large. The density of mounds on sites with mounds was relatively constant through all periods, but there was a tiny jump in the ~Epiclassic. Mound use was focused in the southern study area, based on the quantitative dataset. The southern study area had more mounds and more sites with mounds, although this pattern may have diminished after the ~Early Classic if I had had more data from areas surrounding the Basin of Mexico. The southern study area certainly did have a deeper mound site hierarchy. Primate centers tended to have more mounds than other central places, and central places tended to have mounds.

Ball courts also seem to have been more of a southern phenomenon, although this trend may be a factor of the areas from which the quantitative data are drawn. Ball courts tend to be on larger settlements that have some central place functions, and those in this database are always part of mound complexes. Ball court construction increased through the ~Early Classic, then waned, although ball courts continued to be used through the ~Late Postclassic. In the ~Epiclassic, ball courts were built on large sites outside the Basin.

These are the broadest empirical patterns generated by this study. In the next subsection, I address concordant change.

Concordant change

By concordant (or coordinated) change, I refer to the type and timing of change being similar, so that the "system's parts" are "transformed together in roughly the same way" (Kowalewski 1996:27). We can look for concordant change (Kowalewski 1995, 1996), for example, in ceramic styles, in population centralization, in settlement hierarchy, and in civic-ceremonial architecture. Two lines of evidence show the concordant change very clearly; they are ceramic styles and settlement patterns.

Willey has noted alternating periods of regional diversity and horizonal integration in prehispanic Mesoamerica; what Willey is recognizing are two modes of concordant change. He finds evidence for these two modes most prominent in the presence or absence of "art styles" (1991:207; 1999a:86). Periods with common design motifs, such as when the "Olmec" styles were widespread, are periods of horizonal integration. When these prominent styles are no longer in use, Willey identifies periods of diversity, with "regional artistic traditions" (1991:207). Ultimately, he concludes that ideology was "the primary motivating force" in periods of horizonal integration, such as when "Olmec" styles were used. Willey has identified an important pattern, but by rooting his explanation for the pattern in cosmology, he denies the importance of other characteristics of the civilizations that were also changing in tandem with the "art styles," such as settlement patterns. As I mentioned above, concordant change is evident in both the periods of diversity *and* the periods of integration—because both were periods in which the same pattern was playing out across the civilization.

The macroregional chronology upon which this analysis is based is essentially a chart of concordant change. I derived that chronology from charting ceramic crossties and ceramic style horizons; in that sense, it is a table of concordant change. Willey, in his study of horizonal integration, finds evidence for integration in "art styles" (1991:207; 1999a:86). However, he detects "art style" in design motifs rather than in ceramic forms and types. Nevertheless, I see the ceramic types that underlie the chronology as consistent with Willey's ideas for art styles that evidence horizonal integration. The ceramics change at the same times (e.g., types begin to be used, or cease to be made), which we use to mark the beginnings and endings of chronological periods. Therefore, ceramic changes that happen across multiple regions are evidence of concordant change.

Concordant change is also evident in settlement patterns. As I described in the last subsection, changes in settlement patterns (e.g., the scale of hierarchical development) and indices of urbanization are similar in both increases and declines across the study area. Indeed, almost all variables, when analyzed region-by-region, show change at the same time. This is not an artifact of consistent fieldwork and analytical methods. Examples are myriad. Population increased across the study area in all periods except for during the ~Epiclassic, when populations decreased across the study area. Across the study area, the complexity of the settlement hierarchy increased over time, again except for in the ~Epiclassic. Average settlement size increased, except for during the ~Late Postclassic. Prior to the ~Early Classic, settlements tended to show low rates of continuity—there were many new settlements and settlements in new places.

Indices of urbanization are another indicator of concordant change. Settlements with 2500 people or more first occur in the study area in the ~Late Formative, in each of the big three regions. In each successive period, there are settlements of this size, and larger. In the ~Middle Formative, the largest settlements had less than 2000 residents, so this increase marks a striking shift in the settlement hierarchy—and that shift happened at the same time in the three regions for which we have the most population data.

Having shown empirical examples of concordant change derived from archaeological site data, I next discuss regional variation embedded within these patterns of concordant change.

Regional variation and concordant change

The broad patterns shown by these data encompass important regional variation. These variations are of a scale such that they are within the broad patterns, rather than counter to them. I propose that these regional variations are the result of core-periphery relations that occurred within the larger macroregional patterns I discussed above.

What are cores and peripheries, and how do we recognize them? Cores, or core zones, fit in a continuum that extends from clusters of settlements to core regions. Core zones include multiple settlements and may be relatively small or very large in geographic extent and population; core size depends on the larger system in which they are enmeshed. Cores have relatively higher total populations, higher population densities, higher indexes of urbanization, and more integration and hierarchical complexity, while peripheries have lower total populations, lower population densities, lower indexes of urbanization, and less integration and hierarchical complexity. Cores influence or dominate peripheries.

> Cores and peripheries develop in tandem through their mutually reinforcing interactions. The hierarchically structured core-periphery systems of the early civilizations became engines of social, cultural, and technological change as the flows of goods, people, and information across cultural boundaries increased [Blanton 1999:6].

Core-periphery interactions are part of the answer to the question I posed at the beginning of this section about how a civilization grows. Part of the complexity we observe in that growth is the result of core-periphery interaction. Cores and peripheries are part of a sociopolitical landscape that includes multiple cores, which may have different scales. In his examination of regional patterns in ancient Greece, John L. Bintliff (1997; 1999) concludes that core-periphery interactions were important in short- and medium-term dynamics (roughly the equivalent of several periods). In addition, he argues that regional environmental potential (both agricultural and raw materials) and the diffusion of innovations also had significant effects on the particular trajectories of various areas within the Greek macroregion.

In the following paragraphs, I note the areas that were the cores and peripheries in the study area for the seven periods I analyze in this dissertation. In the ~Early Formative, I identify two cores in the survey area, one in the north and one in the south. The northern core was in the southern Basin of Mexico, and may have extended north along the western edge of the Basin. The Mixteca Alta was a second core, especially the Nochixtlán

Valley, but also in the mountains to the west around Teposcolula. The Puebla-Tlaxcala data are incomplete, but there may have been another core in the western Tlaxcala-Puebla Valley. The rest of the study area, judging by these data, was periphery.

In the ~Middle Formative, both the southern Basin and the Mixteca Alta core continued, and there still is evidence that there might have been a third core in the western Tlaxcala-Puebla Valley. The rest of the study area was periphery.

In the ~Late Formative, the southern Basin core had shifted to the eastern side of the Basin, and a bit farther north. The Tlaxcala-Puebla Valley has clearer evidence of a core there (although the data are poorly reported), centered in the central valley south of the volcano Malinche. The Mixteca Alta core continued to function, but was not as prominent compared to the northern cores as it had been in previous periods. The northern Oaxaca Valley had a core with Monte Albán as its primate community. The rest of the study area was periphery.

In the ~Terminal Formative, the Basin core extended across the Basin and the Teotihuacán Valley to the northeast. Another core seems to have spread across the Tlaxcala-Puebla Valley, including on all sides of Malinche, but apparently especially on the western side. Some of the largest settlements in the Mixteca Alta core shifted west into the mountains, although some major population centers remained in the western Nochixtlán Valley. The Oaxaca Valley core spread across the valley (Monte Albán was the primate settlement), with more secondary centers in the northern arm of the valley. Another core may have developed in the Tehuacán Valley (possibly in reaction to conquest activities in the Cuicatlán Cañada by Monte Albán), but the site size data are too poorly reported to be certain. The rest of the study area was periphery.

In the ~Early Classic, as reflected in the quantitative data, the study area had four cores. The Basin was a core, with Teotihuacán its primate city. A second core was apparently in the west-central Tlaxcala-Puebla Valley. The Mixteca Alta was a third core, and its main population centers were in the mountains west of the Nochixtlán Valley. The Valley of Oaxaca was the fourth core, with a trio of prominent population centers in the central valley. The rest of the study area was periphery.

In the ~Epiclassic, the quantitative data shows four cores, and I suspect there were at least three more in the study area. The four clearly recognizable cores include Tula (although I do not have regional survey data for this period), the Basin of Mexico, the eastern Mixteca Alta, and the Oaxaca Valley. Additional cores may have been in the southern Toluca Valley, around Xochicalco in the Morelos Valleys region, and around Cholula in the Puebla Valley. The rest of the study area was periphery.

The ~Late Postclassic was a period of multiple cores, including core zones in the Tula region, the Basin of Mexico, probably around Cholula, in the central Mixteca Alta, and in the Oaxaca Valley. There's some evidence for a core in the Tehuacán Valley, and a second core in the eastern Mixteca Alta. The rest of the study area was periphery.

These data show two types of cores, which may be contrasted as either more primate or more hierarchical. Primate cores have a single prominent community, at least twice the size of the next largest settlement; the core is a zone, however, including many communities. Hierarchical cores do not have a single high-population community, but multiple central places. For example, the ~Early Classic Basin of Mexico core, with its leading city, Teotihuacán, 10 times the size of the next largest community, was a primate type of core. The ~Early and ~Middle Formative cores were all hierarchically organized cores.

In the next subsection, I offer an explanation for the empirical patterns described here.

The explanation

I believe the explanation for the empirical patterns discussed above lies in the interplay of market integration and core-periphery relationships. Market integration is the mechanism behind the concordant change (Kowalewski 1995, 1996), and core-periphery relationships underlie the variations that occur at the regional scale. Concordant change—the pattern of ups and downs at the same time across a macroregion—is evidence that the whole study area was participating in the same system, or the same market realm. The economic roles of the cores and peripheries, and the shifts among them, account for the differences among the regions.

As I describe in Chapter 3, the study area is surrounded by bounding terrain that is either rugged, high, or both, making it a natural unit with a high potential for integration. Travel and communication were easier within the study area than with areas outside the study area. More than interaction was facilitated, however; between-region integration was also easier among the nine regions of the study area.

We have considerable evidence for interregional interaction and integration. Above I discussed how settlement patterns, including total population, population density, settlement hierarchy, and indices of urbanization, show integration. Integration and market behavior are also evident in the ceramic types on which the chronology is based—market exchange facilitated the movement of many pots and potters (e.g., Finsten and Kowalewski 1999). Thin Orange pottery is a good example of a widely traded ceramic type; it is found on sites throughout the study area, and beyond. Although it is identified with Teotihuacán, Thin Orange ceramics were actually produced in the Puebla Valley (Rattray 1990). Charlton has documented a trade route that extended between Puebla and Teotihuacán, based on extraordinarily high ratios of Thin Orange ceramics to typical residential pottery in sites along the route (1987).

Obsidian is another good example of the pervasive trading network in the study area—not because obsidian was so important, but because it is so obvious archaeologically. Obsidian blades and flakes are also found throughout the study area, although the resource came from only a few locales. Most highland obsidian can be sourced by color, so we know where even small flakes were quarried, based on visual inspections in the field.

Although it can be considered indirect, we also have evidence of the extensive network of interaction in the highlands because there are no areas that lack settlement, at least after the earliest Formative periods. There were no broad, uninhabited zones across the study area. Even the peripheries show strong links to the cores. They made pottery that imitated types made in the cores, for example. Even peripheries have exotic trade goods that came from outside the highlands (e.g., marine shell), however, although few of them. The Morelos Valleys periphery may have exported cotton fabrics to the Basin in the Late Classic, based on the presence of spindle whorls (Hirth and Angulo Villaseñor 1981).

Despite this emphasis on market integration, I am not saying that political interaction was not also happening. States can and do help guarantee the security that market systems depend on to function successfully. Those bearing goods must be able to seek buyers and markets with reasonable assurance that they will arrive at their destinations with their goods intact, and have a place in which to conduct successful trading.

The idea that market activities integrated communities and regions across the highlands is not new. Blanton et al. (1999:99) note that exchange in the Early and Middle Formative was probably through gift exchanges and barter, and through redistribution by chiefs. By the Late Formative, they argue that exchange in the Valley of Oaxaca "was primarily in the hands of households" and not "controlled by a central political institution" (1999:100), and production and exchange intensified through the succeeding periods. They point to an unusual concentration of evidence of specialized ceramic production, lithic reduction, etc., around an open, moundless platform as evidence of a marketplace in the central Valley (1999:100).

Sanders and Price have argued for a highland-lowland symbiosis that defined Mesoamerican interactions. Their Central Mexican Symbiotic Region is "the product of…population growth, competition, and cooperation in a unique environmental setting" (1968:191). They find the interactions between the highlands and lowlands exemplified in the relations between Teotihuacán and Kaminaljuyú, in which Kaminaljuyú was a lowland colony of Teotihuacán that collapsed after Teotihuacán withdrew (1968:202–204). I argue that the highland interactions instead focused within the highlands, within the bounding terrain and within the study area of this synthesis.

Willey (1991) has postulated that ideology was the mechanism behind the concordant change he described as horizonal integration and regional diversity. He also noted, referring to the Teotihuacán and Tiahuanaco (Peru) cores (which he calls horizons, reflecting his focus on design styles), that they were

> …characterized by their distinctive art styles, but both horizons are also defined by other traits and qualities. These include architectural innovations and the dissemination of these among the various regions, and this many be testimony of the spread of political power and authority. But I am inclined to think that the strong economic and commercial linkages that were forged during the two horizons were probably even more important than the political ones. I think this was certainly the case for Teotihuacán and Mesoamerica [Willey 1991:207].

Later, however, Willey dropped the economic explanation he raised here in favor of the ideological one. I argue that the "art styles" Willey describes are evidence of interactions that occurred due to the market linkages.

In conclusion, I believe only market integration explains the broadest patterns of concordant change—whether increases or declines—that these data show for the highlands. Regional variation within the scope of those concordant changes is explained by the economic roles of cores and peripheries.

References Cited

Abascal M., Rafael
1980 Riego y Control de Agua en los Cultivos Prehispánicos de Tlaxcala. *Revista Mexicana de Estudios Antropológicos* 26:115–149.

Abascal M., Rafael, Garman Harbottle and Edward V. Sayre
1974 Correlation Between Terra Cotta Figurines and Pottery from the Valley of Mexico and Source Clays by Activation Analysis. In *Archaeological Chemistry*, edited by Curt W. Beck, pp. 81–99. Advances in Chemistry Series, no. 138. American Chemical Society, Washington, D.C.

Adams, Richard E.W.
1997 *Ancient Civilizations of the New World*. Westview Press, Boulder, Colorado.

Adams, Richard E.W. and Richard C. Jones
1981 Spatial Patterns and Regional Growth among Classic Maya Cities. *American Antiquity* 46:301–322.

Agrinier, Pierre
1991 The Ballcourts of Southern Chiapas, Mexico. In *The Mesoamerican Ballgame*, edited by Vernon L. Scarborough and David R. Wilcox, pp. 175–194. University of Arizona Press, Tucson.

Anderson, David G.
1994 *The Savannah River Chiefdoms: Political Change in the Late Prehistoric Southeast*. University of Alabama Press, Tuscaloosa.
1996a Chiefly Cycling and Large-Scale Abandonments as Viewed from the Savannah River Basin. In *Political Structure and Change in the Prehistoric Southeastern United States*, edited by John F. Scarry, pp. 150–191. University Press of Florida, Gainesville.
1996b Fluctuations Between Simple and Complex Chiefdoms: Cycling in the Late Prehistoric Southeast. In *Political Structure and Change in the Prehistoric Southeastern United States*, edited by John F. Scarry, pp. 231–252. University Press of Florida, Gainesville.

Andrews, Anthony P.
1983 *Maya Salt Production and Trade*. University of Arizona Press, Tucson.

Appel, Jill
1986 A Central-Place Analysis of Classic and Late Postclassic Settlement Patterns in

the Valley of Oaxaca. In *Economic Aspects of Prehispanic Highland Mexico*, edited by Barry L. Isaac, pp. 375–418. Research in Economic Anthropology, Supplement 2. JAI Press, Greenwich, Connecticut.

Arnold, Philip J., III

2000 Sociopolitical Complexity and the Gulf Olmecs: A View from the Tuxtla Mountains, Veracruz, Mexico. In *Olmec Art and Archaeology in Mesoamerica*, edited by John E. Clark and Mary E. Pye, pp. 117–135. Studies in the History of Art, no. 58; Center for Advanced Study in the Visual Arts Symposium Papers, no. 35. Yale University Press, New Haven.

Aufdermauer, Joerg

1973 Aspectos de la Cronología del Preclásico en la Cuenca de Puebla-Tlaxcala: Nueva Evidencia de Moyotzingo, Puebla. *Comunicaciones* 9:11–24.

Balkansky, Andrew K.

1997 *Archaeological Settlement Patterns of the Sola Valley, Oaxaca, Mexico.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Wisconsin, Madison.

1998 Urbanism and Early State Formation in the Huamelulpan Valley of Southern Mexico. *Latin American Antiquity* 9:37–67.

1999 Settlement Pattern Studies in the Mixteca Alta, Oaxaca, 1966–1996. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 191–202. Smithsonian Institution Press, Washington, D.C.

Balkansky, Andrew K., Stephen A. Kowalewski, Laura R. Stiver, Thomas J. Pluckhahn, Dmitri Beliaev, John F. Chamblee, Verenice Y. Heredia Espinoza, Verónica Pérez Rodríguez, Roberto Santos Pérez, and Charlotte A. Smith

2002 Archaeological Survey in the Mixteca Alta of Oaxaca, Mexico. *Journal of Field Archaeology* (in press).

Barbour, Warren

1976 *The Figurines and Figurine Chronology of Ancient Teotihuacán, Mexico.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Rochester, Rochester.

Barlow, Robert H.

1949 The Extent of the Empire of the Culhua-Mexica. *Ibero-Americana* 28.

Berdan, Frances F.

1982 *The Aztecs of Central Mexico: An Imperial Society*. Holt, Rinehart, and Winston, New York.

1996 The Tributary Provinces. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E.

Smith and Emily Umberger, pp. 115–135. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Berdan, Frances F., Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger

1996 *Aztec Imperial Strategies*. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Berdan, Frances F. and Michael E. Smith

1996 Imperial Strategies and Core-Periphery Relations. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger, pp. 209–217. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Bernal, Ignacio

1965 Archaeological Synthesis of Oaxaca. In *Archaeology of Southern Mesoamerica, part 2*, edited by Gordon R. Willey, pp. 788–813. Handbook of Middle American Indians, vol. 3, part 2, Robert Wauchope, general editor. University of Texas Press, Austin.

Berres, Thomas E.

2000 Climatic Change and Lacustrine Resources at the Period of Initial Aztec Development. *Ancient Mesoamerica* 11:27–38.

Billman, Brian R.

1999 Settlement Pattern Research in the Americas: Past, Present, and Future. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 1–5. Smithsonian Institution Press, Washington, D.C.

Bintliff, John L.

1997 Regional Survey, Demography, and the Rise of Complex Societies in the Ancient Aegean: Core-Periphery, Neo-Malthusian, and Other Interpretive Models. *Journal of Field Archaeology* 24:1–38.

1999 Regional Field Surveys and Population Cycles. In *Reconstructing Past Population Trends in Mediterranean Europe (3000 BC – AD 1800)*, edited by John L. Bintliff and Kostas Sbonias, pp. 21–33. The Archaeology of Mediterranean Landscapes, vol. 1, Graeme Barker and D.J. Mattingly, general editors. Oxbow Books, Oxford.

Bintliff, John L. and Kostas Sbonias

1999 Demographic and Ceramic Analysis in Regional Survey. In *Extracting Meaning from Ploughsoil Assemblages*, edited by Graeme Barker, pp. 244–258. The Archaeology of Mediterranean Landscapes, vol. 5, D.J. Mattingly, general editor. Oxbow Books, Oxford.

Blackwell, Bonnie A. and Henry P. Schwarcz

1993 Archaeochronology and Scale. In *Effects of Scale on Archaeological and Geoscientific Perspectives*, edited by Julie K. Stein and Angela R. Linse, pp. 39–58. Special Paper, no. 283. The Geological Society of America, Boulder, Colorado.

Blanton, Richard E.

1972 *Prehistoric Settlement Patterns of the Ixtapalapa Peninsula Region, Mexico*. Department of Anthropology Occasional Papers, no. 6. Pennsylvania State University, University Park.

1976 Anthropological Studies of Cities. *Annual Review of Anthropology* 5:249–264.

1978 *Monte Albán: Settlement Patterns at the Ancient Zapotec Capital*. Academic Press, New York.

1981 The Rise of Cities. In *Archaeology*, edited by Jeremy A. Sabloff, pp. 392–400. Supplement to the Handbook of Middle American Indians, vol. 1, Victoria Reifler Bricker, general editor. University of Texas Press, Austin.

1983 Advances in the Study of Cultural Evolution in Prehispanic Highland Mesoamerica. *Advances in World Archaeology* 2:245–288.

1989 Continuity and Change in Public Architecture: Periods I through V of the Valley of Oaxaca, Mexico. In *Monte Albán's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlán, the Valley of Oaxaca, Mexico*, edited by Stephen A. Kowalewski, Gary M. Feinman, Laura Finsten and Richard E. Blanton, pp. 409–447. Memoirs, no. 23. University of Michigan Museum of Anthropology, Ann Arbor.

1990 Theory and Practice in Mesoamerican Archaeology: A Comparison of Two Modes of Scientific Inquiry. In *Debating Oaxaca Archaeology*, edited by Joyce Marcus, pp. 1–16. Anthropological Papers, no. 84. University of Michigan Museum of Anthropology, Ann Arbor.

1996 The Basin of Mexico Market System and the Growth of Empire. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger, pp. 47–84. Dumbarton Oaks Research Library and Collection, Washington, D.C.

2000 *Hellenistic, Roman and Byzantine Settlement Patterns of the Coast Lands of the Western Rough Cilicia*. BAR International Series, no. 879. Archaeopress, Oxford.

Blanton, Richard E., Gary M. Feinman, Stephen A. Kowalewski and Linda M. Nicholas

1999 *Ancient Oaxaca: The Monte Albán State*. Cambridge University Press, Cambridge.

Blanton, Richard E., Laura M. Finsten, Stephen A. Kowalewski and Gary M. Feinman

1996 Migration and Population Change in the Prehispanic Valley of Oaxaca, Mexico. In *Arqueología Mesoamericana: Homenaje a William T. Sanders*, vol. 2, edited by Alba Guadalupe Mastache, Jeffrey R. Parsons, Robert S. Santley and Mari Carmen Serra Puche, pp. 11–36. Instituto Nacional de Antropología e Historia; Arqueología Mexicana, México, D.F.

Blanton, Richard E., Stephen A. Kowalewski, Gary M. Feinman and Jill Appel

1981 *Ancient Mesoamerica: A Comparison of Change in Three Regions*. Cambridge University Press, Cambridge.

1982 *Monte Albán's Hinterland, Part I: The Prehispanic Settlement Patterns of the Central and Southern Parts of the Valley of Oaxaca*. Memoir, no. 15; Prehistory and Human Ecology of the Valley of Oaxaca, vol. 7. University of Michigan Museum of Anthropology, Ann Arbor.

Blanton, Richard E., Stephen A. Kowalewski, Gary M. Feinman and Laura M. Finsten

1993 *Ancient Mesoamerica: A Comparison of Change in Three Regions*. 2nd ed. Cambridge University Press, Cambridge.

Blanton, Richard E. and Peter N. Peregrine

1997 Main Assumptions and Variables for Economic Analysis Beyond the Local System. In *Economic Analysis Beyond the Local System*, edited by Richard E. Blanton, Peter N. Peregrine, Deborah Winslow and Thomas D. Hall, pp. 3–12. Monographs in Economic Anthropology, no. 13. University Press of America, Lanham, Maryland.

Blanton, Richard E., Deborah Winslow, Peter N. Peregrine and Thomas D. Hall

1997 Introduction: Economic Analysis Beyond the Local System—and Back Again. In *Economic Analysis Beyond the Local System*, edited by Richard E. Blanton, Peter N. Peregrine, Deborah Winslow and Thomas D. Hall, pp. v–ix. Monographs in Economic Anthropology, no. 13. University Press of America, Lanham, Maryland.

Blomster, Jeffrey P.

1998 Context, Cult, and Early Formative Period Public Ritual in the Mixteca Alta: Analysis of a Hollow-Baby Figurine from Etlatongo, Oaxaca. *Ancient Mesoamerica* 9:309–326.

Braudel, Fernand

1980 [1969] *On History*. Translated by Sarah Matthews. University of Chicago Press, Chicago.

Brockington, Donald L.

1973 *Archaeological Investigations at Miahuatlán, Oaxaca*. Publications in Anthropology, no. 7. Vanderbilt University Department of Anthropology, Nashville.

Brown, Ian W.

1980 *Salt and the Eastern North American Indian: An Archaeological Study*. Lower Mississippi Survey Bulletin, no. 6. Peabody Museum, Harvard University, Cambridge, Massachusetts.

Brumfiel, Elizabeth M.

1991 Agricultural Development and Class Stratification in the Southern Valley of

Mexico. In *Land and Politics in the Valley of Mexico: A Two-Thousand Year Perspective*, edited by Herbert R. Harvey, pp. 43–62. University of New Mexico Press, Albuquerque.

Burghardt, Andrew F.

1996 Boundaries: Setting Limits to Political Areas. In *Concepts in Human Geography*, edited by Carville V. Earle, Kent Mathewson and Martin S. Kenzer, pp. 213–230. Rowman & Littlefield, Lanham, Maryland.

Butzer, Karl W.

1982 *Archaeology as Human Ecology: Method and Theory for a Contextual Approach*. Cambridge University Press, Cambridge.

1996 Ecology in the Long View: Settlement Histories, Agrosystemic Strategies, and Ecological Performance. *Journal of Field Archaeology* 23:141–150.

Byers, Douglas S. (editor)

1967 *Environment and Subsistence*. University of Texas Press, Austin.

Byland, Bruce E.

1980 *Political and Economic Evolution in the Tamazulapan Valley, Mixteca Alta, Oaxaca, Mexico: A Regional Approach.* Unpublished Ph.D. dissertation, Department of Anthropology, The Pennsylvania State University, University Park.

1994 Political Factions in the Transition from Classic to Postclassic in the Mixteca Alta. In *Factional Competition and Political Development in the New World*, edited by Elizabeth M. Brumfiel and John W. Fox, pp. 117–126. Cambridge University Press, Cambridge.

Byland, Bruce E. and John M.D. Pohl

1990 Alianza y Conflicto de las Estados Mixtecos: El Caso Tilantongo. In *Lecturas Históricas del Estado de Oaxaca,* vol. 1, *Época Prehispánica*, edited by Marcus C. Winter, pp. 379–389. Instituto Nacional de Antropología e Historia, Gobierno del Estado de Oaxaca, Oaxaca.

1994 *In the Realm of 8 Deer: The Archaeology of the Mixtec Codices*. University of Oklahoma Press, Norman.

Cabrera Castro, Rubén

1991 Secuencia Arquitectónica Cronológica de La Ciudadela. In *Teotihuacan 1980–1982: Nuevas Interpretaciones*, edited by Rubén Cabrera Castro, Ignacio Rodríguez García and Noel Morelos García, pp. 31–60. Serie Arqueología, no. 227. Instituto Nacional de Antropología e Historia, México.

1998 La Cronología de la Ciudadela en su Secuencia Arquitectónica. In *Los Ritmos de Cambio en Teotihuacán: Reflexiones y Discusiones de su Cronología*, edited by Rosa Brambila Paz and Rubén Cabrera Castro, pp. 143–166. Colección Científica, Serie Arqueología, no. 366. Instituto Nacional de Antropología e Historia, México, D.F.

Cabrera Castro, Rubén, George L. Cowgill, Saburo Sugiyama and Carlos Serrano
1989 El Proyecto Templo de Quetzalcoatl. *Arqueología* 5:51–79.

Cabrera Castro, Rubén, Ignacio Rodríguez García and Noel Morelos García (editors)
1982 *Memoria del Proyecto Arquelógico Teotihuacan 80–82*. Instituto Nacional de Antropología e Historia, México.

Cabrera Castro, Rubén, Saburo Sugiyama and George L. Cowgill
1991 The "Templo de Quetzalcoatl" Project at Teotihuacan: A Preliminary Report. *Ancient Mesoamerica* 2:77–92.

Calnek, Edward E.
1976 The Internal Structure of Tenochtitlan. In *The Valley of Mexico: Studies in Pre-Hispanic Ecology and Society*, edited by Eric R. Wolf, pp. 287–302. University of New Mexico Press, Albuquerque.

Carrasco, Pedro
1996 *Estructura Político-Territorial del Imperio Tenochca: La Triple Alianza de Tenochtitlan, Tetzcoco y Tlacopan*. El Colegio de México, Fideicomiso Historia de las Américas, Fondo de Cultura Económica, México, D.F.

Caso, Alfonso and Ignacio Bernal
1965 Ceramics of Oaxaca. In *Archaeology of Southern Mesoamerica, part 2*, edited by Gordon R. Willey, pp. 871–895. Handbook of Middle American Indians, vol. 3, Robert Wauchope, general editor. University of Texas Press, Austin.

Caso, Alfonso, Ignacio Bernal and Jorge R. Acosta
1967 *La Cerámica de Monte Albán*. Memorias, no. 13; Exploraciones de Monte Albán, Oaxaca, no. 2. Instituto Nacional de Antropología e Historia, México.

Castillo Mangas, María Teresa, Luis Córdoba Barradas and Raúl García Chávez
1993 Una Aldea del Formativo en San Miguel Amantla, Azcapotzalco, D.F. In *A Propósito del Formativo*, edited by María Teresa Castillo Mangas, pp. 59–71. Instituto Nacional de Antropología e Historia, Subdirección de Salvamento Arqueológico, México.

Charlton, Thomas H.
1969 Texcoco Fabric-Marked Pottery, *Tlateles*, and Salt-Making. *American Antiquity* 34:73–76.
1987 Teotihuacan Non-Urban Settlements: Functional and Evolutionary Implications. In *Teotihuacan: Nuevos Datos, Nuevas Síntesis, Nuevos Problemas*, edited by Emily McClung de Tapia and Evelyn Childs Rattray, pp. 473–488. Arqueología, Serie Antropológica, no. 72. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, Ciudad Universitaria.

Charlton, Thomas H. and Deborah L. Nichols

1997 Diachronic Studies of City-States: Permutations on a Theme—Central Mexico from 1700 B.C. to A.D. 1600. In *The Archaeology of City-States: Cross-Cultural Approaches*, edited by Deborah L. Nichols and Thomas H. Charlton, pp. 169–207. Smithsonian Institution Press, Washington, D.C.

Chase-Dunn, Christopher K. and Thomas D. Hall

1994 The Historical Evolution of World-Systems. *Sociological Inquiry* 64:257–280.

1997 *Rise and Demise: Comparing World Systems*. Westview Press, Boulder, Colorado.

2000 Comparing World-Systems to Explain Social Evolution. In *World System History: The Social Science of Long-Term Change*, edited by Robert A. Denemark, Jonathan Friedman, Barry K. Gills and George Modelski, pp. 85–111. Routledge, London.

Cherry, John F., Jack L. Davis and E. Mantzourani

1991 Patterns in the Landscape of Keos. In *Landscape Archaeology as Long-Term History: Northern Keos in the Cycladic Islands from Earliest Settlement until Modern Times*, edited by John F. Cherry, Jack L. Davis and E. Mantzourani, pp. 457–479. Monumenta Archaeologica, vol. 16. UCLA Institute of Archaeology, University of California, Los Angeles.

Christaller, Walter

1966 *Central Places in Southern Germany*. Orig. pub. 1933 ed. Translated by Carlisle W. Baskin. Prentice-Hall, Englewood Cliffs, New Jersey.

Clark, John E.

1991 The Beginnings of Mesoamerica: Apologia for the Soconusco Early Formative. In *The Formation of Complex Society in Southeastern Mesoamerica*, edited by William R. Fowler, Jr., pp. 13–26. CRC Press, Boca Raton.

Cobean, Robert H.

1990 *La Cerámica de Tula, Hidalgo.* Estudios Sobre Tula, no. 2; Colección Científica, no. 215. Instituto Nacional de Antropología e Historia, México.

Cobean, Robert H., James R. Vogt, Michael D. Glascock and Terrance L. Stocker

1991 High-Precision Trace-Element Characterization of Major Mesoamerican Obsidian Sources and Further Analyses of Artifacts from San Lorenzo Tenochtitlán, Mexico. *Latin American Antiquity* 2:69–91.

Coe, Michael D.

1981 San Lorenzo Tenochtitlan. In *Supplement to the Handbook of Middle American Indians,* vol. 1*, Archaeology*, edited by Jeremy A. Sabloff, pp. 117–146. University of Texas Press, Austin.

Coe, Michael D. and Richard A. Diehl

1980 *The Archaeology of San Lorenzo Tenochtitlán*. In the Land of the Olmec, vol. 1. University of Texas Press, Austin.

Coe, Michael D. and Kent V. Flannery

1964 Microenvironments and Mesoamerican Prehistory. *Science* 143:650–654.

Coe, Sophie D.

1994 *America's First Cuisines*. University of Texas Press, Austin.

Cook de Leonard, Carmen

1971 Ceramics of the Classic Period in Central Mexico. In *Archaeology of Northern Mesoamerica, Part 1*, edited by Robert Wauchope, Gordon F. Ekholm and Ignacio Bernal, pp. 179–205. Handbook of Middle American Indians, vol. 10. University of Texas Press, Austin.

Cook, Sherburne F. and Woodrow W. Borah

1968 The Population of the Mixteca Alta: 1520–1960. *Ibero-Americana* 50.

Cowgill, George L.

1996 Discussion. *Ancient Mesoamerica* 7:325–331.

1997 State and Society at Teotihuacan, Mexico. *Annual Review of Anthropology* 26:129–161.

Cyphers Guillén, Ann

1992 *Chalcatzingo, Morelos: Estudio de Cerámica y Sociedad*. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, México.

Day, Jane Stevenson

2001 Performing on the Court. In *The Sport of Life and Death: The Mesoamerican Ballgame*, edited by E. Michael Whittington, pp. 65–77. Thames and Hudson, New York.

Dehouve, Danièle

1994 *Entre El Caimán y el Jaguar: Los Pueblos Indios de Guerrero*. Historia de los Pueblos Indígenas de México. Centro de Investigaciones y Estudios Superiores en Antropología Social, Tlalpan, D.F.

Diamond, Jared M.

1997 *Guns, Germs, and Steel: The Fates of Human Societies*. W.W. Norton, New York.

Díaz Oyarzabal, Clara Luz

1981 Chingú y La Expansión Teotihuacana. In *Interacción Cultural en México Central*, edited by Evelyn Childs Rattray, Jaime Litvak King and Clara Luz Díaz Oyarzabal, pp. 107–112. Serie Antropológica, no. 41. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, México.

Diehl, Richard A.
1983 *Tula: The Toltec Capital of Ancient Mexico.* Thames and Hudson, London.
1989 A Shadow of Its Former Self: Teotihuacan During the Coyotlatelco Period. In *Mesoamerica After the Decline of Teotihuacan, A.D. 700–900*, edited by Richard A. Diehl and Janet Catherine Berlo, pp. 9–18. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Donkin, R.A.
1979 *Agricultural Terracing in the Aboriginal New World.* Viking Fund Publications in Anthropology, no. 56. Wenner-Gren Foundation for Anthropological Research and University of Arizona, Tucson.

Doolittle, William E.
1990 *Canal Irrigation in Prehistoric Mexico: The Sequence of Technological Change.* University of Texas Press, Austin.

Drennan, Robert D.
1988 Household Location and Compact Versus Dispersed Settlement in Prehispanic Mesoamerica. In *Household and Community in the Mesoamerican Past: Case Studies from the Maya Area and Oaxaca*, edited by Richard R. Wilk and Wendy Ashmore, pp. 273–293. University of New Mexico Press, Albuquerque.
1989 The Mountains North of the Valley. In *Monte Albán's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlán, the Valley of Oaxaca, Mexico*, edited by Stephen A. Kowalewski, Gary M. Feinman, Laura Finsten and Richard E. Blanton, pp. 367–384. Memoirs, no. 23. vol. 1. University of Michigan Museum of Anthropology, Ann Arbor.
1996 *Statistics for Archaeologists: A Commonsense Approach*. Plenum, New York.
1997 Tehuacán y los Estados del Clásico. In *Simposium Internacional Tehuacán y su Entorno: Balance y Perspectivas*, edited by Eréndira de la Lama, pp. 51–61. Colección Científica, no. 313. Instituto Nacional de Antropología e Historia, México, D.F.

Drennan, Robert D., Philip T. Fitzgibbons and Heinz Dehn
1990 Imports and Exports in Classic Mesoamerican Political Economy: The Tehuacan Valley and the Teotihuacan Obsidian Industry. In *Economic Aspects of Prehispanic Highland Mesoamerica*, edited by Barry L. Isaac, pp. 177–199. Research in Economic Anthropology, Supplement 2. JAI Press, Greenwich, Connecticut.

Eisenstadt, Shmuel N., Michel Abitbol and Naomi Chazan
1988 The Origins of the State Reconsidered. In *The Early State in African Perspective: Culture, Power, and Division of Labor*, edited by Shmuel N. Eisenstadt, Michel Abitbol and Naomi Chazan, pp. 1–27. Studies in Human Society, vol. 3. E.J. Brill, New York.

Elam, J. Michael
1993 *Obsidian Exchange in the Valley of Oaxaca, Mexico: 2500–500 BP.* Unpublished Ph.D. dissertation, Department of Anthropology, University of Missouri, Columbia.

Evans, John G.
1978 *An Introduction to Environmental Archaeology*. Cornell University Press, Ithaca, New York.

Evans, Susan Toby and William T. Sanders (editors)
2000 *The Aztec Period Occupation of the Valley: Part 1—Natural Environment, 20th Century Occupation, Survey Methodology, and Site Descriptions*. Pennsylvania State University, University Park.

Falconer, Steven E. and Stephen H. Savage
1995 Heartlands and Hinterlands: Alternative Trajectories of Early Urbanization in Mesopotamia and the Southern Levant. *American Antiquity* 60:37–58.

Feinman, Gary M.
1985 Changes in the Organization of Ceramic Production in Pre-Hispanic Oaxaca, Mexico. In *Decoding Prehistoric Ceramics*, edited by Ben A. Nelson, Jr., pp. 195–223. Southern Illinois University at Carbondale Center for Archaeological Investigations, Carbondale.
1998 Scale and Social Organization: Perspectives on the Archaic State. In *Archaic States*, edited by Gary M. Feinman and Joyce Marcus, pp. 95–133. School of American Research Press, Santa Fe.

Feinman, Gary M., Sherman Banker, Reid F. Cooper, Glen B. Cook and Linda M. Nicholas
1989 A Technological Perspective on Changes in the Ancient Oaxacan Grayware Ceramic Tradition: Preliminary Results. *Journal of Field Archaeology* 16:331–344.

Feinman, Gary M., Richard E. Blanton and Stephen A. Kowalewski
1984 Market System Development in the Prehispanic Valley of Oaxaca, Mexico. In *Trade and Exchange in Early Mesoamerica*, edited by Kenneth G. Hirth, pp. 157–178. University of New Mexico Press, Albuquerque.

Feinman, Gary M. and Joyce Marcus (editors)
1998 *Archaic States*. School of American Research Press, Santa Fe, New Mexico.

Feinman, Gary M. and Linda M. Nicholas
1995 *Reconocimiento Sistemático de Asentamientos Prehispánicos en el Area de Guirún, Oaxaca, Mexico*. University of Wisconsin Department of Anthropology. Submitted to Informe Técnico Final de la Temporada de Campo de 1995, Preparado para el Instituto Nacional de Antropología e Historia, México.

1996 Defining the Eastern Limits of the Monte Albán State: Systematic Settlement Pattern Survey in the Guirún Area, Oaxaca, Mexico. *Mexicon* 18(5):91–97.

1999 Reflections on Regional Survey: Perspectives from the Guirún Area, Oaxaca, Mexico. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 172–190. Smithsonian Institution Press, Washington, D.C.

Ferriz, Horacio

1985 Caltonac: A Prehispanic Obsidian-Mining Center in Eastern Mexico? A Preliminary Report. *Journal of Field Archaeology* 12:363–370.

Filloy Nadal, Laura

2001 Rubber and Rubber Balls in Mesoamerica. In *The Sport of Life and Death: The Mesoamerican Ballgame*, edited by E. Michael Whittington, pp. 21–31. Thames and Hudson, New York.

Finsten, Laura

1995 *Jalieza, Oaxaca: Activity Specialization at a Hilltop Center*. Publications in Anthropology, no. 48. Vanderbilt University Department of Anthropology, Nashville.

1996 Periphery and Frontier in Southern Mexico: The Mixtec Sierra in Highland Oaxaca. In *Pre-Columbian World Systems*, edited by Peter N. Peregrine and Gary M. Feinman, pp. 77–95. Monographs in World Archaeology, no. 26. Prehistory Press, Madison, Wisconsin.

Finsten, Laura and Stephen A. Kowalewski

1999 Spatial Scales and Processes: In and Around the Valley of Oaxaca. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 22–35. Smithsonian Institution Press, Washington, D.C.

Finsten, Laura, Stephen A. Kowalewski, Charlotte A. Smith, Mark D. Borland, and Richard D. Garvin

1996 Circular Architecture and Symbolic Boundaries in the Mixtec Sierra, Oaxaca. *Ancient Mesoamerica* 7:19–35.

Fish, Suzanne K. and Stephen A. Kowalewski (editors)

1990 *The Archaeology of Regions: A Case for Full-Coverage Survey*. Smithsonian Institution Press, Washington, D.C.

Flannery, Kent V.

1972 The Cultural Evolution of Civilizations. *Annual Review of Ecology and Systematics* 3:399–426.

1976 Evolution of Complex Settlement Systems. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 162–173. Academic Press, New York.

1983 The Tierras Largas Phase and the Analytical Units of the Early Oaxacan

Village. In *The Cloud People: Divergent Evolution of the Zapotec and Mixtec Civilizations*, edited by Kent V. Flannery and Joyce Marcus, pp. 43–45. Academic Press, New York.

Flannery, Kent V. and Joyce Marcus
1976 Evolution of the Public Building in Formative Oaxaca. In *Cultural Change and Continuity: Essays in Honor of James Bennett Griffin*, edited by Charles E. Cleland, pp. 205–221. Academic Press, New York.
1990 Borrón y Cuenta Nueva: Setting Oaxaca's Archaeological Record Straight. In *Debating Oaxaca Archaeology*, edited by Joyce Marcus, pp. 17–69. Anthropological Papers, no. 84. University of Michigan Museum of Anthropology, Ann Arbor.
1994 *Early Formative Pottery of the Valley of Oaxaca*. Memoirs, no. 27; Prehistory and Human Ecology of the Valley of Oaxaca, vol. 10. University of Michigan Museum of Anthropology, Ann Arbor.
2000 Formative Mexican Chiefdoms and the Myth of the "Mother Culture." *Journal of Anthropological Archaeology* 19:1–37.

Folan, William J., Joel D. Gunn, Jack D. Eaton and Robert W. Patch
1983 Paleoclimatological Patterning in Southern Mesoamerica. *Journal of Field Archaeology* 10:453–468.

Fowler, Melvin L.
1968 The Temple Town Community: Cahokia and Amalucan Compared. *Actas y Memorias del XXXVII Congreso Internacional de Americanistas* 1. Reprinted in *The Rise and Fall of Civilizations: Modern Archaeological Approaches to Ancient Cultures, Selected Readings*, edited by C.C. Lamberg-Karlovsky and Jermy A. Sabloff, 1974.

Frank, Andre Gunder
1993 Bronze Age World System Cycles. *Current Anthropology* 34:383–429.

Franklin, Jerry F.
1989 Importance and Justification of Long-Term Studies in Ecology. In *Long-Term Studies in Ecology: Approaches and Alternatives*, edited by Gene E. Likens, pp. 3–19. Springer-Verlag, New York.

Gámez Eternod, Lorena
1993 Crecimiento del Sitio de Tlapacoya, Estado de México, Durante el Horizonte Formativo. In *A Propósito del Formativo*, edited by María Teresa Castillo Mangas, pp. 11–32. Instituto Nacional de Antropología e Historia, Subdirección de Salvamento Arqueológico, México.

García Chávez, Raúl
1998 Evidencias Teotihuacanas en Mesoamérica y su Posible Significado para la Cronología de Teotihuacán. In *Los Ritmos de Cambio en Teotihuacán: Reflexiones y Discusiones de su Cronología*, edited by Rosa Brambila Paz and Rubén Cabrera

Castro, pp. 477–502. Colección Científica, Serie Arqueología, no. 366. Instituto Nacional de Antropología e Historia, México, D.F.

García Cook, Ángel
1981 The Historical Importance of Tlaxcala in the Cultural Development of the Central Highlands. In *Archaeology*, edited by Jeremy A. Sabloff, pp. 244–276. Supplement to the Handbook of Middle American Indians, vol. 1, Victoria Reifler Bricker, general editor. University of Texas Press, Austin.

García Cook, Ángel and B. Leonor Merino Carrión
1974 Malacates de Tlaxcala: Intento de una Sequencia Evolutiva. *Comunicaciones* 11:27–36.
1989a El Formativo en la Región Tlaxcala-Puebla. In *El Preclásico o Formativo: Avances y Perspectivas*, edited by Martha Carmona Macías, pp. 161–193. Consejo Nacional para la Cultura y las Artes; Instituto Nacional de Antropología e Historia, Museo Nacional de Antropología, México.
1989b Proyecto Arqueológico del Suroeste de Puebla. *Notas Mesoamericanas* 11:94–109.

García Cook, Ángel and B. Leonor Merino Carrión (editors)
1996 *Antología de Tizatlán*. Instituto Nacional de Antropología e Historia, Mexico.

García Cook, Ángel and Raziel Mora López
1974 Tetepetla: Un Sitio Fortificado del "Clásico" en Tlaxcala. *Comunicaciones* 10:23–30.

García Cook, Ángel and Felipe Rodríguez B.
1975 Excavaciones Arqueológicas en "Gualupita las Dalias" Puebla. *Comunicaciones* 12:1–8.

García Moll, Roberto, Daniel Juarez, Carmen Pijoan Aguade, María Elena Salas Cuesta and Marcela Salas Cuesta
1989 San Luis Tlatilco, México: Temporada IV. In *El Preclásico o Formativo: Avances y Perspectivas*, edited by Martha Carmona Macías, pp. 237–248. Consejo Nacional para la Cultura y las Artes; Instituto Nacional de Antropología e Historia, Museo Nacional de Antropología, México.

García Samper, Asunción
1989 Rescates y Salvamento Arqueológico en Cholula, Puebla. In *La Validez Teórica de Mesoamérica: Memorias de la XIX Mesa Redonda de la Sociedad Mexicana de Antropología*, pp. 290–306. Universidad Autonoma de Queretaro; Sociedad Mexicana de Antropología.

Garvin, Richard D.
1994 *Modern and Prehistoric Agriculture in the Mixtec Sierra, Oaxaca, Mexico.*

Unpublished Ph.D. dissertation, Department of Anthropology, University of Calgary, Calgary.

Gasca Durán, Abel
1981 *Algunas Notas de la Génesis de los Lagos-Cráter de la Cuenca de Oriental, Puebla-Tlaxcala-Veracruz*. Colección Científica, no. 98. Instituto Nacional de Antropología e Historia, Departamento de Prehistória, México, D.F.

Gaxiola González, Margarita
1984 *Huamelulpan: Un Centro Urbano del la Mixteca Alta*. Colección Científica, no. 114. Instituto Nacional de Antropología e Historia, Mexico, D.F.

Gaxiola González, Margarita and John E. Clark (editors)
1989 *La Obsidiana en Mesoamérica*. Instituto Nacional de Antropología e Historia, México.

Gendrop, Paul
1984 El Tablero-Talud y Otros Perfiles Arquitectónicos en Mesoamérica. *Cuadernos de Arquitectura Mesoaméricana* 2:5–48.

Gillespie, Susan D.
1991 Ballgames and Boundaries. In *The Mesoamerican Ballgame*, edited by Vernon L. Scarborough and David R. Wilcox, pp. 317–345. University of Arizona Press, Tucson.

González Crespo, Norberto, Silvia Garza Tarazona, Hortensia de Vega Nova, Pablo Mayer Guala and Giselle Canto Aguilar
1995 Archaeological Investigations at Xochicalco, Morelos: 1984 and 1986. *Ancient Mesoamerica* 6:223–236.

González de la Vara, Fernán
1999 *El Valle de Toluca Hasta la Caída de Teotihuacán*. Colección Científica, Serie Arqueología, no. 389. Instituto Nacional de Antropología e Historia, México.

González Rul, Francisco (editor)
1996 *Tlatelolco a Través de los Tiempos: 50 Años Después (1944–1994), Tomo I: Arqueología*. Instituto Nacional de Antropología e Historia, México.

Gorenflo, Larry J. and William T. Sanders
2000 The Temascalapa Region: Aztec Period Site Descriptions. In *The Aztec Period Occupation of the Valley: Part 2—Excavations at T.A. 40 and Related Projects*, edited by William T. Sanders and Susan Toby Evans, pp. 575–685. The Teotihuacan Valley Project Final Report, vol. 5; Occasional Papers in Anthropology, no. 26. Pennsylvania State University, University Park.

Grove, David C. (editor)
1987a *Ancient Chalcatzingo*. University of Texas Press, Austin.

Grove, David C.
1987b Chalcatzingo in a Broader Perspective. In *Ancient Chalcatzingo*, edited by David C. Grove, pp. 434–442. University of Texas Press, Austin.
1989a Chalcatzingo and Its Olmec Connection. In *Regional Perspectives on the Olmec*, edited by Robert J. Sharer and David C. Grove, pp. 122–147. Cambridge University Press, Cambridge.
1989b Olmec: What's In a Name? In *Regional Perspectives on the Olmec*, edited by Robert J. Sharer and David C. Grove, pp. 8–14. School of American Research Advanced Seminar Series. Cambridge University Press, Cambridge.

Hall, Thomas D.
1996 World-Systems and Evolution. *Journal of World Systems Research* 2(4).
1999 World-Systems and Evolution: An Appraisal. In *World-Systems Theory in Practice: Leadership, Production, and Exchange*, edited by P. Nick Kardulias, pp. 1–23. Rowman & Littlefield, Lanham, Maryland.

Hally, David J.
1993 The Territorial Size of Mississippian Chiefdoms. In *Archaeology of Eastern North America: Papers in Honor of Stephen Williams*, edited by James B. Stoltman, pp. 143–168. Archaeological Report, no. 25. Mississippi Department of Archives and History, Jackson.
1994 An Overview of Lamar Culture. In *Ocmulgee Archaeology, 1936–1986*, edited by David J. Hally, pp. 144–174. University of Georgia Press, Athens.
1996 Platform-Mound Construction and the Instability of Mississippian Chiefdoms. In *Political Structure and Change in the Prehistoric Southeastern United States*, edited by John F. Scarry, pp. 92–127. University Press of Florida, Gainesville.
1999 The Settlement Pattern of Mississippian Chiefdoms in Northern Georgia. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 96–115. Smithsonian Institution Press, Washington, D.C.

Hare, Timothy S. and Michael E. Smith
1996 A New Postclassic Chronology for Yautepec, Morelos. *Ancient Mesoamerica* 7:281–297.

Hassig, Ross
1985 *Trade, Tribute, and Transportation: The Sixteenth-Century Political Economy of the Valley of Mexico*. Civilization of the American Indian Series, vol. 171. University of Oklahoma Press, Norman.

Healan, Dan M. (editor)
1989 *Tula of the Toltecs: Excavations and Survey*. University of Iowa Press, Iowa City.

Hegmon, Michelle (editor)

2000 *The Archaeology of Regional Interaction: Religion, Warfare, and Exchange across the American Southwest and Beyond—Proceedings of the 1996 Southwest Symposium*. University Press of Colorado, Boulder.

Hewitt, William P., Marcus C. Winter and David A. Peterson

1987 Salt Production at Hierve el Agua, Oaxaca. *American Antiquity* 52:799–812.

Hirth, Kenneth G.

1980 *Eastern Morelos and Teotihuacan: A Settlement Survey*. Publications in Anthropology, no. 25. Vanderbilt University Department of Anthropology, Nashville.

1984 Trade and Society in Late Formative Morelos. In *Trade and Exchange in Early Mesoamerica*, edited by Kenneth G. Hirth, pp. 125–146. University of New Mexico Press, Albuquerque.

1987a Formative Period Settlement Patterns in the Río Amatzinac Valley. In *Ancient Chalcatzingo*, edited by David C. Grove, pp. 343–367. University of Texas Press, Austin.

1987b Río Amatzinac Survey: Site Descriptions. In *Ancient Chalcatzingo*, edited by David C. Grove, pp. 509–524. University of Texas Press, Austin.

1995 The Investigation of Obsidian Craft Production at Xochicalco, Morelos. *Ancient Mesoamerica* 6:251–258.

1998 The Distributional Approach: A New Way to Identify Marketplace Exchange in the Archaeological Record. *Current Anthropology* 39:451–476.

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

Hirth, Kenneth G. and Jorge Angulo Villaseñor

1981 Early State Expansion in Central Mexico: Teotihuacan in Morelos. *Journal of Field Archaeology* 8:135–150.

Hirth, Kenneth G. and Ann Cyphers Guillén

1988 *Tiempo y Asentamiento en Xochicalco.* Arqueología, Serie Monografías, no. 1. Universidad Nacional Autónoma de México, México.

Hodder, Ian R. and Clive Orton

1976 *Spatial Analysis in Archaeology*. Cambridge University Press, Cambridge.

Hodge, Mary G.

1996 Political Organization of the Central Provinces. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger, pp. 17–45. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Hodge, Mary G. and Leah D. Minc
1990 The Spatial Patterning of Aztec Ceramics: Implications for Prehispanic Exchange Systems in the Valley of Mexico. *Journal of Field Archaeology* 17:415–437.

Hunt, Robert C.
1994 Irrigation in Cuicatlán: The Question of Río Grande Waters. In *Caciques and Their People: A Volume in Honor of Ronald Spores*, edited by Joyce Marcus, pp. 163–187. Anthropological Papers, no. 89. University of Michigan Museum of Anthropology, Ann Arbor.

Instituto Nacional de Estadística, Geographía, e Informática
undated (based on 1976–1982 maps) *Ciudad de Mexico, Carta Topografica, 1:1,000,000 scale*. Instituto Nacional de Estadística, Geographía, e Informática, México.

Johnson, Frederick and Richard S. MacNeish
1972 Chronometric Dating. In *Chronology and Irrigation*, edited by Frederick Johnson, pp. 3–55. The Prehistory of the Tehuacán Valley, vol. 4. University of Texas Press, Austin.

Johnson, Gregory A.
1977 Aspects of Regional Analysis in Archaeology. *Annual Review of Anthropology* 6:479–508.
1978 Information Sources and the Development of Decision-Making Organizations. In *Social Archaeology: Beyond Subsistence and Dating*, edited by Charles L. Redman, Mary Jane Berman, Edward V. Curtin, William T. Langhorne, Jr., Nina M. Versaggi and Jeffery C. Wanser, pp. 87–112. Academic Press, New York.
1980 Rank-Size Convexity and System Integration: A View from Archaeology. *Economic Geography* 56:234–247.
1981 Monitoring Complex System Integration and Boundary Phenomena with Settlement Size Data. In *Archaeological Approaches to the Study of Complexity*, edited by Sander E. van der Leeuw, pp. 143–188. Cingula, no. 6. Albert Egges van Giffen Instituut voor Prae- en Protohitorie, Universiteit van Amsterdam, Amsterdam.
1982 Organizational Structure and Scalar Stress. In *Theory and Explanation in Archaeology: The Southampton Conference*, edited by Colin F. Renfrew, Michael J. Rowlands and Barbara A. Segraves, pp. 389–421. Academic Press, New York.

Joralemon, Peter David
1971 *A Study of Olmec Iconography*. Studies in Pre-Columbian Art and Archaeology, no. 7. Dumbarton Oaks, Washington, D.C.

Kirchoff, Paul
1943 Mesoamérica: Sus Límites Geográficos, Composición Étnica y Caracteres Culturales. *Acta Americana* 1:92–107.
1952 Mesoamerica: Its Geographic Limits, Ethnic Composition and Cultural

Characteristics. In *Heritage of Conquest: The Ethnology of Middle America*, edited by Sol Tax, pp. 17–30. Translated by Norman McQuown. The Free Press, Glencoe, Illinois.

Kirkby, Anne V.T.
1973 *The Use of Land and Water Resources in the Past and Present Valley of Oaxaca, Mexico*. University of Michigan Museum of Anthropology Memoir, no. 5; Prehistory and Human Ecology of the Valley of Oaxaca, vol. 4. University of Michigan Museum of Anthropology, Ann Arbor.

Kirkby, Michael J.
1972 *The Physical Environment of the Nochixtlan Valley, Oaxaca*. Publications in Anthropology, no. 2. Vanderbilt University Department of Anthropology, Nashville.

Kolb, Charles C.
1995 Teotihuacan Period Figurines: A Typological Classification, Their Spatial and Temporal Distribution in the Teotihuacan Valley. In *The Teotihuacan Period Occupation of the Valley: Part 2—Artifact Analyses*, edited by William T. Sanders, pp. 275–465. The Teotihuacan Valley Project Final Report, vol. 3; Occasional Papers in Anthropology, no. 20. Pennsylvania State University, University Park.

Kolb, Charles C. and William T. Sanders
1996 The Surface Survey. In *The Teotihuacan Period Occupation of the Valley: Part 3—The Surface Survey*, edited by William T. Sanders, pp. 484–652. The Teotihuacan Valley Project Final Report, vol. 3; Occasional Papers in Anthropology, no. 21. Pennsylvania State University, University Park.

Kosse, Krisztina
1994 The Evolution of Large, Complex Groups: A Hypothesis. *Journal of Anthropological Archaeology* 13:35–50.

Kowalewski, Stephen A.
1983 Differences in the Site Hierarchies Below Monte Albán and Teotihuacán: A Comparison Based on the Rank-Size Rule. In *The Cloud People: Divergent Evolution of the Zapotec and Mixtec Civilizations*, edited by Kent V. Flannery and Joyce Marcus, pp. 168–169. Academic Press, New York.
1990 The Evolution of Complexity in the Valley of Oaxaca. *Annual Review of Anthropology* 19:39–58.
1991 *Peñoles: Archaeological Survey in the Mixtec Sierra, Mexico*. Report submitted to the National Science Foundation and the National Geographic Society. University of Georgia Department of Anthropology, Athens.
1994 Internal Subdivisions of Communities in the Prehispanic Valley of Oaxaca. In *Factional Competition and Political Development in the New World*, edited by Elizabeth M. Brumfiel and John W. Fox, pp. 127–137. Cambridge University Press, Cambridge.

1995 Large-Scale Ecology in Aboriginal Eastern North America. In *Native American Interactions: Multiscalar Analyses and Interpretations in the Eastern Woodlands*, edited by Michael S. Nassaney and Kenneth E. Sassaman, pp. 147–173. University of Tennessee Press, Knoxville.

1996 Clout, Corn, Copper, Core-Periphery, Culture Area. In *Pre-Columbian World Systems*, edited by Peter N. Peregrine and Gary M. Feinman, pp. 27–37. Monographs in World Archaeology, no. 26. Prehistory Press, Madison, Wisconsin.

2002 Monte Albán: Alfa y Omega. In *Sociedad y Patrimonio Arqueológico en el Valle de Oaxaca: Memoria de la Segunda Mesa Redonda de Monte Albán*, edited by Nelly M. Robles García, pp. 409–434. Instituto Nacional de Antropología e Historia; CONACULTA, México.

Kowalewski, Stephen A., Richard E. Blanton, Gary M. Feinman and Laura Finsten

1983 Boundaries, Scale, and Internal Organization. *Journal of Anthropological Archaeology* 2:32–56.

Kowalewski, Stephen A., Gary M. Feinman, Laura Finsten and Richard E. Blanton

1991 Pre-Hispanic Ballcourts from the Valley of Oaxaca, Mexico. In *The Mesoamerican Ballgame*, edited by Vernon L. Scarborough and David R. Wilcox, pp. 25–44. University of Arizona Press, Tucson.

Kowalewski, Stephen A., Gary M. Feinman, Laura Finsten, Richard E. Blanton and Linda M. Nicholas

1989 *Monte Albán's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlán, the Valley of Oaxaca, Mexico*. Memoirs, no. 23. University of Michigan Museum of Anthropology, Ann Arbor.

Kowalewski, Stephen A., Charles S. Spencer and Elsa M. Redmond

1978 Description of Ceramic Categories. In *Monte Albán: Settlement Patterns at the Ancient Zapotec Capital*, edited by Richard E. Blanton, pp. 167–193. Academic Press, New York.

Kristiansen, Kristian

1998 *Europe Before History*. Cambridge University Press, Cambridge.

Levin, Simon A.

1995 The Problem of Pattern and Scale in Ecology. In *Ecological Time Series*, edited by Thomas M. Powell and John H. Steele, pp. 277–326. Chapman and Hall, New York.

Lind, Michael D.

1991–1992 Unos Problemas con la Cronología de Monte Albán y una Nueva Serie de Nombres para las Fases. *Notas Mesoamericanas* 13:177–192.

1994a Monte Albán y el Valle de Oaxaca Durante el Fase Xoo. In *Monte Albán: Estudios Recientes*, edited by Marcus C. Winter, pp. 99–111. Proyecto Especial

Monte Albán 1992–1994 Contribución, no. 2. Instituto Nacional de Antropología e Historia, Oaxaca.

1994b The Obverse of the Codex of Cholula: Defining the Borders of the Kingdom of Cholula. In *Caciques and Their People: A Volume in Honor of Ronald Spores*, edited by Joyce Marcus and Judith Francis Zeitlin, pp. 87–100. Anthropological Papers, no. 89. University of Michigan Museum of Anthropology, Ann Arbor.

Lind, Michael D. and Javier Urcid Serrano

1990 La Zona Arqueológica de Lambityeco. In *Lecturas Históricas del Estado de Oaxaca*, vol. 1, *Época Prehispánica*, edited by Marcus C. Winter, pp. 287–307. Instituto Nacional de Antropología e Historia, Oaxaca.

Love, Michael W.

1991 Style and Social Complexity in Formative Mesoamerica. In *The Formation of Complex Society in Southeastern Mesoamerica*, edited by William R. Fowler, Jr., pp. 47–76. CRC Press, Boca Raton.

MacNeish, Richard S., Melvin L. Fowler, Ángel García Cook, Frederick A. Peterson, Antoinette Nelken-Terner and James A. Neely (editors)

1975 *Excavations and Reconnaissance*. University of Texas Press, Austin.

MacNeish, Richard S., Antoinette Nelken-Terner and Irmgard W. Johnson

1967 *Nonceramic Artifacts*. The Prehistory of the Tehuacán Valley, vol. 2. University of Texas Press, Austin.

MacNeish, Richard S., Frederick A. Peterson and Kent V. Flannery

1970 *Ceramics*. The Prehistory of the Tehuacán Valley, vol. 3. University of Texas Press, Austin.

MacNeish, Richard S., Frederick A. Peterson and James A. Neely

1975 The Archaeological Reconnaissance. In *Excavations and Reconnaissance*, edited by Richard S. MacNeish, Melvin L. Fowler, Ángel García Cook, Frederick A. Peterson, Antoinette Nelken-Terner and James A. Neely, pp. 341–495. The Prehistory of the Tehuacán Valley, vol. 5. University of Texas Press, Austin.

Manzanilla, Linda (editor)

1993 *Anatomía de un Conjunto Residencial Teotihuacano en Oztoyahualco,* vol. 1, *Las Excavaciones*. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, México.

Manzanilla, Linda

1995 La Zona del Altiplano Central en el Clásico. In *El Horizonte Clásico*, edited by Linda Manzanilla and Leonardo López Luján, pp. 139–173. Historia Antigua de México, vol. 2. Consejo Nacional para la Cultura y las Artes, Universidad Nacional Autónoma de México, México.

1997 Early Urban Societies: Challenges and Perspectives. In *Emergence and Change in*

Early Urban Societies, edited by Linda Manzanilla, pp. 3–39. Plenum Press, New York.

Marcus, Joyce

1989 Zapotec Chiefdoms and the Nature of Formative Religions. In *Regional Perspectives on the Olmec*, edited by Robert J. Sharer and David C. Grove, pp. 148–197. School of American Research Advanced Seminar Series. Cambridge University Press, Cambridge.

1996 The Importance of Context in Interpreting Figurines. *Cambridge Archaeological Journal* 6:285–291.

1998a The Peaks and Valleys of Ancient States: An Extension of the Dynamic Model. In *Archaic States*, edited by Gary M. Feinman and Joyce Marcus, pp. 59–94. School of American Research Press, Santa Fe.

1998b *Women's Ritual in Formative Oaxaca: Figurine-Making, Divination, Death and the Ancestors*. Prehistory and Human Ecology of the Valley of Oaxaca, vol. 11; Memoirs, no. 33. University of Michigan Museum of Anthropology, Ann Arbor.

1999a Early Architecture in the Valley of Oaxaca: 1350 B.C.–A.D. 500. In *Mesoamerican Architecture as a Cultural Symbol*, edited by Jeff Karl Kowalski, pp. 58–75. Oxford University Press, New York.

1999b Men's and Women's Ritual in Formative Oaxaca. In *Social Patterns in Pre-Classic Mesoamerica: A Symposium at Dumbarton Oaks, 9 and 10 October 1993*, edited by David C. Grove and Rosemary A. Joyce, pp. 67–96. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Marcus, Joyce and Kent V. Flannery

1996 *Zapotec Civilization: How Urban Society Evolved in Mexico's Oaxaca Valley*. Thames and Hudson, London.

Markens, Robert and Cira Martínez López

2001 Resumen de la Cerámica de la Fase Xoo (Época Monte Albán IIIB-IV) en el Valle de Oaxaca. In *Memoria de la Primera Mesa Redonda de Monte Albán: Procesos de Cambio y Conceptualización del Tiempo*, edited by Nelly M. Robles García, pp. 303–327. Instituto Nacional de Antropología e Historia; CONACULTA, México.

Markman, Charles W.

1981 *Prehistoric Settlement Dynamics in Central Oaxaca, Mexico: A View from the Miahuatlán Valley*. Publications in Anthropology, no. 26. Vanderbilt University Department of Anthropology, Nashville.

Marlowe, Greg

1999 Year One: Radiocarbon Dating and American Archaeology, 1947–1948. *American Antiquity* 64:9–32.

Marquina, Ignacio

1970 Pirámide de Cholula. In *Proyecto Cholula*, edited by Ignacio Marquina, pp.

31–45. Serie Investigaciones, no. 19. Instituto Nacional de Antropología e Historia, México.

Martín del Pozzo, Ana Lillian, Carlos F. de A. Córdoba and Javier López Camacho
1997 Volcanic Impact on the Southern Basin of Mexico during the Holocene. *Quaternary International* 43–44:181–190.

Martínez López, Cira, Robert Markens, Marcus C. Winter and Michael D. Lind
2000 *Cerámica de la Fase Xoo (Epoca Monte Albán IIIB–IV) del Valle del Oaxaca*. Proyecto Especial Monte Albán 1992–1994 Contribución, no. 8. Centro Instituto Nacional de Antropología e Historia—Oaxaca, Oaxaca.

Martínez López, Cira and Marcus C. Winter
1994 *Figurillas y Silbatos de Cerámica de Monte Albán*. Contribución del Proyecto Especial Monte Albán 1992–1994, no. 5. Instituto Nacional de Antropología e Historia Centro Regional de Oaxaca, Oaxaca.

Martínez López, Cira, Marcus C. Winter and Pedro Antonio Juárez
1996 Entierros Humanos del Proyecto Especial Monte Albán, 1992–1994. In *Entierros Humanos de Monte Albán: Dos Estudios*, edited by Marcus C. Winter, pp. 79–244. Contribución del Proyecto Especial Monte Albán 1992–1994, no. 7. Instituto Nacional de Antropología e Historia—Centro Oaxaca, Oaxaca.

Mastache, Alba Guadalupe and Ana María Crespo Oviedo
1974 La Ocupación Prehispánica en el Área de Tula, Hidalgo. In *Proyecto Tula, Primera Parte*, edited by Eduardo Matos Moctezuma, pp. 74–103. Departamento de Monumentos Prehispánicos, Colección Científica, no. 15. Instituto Nacional de Antropología e Historia, México.

Matos Moctezuma, Eduardo (editor)
1999 *Excavaciones en la Catedral y el Sagrario Metropolitanos: Programa de Arqueología Urbana*. Instituto Nacional de Antropología e Historia, México.
2001 The Ballcourt at Tenochtitlan. In *The Sport of Life and Death: The Mesoamerican Ballgame*, edited by E. Michael Whittington, pp. 89–95. Thames and Hudson, New York.

Matos Moctezuma, Eduardo and John M.D. Pohl
1999 The Templo Mayor of Tenochtitlan: Cosmic Center of the Aztec Universe. In *Mesoamerican Architecture as a Cultural Symbol*, edited by Jeff Karl Kowalski, pp. 198–219. Oxford University Press, New York.

McCafferty, Geoffrey G.
1996a The Ceramics and Chronology of Cholula, Mexico. *Ancient Mesoamerica* 7:299–323.

1996b Reinterpreting the Great Pyramid of Cholula, Mexico. *Ancient Mesoamerica* 7:1–17.

2000 Tollan Chollolan and the Legacy of Legitimacy During the Classic-Postclassic Transition. In *Mesoamerica's Classic Heritage: From Teotihuacán to the Aztecs*, edited by Davíd Carrasco, Lindsay Jones and Scott Sessions, pp. 341–367. University Press of Colorado, Niwot.

McGuire, Randall H.

1996 The Limits of World-Systems Theory for the Study of Prehistory. In *Pre-Columbian World Systems*, edited by Peter N. Peregrine and Gary M. Feinman, pp. 51–64. Monographs in World Archaeology, no. 26. Prehistory Press, Madison, Wisconsin.

Meentemeyer, Vernon

1989 Geographical Perspectives on Space, Time, and Scale. *Landscape Ecology* 3(3/4):163–173.

Meentemeyer, Vernon and Elgene O. Box

1987 Scale Effects in Landscape Studies. In *Landscape Heterogeneity and Disturbance*, edited by Monica Goigel Turner, pp. 15–34. Ecological Studies, vol. 64. Springer-Verlag, New York.

Merlo Juarez, Eduardo

1980 Las Rutas de Intercambio en el Sur de Puebla (Época Prehíspanica). In *Rutas de Intercambio en Mesoamérica y el Norte de México*, vol. 1, pp. 265–269. Sociedad Mexicana de Antropología, Saltillo.

Millon, René F.

1981 Teotihuacan: City, State, and Civilization. In *Archaeology*, pp. 198–243. Supplement to the Handbook of Middle American Indians. vol. 1. University of Texas Press, Austin.

1988 The Last Years of Teotihuacan Dominance. In *The Collapse of Ancient States and Civilizations*, edited by Norman Yoffee and George L. Cowgill, pp. 102–164. University of Arizona Press, Tucson.

1993 The Place Where Time Began: An Archaeologist's Interpretation of What Happened in Teotihuacán History. In *Teotihuacan: Art from the City of the Gods*, edited by Kathleen Berrin and Esther Pasztory, pp. 17–43. The Fine Arts Museums of San Francisco; Thames and Hudson, San Francisco.

Minc, Leah D., Mary G. Hodge and M. James Blackman

1994 Stylistic and Spatial Variability in Early Aztec Ceramics: Insights into Pre-Imperial Exchange Systems. In *Economies and Polities in the Aztec Realm*, edited by Mary G. Hodge and Michael E. Smith, pp. 133–174. Studies on Culture and Society, no. 6. State University of New York at Albany Institute for Mesoamerican Studies, Albany, New York.

Monaghan, John
1994 Irrigation and Ecological Complementarity in Mixtec *Cacicazgos.* In *Caciques and Their People: A Volume in Honor of Ronald Spores*, edited by Joyce Marcus, pp. 143–161. Anthropological Papers, no. 89. University of Michigan Museum of Anthropology, Ann Arbor.

Morelos García, Noel
1998 El Advenimiento de la Sociedad Urbana: Una Reinterpretación de la Cronología para Teotihuacán. In *Los Ritmos de Cambio en Teotihuacán: Reflexiones y Discusiones de su Cronología*, edited by Rosa Brambila Paz and Rubén Cabrera Castro, pp. 81–102. Colección Científica, Serie Arqueología, no. 366. Instituto Nacional de Antropología e Historia, México, D.F.

Moore, Jerry D.
1996 The Archaeology of Plazas and the Proxemics of Ritual: Three Andean Traditions. *American Anthropologist* 98(4):789–802.

Nagao, Debra
1989 Public Proclamation in the Art of Cacaxtla and Xochicalco. In *Mesoamerica After the Decline of Teotihuacan, A.D. 700–900*, edited by Richard A. Diehl and Janet Catherine Berlo, pp. 83–104. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Nárez Z., Jesús
1980 Algunas Aportaciones para el Estudio de las Rutas de Intercambio en Puebla: La Región de Oriental. In *Rutas de Intercambio en Mesoamérica y el Norte de México*, vol. 1, edited by Sociedad Mexicana de Antropología, pp. 251–256. Sociedad Mexicana de Antropología, Saltillo.

Nash, Stephen E. (editor)
2000 *It's About Time: A History of Archaeological Dating in North America*. University of Utah Press, Salt Lake City.

Neff, Hector, Michael D. Glascock, Thomas H. Charlton, Cynthia L. otis Charlton and Deborah L. Nichols
2000 Provenience Investigation of Ceramics and Obsidian from Otumba. *Ancient Mesoamerica* 11:307–321.

Neitzel, Jill E.
2000 What is a Regional System? Issues of Scale and Interaction in the Prehistoric Southwest. In *The Archaeology of Regional Interaction: Religion, Warfare, and Exchange across the American Southwest and Beyond—Proceedings of the 1996 Southwest Symposium*, edited by Michelle Hegmon, pp. 25–40. University Press of Colorado, Boulder.

Nicholas, Linda M.

1989 Land Use in Prehispanic Oaxaca. In *Monte Albán's Hinterland, Part II: Prehispanic Settlement Patterns in Tlacolula, Etla, and Ocotlán, the Valley of Oaxaca, Mexico*, edited by Stephen A. Kowalewski, Gary M. Feinman, Laura Finsten, Richard E. Blanton and Linda M. Nicholas, pp. 449–505. Memoirs, no 23. University of Michigan Museum of Anthropology, Ann Arbor.

Nichols, Deborah L.

1996 An Overview of Regional Settlement Pattern Survey in Mesoamerica: 1960–1995. In *Arqueología Mesoamericana: Homenaje a William T. Sanders*, vol. 1, edited by Alba Guadalupe Mastache, Jeffrey R. Parsons, Robert S. Santley and Mari Carmen Serra Puche, pp. 59–95. Instituto Nacional de Antropología e Historia; Arqueología Mexicana, México, D.F.

Nichols, Deborah L. and Thomas H. Charlton (editors)

1997 *The Archaeology of City-States: Cross-Cultural Approaches*. Smithsonian Institution Press, Washington, D.C.

Nicholson, Henry B. and Eloise Quiñones Keber (editors)

1994 *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*. Labyrinthos, Culver City, California.

Niederberger, Christine

1987 *Paleopaysages et Archéologie Pre-Urbaine du Bassin de Mexico (Mexique)*. Etudes Mesoamericaines, vol. 11, book 2. Centre d'Etudes Mexicaines et Centraméricaines, México.

Noguera, Eduardo

1947 Cerámica de Xochicalco. *El México Antiguo* 6(9–12):273–298.

1954 *La Cerámica Arqueológica de Cholula*. Biblioteca de Historia y Arqueología Americanas. Editorial Guaranía, México.

1965 *La Cerámica Arqueológica de Mesoamérica*. Publicaciones, 1st ser., no. 86; serie Antropológica, no. 8. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, Ciudad Universitaria.

O'Neill, R.V. and A.W. King

1998 Homage to St. Michael: or, Why are There So Many Books on Scale? In *Ecological Scale: Theory and Applications*, edited by David L. Peterson and V. Thomas Parker, pp. 3–15. Columbia University Press, New York.

Olmo Frese, Laura del (editor)

1999 *Análisis de la Ofrenda 98 del Templo Mayor de Tenochitlan*. Instituto Nacional de Antropología e Historia, México.

Orozco y Berra, Manuel

1992 [1522] Mapa para Servir de Intinerario de la Conquista Española. In *Cartas de Relación*, edited by Manuel Alcalá, pp. between pages 136 and 137. 16th ed. "Sepan Cuantos…", no. 7. Editorial Porrúa, México.

Ortíz C., Poinciano and María del Carmen Rodríguez

1999 Olmec Ritual Behavior at El Manatí: A Sacred Space. In *Social Patterns in Pre-Classic Mesoamerica: A Symposium at Dumbarton Oaks, 9 and 10 October 1993*, edited by David C. Grove and Rosemary A. Joyce, pp. 225–254. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Otis Charlton, Cynthia L. and Thomas H. Charlton

2000 The Trade Route Survey—1975: Axapusco-Tlamapa Surface Survey Area. In *The Aztec Period Occupation of the Valley: Part 2—Excavations at T.A. 40 and Related Projects*, edited by William T. Sanders and Susan Toby Evans, pp. 565–574. The Teotihuacan Valley Project Final Report, vol. 5; Occasional Papers in Anthropology, no. 26. Pennsylvania State University, University Park.

Parry, William J.

1987 *Chipped Stone Tools in Formative Oaxaca, Mexico: Their Procurement, Production, and Use*. Memoirs, no. 20; Prehistory and Human Ecology of the Valley of Oaxaca, vol. 8. University of Michigan Museum of Anthropology, Ann Arbor.

2001 Production and Exchange of Obsidian Tools in Late Aztec City-States. *Ancient Mesoamerica* 12:101–111.

Parsons, Jeffrey R.

1971 *Prehistoric Settlement Patterns in the Texcoco Region, Mexico*. Memoirs, no. 3. University of Michigan Museum of Anthropology, Ann Arbor.

1987 El Área Central de Teotihuacan. In *El Auge y la Caída del Clásico en el México Central*, edited by Joseph B. Mountjoy and Donald L. Brockington, pp. 37–75. Arqueología, Serie Antropológica, no. 89. Universidad Nacional Autónoma de México, México.

1996 *Tequesquite* and *Ahuauhtle*: Rethinking the Prehistoric Productivity of Lake Texcoco-Xaltocan-Zumpango. In *Arqueología Mesoamericana: Homenaje a William T. Sanders*, vol. 1, edited by Alba Guadalupe Mastache, Jeffrey R. Parsons, Robert S. Santley and Mari Carmen Serra Puche, pp. 439–459. Instituto Nacional de Antropología e Historia; Arqueología Mexicana, México, D.F.

Parsons, Jeffrey R., Elizabeth M. Brumfiel and Mary G. Hodge

1996 Developmental Implications of Earlier Dates for Early Aztec in the Basin of Mexico. *Ancient Mesoamerica* 7:217–230.

Parsons, Jeffrey R., Elizabeth M. Brumfiel, Mary Hrones Parsons and David J. Wilson

1982 *Prehispanic Settlement Patterns in the Southern Valley of Mexico: The Chalco-*

Xochimilco Region. University of Michigan Museum of Anthropology Memoirs, no. 14. University of Michigan Museum of Anthropology, Ann Arbor.

Parsons, Jeffrey R., Keith W. Kintigh and Susan A. Gregg

1983 *Archaeological Settlement Pattern Data from the Chalco, Xochimilco, Ixtapalapa, Texcoco and Zumpango Regions, Mexico*. Technical Report, no. 14; Research Reports in Archaeology Contribution, no. 9. University of Michigan Museum of Anthropology, Ann Arbor.

Parsons, Jeffrey R. and Mary Hrones Parsons

1990 *Maguey Utilization in Highland Central Mexico: An Archaeological Ethnography*. Anthropological Papers, no. 82. University of Michigan Museum of Anthropology, Ann Arbor.

Parsons, Jeffrey R. and William T. Sanders

2000 The 1966 Survey of Zones 10 and 17 of the Teotihuacan Valley. In *The Aztec Period Occupation of the Valley: Part 2—Excavations at T.A. 40 and Related Projects*, edited by William T. Sanders and Susan Toby Evans, pp. 501–563. The Teotihuacan Valley Project Final Report, vol. 5; Occasional Papers in Anthropology, no. 26. Pennsylvania State University, University Park.

Parsons, Mary Hrones

1972a Aztec Figurines from the Teotihuacán Valley, Mexico. In *Miscellaneous Studies in Mexican Prehistory*, edited by Michael W. Spence, Jeffrey R. Parsons and Mary Hrones Parsons, pp. 81–125. Anthropological Papers, no 45. Museum of Anthropology University of Michigan, Ann Arbor.

1972b Spindle Whorls from the Teotihuacán Valley, Mexico. In *Miscellaneous Studies in Mexican Prehistory*, edited by Michael W. Spence, Jeffrey R. Parsons and Mary Hrones Parsons, pp. 45–79. Anthropological Papers, no 45. Museum of Anthropology University of Michigan, Ann Arbor.

1975 The Distribution of Late Postclassic Spindle Whorls in the Valley of Mexico. *American Antiquity* 40:207–215.

Pastor, Rodolfo

1987 *Campesinos y Reformas: La Mixteca, 1700–1856*. El Colegio de México, México.

Payne, William O.

1994 The Raw Materials and Pottery-Making Techniques of Early Formative Oaxaca: An Introduction. In *Early Formative Pottery of the Valley of Oaxaca*, edited by Kent V. Flannery and Joyce Marcus, pp. 7–20. University of Michigan Museum of Anthropology Memoirs, no. 27. Prehistory and Human Ecology of the Valley of Oaxaca, vol. 10. University of Michigan Museum of Anthropology, Ann Arbor.

Pazdur, Ana and Mieczyslaw F. Pazdur

1994 Fundamental Concepts and Archaeological Applications of the Radiocarbon Dating Method. In *Andes: Radiocarbon Database for Bolivia, Ecuador and Peru*, edited by Mariusz S. Ziólkowski, Mieczyslaw F. Pazdur, Andrzej Krzanowski and Adam Michczynski, pp. 25–58. Andean Archaeological Mission of the Institute of Archaeology Warsaw University and Gliwice Radiocarbon Laboratory of the Institute of Physics Silesian Technical University, Warsawa & Gliwice.

Peregrine, Peter N.

1996a Archaeology and World-Systems Theory. *Sociological Inquiry* 66:486–495.

1996b Introduction: World-Systems Theory and Archaeology. In *Pre-Columbian World Systems*, edited by Peter N. Peregrine and Gary M. Feinman, pp. 1–10. Monographs in World Archaeology, no. 26. Prehistory Press, Madison, Wisconsin.

Peterson, David L. and V. Thomas Parker

1998 Dimensions of Scale in Ecology, Resource Management, and Society. In *Ecological Scale: Theory and Applications*, edited by David L. Peterson and V. Thomas Parker, pp. 499–522. Columbia University Press, New York.

Piña Chán, Román

1971 Preclassic or Formative Pottery and Minor Arts of the Valley of Mexico. In *Archaeology of Northern Mesoamerica, Part 1*, edited by Robert Wauchope, Gordon F. Ekholm and Ignacio Bernal, pp. 157–178. Handbook of Middle American Indians, vol. 10. University of Texas Press, Austin.

Pires-Ferreira, Jane W.

1976 Obsidian Exchange in Formative Mesoamerica. In *The Early Mesoamerican Village*, edited by Kent V. Flannery, pp. 292–306. Academic Press, New York.

Plunket, Patricia S.

1983 *An Intensive Survey in the Yucuita Sector of the Nochixtlán Valley, Oaxaca, Mexico.* Unpublished Ph.D. dissertation, Department of Anthropology, Tulane University, New Orleans.

1990 Arqueología y Etnohistoria en el Valle de Atlixco. *Notas Mesoamericanas* 12:3–18.

Plunket, Patricia S. and Monica Blanco García Méndez

1989 Teotihuacán y el Valle de Atlixco. *Notas Mesoamericanas* 11:120–132.

Pohl, John M.D.

1994 *The Politics of Symbolism in the Mixtec Codices*. Publications in Anthropology, no. 46. Vanderbilt University Department of Anthropology, Nashville.

Pollock, Susan
1999 *Ancient Mesopotamia: The Eden that Never Was*. Cambridge University Press, Cambridge.

Postgate, J. Nicholas
1994 How Many Sumerians per Hectare?—Probing the Anatomy of an Early City. *Cambridge Archaeological Journal* 4:47–65.

Pyburn, K. Anne
1997 The Archaeological Signature of Complexity in the Maya Lowlands. In *The Archaeology of City-States: Cross-Cultural Approaches*, edited by Deborah L. Nichols and Thomas H. Charlton, pp. 155–168. Smithsonian Institution Press, Washington, D.C.

Pye, Mary E. and John E. Clark
2000 Introducing Olmec Archaeology. In *Olmec Art and Archaeology in Mesoamerica*, edited by John E. Clark and Mary E. Pye, pp. 9–17. Studies in the History of Art, no. 58; Center for Advanced Study in the Visual Arts Symposium Papers, no. 35. Yale University Press, New Haven.

Rattray, Evelyn Childs
1990 New Findings of the Origins of Thin Orange Ceramics. *Ancient Mesoamerica* 1:181–195.
1991 Fechamientos por Radiocarbono en Teotihuacán. *Arqueología*, segunda época (6):3–18.
1996 A Regional Perspective on the Epiclassic Period in Central Mexico. In *Arqueología Mesoamericana: Homenaje a William T. Sanders*, vol. 1, edited by Alba Guadalupe Mastache, Jeffrey R. Parsons, Robert S. Santley and Mari Carmen Serra Puche, pp. 213–231. Instituto Nacional de Antropología e Historia; Arqueología Mexicana, México, D.F.
2001 *Teotihuacan: Cerámica, Cronología y Tendencias Culturales/Teotihuacan: Ceramics, Chronology and Cultural Trends*. University of Pittsburgh, Pittsburgh.

Redmond, Elsa M.
1983 *A Fuego y Sangre: Early Zapotec Imperialism in the Cuicatlán Cañada, Oaxaca*. Memoirs, no. 16; Studies in Latin American Ethnohistory and Archaeology, vol. 1. University of Michigan Museum of Anthropology, Ann Arbor.

Redmond, Elsa M. and Charles S. Spencer
1994 The Cacicazgo: An Indigenous Design. In *Caciques and Their People: A Volume in Honor of Ronald Spores*, edited by Joyce Marcus and Judith Francis Zeitlin, pp. 189–225. University of Michigan Museum of Anthropology Anthropological Papers, no. 89. University of Michigan Museum of Anthropology, Ann Arbor.

Renfrew, Colin F.

1978 Space, Time and Polity. In *The Evolution of Social Systems*, edited by Jonathan Friedman and Michael J. Rowlands, pp. 89–112. University of Pittsburgh Press, Pittsburgh.

1979 Systems Collapse as Social Transformation: Catastrophe and Anastrophe in Early State Societies. In *Transformations: Mathematical Approaches to Culture Change*, edited by Colin F. Renfrew and Kenneth L. Cooke, pp. 481–506. Academic Press, New York.

Reyes Cortés, Manuel

1979 *Geología de la Cuenca de Oriental: Estados de Puebla, Veracruz, y Tlaxcala*. Colección Científica, Serie Arqueología, no. 71. Instituto Nacional de Antropología e Historia, Departamento de Prehistória, México.

Reyna Robles, Rosa María

1981 Cronología Relativa en Dos Sitios Preclásicos de la Región Simbiótica del Centro de México. In *Interacción Cultural en México Central*, edited by Evelyn Childs Rattray, Jaime Litvak King and Clara Luz Díaz Oyarzabal, pp. 35–42. Serie Antropológica, no. 41. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, México.

Ringle, William M., Tomás Gallareta Negrón and George J. Bey, III

1998 The Return of Quetzalcoatl: Evidence for the Spread of a World Religion During the Epiclassic Period. *Ancient Mesoamerica* 9:183–232.

Rivera Guzmán, Ángel Iván

1999 *El Patrón de Asentamiento en la Mixteca Baja de Oaxaca: Análisis del Área de Tequixtepec-Chazumba.* MA, Escuela Nacional de Antropología.

Romero Frizzi, María de los Ángeles

1990a *Economía y Vida de los Españoles en la Mixteca Alta: 1519–1720*. Instituto Nacional de Antropología e Historia Colección Regiones de México, Oaxaca.

1990b Evolución Económica de la Mixteca Alta. In *Época Colonial*, edited by María de los Ángeles Romero Frizzi, pp. 317–343. Lecturas Históricas del Estado de Oaxaca, vol. 2. Instituto Nacional de Antropología e Historia, México, D.F.

1996 *El Sol y La Cruz: Los Pueblos Indios de Oaxaca Colonial*. Historia de los Pueblos Indígenas de México. Centro de Investigaciones y Estudios Superiores en Antropología Social, Tlalpan.

Sánchez de la Barquera Arroyo, Elvia Cristina

1996 *Figurillas Prehispánicas del Valle de Atlixco, Puebla*. Colección Científica, Serie Arqueología, no. 355. Instituto Nacional de Antropología e Historia, México.

Sanders, William T.
1965 *The Cultural Ecology of the Teotihuacán Valley: A Preliminary Report of the Results of the Teotihuacán Valley Project*. Pennsylvania State University Department of Sociology and Anthropology, University Park.
1970 The Population of the Teotihuacan Valley, the Basin of Mexico and the Central Mexican Symbiotic Region in the Sixteenth Century. In *The Natural Environment, Contemporary Occupation and 16th Century Population of the Valley*, edited by William T. Sanders, Anton J. Kovar, Thomas H. Charlton and Richard A. Diehl, pp. 385–457. Teotihuacan Valley Project Final Report, vol. 1; Occasional Papers, no. 3. Pennsylvania State University Department of Anthropology, University Park.
1972 Population, Agricultural History, and Societal Evolution in Mesoamerica. In *Population Growth: Anthropological Implications*, edited by Brian Spooner, pp. 101–153. MIT Press, Cambridge.
1976a The Agricultural History of the Basin of Mexico. In *The Valley of Mexico: Studies in Pre-Hispanic Ecology and Society*, edited by Eric R. Wolf, pp. 101–159. University of New Mexico Press, Albuquerque.
1976b The Natural Environment of the Basin of Mexico. In *The Valley of Mexico: Studies in Pre-Hispanic Ecology and Society*, edited by Eric R. Wolf, pp. 59–67. University of New Mexico Press, Albuquerque.
1986 *The Toltec Period Occupation of the Valley: Part 1—Excavations and Ceramics*. Pennsylvania State University, University Park.
1987 *The Toltec Period Occupation of the Valley: Part 2—Surface Survey and Special Studies*. Pennsylvania State University, University Park.
1989 The Epiclassic as a Stage in Mesoamerican Prehistory: An Evaluation. In *Mesoamerica After the Decline of Teotihuacan, A.D. 700–900*, edited by Richard A. Diehl and Janet Catherine Berlo, pp. 211–218. Dumbarton Oaks Research Library and Collection, Washington, D.C.
1994 *The Teotihuacan Period Occupation of the Valley: Part 1—The Excavations*. Pennsylvania State University, University Park.
1995 *The Teotihuacan Period Occupation of the Valley: Part 2—Artifact Analyses*. Pennsylvania State University, University Park.
1996a *The Teotihuacan Period Occupation of the Valley: Part 3—The Surface Survey*. Pennsylvania State University, University Park.
1996b *The Teotihuacan Period Occupation of the Valley: Part 4—Special Analyses, Miscellaneous Appendices, and Volume Bibliography*. Pennsylvania State University, University Park.
1999 Three Valleys: Twenty-Five Years of Settlement Archaeology in Mesoamerica. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 12–21. Smithsonian Institution Press, Washington, D.C.
2000 Methodology: The Surface Survey. In *The Aztec Period Occupation of the Valley: Part 1—Natural Environment, 20th Century Occupation, Survey Methodology, and Site Descriptions*, edited by Susan Toby Evans and William T. Sanders, pp. 59–84. The

Teotihuacan Valley Project Final Report, vol. 5; Occasional Papers in Anthropology, no. 25. Pennsylvania State University, University Park.

Sanders, William T. and Susan Toby Evans (editors)
2000 *The Aztec Period Occupation of the Valley: Part 2—Excavations at T.A. 40 and Related Projects*. Pennsylvania State University, University Park.

Sanders, William T. and Deborah L. Nichols
1988 Ecological Theory and Cultural Evolution in the Valley of Oaxaca. *Current Anthropology* 29:33–80.

Sanders, William T., Jeffrey R. Parsons and Robert S. Santley
1979 *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. Academic Press, New York.

Sanders, William T. and Barbara J. Price
1968 *Mesoamerica: The Evolution of a Civilization*. Random House, New York.

Sanders, William T., Michael West, Charles Fletcher and Joseph Marino, Jr.
1975a *The Formative Period Occupation of the Valley: Part 1—Texts and Tables*. The Teotihuacan Valley Project Final Report, vol. 2; Occasional Papers in Anthropology, no. 10. Pennsylvania State University Department of Anthropology, University Park.
1975b *The Formative Period Occupation of the Valley: Part 2—Plates and Figures*. The Teotihuacan Valley Project Final Report, vol. 2; Occasional Papers in Anthropology, no. 10. Pennsylvania State University Department of Anthropology, University Park.

Sanderson, Stephen K.
1990 *Social Evolutionism: A Critical History*. Basil Blackwell, Oxford.
1995 *Social Transformations: A General Theory of Historical Development*. Blackwell, Oxford.

Santley, Robert S., Michael J. Berman and Rani T. Alexander
1991 The Politicization of the Mesoamerican Ballgame and Its Implications for the Interpretation of the Distribution of Ballcourts in Central Mexico. In *The Mesoamerican Ballgame*, edited by Vernon L. Scarborough and David R. Wilcox, pp. 3–24. University of Arizona Press, Tucson.

Santley, Robert S., Janet M. Kerley and Thomas P. Barrett
1995 Teotihuacan Period Obsidian Assemblages from the Teotihuacan Valley. In *The Teotihuacan Period Occupation of the Valley: Part 2—Artifact Analyses*, edited by William T. Sanders, pp. 466–483. The Teotihuacan Valley Project Final Report, vol. 3; Occasional Papers in Anthropology, no. 20. Pennsylvania State University, University Park.

Sbonias, Kostas

1999 Introduction to Issues in Demography and Survey. In *Reconstructing Past Population Trends in Mediterranean Europe (3000 BC – AD 1800)*, edited by John L. Bintliff and Kostas Sbonias, pp. 1–20. The Archaeology of Mediterranean Landscapes, vol. 1, Graeme Barker and D.J. Mattingly, general editors. Oxbow Books, Oxford.

Serra Puche, Mari Carmen

1988 *Los Recursos Lacustres de la Cuenca de México Durante el Formativo*. Colección Posgrado, no. 3. Universidad Nacional Autónoma de México Instituto de Investigaciones Antropológicas, México.

Service, Elman R.

1962 *Primitive Social Organization: An Evolutionary Perspective*. Random House, New York.

Shennan, Stephen J.

1988 *Quantifying Archaeology*. Edinburgh University Press, Edinburgh.

Siebe, Claus

2000 Age and Archaeological Implications of Xitle Volcano, Southwestern Basin of Mexico-City. *Journal of Volcanology and Geothermal Research* 104:45–64.

Smith, Carol A.

1976a Exchange Systems and the Spatial Distribution of Elites: The Organization of Stratification in Agrarian Societies. In *Regional Analysis,* vol. 2*, Social Systems*, edited by Carol A. Smith, pp. 309–374. Academic Press, New York.

1976c Regional Economic Systems: Linking Geographical Models and Socioeconomic Problems. In *Regional Analysis,* vol. 1, *Economic Systems*, edited by Carol A. Smith, pp. 3–63. Academic Press, New York.

Smith, Carol A. (editor)

1976b *Regional Analysis*. 2 vols. Academic Press, New York.

Smith, Charlotte A.

1993 *Prehispanic Mixtec Social Organization: The Architectural Evidence.* Unpublished Master's thesis, University of Georgia.

Smith, Michael E.

1996 The Strategic Provinces. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger, pp. 137–150. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Smith, Michael E. and Frances F. Berdan

1996 Province Descriptions. In *Aztec Imperial Strategies*, edited by Frances F. Berdan, Richard E. Blanton, Elizabeth Hill Boone, Mary G. Hodge, Michael E. Smith and Emily Umberger, pp. 265–349. Dumbarton Oaks Research Library and Collection, Washington, D.C.

Smith, Michael E. and Mary G. Hodge

1994 An Introduction to Late Postclassic Economies and Polities. In *Economies and Polities in the Aztec Realm*, edited by Mary G. Hodge, pp. 1–42. Studies on Culture and Society, no. 6. State University of New York at Albany Institute for Mesoamerican Studies, Albany, New York.

Smith, Michael E. and T. Jeffrey Price

1994 Aztec-Period Agricultural Terraces in Morelos, Mexico: Evidence for Household-Level Agricultural Intensification. *Journal of Field Archaeology* 21:169–179.

Sorenson, John L.

2000 A Mesoamerican Chronology in Process, Salt Lake City. Unpublished manuscript in possession of the author.

Spence, Michael W.

1987a La Evolución del Sistema de Producción de Obsidiana en Teotihuacan. In *El Auge y la Caída del Clásico en el México Central*, edited by Joseph B. Mountjoy and Donald L. Brockington, pp. 87–128. Arqueología, Serie Antropológica, no. 89. Universidad Nacional Autónoma de México, México.

1987b The Scale and Structure of Obsidian Production in Teotihuacan. In *Teotihuacan: Nuevos Datos, Nuevas Síntesis, Nuevos Problemas*, edited by Emily McClung de Tapia and Evelyn Childs Rattray, pp. 429–450. Arqueología, Serie Antropológica, no. 72. Instituto de Investigaciones Antropológicas, Universidad Nacional Autónoma de México, Ciudad Universitaria.

Spencer, Charles S.

1982 *The Cuicatlán Cañada and Monte Albán: A Study of Primary State Formation.* Academic Press, New York.

Spencer, Charles S. and Elsa M. Redmond

1997 *Archaeology of the Cañada de Cuicatlán, Oaxaca.* Anthropological Papers, no. 80. American Museum of Natural History, New York.

Spores, Ronald

1965 The Zapotec and Mixtec at Spanish Conquest. In *Archaeology of Southern Mesoamerica, part 2*, edited by Gordon R. Willey, pp. 962–987. Handbook of Middle American Indians, vol. 3, Robert Wauchope, general editor. University of Texas Press, Austin.

1969 Settlement, Farming Technology, and Environment in the Nochixtlan Valley. *Science* 116(3905):557–568.

1972 *An Archaeological Settlement Survey of the Nochixtlán Valley, Oaxaca*. Publications in Anthropology, no. 1. Vanderbilt University Department of Anthropology, Nashville.

1974 *Stratigraphic Excavations in the Nochixtlan Valley, Oaxaca*. Publications in Anthropology, no. 11. Vanderbilt University Department of Anthropology, Nashville.

1983 Middle and Late Formative Settlement Patterns in the Mixteca Alta. In *The Cloud People: Divergent Evolution of the Zapotec and Mixtec Civilizations*, edited by Kent V. Flannery and Joyce Marcus, pp. 72–74. Academic Press, New York.

1984 *The Mixtecs in Ancient and Colonial Times*. Civilization of the American Indian Series, vol. 168. University of Oklahoma Press, Norman.

1993 Tututepec: A Post-Classic Period Mixtec Conquest State. *Ancient Mesoamerica* 4:167–174.

Stark, Barbara L. and Philip J. Arnold, III (editors)

1997 *Olmec to Aztec: Settlement Patterns in the Ancient Gulf Lowlands*. University of Arizona Press, Tucson.

Steponaitis, Vincas P.

1978 Location Theory and Complex Chiefdoms: A Mississippian Example. In *Mississippian Settlement Patterns*, edited by Bruce D. Smith, pp. 417–453. Academic Press, New York.

1981 Settlement Hierarchies and Political Complexity in Nonmarket Societies: The Formative Period in the Valley of Mexico. *American Anthropologist* 83:320–363.

Stiver, Laura R.

2001 *Prehispanic Mixtec Settlement and State in the Teposcolula Valley of Oaxaca, Mexico.* Unpublished Ph.D. dissertation, Department of Anthropology, Vanderbilt University, Nashville.

Sugiyama, Saburo

1998 Termination Programs and Prehispanic Looting at the Feathered Serpent Pyramid in Teotihuacan, Mexico. In *The Sowing and the Dawning: Termination, Dedication, and Transformation in the Archaeological and Ethnographic Record of Mesoamerica*, edited by Shirley Boteler Mock, pp. 147–164. University of New Mexico Press, Albuquerque.

Taladoire, Eric

2001 The Architectural Background of the Pre-Hispanic Ballgame: An Evolutionary Perspective. In *The Sport of Life and Death: The Mesoamerican Ballgame*, edited by E. Michael Whittington, pp. 97–115. Thames and Hudson, New York.

Taylor, R.E.
1987 *Radiocarbon Dating: An Archaeological Perspective*. Academic Press, Orlando.
2000 The Contribution of Radiocarbon Dating to New World Archaeology. *Radiocarbon* 42(1):1–21.

Taylor, R.E., Austin Long and Renee S. Kra (editors)
1992 *Radiocarbon After Four Decades: An Interdisciplinary Perspective*. Springer-Verlag, New York.

Terraciano, Kevin
2001 *The Mixtecs of Colonial Oaxaca: Ñudzahui History, Sixteenth through Eighteenth Centuries*. Stanford University Press, Stanford, California.

Tolstoy, Paul
1971 Utilitarian Artifacts of Central Mexico. In *Archaeology of Northern Mesoamerica, Part 1*, edited by Robert Wauchope, Gordon F. Ekholm and Ignacio Bernal, pp. 270–296. Handbook of Middle American Indians, vol. 10. University of Texas Press, Austin.
1975 Settlement and Population Trends in the Basin of Mexico (Ixtapaluca and Zacatenco Phases). *Journal of Field Archaeology* 2:331–349.
1978 Western Mesoamerica Before A.D. 900. In *Chronologies in New World Archeology*, edited by R.E. Taylor and Clement W. Meighan, pp. 241–284. Academic Press, New York.
1989 Western Mesoamerica and the Olmec. In *Regional Perspectives on the Olmec*, edited by Robert J. Sharer and David C. Grove, pp. 275–302. Cambridge University Press, Cambridge.

Tolstoy, Paul, Suzanne K. Fish, Martin W. Boksenbaum, Kathryn Blair Vaugh and C. Earle Smith, Jr.
1977 Early Sedentary Communities of the Basin of Mexico: A Summary of Recent Investigations. *Journal of Field Archaeology* 4:91–106.

Tolstoy, Paul and Louise I. Paradis
1971 Early and Middle Preclassic Culture in the Basin of Mexico. In *Observations on the Emergence of Civilization in Mesoamerica*, edited by Robert F. Heizer and John A. Graham, pp. 7–28. Contributions of the University of California Archaeological Research Facility, no. 11. University of California Department of Anthropology, Berkeley.

Trinkaus, Kathryn Maurer
1987 Introduction: On Boundaries and Social Complexity. In *Polities and Partitions: Human Boundaries and the Growth of Complex Societies*, edited by Kathryn Maurer Trinkaus, pp. 1–28. Anthropological Research Papers, no. 37. Arizona State University, Tempe.

Tschohl, Peter
1976 *Proyecto Puebla–Tlaxcala, Tomo 2, Ch–O.* Catalogo Arqueológico y Etnohistórico de Puebla-Tlaxcala, México. Fundación Alemana para la Investigación Científica, Köln & Freiburg i. Br. [sic].

Tschohl, Peter and Herbert J. Nickel
1972 *Proyecto Puebla–Tlaxcala, Tomo 1, Edición Preliminar, A-C.* Catalogo Arqueológico y Etnohistórico de Puebla-Tlaxcala, México. Fundación Alemana para la Investigación Científica, Köln & Freiburg i. Br.

Turner, Victor W.
1972–1973 The Center Out There, Pilgrim's Goal. *History of Religions* 12:191–230.

van der Leeuw, Sander E.
1991 Variation, Variability, and Explanation in Pottery Studies. In *Ceramic Ethnoarchaeology*, edited by William A. Longacre, pp. 11–39. University of Arizona Press, Tucson.

Wallerstein, Immanuel
1974 *The Modern World System I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*. Academic Press, San Diego.
1990 World-Systems Analysis: The Second Phase. *Review* 13:287–293.

Wilken, Gene C.
1987 *Good Farmers: Traditional Agricultural Resource Management in Mexico and Central America*. University of California Press, Berkeley.

Willey, Gordon R.
1945 Horizon Styles and Pottery Traditions in Peruvian Archaeology. *American Antiquity* 11:49–56.
1953 *Prehistoric Settlement Patterns in the Virú Valley, Perú*. Bureau of American Ethnology Bulletin, no. 155. Smithsonian Institution, Washington, D.C.
1991 Horizonal Integration and Regional Diversity: An Alternating Process in the Rise of Civilizations. *American Antiquity* 56:197–215.
1999a Styles and State Formations. *Latin American Antiquity* 10:86–90.
1999b The Virú Valley Project and Settlement Archaeology: Some Reminiscences and Contemporary Comments. In *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*, edited by Brian R. Billman and Gary M. Feinman, pp. 9–11. Smithsonian Institution Press, Washington, D.C.

Wilson, David J.
1997 Early State Formation on the North Coast of Peru: A Critique of the City-State Model. In *The Archaeology of City-States: Cross-Cultural Approaches*, edited by Deborah L. Nichols and Thomas H. Charlton, pp. 229–244. Smithsonian Institution Press, Washington, D.C.

Winter, Marcus C.

1989 El Preclásico en Oaxaca. In *El Preclásico o Formativo: Avances y Perspectivas*, edited by Martha Carmona Macías, pp. 461–479. Consejo Nacional para la Cultura y las Artes; Instituto Nacional de Antropología e Historia, Museo Nacional de Antropología, México.

1994a The Mixteca Prior to the Late Postclassic. In *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, edited by Henry B. Nicholson and Eloise Quiñones Keber, pp. 201–221. Labyrinthos, Culver City, California.

1995 *Oaxaca: The Archaeological Record*. 2nd ed. Minutiae Mexicana, México.

1996 *Cerro de las Minas: Arqueología de la Mixteca Baja*. Casa de la Cultura de Huajuapan de León, Oaxaca.

2000 Review of *Ancient Oaxaca*. *American Anthropologist* 102:633–634.

Winter, Marcus, Cira Martínez López and Damon E. Peeler

1998 Monte Albán y Teotihuacán: Cronología e Interpretaciones. In L*os Ritmos de Cambio en Teotihuacán: Reflexiones y Discusiones de su Cronología*, edited by Rosa Brambila Paz and Rubén Cabrera Castro, pp. 461–475. Colección Científica, Serie Arqueología, no. 366. Instituto Nacional de Antropología e Historia, México, D.F.

Winter, Marcus C. (editor)

1994b *Monte Albán: Estudios Recientes*. Proyecto Especial Monte Albán 1992–1994 Contribución, no. 2. Instituto Nacional de Antropología e Historia, Oaxaca.

Wolf, Eric R.

1976 Introduction. In *The Valley of Mexico: Studies in Pre-Hispanic Ecology and Society*, edited by Eric R. Wolf, pp. 1–10. University of New Mexico Press, Albuquerque.

Woodbury, Richard B. and James A. Neely

1972 Water Control Systems of the Tehuacan Valley. In *Chronology and Irrigation*, edited by Frederick Johnson, pp. 81–153. The Prehistory of the Tehuacán Valley, vol. 4. University of Texas Press, Austin.

Wright, Henry T.

1986 The Evolution of Civilizations. In *American Archaeology Past and Future: A Celebration of the Society for American Archaeology, 1935–1985*, edited by David J. Meltzer, Don D. Fowler and Jeremy A. Sabloff, pp. 323–365. Smithsonian Institution Press, Washington, D.C.

Zeitlin, Robert N.

1993 Pacific Coastal Laguna Zope: A Regional Center in the Terminal Formative Hinterlands of Monte Albán. *Ancient Mesoamerica* 4:85–101.