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## **Assessing the prehispanic settlement of the Lerma Valley during the first millennium: survey in the floodplain of Tres Mezquites, Michoacán, Mexico**

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### *Abstract*

This article presents the results of archaeological surveys carried out by the Tres Mezquites Project in the Lerma River floodplain at the southwest of the Bajío, Mexico. This research sought to understand settlement dynamics in conjunction with environmental processes in order to recognize the structure of the prehispanic occupation, and to interpret the results within the context of macroregional issues, in particular the social transformations related to the Terminal Preclassic decline of the Chupícuaro culture and the development of Barajas sites during the Epiclassic period. The use of complementary methods combining survey and different types of test pits allowed us to understand and account for biases linked to both sedimentary dynamics and anthropogenic activities. Our results show that the Lerma River was a structuring element for the placement of settlements; the valley foothills were densely occupied, as well as the floodplain, despite the drawbacks of such an environment. The Lerma Valley had a significant occupation from the Terminal Preclassic (A.D. 100-250) to the Epiclassic (A.D. 600-900). The region is located at a strategic point of interface for understanding interactions between the Bajío and the lacustrine regions of Michoacán during the first millennium.

*Key words: Mesoamerica, Western Mexico, Regional survey, Lerma Valley, Classic period, Epiclassic period, Floodplains.*

## **Introduction**

Following Kirchhoff's (1946) theoretical definition of Western Mexico as a uniform Mesoamerican culture area based on information from several major emblematic sites, archaeological knowledge was derived primarily from regional surveys that were conducted throughout the 1970s. These surveys were designed to answer questions formulated in the 1940s regarding the oscillation of the northern frontier of Mesoamerica (Armillas 1964; Nalda 1976), the development of the Tarascan state (Pollard 1972, Gorenstein 1985, Gorenstein & Pollard 1981), and the mechanisms of interaction with Central Mexico. The cultural characterization of the surveyed regions revealed specific, often heterogeneous, and complex processes that inevitably led to the gradual deconstruction of the Western area as a congruent and peripheral entity to Central Mexico. The documentation of these composite archaeological landscapes gave rise to new geocultural concepts, such as the west-central (Brambila et al. 1988) and north-central regions (see Williams 1994, Pollard 1997, Braniff 2000), and many sub-regions became the focus of intensive research programs, including the highlands of Jalisco (Heredia 2017), the lacustrine regions of northern Michoacán and the Bajío (Cárdenas 1999, Beekman 2010) (Figure 1). This article will focus on the two latter regions.

Over the past forty years, several regional projects combining survey, test pits, and excavations have developed in "key zones" (Pollard 2011) in order to reconstruct cultural trajectories with a particular focus on the Zacapu and Pátzcuaro Basins, and in the areas located north and south of the Lerma Valley (e.g., the Acámbaro, Michoacán, Zacapu, Barajas, Erongarícuaro, and Uacusecha Projects). These projects sought to enhance our understanding of the conditions for socio-territorial change in conjunction with the emergence of major cultural entities, such as the expansion of Classic societies at the beginning of the first millennium and the emergence of the Tarascan state from the twelfth century onwards. While this research led to the construction of the regional history of prehispanic settlement, it concentrated primarily on the lake basins, volcanic massifs, and semi-arid zones to the south or north of the Lerma River, rather than focusing on the valley itself or the alluvial plain, which often appears as an area dotted with some monumental

sites and no significant settlement (Figure 2). The Tres Mezquites Archaeological Project<sup>1</sup>, therefore, was established in the Lerma Valley to address this gap in the regional picture. This article presents the results obtained during the archaeological surveys carried out between 2014 and 2018. These studies, followed by test pits and stratigraphic excavations, aimed to understand settlement dynamics in conjunction with environmental processes in order to recognize the structure of the prehispanic occupation and to interpret the results at a wider scale, incorporating regional questions, in particular those related to Terminal Preclassic developments and the transformations following the decline of the Chupícuaro culture during the course of the first century BC (Darras & Faugère 2010), and those from the Epiclassic period and the eighth century transformations in surrounding regions, such as the Barajas Massif (Pereira et al. 2005).

The adoption of a systematic approach in our investigation of the Lerma alluvial plain and foothills enabled us to overcome many of the constraints encountered in this kind of environment. Our results demonstrate that the Lerma River was a structuring element for the emplacement of settlements, from at least the end of the Preclassic onwards, and that the valley bottom and the foothills were densely settled from the Terminal Preclassic (AD 100-250) to the Epiclassic (AD 600-900). These results not only modify the current models of the region's settlement history that place the apogee of the Bajío occupations between the end of the Classic and the Epiclassic, but also open new discussions of regional scenarios.

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<sup>1</sup>The Tres Mezquites project began in 2012 under the direction of Véronique Darras.

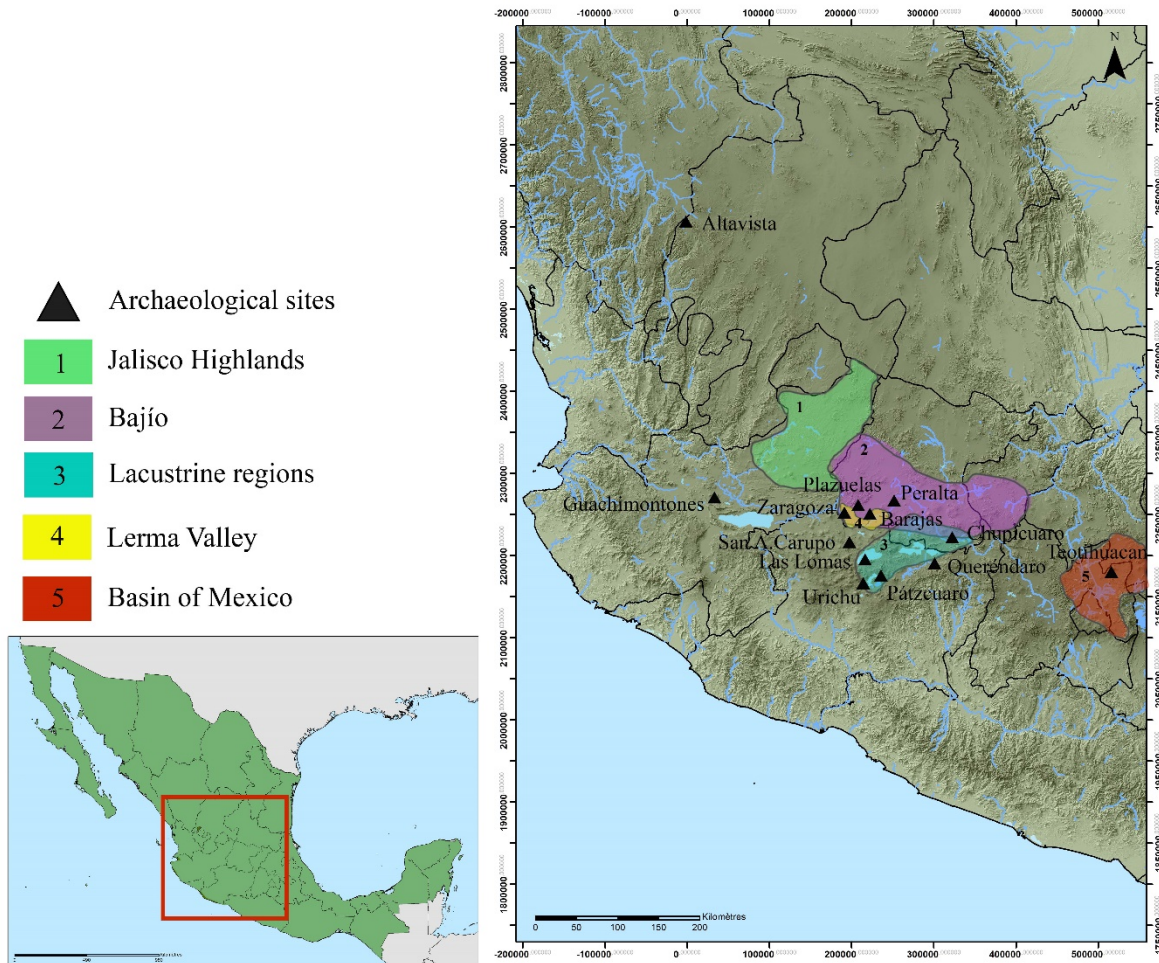


Figure 1. Location of the study area, including regions and sites mentioned in the text.

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### **The contribution of surveys to the construction of regional histories**

In a recent publication, Pollard (2011) recalled the sinuous path taken during the twentieth century before chrono-cultural frameworks could be attributed to pre-Tarascan and Tarascan archaeology and she underlined the important role of regional surveys. The work completed in the Acámbaro Valley (Guanajuato) constituted one of the departure points for the scenarios and questions that formed the foundation for research in the lacustrine basins in northern Michoacán. In addition to the main excavations conducted in 1946 (Porter 1956), which placed the Acámbaro Valley at the heart of one of the most important cultural episodes in Preclassic Mesoamerican history, two regional survey projects were conducted

in the valley and its surroundings during the course of the 1970s (Gorenstein 1985, Florance 1985, 1990). The Survey conducted in the eastern part of the valley recorded 45 sites dated between the Middle and Terminal Preclassic, based on the study of surface ceramics. Meanwhile, regional surveys in other sectors of the Bajío (Bejerano 1969, 1974, Castañeda 1980, Mora 1972, 1973), including the Lerma Medio (Nalda 1975, 1978, 1979, 1981) and Abasolo Projects (Juárez Cossio & Morelos García 1980, 1988), clearly affirmed their ambition to construct a theoretical and methodological framework for their approach. These generally unpublished projects, however, aimed above all to establish an inventory of sites and create an overall chronological framework based on surface finds. Several years later, the Atlas Arqueológico (Cárdenas 1988, Marmolejo 1988), Gasoducto Guanajuato Project (Contreras & Duran 1982), and The Guanajuato Project (Taladoire 1977, Con Uribe 1979) joined this inventory effort, which really progressed thanks to research by conducted by Cárdenas. For a corpus of 1,180 sites recorded in the state of Guanajuato, at least 174 of them dated to the third century and possessed what would become called the “sunken plazas” architectural layout, which came to define the Bajío Cultural Tradition and firmly rooted it in the heritage of the Chupícuaro culture (Cárdenas 1995, 1999, 2015, Darras & Faugère 2007).

Beginning in the 2000s, methodical surveys were carried out in different sectors of the Acámbaro Valley leading to the discovery of more than 180 sites (Faugère & Darras 2008). This work, coupled with pit and excavation operations, as well as a paleoenvironmental study, established the Chupícuaro settlement pattern between the Middle Preclassic and the Terminal Preclassic, confirming the cultural and demographic apogee between 400 and 100 BC. Furthermore, this research demonstrated the massive depopulation that occurred during the first century BC is one of the earliest episodes in the north-central region that likely involved large-scale population movements (Darras & Faugère 2010). Prior to the archaeological documentation of the Chupícuaro decline, previous research had already explored possible dispersion paths and subsequent cultural developments of the Acámbaro Valley populations (Braniff 1996, 1998, 1999; Saint Charles et al. 2005, 2010).

In reality, our knowledge of the Terminal Preclassic, owes a lot to the work undertaken by the Centro de Estudios Mexicanos y Centroamericanos (CEMCA) in the Zacapu region between 1983 and 1996 (Michelet 1992), which included the systematic survey of a region

representing a geographic unit (of about 1,000 km<sup>2</sup>) and led to the identification of more than 500 sites. Although the Michoacán Project set out to explore the question of the northern border and the conditions under which the Tarascan state emerged (Michelet 1992), it ended up focusing on earlier occupations as a result of discoveries in the Zacapu Basin, in particular the Terminal Preclassic and Classic. These occupations, known as the Loma Alta tradition (Arnauld et al. 1993), were identified through the use of iconographic analogies as the heir of the Chupícuaro tradition (Carot 1998, 2001). Around the same time (1990-1996), systematic surveys conducted by Pollard (2008, 2011) in the southwestern portion of the Pátzcuaro basin also revealed the importance of Terminal Preclassic and Classic occupations.

Populations of the Loma Alta tradition were incorporated in the Teotihuacan world-system through the consumption of prestige goods linked to the metropolis (see Filini 2010, Jiménez 2018), yet they experimented with an autonomous and original cultural trajectory. Work by Carot (2001, 2013) on Loma Alta and Queréndaro ceramics shows that these developments resulted from a population movement from Chupícuaro towards the west, along the route of lacustrine basins (i.e., from the Cuitzeo Basin to the Zacapu and Pátzcuaro Basins). In addition, the regional project developed in the Cuitzeo Basin, at the same time as the Michoacán Project, recorded a total of 147 sites (Moguel Cos 1987) and documented a strong Teotihuacan presence, which suggested cultural ties that extended well beyond the strict consumption of prestige goods (Filini 2010, Jimenez 2017).

In the north-central region, as in other regions of Mesoamerica, the period following the collapse of the Teotihuacan system is marked by socio-political and, in some cases, territorial reconfigurations. Regional surveys in northern Michoacán and southern Guanajuato point to the rapid emergence of numerous sites from the seventh century onwards, in regions that had been relatively unpopulated (Faugère 1996, 2009, Arnauld & Faugère 1998, Fisher 2011, Fernández 2004, Hernández 2000, Healan & Hernández 1999, Cárdenas 1999). This territorial expansion is considered to be the result of endogenous demographic growth leading to the colonization of new spaces (Faugère 2009, Cárdenas 2015), and it was accompanied by the development of large civic-ceremonial centers, such as Plazuelas, Zaragoza and Peralta. Whereas the first two sites are considered as pluri-ethnic centers with composite architecture (Castañeda & Quiroz 2004, Fernández 2004),

which would have served as an interface in interaction dynamics between the Bajío and the lacustrine regions of Michoacán, the center of Mexico and the northern regions (Fernández 2004: 295), in contrast, Peralta embodies the true incarnation of the Bajío tradition (Cárdenas 1999, 2015).

At the same time, other sub-regions seem to undergo more complex and heterogeneous processes, as is the case for the Barajas Massif. Research carried out there from 1999 to 2007 revealed the existence of proto-urban occupations that developed mainly between AD 600 and 900 and underwent a massive, rapid and organized abandonment around AD 900-950 (Migeon 2003, Pereira et al. 2005, Pereira 2008). A major transformation represented by a new architectural tradition clearly affiliated to the Chalchihuites tradition ca. AD750, was also identified. These changes were interpreted as the arrival of new populations originating from the northern regions of Mesoamerica (Pereira et al. 2005). The material culture of these populations differed from those dating to the same period in the Zacapu region (Faugère 1996, Darras 1999, Pereira 1999) and elsewhere in the Bajío (Cárdenas 1999); that is, with the exception of San Antonio Carupo, which represents the southernmost example of the Chalchihuites architectural tradition (Faugère 1991).

The major wave of abandonment across the Bajío sites, around AD 900, marks the end of the Epiclassic period and the desertion of these regions by agricultural societies. This process is well documented and was traditionally explained by climatic changes (Palerm & Wolf 1957, Armillas 1964). Recent explorations qualify this hypothesis and propose the desertion of northern regions was due to the environmental over-exploitation (Elliot 2012). However, the history of these societies continued in regions south of the Lerma, where surveys reveal a high population density particularly in the Pátzcuaro Basin from AD 900 to 1200 (Arnaud & Faugère 1998, Faugère 2009, Pollard 2008, 2011). In the Zacapu region, the Early Postclassic is mainly known through the monumental site of El Palacio, which played an important role in the Aztatlán-Toltec spheres of interaction (Michelet & Pereira 2000, Jadot 2016, Jadot et al. 2016, Forest et al. 2019). Finally, the Middle and Late Postclassic periods are probably the best documented due to the many research projects in the Pátzcuaro (Pollard 2008) and Malpaís de Zacapu Basins and especially due to work that focused on specific sites, such as Urichu, Tzintzuntzan (Pollard 1993), Milpillas (Migeon 1990) and Malpaís Prieto (Forest 2016).



This rapid overview of survey-based research (Figure 2) provides a glimpse into the major advances in our knowledge of the cultural trajectories of the north-central and the northern border of Mesoamerica, and also reveals still poorly understood processes that often coincide with periods of rapid change. For example, the fate of Chupícuaro populations and their dispersal modes have not been fully elucidated. Similarly, although the architectural reconfigurations that occurred in the middle of the Epiclassic period are interpreted as the arrival of foreign groups, we do not know the extent of the phenomenon or its impact on the whole region.

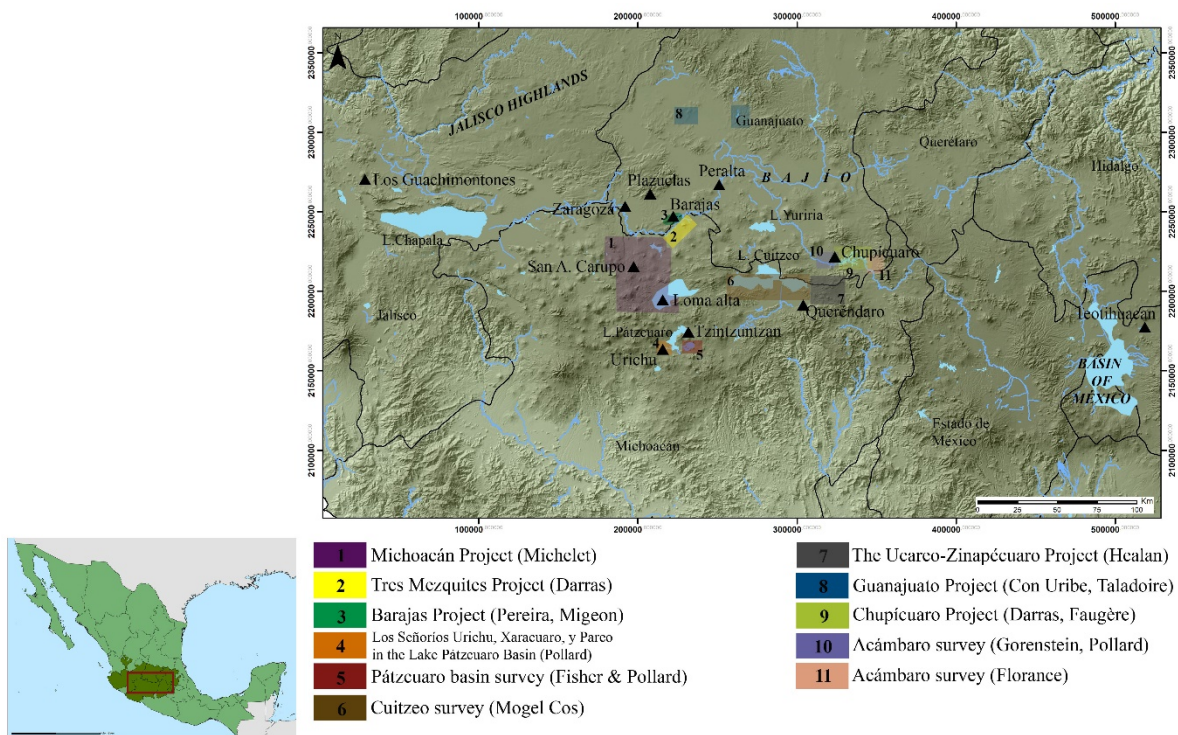


Figure 2. Locations of regional survey projects in central-western Mexico<sup>2</sup>. © Cartographic representation by J.F Cuenot, edited by A.Castañeda and V. Darras. (2 column fitting image)

### The Lerma alluvial plain: an unexplored ecosystem...

The coherency of the research described above enabled the construction of chronological frameworks of reference and scenarios of cultural development. Upon examining

<sup>2</sup> This is a non-exhaustive list. The Gasoducto Project (Contreras & Duran 1982) and the Atlas Arqueológico Project in Guanajuato (Cardenas 1999), mentioned in the text, are not represented.

archaeological maps, however, one notices several unexplored regions, including some that likely played a key role in regional processes and could contribute to elucidating several unresolved questions. This is particularly true for the alluvial plain of the Lerma, situated in the southwestern part of the Bajío, or, more precisely, against the southern foothills of the Barajas Massif and the southern slope of the Lerma. Apart from some rare monumental sites recorded by the INAH's regional center or as part of the INAH's Archaeological Rescue Department programs (Departamento de Salvamento Arqueológico, INAH), this plain and its foothills were considered to be void of archaeological remains. A priori, this void appeared to be due to a gap in archaeological knowledge that was linked to two interdependent parameters: a potential considered as extremely poor and misunderstood taphonomic landfill bias; but it could also be due to prehispanic settlement choices. Established in 2012, the goal of the Tres Mezquites Project was two-fold: (1) evaluate the archaeological potential by taking into consideration the environmental characteristics; and (2) understand the prehispanic settlement pattern in conjunction with what we knew of cultural developments in the Bajío and Michoacán. To resolve this knowledge gap, research conducted by the project focused on two main objectives. First, an examination of the first century BC depopulation of the Acámbaro Valley from an area located about 100 kilometers upstream as a possible dispersal routes of Chupícuaro populations toward the west. It was also imperative to determine whether this alluvial plain had been inhabited by populations contemporaneous with the Chupícuaro, to establish their cultural affiliations, and to expand our comprehension of Preclassic settlement at the wider scale of the Lerma fluvial system. Second, the characterization of Epiclassic occupations in order to create a geographic continuum between the Barajas Massif in southwestern Bajío and the lacustrine basins of Michoacán. This objective aimed to enhance our understanding of the origins for sociopolitical development on the Barajas Massif, as well as the changes and population movements during the eighth century and their impact on the rest of the region.

### **..and a dynamic and difficult context for archaeology**

The sector chosen for our study is located between the states of Guanajuato and Michoacán, about thirty kilometers north of the Zacapu Basin (GPS coordinates), and it falls between the Barajas foothills to the north and the Cerro La Joya to the south (Figure 3). It is

delimited to the west by the Rio Angulo, which originates in the Zacapu Basin, crosses the plain and flows north into the Lerma River at Santiago Conguripo. The plain has a slight slope and the sinuous course of the Lerma cuts into fifteen-meter-thick alluvial and colluvial deposits.

The project area circumscribes a zone of about 290 km<sup>2</sup>, but 12 weeks of survey conducted over four seasons only covered a total of 15 km<sup>2</sup> (approximately 5% of the delimited zone). Three distinct topographic environments were detected: the banks of the Lerma and its tributaries (Río Angulo and Río Turbio), the lower parts of the plain, and the foothills. Today, the riverbanks and the lower parts oscillate between 1680 and 1692 masl and are characterized by homogenous expanses of brown silts in the immediate surroundings of the watercourses, and clayey black sediments further away (Sedov et al. in preparation). The plain is currently under intensive agriculture with surface runoff irrigation. The land is not left to rest and produces two harvests per year. As a result of these intensive rhythms and high degree of mechanization, there is rarely more than a week between the harvest and the preparation for new sowing operations. Thus, the irrigated fields are generally inaccessible for survey or excavation, which implicated a major problem at the beginning of the project. Obviously, the foothills present a different configuration as they oscillate on average between 1695 and 1715 masl and are generally characterized by black vertisols. Unlike the lower irrigated zones, the foothills are seasonally cultivated and many sectors have been organized into farming terraces, some of which probably date back to prehispanic times<sup>3</sup>.

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<sup>3</sup>Seasonal crop farming makes these zones accessible between the harvest and the sowing season, namely between December and April. Surveys were thus planned for this period, more specifically between February and April.

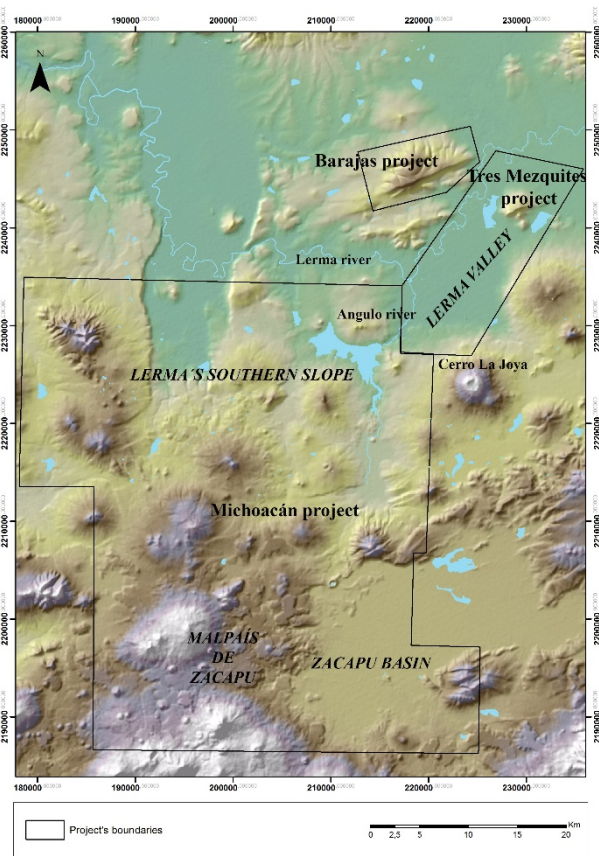


Figure 3. Study area. © Cartographic representation by J.F Cuenot, edited by A.Castañeda and V. Darras. (1 column fitting image)

### Survey design

The dynamic context of the Lerma alluvial plain required the implementation of a methodology adapted to the characteristics of the landscape and the type of archaeological record, in order to construct a coherent framework, to generate a relevant map, and to understand the settlement pattern. The main problems to overcome were the study area size, its geomorphological characteristics (i.e., high levels of alluvial and colluvial sedimentation), and, last but not least, the effects of human activity (i.e., accessibility to cultivated land, restrictions linked to agrarian practices, and the destructive nature of these activities).

Archaeological survey methods are quite variable and they have never really followed the uniform strategy envisaged by the New Archaeology (Binford 1964). In practice, methodologies must adapt to the characteristics of the study area and to the aims and

feasibility of each project (Schiffer, et. al, 1978; Banning 2002). That being said, and as several researchers have pointed out (Hirth 1978, Finsten & Kowaleski 1999, Stark & Garraty 2008), the perception of archaeological surface remains is strongly influenced by environmental conditions. The choice of the procedures applied in the field (e.g., systematic vs. selective surface collections, time devoted to fieldwork, not taking visibility into account, heterogeneity of methods preventing comparisons, etc.), therefore, is absolutely crucial to reduce the risks linked to the data representativeness (Stark & Garraty 2008:181). Thus, our survey methods had to take into consideration the specificities of the landscape and opted for partial coverage over a procedure covering the whole zone, which nonetheless had to be sufficient to obtain congruent data. The foothills were explored in a methodical and extensive way.

While the aim of this article is not to discuss the advantages and disadvantages of the exploration method, nor to assess its effectiveness (an article focusing on this question is in preparation), it seems essential for us to clarify several points.

First of all, the zone was explored in close collaboration with environmental scientists<sup>4</sup> in order to understand the taphonomic biases in the formation of the archaeological record and, in particular, the impact of sedimentary dynamics in burial processes and/or the destruction of archaeological remains (Darras 2013, Darras et. al, 2016, Sedov et al. in preparation).

Secondly, in the alluvial plain, intensive agricultural practices can create biases in the archaeological record. On one hand, they can reveal the remains that are brought up towards the surface as a result of deep ploughing. On the other hand, they lead to the massive destruction of outcropping structures. The intentional levelling of mounds and platforms has become widespread since the 1980s and often results in the complete disappearance of prehispanic remains. That being said, preliminary explorations have shown that traces often persist as alterations in the color and texture of the sediment, relatively significant spreads of artifact scatters, and, in some cases, discreet topographic deformations. These conditions, in addition to the difficulty of walking the land, prompted us to consider how to optimize the identification of archaeological remains. For these

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<sup>4</sup>Laboratory Chrono-environment, Bezançon and Faculty of Geology of the UNAM, México.

reasons, we chose a combination of methods including survey by satellite image, survey in the field, and the assistance of local informants.

- *Examining Google Earth satellite images:* We methodically searched for anomalies over a surface area of approximately 200km<sup>2</sup>. The anomalies were individualized, discussed and listed in the laboratory, then exported into the GPS for field verification. Different types of anomalies were tracked: pedological anomalies in cultivated zones that could be dismantled sites; phytographic anomalies that might reveal buried structures; concentrations of shrub vegetation in cultivated areas, which can conceal built structures that resist well to agrarian work; and architectural remains.

- *Hiking survey:* Systematic itineraries were drawn up where possible, mainly in accessible land plots and traversable non-cultivated areas. These itineraries followed a protocol involving progression by parallel transects set at a width of 10m and the use of a GPS for recording data (e.g., density of objects, visibility, entities, etc.).

- *Survey with assistance of local informants:* Communication with the local population was essential. Time, therefore, was devoted to looking for the best candidates to supply information (i.e., landowners, farmers, elderly people, local authorities), as well as the verification of the gathered information, often in their presence.

Exploration in the field enabled us to observe different types of archaeological features, from concentrations of surface material to monumental sites. However, on account of preservation conditions, we had to pay close attention to the artifacts and material concentrations. With this in mind, the smallest recording unit was the artifact, followed by the *entity* (concentrations of artifacts, pedological changes, topographic deformations, built structures, petroglyphs etc.), and finally, when it was clear, the recording unit was the same for the whole scale of the site. Each entity was considered independently before considering its status as a site, which could be formed by one or several entities. Laboratory work then enabled us to create a definitive list of sites by grouping or splitting entities, or even sites. In order to produce a relevant site definition, in keeping with our objectives and the type of terrain, objective criteria were cross-examined: the distance between entities, the surface area dimensions, and the density of remains.

In the field, the discovery of an entity systematically generated several actions: 1) a precise georeferencing of the remains; 2) a methodical evaluation of the density of remains using a pre-established grid (ranging from D0 to D4)<sup>5</sup> that took into consideration the different types of materials (i.e., ceramics, obsidian, andesite, bone, and construction materials); 3) an assessment of the terrain type (e.g., cultivated, harvested, ploughed, etc.) and the degree of visibility (good, average, poor, or zero); 4) an exhaustive and/or selective sampling depending on the context; 5) the detailed description on registration forms including sketches and photos; and 6) the delimitation of the surface dimensions in question with the GPS.

Furthermore, all the surveyed areas were georeferenced, regardless of whether or not they revealed archaeological entities. This enabled us to establish an accurate map of the surveyed zones and identify empty areas with no apparent archaeological remains. It is also important to note that the evaluation of density and visibility were not only carried out for the detected sites, but for all of the surveyed plots, which is an indispensable prerequisite for a pertinent and continuous representation of the studied zone.

### **Dating the sites**

After four field seasons, a total of 192 sites were recorded that yielded surface sherds indicating several occupation phases, in particular during the Classic and Epiclassic periods (Graph.1). The chronological placement of sites was based primarily on ceramic typology but also on architectural characteristics, when possible. In order to obtain more accurate chrono-cultural information, test pits or excavations were carried out at several sites<sup>6</sup>, which allowed them to be dated (Table 1) using comparative analysis of several indicators: ceramics, chrono-stratigraphy, and absolute dating<sup>7</sup>.

The surface-collected ceramic corpus consisted of 7,104 sherds, out of which a total of 2,594 MNI were considered diagnostic. The classification was based on regional typologies established for the Zacapu Basin and the Barajas region (Arnauld et al., 1993, Carot 2001, Michelet 2013, Pereira 2013, Migeon 2013) (Table 1; Fig.4, 6). Other exogenous Classic

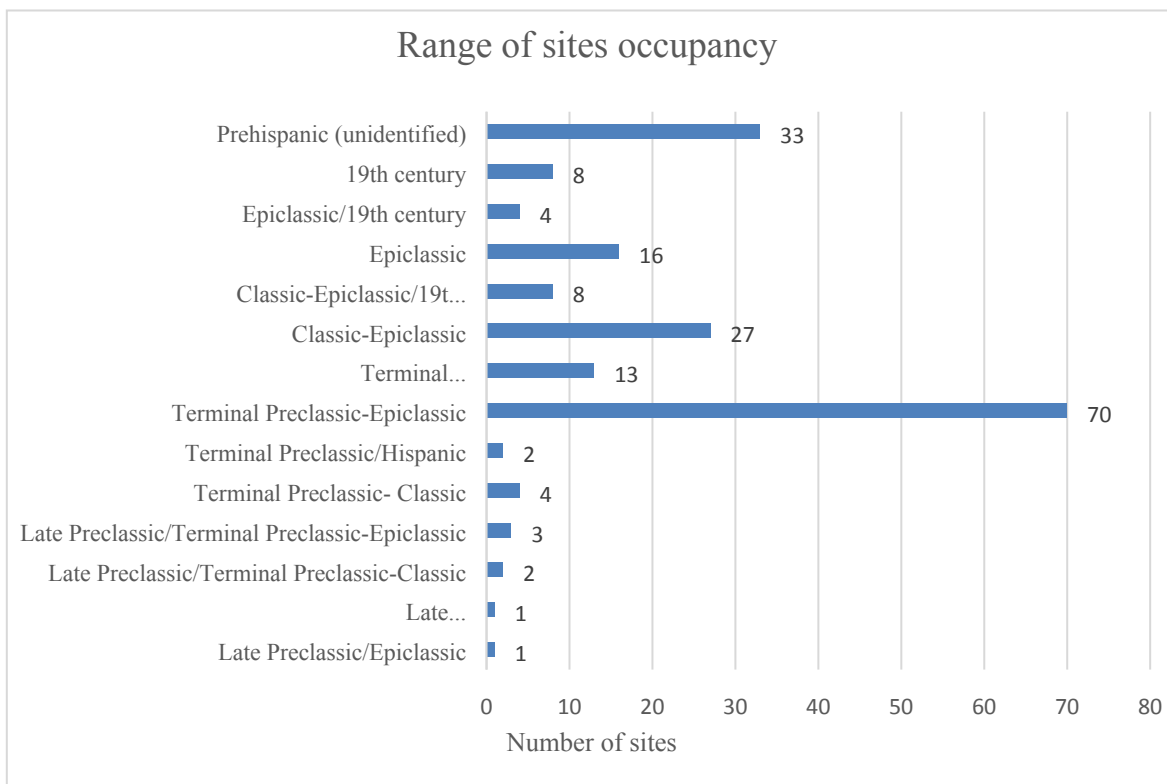
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<sup>5</sup>The density coefficients were classified as follows: D0 = no artifact; D0.5 = presence; D1 = 1 artifact per 2m<sup>2</sup>; D1.5 = 2 to 15/2m<sup>2</sup>; D2 = 16 to 30/2m<sup>2</sup>; D3 = 31 to 100/2m<sup>2</sup>; D4 > 101/2m<sup>2</sup>.

<sup>6</sup>Test pit dimensions were variable, ranging from 2-10 m<sup>2</sup>. Extensive excavations covered between 150 and 400 m<sup>2</sup>.

<sup>7</sup>Twenty-seven radiocarbon dates were obtained from bone and charcoal samples.

period ceramic types were also identified from regions such as Queréndaro (Filini 2010), Acámbaro, the San Juan Valley, or Central Mexico (Flores & Saint Charles 2005, Gorenstein 1985, Rattray 1997, 1979). In addition, sherds with Preclassic morpho-stylistic attributes were also collected but could not be associated with existing typologies (Fig. 4). Finally, sixteenth century colonial pottery and nineteenth century Majolica vessels (Fig.7b) were also identified (Müller 1981, Fournier et al. 2007). Graph 1 presents the number of sites assigned to each occupation span based on the main ceramic groups in our surface collections.



Graph 1: Range of site occupation spans based on diagnostic surface material analysis.

Years	Periods	Zacapu Phases (Arnauld, et.al 1993)	Cerro Barajas Phases (Migeon 2013)
900	<i>Epiclassic</i>	La Joya (AD 850-900)	Late Barajas (AD 750-900/950)
800		Lupe (AD 600-850)	Early Barajas (AD 600-700/750)
700			
600			
500	<i>Classic</i>	Jarácuaró (AD 550-600)	Nogales (AD 450-600/650)
400		Loma alta 3	



300		(AD 350-550)
200		
100	<i>Late Preclassic</i>	Loma alta 2 (AD 1-350)
0		
100		Loma alta 1 (AD 100 BC-1)

Table 1. Regional chronologies.

In order to estimate the chronological depth of occupation in the valley, we required a more detailed exploration. Therefore, 39 stratigraphic test pits and three extensive excavations were carried out at a total of 12 sites that were known *a priori* to have preserved stratigraphic deposits. In addition to the chrono-cultural information, these operations attempted to understand the formation processes of the archaeological contexts in relation to the natural sedimentary dynamics. Predictably, the comparison of surface and stratigraphic data shows differences, which enabled us to evaluate the surface materials representativeness.

Two sites—PA1 “El Cerrito de Tres Mezquites” and PA3 “El Pitayo” (Figure 4b) — yielded a thick stratigraphic sequence that now serves as a reference for our chronological framework. These sites were established on *tepetate*<sup>8</sup> outcrops at during the third century BP and were occupied through the Epiclassic. The stratigraphic sequence also reveals alternating natural deposits (alluvial or colluvial sedimentation) and cultural deposits. El Cerrito de Tres Mezquites (PA1) is a valley bottom site located on the southern bank of the Lerma River. It was a civic-ceremonial center that currently consists of a 6m high artificially raised esplanade that covers an area of approximately eight hectares. This platform supported several structures, including three mounds. In 2012, an analysis of intra-site geodynamics showed that significant sedimentation spanning two millennia occurred in the Lerma alluvial plain as a result of diverse mechanisms (i.e., flood deposits alternating with palustrine deposits), which buried prehispanic occupations and some Hispanic structures (Darras 2013). Thus, it appears that hydro-sedimentary deposits had a significant impact on settlement conditions in the plain and on the burial conditions of the archaeological remains. The test pit at the foot of the main pyramidal mound, for example,

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<sup>8</sup> Tepetate refers to the local name given to the bedrock (volcanic tuff) in the region.

revealed a 5.7m stratigraphic sequence of cultural and natural deposits that correspond to an occupation of about seven centuries. The first occupation was dated between 255 – 415 BP\*<sup>9</sup>, followed by a sequence of occupation floors and destruction episodes dated between 410 and 590 BP\*. Finally, the stratigraphy corresponding to the main mound's foundation deposits, the last occupation of the structure and its abandonment were associated with Epiclassic ceramics, but were also severely altered by agricultural activities. The surprising amount of sedimentary accumulation, therefore, is attributed to a combination of active geodynamics and the cultural backfill of structures.

The other site, El Pitayo (PA3), was an elite residential site located on the foothill dominating the plain and is characterized by a marked topographic deformation produced by successive anthropogenic structures. The extensive excavation carried out between 2015 and 2019 revealed 2.65m of stratigraphy composed of alternating anthropogenic and natural deposits that date between 387 and 542 BP\*. The last level, which was destroyed by recent levelling, could still be observed in the ploughing activity layer and contained Epiclassic materials. The stratigraphy of El Pitayo revealed seven consecutive stages of construction and site development. Two of them were in response to destructions brought about by natural catastrophes (Sedov et al. in preparation), whereas the others stem from different factors (e.g., structure renewal activities).

In any event, the stratigraphic data correlated with the 14C dates and the ceramic typology from these two reference sites show a continuous occupation between at least the third century and the Epiclassic. However, the stratigraphic contexts reveal that most of the occupation is Classic and is contemporaneous with the Loma Alta 2 and 3 sub-phases (AD 200-550).

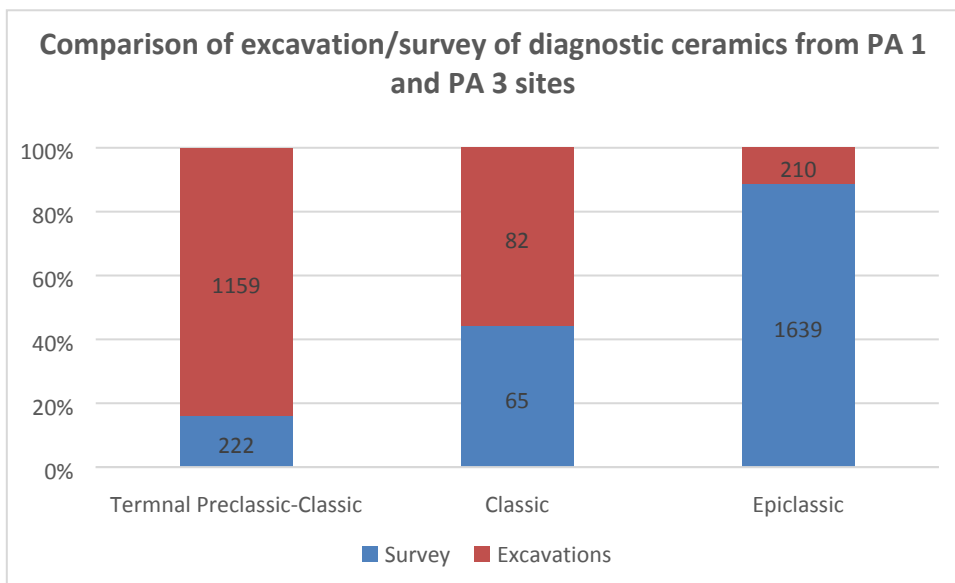
As predicted, the analysis and comparison of materials derived from the surveys, test pits, and excavations, illustrated that the surface ceramic remains do not accurately reflect site occupations (Graph 2)<sup>10</sup>. The last occupation level, for example, was largely visible on the surface but had been destroyed by agricultural activities. In this sense, apart from some monumental structures and surface finds indicating settlement from AD 600-900, it was difficult to assess the intensity and duration of this occupation. The oldest occupation

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<sup>9</sup>The AMS radiocarbon dates were conducted on samples of bone and charcoal by the Centre for Isotope Research, University of Groningen, The Netherlands. All dates are calibrated.

<sup>10</sup>Graph 2 takes into account the minimum number of individuals (MNI) based on ceramic sherds.

levels, on the other hand, were often sealed either by cultural deposits (backfill) or alluvial or colluvial deposits. Ultimately, the information presented in Graph 2 shows logical and predictable behavior: the intensity of the earliest occupations buried in the deepest strata is more difficult to assess from the surface, while the latest occupation is often missing from the stratigraphy. What we find most striking, however, is that the three centuries of Epiclassic occupation are contained in the ploughing activity layer, whereas the four centuries of the Classic occupation are spread over a several meter thick stratigraphic sequence. Regardless, Graph 2 illustrates the complementarity of both strategies (i.e., surface survey and test pits/excavations) and the need to combine them in order to fully comprehend the settlement dynamics of a territory. The evaluation of these data implies that the cultural apogee of the alluvial plain began at the beginning of Classic and continued until the Epiclassic.



**Graph 2:** Comparison of excavation (PA1 in addition with PA3 sites) vs. survey materials.

### Scenarios for the Lerma Valley

Our methodical archaeological approach to the Lerma alluvial plain and its immediate surroundings, which combined complementary methods of exploration, enabled us to overcome most of the constraints specific to this type of environment. Despite the limits of taphonomic burial and erosion biases, the physical constraints linked to the physical progression in the field and the conditions of visibility and accessibility, it was possible to

acquire unprecedented and relevant data on population dynamics in this region of Mesoamerica and to propose a scenario of settlement during the first millennium.

### *Preclassic occupations*

In our current state of knowledge, the Late Preclassic period (before 100 BC) is poorly represented. Only seven sites have yielded surface pottery dating from this period, based on their techno-stylistic characteristics (Figure 4a). Test pits excavated into two of these sites provided no further information, as bedrock was encountered just below the plow zone, which suggests they were subjected to intense erosion processes instead of being covered by subsequent deposits. Since these sites are located on the north bank of the river, this process could denote different geodynamics between the north and south banks of the river but may also indicate that these sites were abandoned during the Late Preclassic. As for the other stratigraphic contexts, we saw that the oldest levels dated from the beginning of our era. Furthermore, in the five other sites, the Preclassic material was mainly found on the surface and in the plow zone, - and mixed with Epiclassic or Hispanic material-, whereas the stratigraphic contexts of these same sites did not always provide material from the Preclassic period. These are thus intrusive, that is secondary deposits, linked to later developments.

In sum, although the rarity of Preclassic sites could reflect a prehispanic reality, we hypothesize that taphonomic factors contributed to their scarcity in the archaeological record. The spatial and stratigraphic discontinuities between Late Preclassic and Terminal Preclassic deposits, however, point to the absence of kinship between these populations. At the scale of the Mesoamerican highlands, the following Terminal Preclassic (ca. 100 BC to AD 200) period is considered to be a period of rapid transition during which social and political reorganizations occur alongside and in the background of spatial reconfigurations linked to population movements. For our region of interest, the number of sites multiplies at the end of this period, which coincides with continued demographic growth throughout the Classic period. A total of 78 sites present ceramic material dated to the Loma Alta 2 and 3 sub-phases (Arnauld et al. 1993; Carot 2001), but this is a minimum number since some levels from this period may have been sealed by naturally-deposited alluvial or colluvial layers. The two reference sites mentioned above yielded ceramics dating from these two

sub-phases, even though the 14C results suggest a third century date for their occupation (Figure 4b, Figure 5).

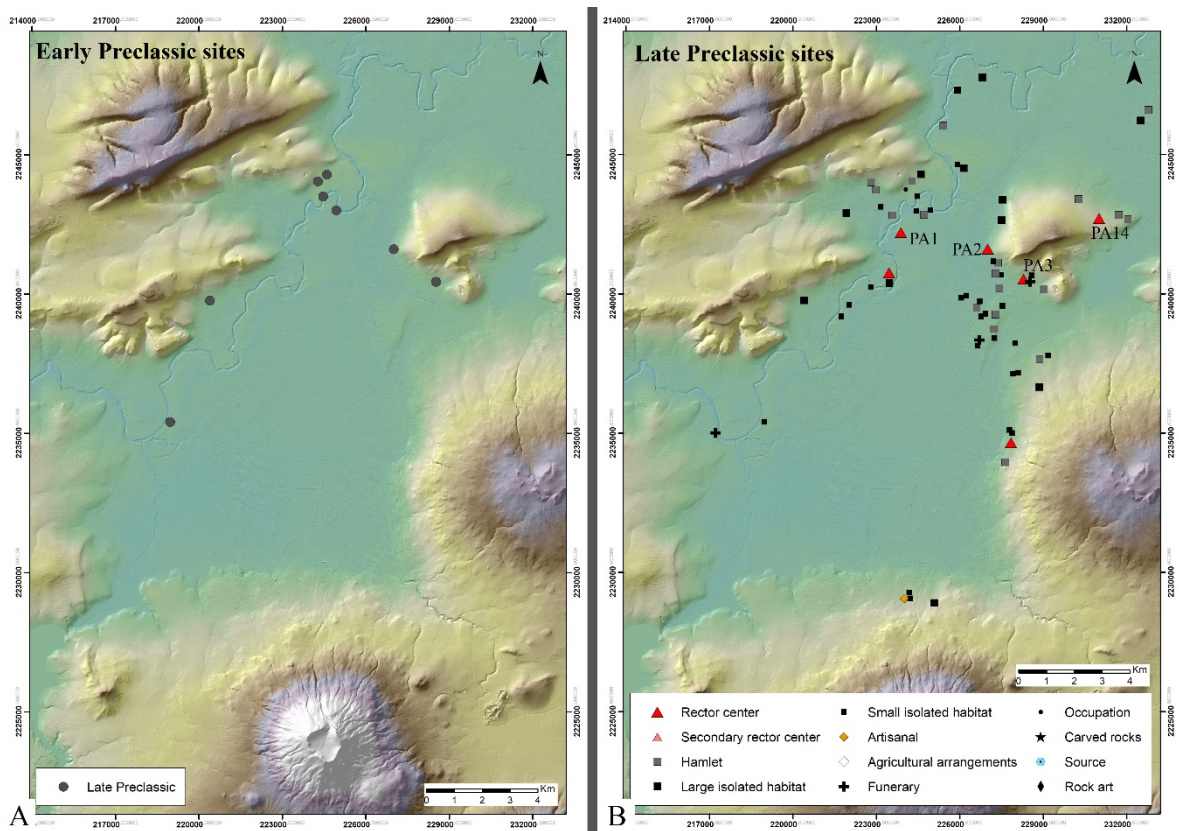


Figure 4. The distribution of Lerma Valley sites during (A) the Early Preclassic and (B) Late Preclassic periods, and the location of excavated sites mentioned in the text (PA 1-3 and PA 14). © Tres Mezquites Project, GIS by L. Déodat, Cartographic representation by J.F Cuenot. (2 column fitting image)

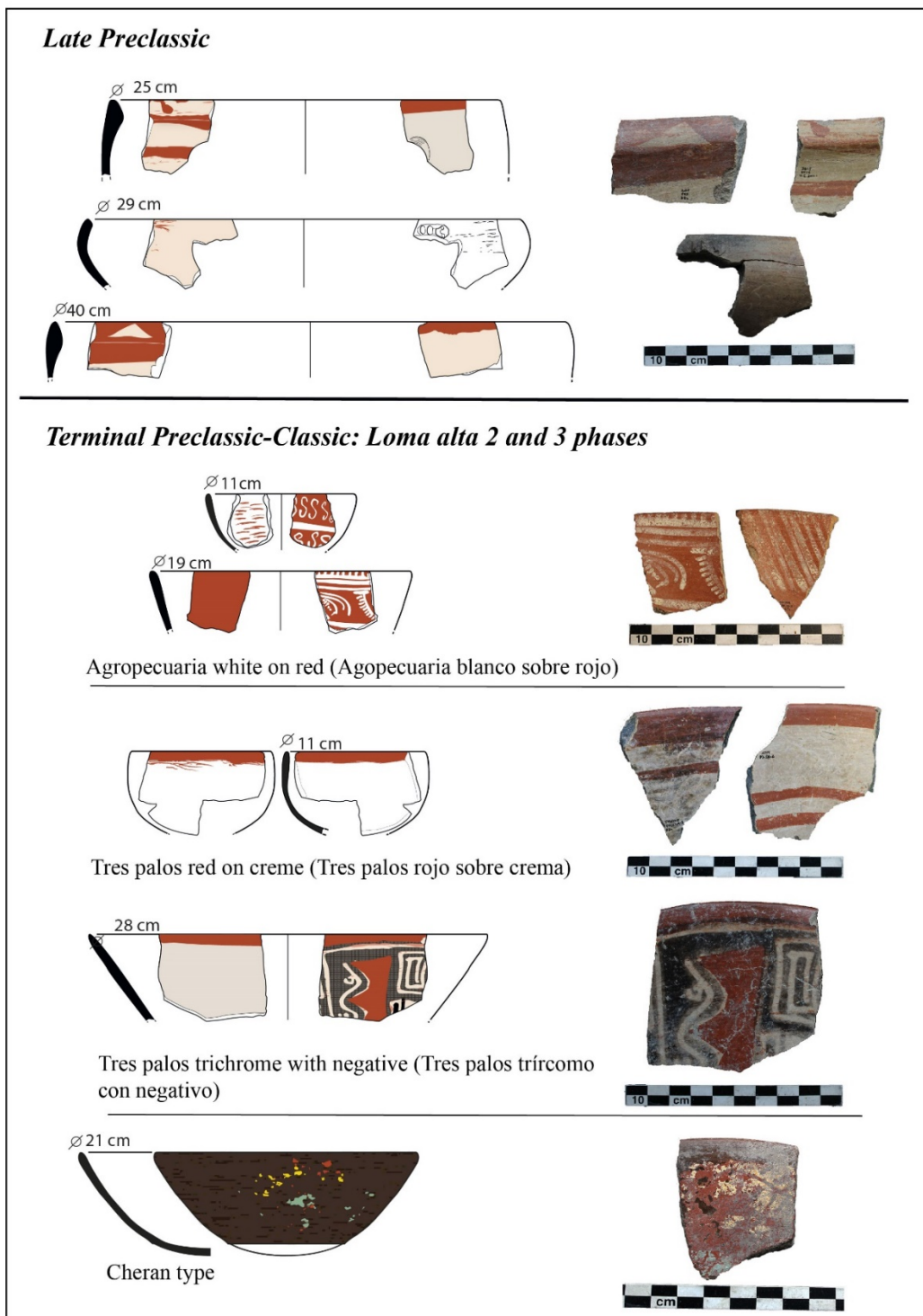


Figure 5. Diagnostic pottery by period in the Lerma Valley. © Tres Mezquites Project, Photographs by A. Castañeda and drawings by S. Eliès. (2 column fitting image)

### *The Classic occupation*

During the period between AD 200 and 600, the growth trend that began in the previous period continued, as evidenced by the 135 sites found to contain ceramic material from the Classic period (Figure 6a). Ceramic attributes show a very strong techno-stylistic association with the ceramic complex corresponding to the Loma Alta 3 phase of the Zacapu Basin (Figure 7), and on occasion include several ceramic types defined for the Nogales phase in the Barajas region (AD 420-540) (Álvarez 2010; Pomedio 2009; Migeon 2013). Nearly all of the test pits and excavations at these sites uncovered stratigraphic deposits from the Classic period that were often sealed by black clay deposited by colluvial and alluvial activity. Taken together, we consider the Classic period to have been the apogee of occupation in the alluvial plain.

### *The Epiclassic occupation*

The Epiclassic period, represented by 137 sites (Figure 6b), is almost exclusively characterized by pottery recovered from the surface or plow zone, with the exception of one site, “El Arco-PA14”, that has yielded preserved stratigraphy. The ceramic complex found at these sites mainly coincides with the Barajas 1 and 2 phases defined for the Barajas Massif (Figure 7; Álvarez 2010; Pomedio 2009; Migeon 2013; Pereira 2013).

Due to spatial continuity in the valley’s occupation, about 75% of the Epiclassic sites are situated directly above the Classic period occupation levels. Nevertheless, it was possible to identify an episode of spatial reconfiguration likely associated with natural phenomena that took place at the end of the Classic. Specifically, we identify a landslide that probably had an impact on the southern and western sides of the Cerro el Arco, and also flooding events in the Lerma alluvial plain (Sedov et al. in preparation). At least 15 new sites can be observed on the northern and north-western areas of Cerro El Arco at the beginning of the Epiclassic period; while on the western and southern sides, the abandonment of a civic-ceremonial center (Las Yácatas-PA2) and less Epiclassic materials in this sector suggest a lower occupation density. Moreover, there is also an expansion in the southwest area of the valley, along the Lerma riverbed. The lack of alluvial deposits covering Epiclassic levels along the Lerma may show a stabilization in the flood regime during the Epiclassic period

that generated suitable spaces for human settlement, contrary to what was observed at the end of the Classic.

The absence of Epiclassic stratigraphic deposits *in situ*, however, raises questions concerning the intensity and duration of occupation in this period. For sites in the plain, this pattern could be explained by agricultural mechanization and deep ploughing practices, but for the Epiclassic foothill sites, cultivated “con yunta,” the absence of sedimentation remains unexplained. In any case, the ceramic evidence shows an occupation throughout the Epiclassic and, although the number of sites does not denote significant growth, it shows the growth trend that characterized the Classic stabilized during this period.

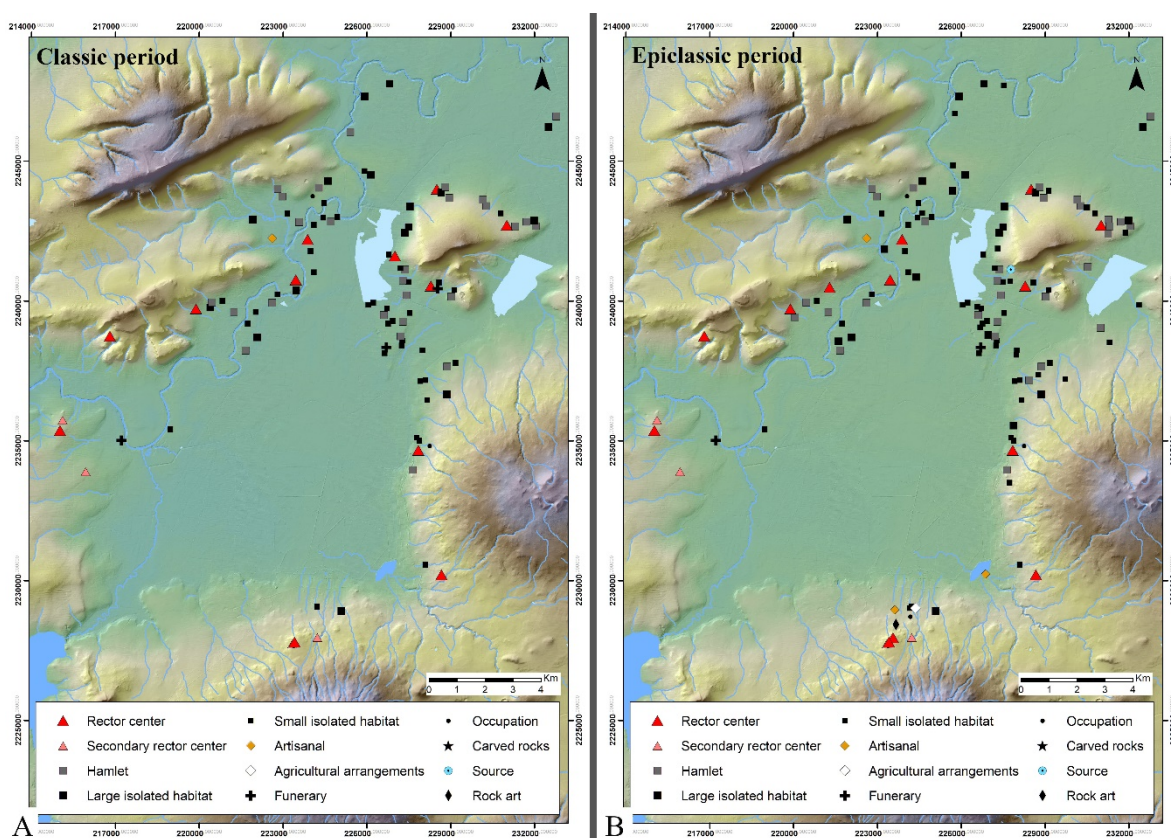


Figure 6. The distribution of Lerma Valley sites during (A) the Classic and (B) Epiclassic periods. © Tres Mezquites Project, GIS by L. Déodat, Cartographic representation by J.F Cuenot. (2 column fitting image)



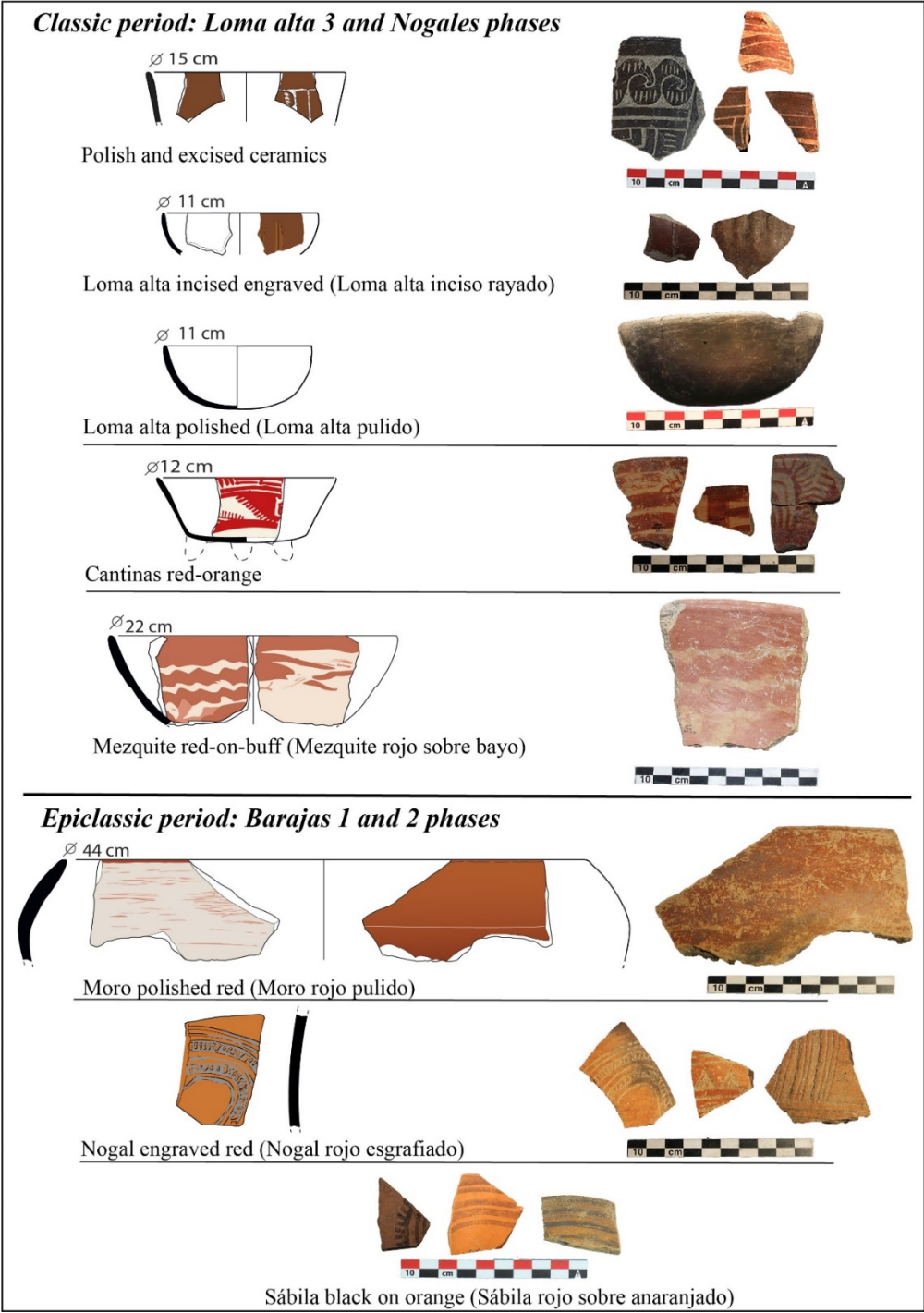


Figure 7. Diagnostic pottery by period in the Lerma Valley. © Tres Mezquites Project, Photographs by A. Castañeda and drawings by S. Eliès. (2 column fitting image)

## Hispanic occupations

The survey also uncovered 43 colonial or modern occupations that were generally detected on prehispanic sites (Figure 8a). At PA1, for example, an early colonial settlement was detected by the presence of figurines dated to the first half of the sixteenth century, the abundance of *Romita Sgraffito* and *Romita Plain* type sherds defined by P. Fournier (Fournier et al., 2007) (Figure 8b).

The presence of Majolica ware sherds (Müller 1981) and vitrified, smoothed and slip decorated ceramics, are a testimony of the establishment of several cereal haciendas in the region during the nineteenth century. Some of the other materials identified in the sites can be dated to the eighteenth century, in particular the *Puebla azul sobre blanco*, *Puebla policromo* and *Santa María* types (Goggin 1968, Lister & Lister 1982) (Figure 8b). This ware is generally found on prehispanic sites that were transformed into agricultural zones and provides evidence of country life during this period. Six sites are exclusively characterized by a nineteenth century occupation and were directly linked to craft activities at the hacienda of Villachuato (sugar cane).

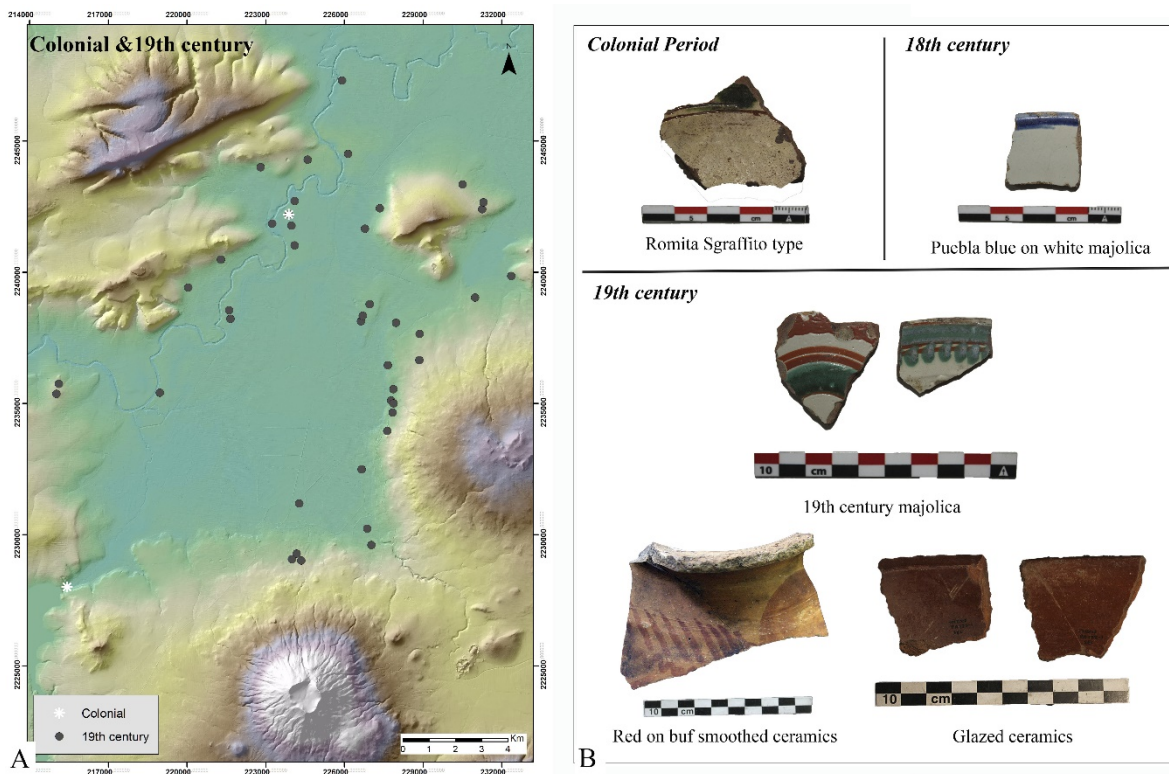


Figure 8. (A) The distribution of Colonial and 19<sup>th</sup> century sites; (B) diagnostic pottery by period. © Tres Mezquites Project, GIS by L. Déodat, Cartographic representation by J.F Cuenot, Photographs by A. Castañeda. (2 column fitting image)

### **A first attempt at establishing a settlement hierarchy**

The surveys revealed a scattering of prehispanic settlements along the Lerma River, in the floodplain, and in the foothills. Our results show that the river was a structuring element in the establishment of settlements from at least the end of the Preclassic period onwards. The relevance of the archaeological data for the distribution pattern along the river is debatable as the main river course may have fluctuated over time. In spite of this drawback, the detection of sites in the plain and along the Lerma River shows that the fluvial system was rather stable, because alluvial sedimentation did not systematically bury sites, especially those dating to the Epiclassic. Those located in the plain, however, were on slight natural elevations. Likewise, the discrete presence of materials from the Loma Alta 2 and 3 phases and the natural formation processes documented during the Classic help us understand the distribution of sites and the proposed settlement pattern.

In other words, our evidence indicates that the flood-prone nature of the alluvial plain was not an obstacle to human settlement. While the Preclassic occupation could not be characterized, settlements continued to multiply and came to colonize all the viable areas in the valley from the Terminal Preclassic onwards.

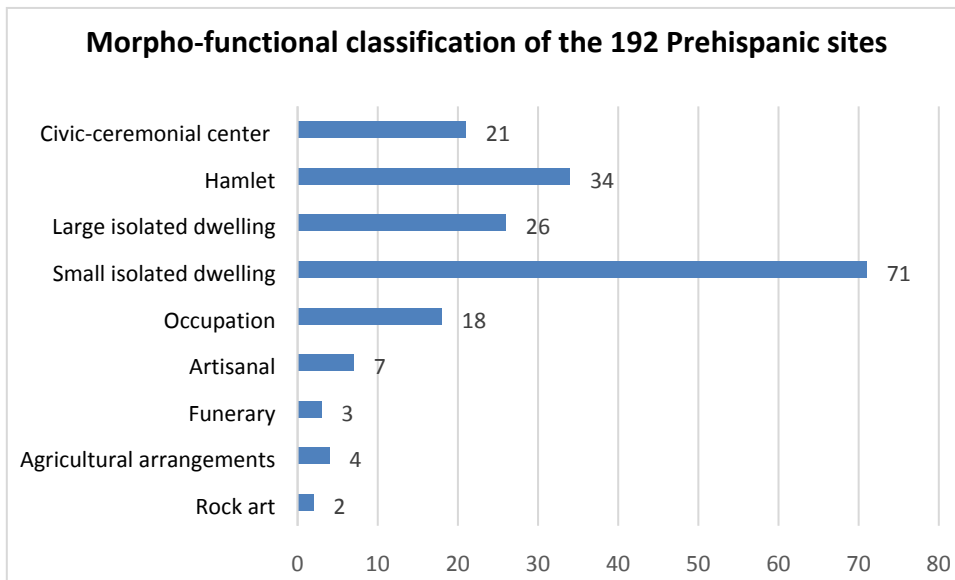
It is not currently possible to discern significant diachronic evolutions in socio-spatial organization between the Terminal Preclassic and the Epiclassic, therefore, the following interpretations apply indifferently to the whole occupational sequence.

Typo-morphological classification for ranking Lerma Valley sites was a difficult exercise. Site morphologies are quite variable and, for some, the only available data come from modern informants. In the floodplain, most sites consist of more or less dense concentrations of materials associated with pedological variations and sometimes with topographic deformations or stone platforms. In the plain, only the large civic-ceremonial center of Cerrito de Tres Mezquites (PA 1) is still standing today amidst a black earth landscape, but it remains vulnerable and exposed to total destruction, as shown by the levelling of the southern and northern parts of its platform. On the other hand, the situation

in the foothills is less catastrophic because farming there is seasonal and less mechanized. A greater number of settlements include architectural remains consisting of platforms with variable dimensions or “sunken plazas.” The artifact scatters also present clear limits and high-density zones allow for representative sampling of human occupations.

The question of site function was addressed first based on several criteria: type of remains (mounds, platforms, topographic deformations, artifact scatters on the surface) and their distribution (extension, limits, and distance between concentrations, number, type and density of material).

The most imprecise level of classification was the “occupation” category that was applied when no elements enabled us to determine site function. This category designates sites with a regular distribution of archaeological material equal to or less than D1. The second category includes settlements with spatial unity and a single concentration of material, a single dwelling platform, and/or a homogenous distribution of material; these cases were interpreted as an “isolated dwelling.” Due to the variability of surface remains observed in the different spatial units, we created two sub-categories: small isolated dwelling ( $\leq 0.5$  ha) and large isolated dwelling ( $> 0.5$  ha). Large isolated dwellings may have comprised several dwelling platforms, sometimes only represented by two or three concentrations of material. On the other hand, concentrations of material or grouped platforms in a site at distances ranging from 20 to 100 m were considered to be a “hamlet.” A hamlet contains at least two houses less than 100 m apart. Lastly, when a hamlet included at least one monumental structure more than 2 meters high, it was considered a “civic-ceremonial center.” When civic-ceremonial centers contained monumental structures more than 100 meters apart, the distance factor was not taken into account and they were grouped together.



**Graph 3:** Morpho-functional classification of the 192 prehispanic sites.

Unsurprisingly, the classification displays a predominance of residential sites, with many of the isolated dwellings (possible farms?) in the plain and along the river (Graph 3). This distribution is interpreted as a dispersed rural settlement organized around civic-ceremonial centers in a continuous and dense settlement pattern (Figure 4b, Figure 6a, Figure 6b).

Twenty-one settlements appear to have served a civic-ceremonial function; eight of which were bigger than the others, five contained a ball court, and their architecture is distinctively Epiclassic. These sites are also preferentially located on the foothills dominating the plain, but two of them are located along the river; thus, their platform height provided sufficient protection from flooding, at least during the last occupation.

Although we could not carry out surveys in the heart of the plain, the routes taken along the Rio Angulo showed that sites were rare, unlike on the banks of the Rio Lerma, especially further upstream. In fact, the western part of the plain and the confluence zone between the Rio Angulo and Rio Lerma are very low in elevation (less than 1,685 masl) and are characterized by alluvial, often sandy, brown-colored silts, rather than the black earth observed elsewhere. In fact, the whole plain between Santiago Conguripo and Villachuato was consistently flooded during the rainy season until the middle of the twentieth century. It is possible, therefore, that the absence of sites in this sector is due to the deposition of these alluvial sediments, which may have occurred during and after the prehispanic

occupations. The climatic and hydrological conditions could have been very different but we cannot rule out the idea of an unsuitable zone for prehispanic settlement.

### **Contribution to regional history**

Our research in the Lerma Valley revealed few markers of Preclassic settlement and diagnostic ceramics do not show a clear link with the Chupícuaro culture. In this respect, the objective established at the beginning of the project of a possible dispersion of Chupícuaro populations along the River Lerma from the first century BC onwards can be ruled out. On the other hand, the rapid development of a dense network of sites at the very beginning of our era, can be linked to the Loma Alta occupations in the lake basins of Michoacán, where stylistic similarity to the Chupícuaro tradition has already been observed (Carot 2001). Our excavations, however, have shown that settlement in the Lerma Valley occurred during the second and third centuries AD, at least two centuries after the beginning of the Loma Alta occupations in the lake basins. On account of this chronological discrepancy, we suggest that the appearance of Loma Alta sites in the Lerma Valley is the result of colonization from the Zacapu Basin, probably via the Río Angulo Valley. Loma Alta groups would have progressively settled in this sparsely populated region, probably as a result of demographic pressure in their home region, and did not share any kinship ties with the Preclassic groups that already inhabited the Lerma.

Our results demonstrate spatial continuity between the Terminal Preclassic and Epiclassic occupations, but also indicate clear changes in the spheres of intra- and interregional interaction that likely reflect socio-political changes.

During the Classic period, we observe strong interactions with the lacustrine regions (Zacapu, Pátzcuaro, Cuitzeo, Queréndaro), and to a lesser degree with the Bajío, Guanajuatense, Acámbaro, and the San Juan Valley (Querétaro). The similarities between the Classic occupations of the Lerma Valley and those of the lacustrine regions of Michoacán are so strong that we can propose they were part of the same politico-territorial network, and that their elites adhered to the Teotihuacan ideology through the consumption of prestige goods (Jiménez 2017, Filini 2010, Darras & Faugère 2018).

At the end of the Classic (between AD 430 and 530), we see the appearance of ceramic types characteristic of the Nogales phase (AD 450-650), defined for the first occupations of

the Barajas Massif (Pereira et al., 2005). The later colonization of the massif, therefore, could have originated in the Lerma Valley, where a dense population existed since the third century AD.

During the course of the Epiclassic period, the Lerma Valley interactions seem to change from the lacustrine regions and become part of the socio-political network that define the Bajío cultures. The architecture of the valley is clearly part of the Bajío tradition, whereas the ceramics are related to the Barajas complex and, to a lesser degree, to the Peralta complex. The perceived changes in architecture and ceramics from the second half of the eighth century onwards on the Barajas Massif and south of the Lerma (Pereira et al. 2005, Faugère 1991)—and which correspond to socio-political changes connected with the arrival of groups from the Chalchihuites tradition are not perceptible in the Lerma Valley. The dynamics in this region do, however, coincide with the phenomenon described for the Bajío during the Epiclassic period; that is, diverse trajectories and regionalism marked by composite cultural traits (Cárdenas 2015). More generally, they fit well with the sphere described by Jimenez (2018), regrouping the Guachimontón and the Bajío traditions, Chalchihuites in the northwest of Mesoamerica and the north of Michoacán. The site of Plazuelas, considered as a pluri-ethnic ceremonial center, would have played the role of interface and mediator (Cárdenas 2015). Of course, it remains to be determined how the Lerma Valley would fit into this composite sphere.

As in neighboring regions, the Lerma Valley was depopulated around AD 900 and became inhabited by mobile hunter-gatherers during the following centuries. It was not until the first decades of the Conquest that a high population density returned to the region; therefore, as was the case for other Bajío regions, the population density of the Lerma Valley remains uncertain after the Epiclassic. At most, we can note the presence of a network of Early Postclassic sites further south, in the Zacapu and Pátzcuaro Basins, which is however built on a local population substrate.

## **Conclusions**

The results of archaeological survey in the Lerma Valley show that it is possible to refine our perception of settlement patterns on a regional scale and to overcome the reductionist scale of focusing only on civic-ceremonial centers. Exploration of the zones between the

three centers initially listed by the INAH in the 1980s has revealed a wide distribution of settlements with variable dimensions, as well as sites with specialized functions and secondary ceremonial centers.

Despite the limits imposed by the characteristics of the study region, a combination of complementary surface and sub-surface survey methods allowed us to understand and account for biases linked to both sedimentary dynamics and anthropogenic activities. The identification of an extensive Classic period occupation enabled us to contextualize the processes that contributed to the settling of Cerro Barajas, which corroborated with the previous assumption that its first occupants came from the Lerma Valley (Pereira et al. 2005). The demographic increase detected on this massif from the seventh century onwards would also be closely linked to internal changes in the valley.

In spite of the characteristics of the region, namely an alluvial floodplain that is not conducive to the detection and/or preservation of archaeological remains, this study turned out to be indispensable for understanding regional dynamics and the scale of population movements throughout time. These movements may have been spurred by demographic pressure and the need for new territories, as was probably the case at the end of the Preclassic for the Loma Alta populations. They may have also taken the form of a progressive expansion into the region from the Rio Angulo valley. In the same way, the colonization of the Barajas Massif and the southern slope of the Lerma, seem to have been driven by social changes in the surrounding regions (Lerma Valley, or the Bajío). It is only in the eighth century that genuinely exogenous elements appear at Barajas and San Antonio Carupo, denoting the presence of foreign groups with Chalchihuites affiliation from the north.

In sum, the Lerma Valley is located at a strategic point of interface for understanding interactions between the Bajío and the lacustrine regions of Michoacán during the first millennium.

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<sup>11</sup> «La Fondation des Treilles, créée par Anne Gruner Schlumberger, a notamment pour vocation d'ouvrir et de nourrir le dialogue entre les sciences et les arts afin de faire progresser la création et la recherche contemporaines. Elle accueille également des chercheurs et des écrivains dans le domaine des Treilles (Var), [www.les-treilles.com](http://www.les-treilles.com). »

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## **Author Statement**

**Alejandra Castañeda:** Investigation, Writing-original draft, Writing - Review & Editing, Visualization, Supervision, Resources, Formal analysis.

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## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

## **Highlights**

- Archaeological surveys situated in the flood plain of Lerma River, southwest of the Bajío, Mexico
- Use of complementary methods of archaeological survey to understand biases linked to sedimentary dynamics.
- The Lerma Valley in the southwest Bajío had its apogee during the Classic period.
- Interface for understanding interactions between the Bajío and the lacustrine regions of Michoacán.
- The Lerma Valley was occupied from the Classic up to the Epiclassic.