Archaeological Palynology of Teuchitlán

Research Year: 1999
Culture: Aztec
Chronology: Late Post Classic
Location: Jalisco, México
Site: Teuchitlán

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Introduction

A contingency grant was obtained from the Foundation for the Advancement of Mesoamerican Studies, Inc. to collect sediment samples for palynological analysis from the archaeological site of Teuchitlán in Jalisco, México, and to aid in establishing a sampling design for collection of palaeoethnobotanical data from archaeological sites in the region. Teuchitlán (Weigand, 1985; 1993a) is one of the large ceremonial centers located in an approximately 300 square kilometer area that forms the geographic core for the Teuchitlán Tradition (Figure 1). The site of Teuchitlán (Figure 2) also contains the largest and perhaps the best example of the Guachimonton-complex architectural pattern – the elaboration of surface architecture into radially symmetrical concentric circles centered by a conical pyramid – that characterizes the Teuchitlán Tradition (Figure 3). But the Teuchitlán Tradition is not defined solely on the basis of an architectural pattern. It is also within the Teuchitlán Tradition that the settlement system attained maximum complexity, and sites their largest size. Additionally, maximum population and population density were achieved, ballcourts reached monumental configurations, long-distance trade and mining intensified, ideological and socio-political systems attained maximal complexity and stratification (Weigand, 1993a; 1996), craft production was at its most specialized (Soto de Arechavaleta, 1982), codical writing displayed on pseudo-cloissonné pottery may have developed (Graham, n.d.), and wetland agriculture apparently flourished (Weigand, 1993b).

The study of these wetland agricultural systems, through analysis of architectural form of system features plus detailed analyses of their palynological assemblages, forms the basis of my own research in the study area. But, as comprehensive as the palynological data set for the wetland agricultural systems is, my analysis of the wetland agriculture was limited by the lack of comparative data from contemporaneous non-wetland archaeological contexts as funding limitations and permit restrictions prevented recovery of pollen samples from non-wetland agricultural fields, ceremonial centers, or habitation sites. Therefore the invitation to participate in the Teuchitlán project represented an outstanding opportunity to augment existing data.

The Teuchitlán project, under the direction of Dr. Phil Weigand of El Colegio de Michoacán and the Museum of Northern Arizona and Efraín Cardenas Garcia of El Colegio de Michoacán, represents the first major excavation research project conducted within the study area. Visiting the site while their first phase of the excavation was at its apex enabled me to obtain samples from a wide range of structures, features, and chronological contexts. It was assumed that analysis of some of the samples collected at Teuchitlán would provide pollen samples contemporaneous with those of the wetland systems, but from depositional contexts subject to different pollen production, dispersal and preservation patterns. Comparing and contrasting the data sets from the two sorts of contexts would facilitate demarcation of the latter and therefore aid in the identification of a palynological signature for wetland agricultural systems, one of the main goals of my research.

However, analysis of pollen samples from the site of Teuchitlán was not limited to providing comparative material for wetland agriculture research. It was thought that the Teuchitlán data would also provide a fair representation of the sort of pollen data that might occur at archaeological sites within the region, thereby serving as a pilot study upon which to base future expectations. Although detailed palynological analysis of the Teuchitlán samples was not planned, it was nevertheless thought that at least some data pertinent to reconstruction of vegetation patterns at and near the site, human – land relationships, and possible impacts the occupants of Teuchitlán had on their environment would be generated. It was also thought likely that samples from archaeological contexts would aid in documenting functional differences between architectural features, and possibly help in establishing their relative chronologies (cf. Stuart and Schoenwetter, n.d.). And finally, being able to see how the above ground architecture related to subsurface archaeological manifestations would aid in creating a sampling design for collection of palaeoethnobotanical samples from future excavations at Teuchitlán, and possibly other sites within the study area.

Submitted 10/01/2000 by:
Glenn Stuart
Arizona State University
glenn.stuart@asu.edu

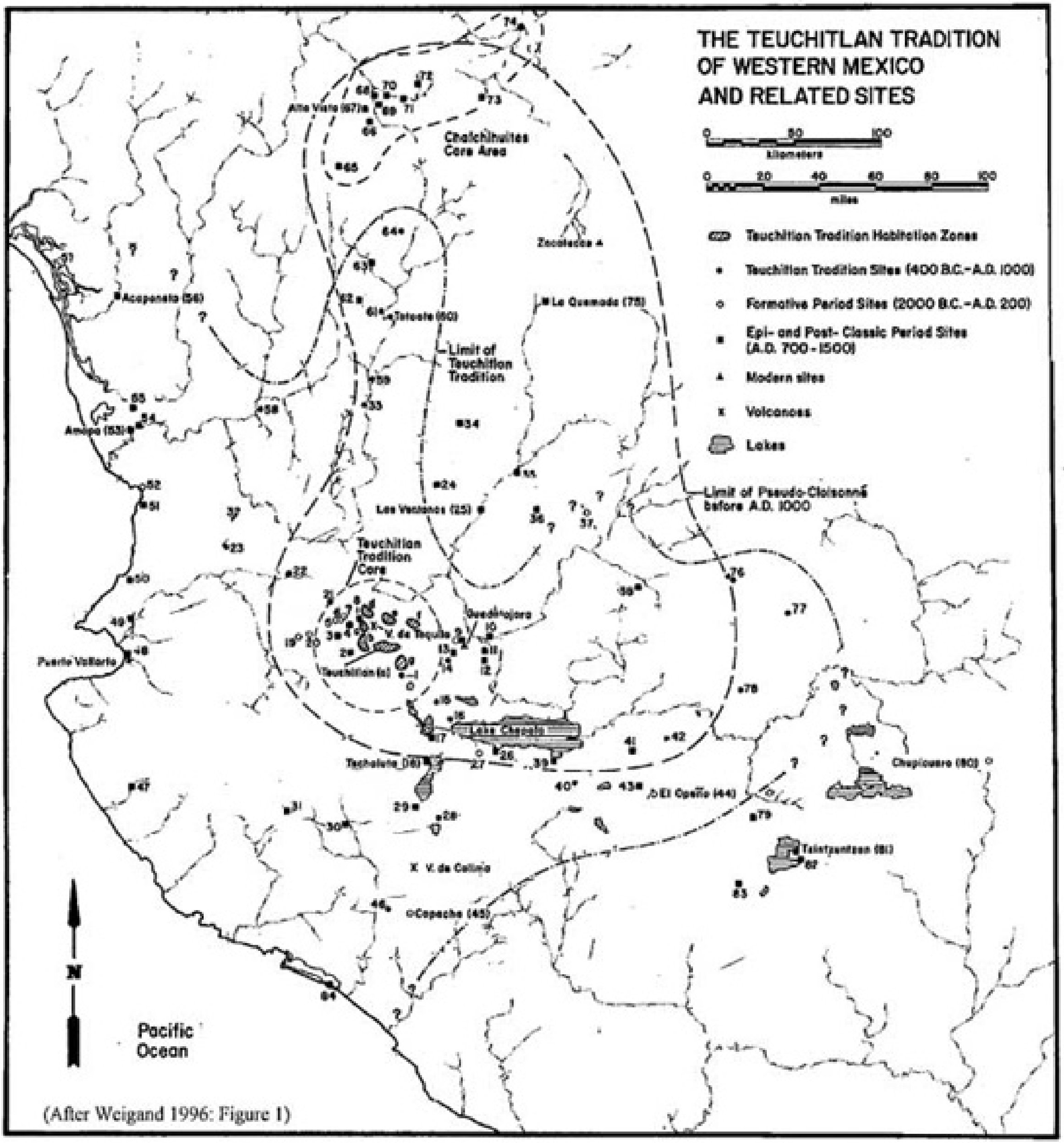

Figure 1. Teuchitlan-tradition and related sites in West Mexico: a, Teuchitlan/El Refuio; b, Ahualulco; c, La Providencia; d, Huitzilapa; e, Las Pilas; f, Santa Quiteria; g, San Juan de los Arcos (a-g refer to Teuchitlan tradition core area habitation zones); 1, Santa Maria de las Navajas; 2, Santa Cruz de Barcenas; 3, Etzatlan; 4, Las Cuevas; 5, El Arenal; 6 , Santa Rosalia; 7, San Pedro; 8, La Joya; 9, Tabachines/El Grillo; 10, Matatlan; 11, Coyula; 12, Tonala; 13, Ixtepete; 14, Bugambilias; 15, El Molino; 16, Jocotepec; 17, Zacoalco; 18, Techaluta; 19, Pipiole; 20, San Felipe; 21, Llano Grande; 22, Ixtlan del Rio; 23, San Pedro Lagunillas; 24, Teul; 25, Juchipila /Las Ventanas; 26, Tizapan; 27, Citala; 28, Gómez Farias; 29, Sayula; 30, Tuxcacuezco; 31, Autlan; 32, Santa Maria del Oro; 33, Cerro Cototlan; 34, Tlaltenango; 35, Jalpa; 36, Nochistlan; 37, Teocaltiche; 38, San Miguel el Alto; 39, Cojumatlan; 40, Jiquilpan; 41, Ixtlan/El Salitre; 42, Ecuandureo; 43, Jacona; 44, El Opeño; 45, Capacha; 46, Comala; 47, Tomatan; 48, Ixtapa; 49, San Juan de Abajo; 50, La Penita; 51, Santa Cruz; 52, Matanchen; 53, Amapa; 54, Ixcuintla; 55, Coamiles; 56, Acaponeta; 57, El Calón, 58, Guaynamota; 59, Las Juntas; 60, Totoate; 61, Cerro Prieto; 62, Tenzompan; 63, Huejuguilla; 64, La Florida; 65, San Andres de Teul; 66, El Chapin; 67, Alta Vista; 68, Pedragoso; 69, Calichal; 70, Gualterio; 71, Moctezuma; 72, Cruz de la Boca; 73, Sain Alto; 74, Rio Grande; 75, La Quemada; 7 6, San Francisco del Rincon; 77, La Gloria; 78, El Cobre; 79, Zacapu; 80, Chupicuaro; 81, Tzintzuntzan; 82, Ihuatzio; 83, Tingambato; 84, Cuyutian (1-84 refer to Teuchitlan tradition and other West Mexican sites).

Figure 1: Teuchitlán Tradition of Western México & Related Sites.

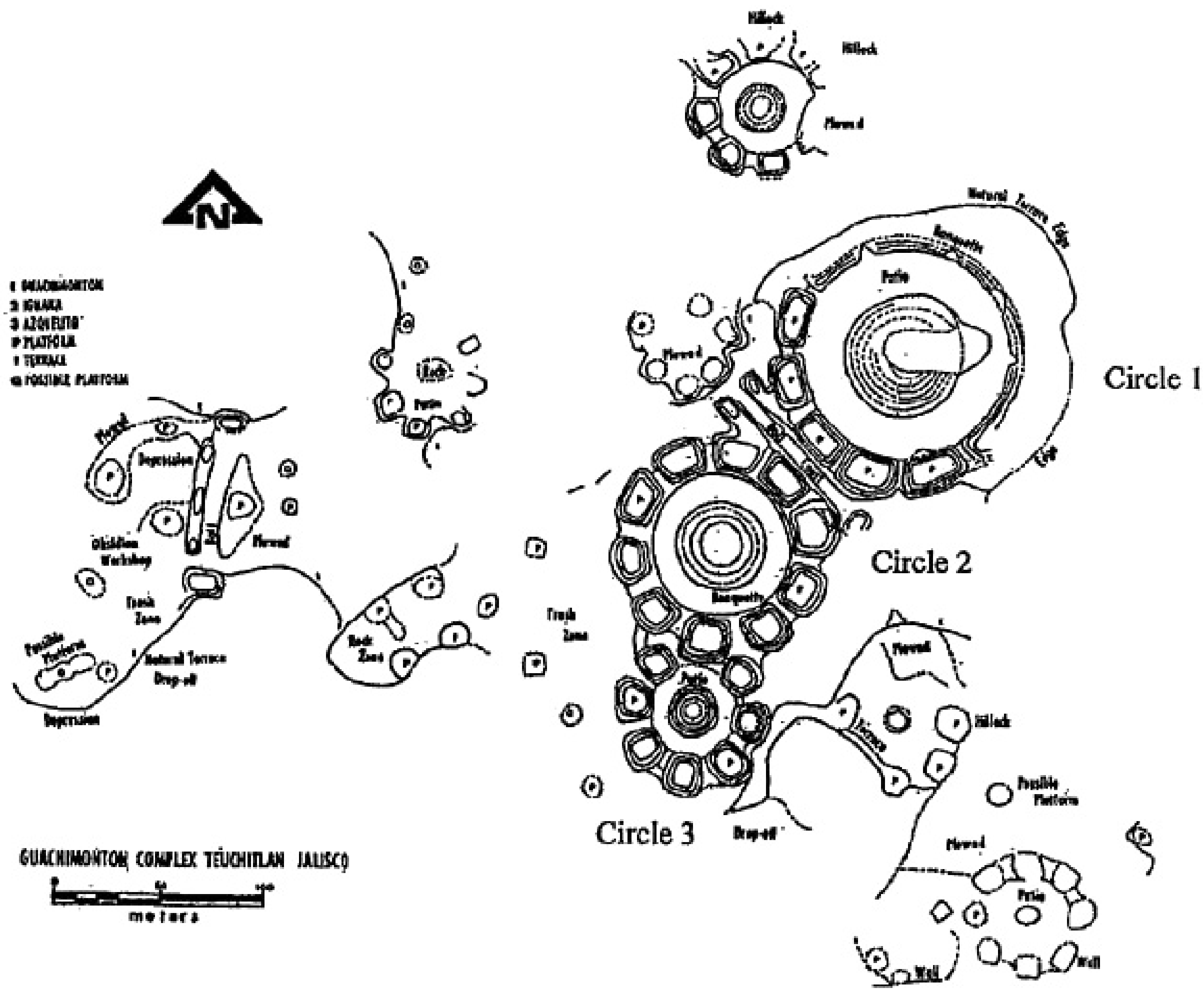

Figure 2: The Guachimonton precinct at Teuchitlán, Jalisco.

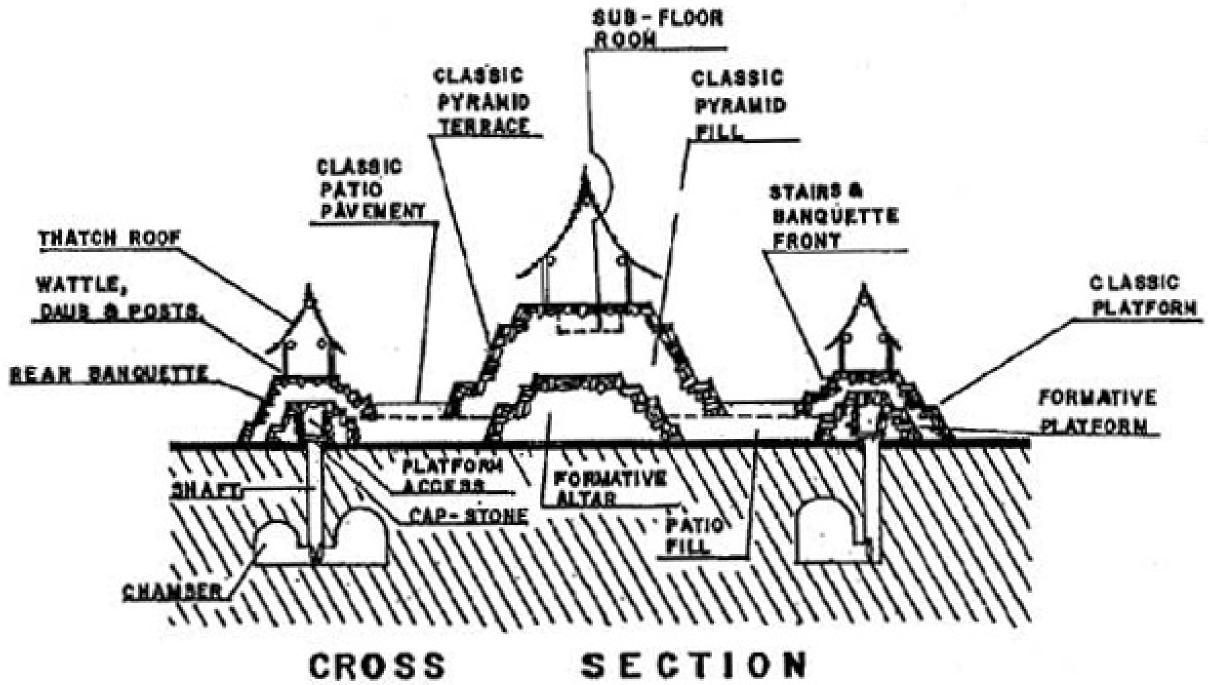

Figure 3: Idealized profile through a Guachimonton circle.

Field Strategies

A standard sampling protocol for habitation sites is to collect samples from floors uncovered during excavation (cf. Fish, 1998). Such a protocol has the advantage of providing samples from similar depositional contexts known to have been exposed to pollen deposition during occupation of the site, thereby producing comparable data sets. Such a protocol was difficult to realize at Teuchitlán for two reasons. First, the site is not predominately a habitation site, so the number of rooms is limited, presumably occurring only on the platforms. Second, the fact that excavation consisted predominately of trenching rather than opening-up excavation blocks means that floors that might be encountered were not as extensively exposed. Where excavation was more laterally extensive, it was only being conducted to a depth sufficient to expose *in situ* rock and rock alignments for mapping; at the time of my visit, no floors on the platform mounds had been exposed. On the other hand, a floor or floors were uncovered in three locations within the ballcourt, all three were sampled. Samples from a variety of other contexts were also obtained.

The collection of the samples took place in late November 1999, just prior to termination of the field season. At this time, excavation of the site had consisted of clearing the surface vegetation and removing loose sediment from pyramid #2, as well as from three of the platforms surrounding this pyramid. The ballcourt, lying between circles 1 and 2, had also been cleared. Several trenches had been excavated within these areas; those with stable sides had been left open for my examination. Samples were collected from the walls and faces of the trenches; such samples consisted of collecting material from a 5 centimeter x 5 centimeter area. Where floors and other surfaces were exposed, pinch samples – that is, the collection of a small pinch of material from several different spots within a defined chronologically synchronous area – were also obtained. A total of 184 samples were collected.

Most of the samples were collected from construction fill. The most common fill material was clay carried up from the lake (now Presa de la Vega) lying several hundred meters from the site. As a lacustrine clay, it is likely that this material contained fairly high concentrations of pollen. However, transportation and using it as fill apparently introduces both oxygen and microorganisms into the clay, thereby diminishing or even eliminating the original pollen content (J. Schoenwetter, 2000 personal communication). Thus, pollen within this sediment may date to the period of its use as construction fill and therefore directly to site occupation. The question then becomes whether or not the clay was exposed long enough to trap sufficient quantities of pollen for analysis.

The second most common construction fill, aside from rock, was puddled adobe; whether this material would even contain pollen is uncertain, but again, transportation of the material to make the adobe, and production of that adobe may well eliminate whatever pollen was previously present. The adobe, as well as a kaolin-rich clay that was not commonly present in the areas I sampled, was applied moist, allowed to dry, then covered with clay fill; the sequence then being repeated as necessary (P. Weigand, 1999 personal communication). How long the adobe was left to dry before being covered would be critical in regard to the amount of pollen that may be deposited on it. These contexts were thought important to sample because if they did contain sufficient pollen for analysis, they would provide a chronological sequence directly tied to construction episodes.

The final sampling context consisted of soil that pre-dated site construction. Such samples are particularly important as they would evidence what the vegetation and environment were like prior to site construction. However, as they appeared to be of aeolian origin, it was thought that they may not have represented a very stable surface upon which pollen could accumulate, so again their pollen concentrations may be quite low. This soil was also only rarely encountered; there were only two locations where this soil was able to be sampled.

The final type of sediment from which samples were collected was a volcanic ash-rich fill that was predominately used as a basal fill placed over top of and amongst bedrock outcrops. It seems unlikely that this material would contain pollen, but was sampled anyway. None of this material has yet been processed for pollen analysis.

In sum, most of the available contexts, and the sediment / material they contained, were not of the sort that routinely provide good pollen samples. They were, nevertheless, sampled extensively to see what they may contain.

Circle 1: Patio

Excavation on the patio of circle 1 consisted of a units 1 x 2 meters in size excavated through the more than 2 meters of patio fill to bedrock (Figure 4, below). The profiled face of one of these units was sampled at 10 centimeter intervals to obtain a complete fill sequence. Given that samples were taken from 5 cm x 5 cm areas, this means there is actually only a 5 centimeter gap between samples. A total of 24 samples were collected from the circle 1 patio.

Ballcourt

The only floors exposed prior to or during my visit were in the ballcourt, where three different sections of floor were exposed (Figure 5). Whether all three of these sections are from one contemporaneous floor or from more than one floor is unknown; all appear to be from the same depth and have the same color and consistency, but this may not be indicative of contemporaneity. A pinch sample was recovered from each of these floor sections.

Four of the ballcourt trenches were being excavated to follow the upper and lower walls that lie along either side of the ballcourt and run parallel to the long axis of the court (Figure 6). Samples were taken from the soil immediately below the bottom course of these walls.

A test pit excavated through the ballcourt fill down to bedrock was sampled according to the same procedure used for the circle 1 patio. This pit indicated that the fill extended for more than 1 meter.

A total of 46 samples were collected from various locations within the ballcourt.

Figure 4: Circle 1 patio test pits. Pyramid 2 visible at top.

Figure 5: Sampling location for one of the ballcourt floors.

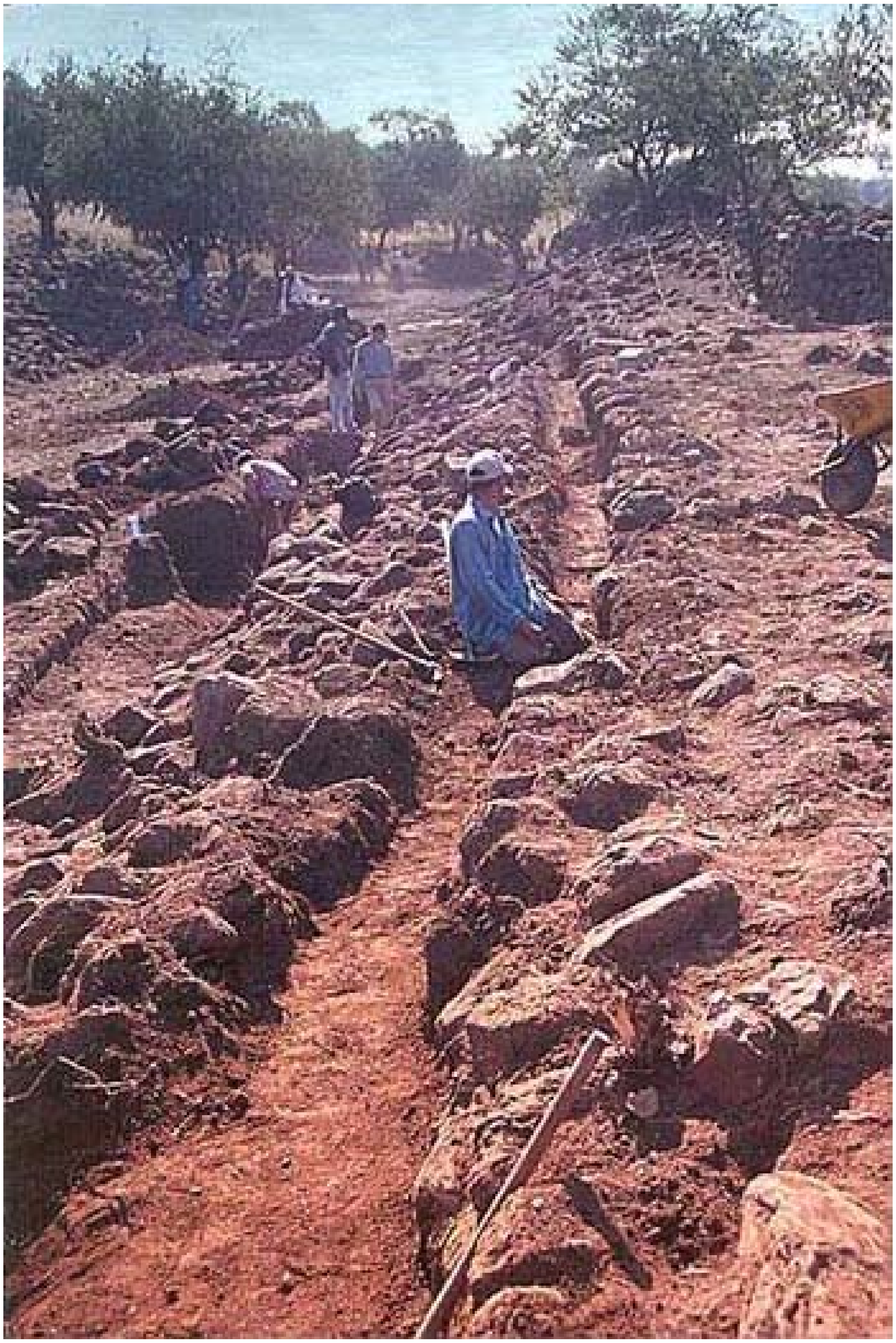
Figure 6: View along side of the ballcourt.

Circle 2: Pyramid

Excavation at pyramid 2 consisted of clearing off the vegetation and loose soil from the entire pyramid, excavating trenches into the side of the pyramid to attempt to document construction episodes, or doing shallow excavations to expose the tread and rise sequence of the step-sided pyramid (Figure 7).

Samples were collected from vertical faces within the trenches to document construction episodes as revealed through sequences of 5 to 15 centimeter thick clay and rubble fill capped with puddled adobe varying in thickness from about 2 to 5 centimeters. Both the fill and the adobe were sampled. Samples were taken from the base of the pyramid where it sits upon bedrock, to the top of the pyramid, as excavation allowed. As the trenches from which these samples were obtained have not been excavated very far into the pyramid, the fill sampled probably dates from relatively late (recent) building episodes.

Samples were also collected from the exposed steps of the pyramid, with one or two samples collected from each tread and rise. There was no evidence of a plastered floor or prepared sub-floor on the treads, or of the rises having been plastered. There is also no evidence to indicate that these steps functioned as stairs, aside from the one area that Weigand has specifically hypothesized to be a stairway, or that any of the surfaces sampled were exposed while the site was occupied.

Toward the top of the pyramid, but only a few centimeters below the current ground surface, excavation revealed a packed surface that was interpreted as being prepared for a floor, but if a floor had been constructed on this surface, it has eroded away. This prepared surface was, nevertheless, sampled.

A total of 74 samples were collected from pyramid 2.

Circle 2: Platform 1

A trench excavated into this platform also revealed it to be step-sided (Figure 8). In this case, the fill and rises appeared to be of clay, with the tread being capped by rock. There was no evidence of a plastered floor or prepared sub-floor on the treads, or of the rises having been plastered. The use of puddled adobe capping clay fill was as seen for the pyramid. Samples were collected from both the tread and rise portions of the step, and from the clay fill / adobe sequences.

Two of the trenches were also excavated down into what appeared to be original soil, that is, soil that was present prior to construction of the sites architectural elements. This soil appeared to be aeolian, and therefore less likely to contain sufficient concentrations of pollen for analysis, but was collected.

A total of 29 samples were collected from platform 1 of circle 2.

Figure 7: Pyramid 2 showing some of the excavation trenches.

Circle 2: Platform 3

Clearing of surface vegetation plus loose rock and soil on circle 2 platform 3 resulted in the exposure of what may have been the foundations for a couple of small structures plus one larger structure (Figure 9). Pinch samples were recovered from within each of these structures, as well as from four of six areas along the edges of the platform that were relatively rich in pebbles and small cobbles, two of the four areas between these pebble patches that did not contain the pebbles, plus along the pronounced step running along the front of the platform. Thus a total of 10 pinch samples were obtained from this platform.

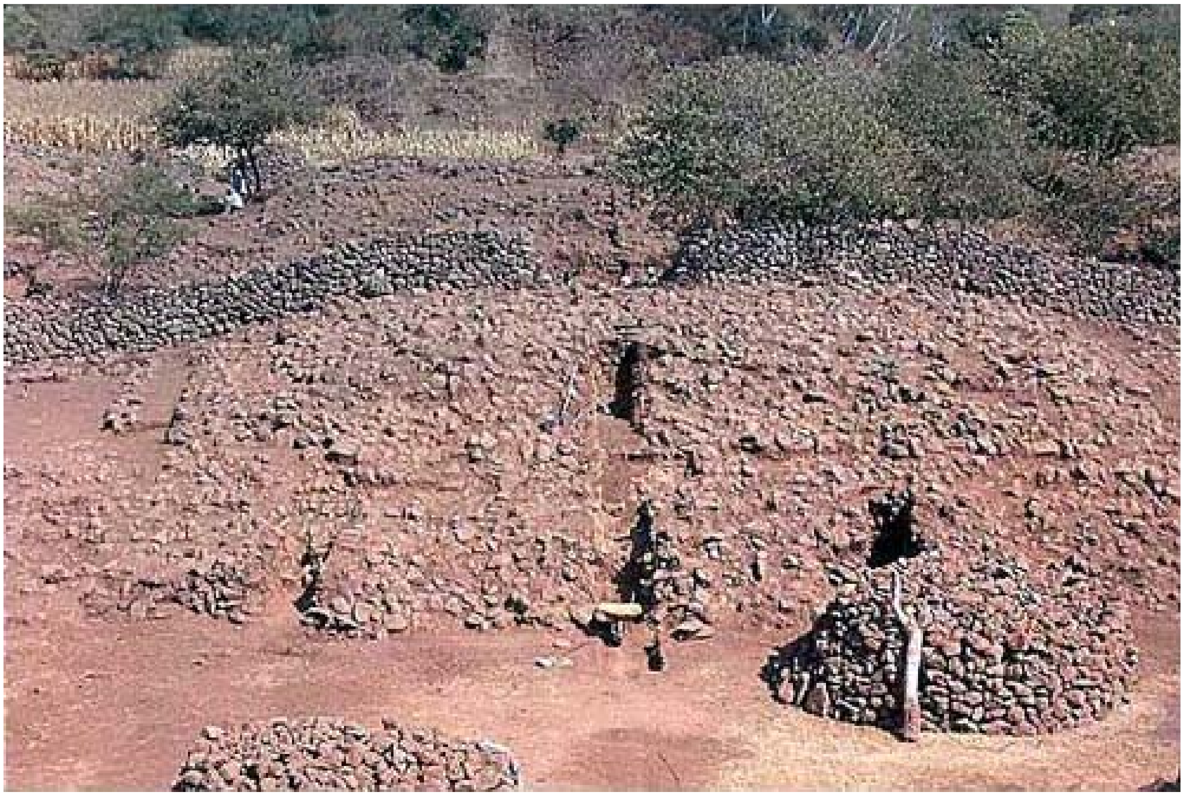

Figure 8: Circle 2, Platform 1 as seen from Pyramid 2.

Figure 9: Possible stone foundation for a structure on Circle 2, Platform 3.

Circle 2: Platform 9

Adobe, believed to be from a wall, and covering an approximately 25 centimeter x 25 centimeter area was uncovered during excavation. A sample of this adobe was collected, but has not yet been processed.

Lab Strategies

Sixteen samples were either judgmentally or randomly selected for laboratory processing. Samples were selected such that the circle 1 patio, the ballcourt, and both the circle 2 pyramid and two of the circle 2 platforms were represented. The samples processed included all three ballcourt floor samples plus one randomly selected trench wall sample; the two 'original soil' samples; two randomly selected pyramid 2 trench wall (face) samples, and one randomly selected rise/tread sample; two randomly selected platform 3 pinch samples and one randomly selected platform 1 trench wall sample; and four randomly selected samples from the circle 1 patio test pit.

Given the very low pollen concentration values that resulted, it was decided to re-process eight of the samples using a different method to see if this would enhance pollen concentration. For the second technique, the three ballcourt floor samples, the two 'original soil' samples, and three randomly selected samples were processed.

Extraction

Method One

Tablets containing a known quantity of *Lycopodium* spores were added prior to processing so concentration values could be calculated. The amount of sediment processed was 5 cubic centimeters per sample. The laboratory procedure involves deflocculation in acid and lye solutions; swirl flotation and screening to separate the lighter and smaller materials of the sample (including pollen) from the heavier and coarser materials; the reduction of inorganic materials using concentrated hydrofluoric acid; acetolysis to reduce the organic fraction, with further reduction of the organic fraction by using bleaching and lye solutions. The resulting polleniferous extract was rinsed in 100% ethanol and stored in glycerol in 1 dram vials.

Method Two

The main difference between the first and second methods involves the use of heavy liquid separation in the latter (cf. (Barr, n.d.), (Schoenwetter, 1996)). As with method one, tablets containing a known quantity of *Lycopodium* spores were added prior to processing so concentration values could be calculated. The amount of sediment processed was 30 cubic centimeters per sample. The laboratory procedure involves deflocculation in dilute hydrochloric acid; swirl flotation and screening to separate the lighter and smaller materials of the sample (including pollen) from the heavier and coarser materials; the reduction of inorganic materials using concentrated hydrofluoric acid; heavy liquid separation in a zinc bromide solution at 2.0 specific gravity to further reduce extraneous material; and reduction of the organic fraction using bleaching and lye solutions. The resulting polleniferous extract was rinsed in 100% ethanol and stored in glycerol in 1 dram vials. Samples that were processed a second time are designated by (M2) in Table 1.

Counting

Slides were prepared for counting by homogenizing the material in the vial, extracting one or two drops, and placing them on a microscope slide; if necessary, additional glycerol was added to use as a mounting medium. The pollen sample was stained using basic fucsin in an alcohol solution. The slide was then observed through a Zeiss light microscope at magnifications ranging from 200X for pollen counting to 1260X for more difficult identifications. Identifications of pollen types were facilitated through use of the Arizona State University Archaeological Pollen Laboratory comparative reference collection, plus the pollen identification key provided by Kapp (1969), as well as pollen descriptions, drawings and/or photographs provided in Erdtman (1952), González Quintero (1969; 1986), Heusser (1971), Sanchez (1980), Sánchez Martínez (1982), Sánchez-Martínez and Xelhuantzi-López (1990), Montúfar (1985), Moore *et al*., (1991), and Montúfar López (1995). The abundance and types of pollen grains observed were recorded until at least 200 identifiable pollen grains, excluding unknowns, or a complete slide, or at least 100 Lycopodium spores, had been counted (Table 1). Two hundred grain counts are believed generally suitable for ascertaining the range of frequency values for the most common taxa present (Martin, 1963).

Results

Although there is no set rule for deciding whether any particular pollen sample contains adequate amounts of pollen for an unbiased analysis, it is generally accepted that minimal concentration values of 1000 to 3000 grains per cubic centimeter are required before the pollen content of a sample is going to satisfactorily reflect the floral community from which it was derived. Values lower than this are thought to reflect pollen contents that have either been significantly altered by loss through poor preservation (Hall, 1981) or rapid burial of a sediment precluding deposition of sufficient quantities of pollen for analysis. Table 1 reveals that the majority of the Teuchitlán samples fall well below this range, regardless of which extraction method was applied. Only one sample produced a pollen concentration value higher than 3000 grains per cubic centimeter, and that sample was located at 2 to 5 centimeters below surface on the circle 1 patio. This is well within the modern plough zone – the patio is currently and for several years has been used as an agricultural field – and therefore the pollen content of this sample likely represents modern pollen. With three exceptions – pyramid 2 trench 5 sample 4, circle 2 platform 3 samples 9 and 10 – all of the remaining samples have pollen concentration values below 1000 grains per cubic centimeter, in many cases well below this figure. There is also reason to suspect the two circle 2 platform 3 samples as they were recovered from cleared surfaces only a few centimeters below the modern surface. Given the otherwise very low pollen concentrations for the Teuchitlán samples, one must wonder if the moderately higher concentrations for these two samples actually reflect pollen deposited during site occupation, or are a product of downward transportation of pollen from the modern surface (cf. Dimbleby, 1985). The pyramid 2 sample, on the other hand, is from a relatively deeply buried context less likely to have been subject to modern pollen contamination.

The circle 1 patio sample is dominated by Cheno-Am pollen. Cheno-Am refers to a morphologically similar group of pollen grains of the Chenopodaceae and Amaranthaceae families. As such, it includes a broad range of plants including those used as food, such as *Amaranthus*, *Chenopodium*, and *Atriplex*, as well as a variety of weedy herbaceous plants encouraged by soil disturbance and enrichment common to both agricultural fields and domestic habitation areas (cf. Cummings, 1990; Fish, 1994). Its occurrence within archaeological site context pollen records of the American Southwest has been variably argued as indicating human environmental impact, resource use, or climatic change (Fish, 1985). Comparing this sample with surface samples collected in the vicinity of the site as part of my wetland agriculture research reveals that this sample has a comparatively high frequency of Cheno-Am. This may indicate that although personal observation reveals that maize has been grown on this field for the past few years, amaranth may have been grown in the not too distant past. Alternatively, the uncultivated ruins of the pyramid and other nearby architectural features may be providing a more suitable habitat for weeds of the Cheno-Am group than is available elsewhere in the surrounding area.

The pyramid 2 sample – the one sample with a reasonable pollen concentration recovered from a context that seems less likely to have been affected by modern pollen rain – rather than being dominated by Cheno-Am pollen is dominated by grass, and, to a lesser extent, by high-spine Compositae pollen. The high-spine Compositae group includes a variety of weedy plants, but also the important food plant sunflower (*Helianthus*), as well as other genera which produce small edible fruits. However, the presence of high-spine Compositae pollen in this context likely reflects the presence of weedy plants. Table 2 indicates that the difference between the pyramid 2 sample and the patio sample in regard to proportions of Cheno-Am, grass, and high-spine Compositae is very significant and quite strong. Similarly, comparing the proportions of these taxa between the pyramid sample and a surface sample that had been collected from an agricultural field approximately 100 meters away – the closest of the surface samples mentioned above – also indicates a very significant difference, but at a lower strength. This lower strength appears to be stem from more similar values for high-spine Compositae and Cheno-Am, while grass frequencies remain quite different. In general, the pyramid sample differs from modern pollen assemblages primarily through a higher grass frequency, and from the patio sample by having a lower frequency of Cheno-Am.

Why the weedy vegetation is reflected predominantly in grass rather than Cheno-Am may arise from the type of disturbance: the higher population density and domestic (i.e., ceremonial and habitation) context of the site area during its occupation versus the less frequented (non-habitation or ceremonial) and modern agricultural context of the abandoned site. However, the possibility that the high frequency of grass pollen may be the product of contamination by modern pollen can not be ruled out.

Earlier, the question of whether the pollen content of circle 2 platform 3 samples 9 and 10 was the product of downward movement of modern pollen or deposition during site occupation was raised. Examination of Table 2 reveals that the proportions of Cheno-Am, high-spine Compositae, and grass pollen from platform samples 9 and 10 are very significantly and quite strongly different from the patio sample. They are also very significantly and fairly to quite strongly different from the pyramid sample. In comparison to the nearby surface sample, platform sample 9 is very significantly, but not particularly strongly, different while platform sample 10 is not especially different at all. As was the case for the pyramid 2 sample, the two platform samples appear to have higher frequencies of grass pollen than do the previously analyzed surface samples. But, this may simply reflect grass pollen being washed down; the circle 2 platforms were grass covered prior to excavation. Thus, it is still unclear whether the pollen assemblage from the two platform 3 samples reflects deposition of pollen during site occupation, or downward movement of modern pollen grains.

Table 2:
Results of Chi-square and Cramer's V analyses of proportions of Cheno-Am, High-spine Compositae and Grass for samples mentioned in the text.

Comparison between:	X^2	p	V
Pyramid 2 sample & patio sample	66.84	0.0001	.56
Patio sample & platform sample 9	81.85	0.0001	.59
Pyramid 2 sample & platform sample 9	35.50	0.0001	.57
Patio sample & platform sample 10	69.38	0.0001	.57
Pyramid 2 & platform sample 10	15.44	0.0004	.42
Platform samples 9 & 10	4.07	0.1305	.19
Patio sample & nearby surface sample	99.70	0.0001	.55
Pyramid 2 & nearby surface sample	18.58	0.0001	.30
Platform sample 9 & nearby surface sample	9.99	0.0070	.21
Platform sample 10 & nearby surface sample	2.58	0.2752	.11

Conclusion

The research had three main goals: (1) to obtain palynological data to compare to and augment existing palynological data obtained during research on wetland agricultural systems within the study area, (2) to provide an indication of the sort of pollen data that may occur at archaeological sites in the region, and (3) to establish a sampling protocol for additional palaeoethnobotanical research to be conducted in the region. Given the results of the analysis, it is difficult to conclusively resolve any of these goals.

A total of 184 sediment samples for palynological analysis were obtained, satisfying the ambition of obtaining samples from a wide range of structures, features, and chronological contexts. Excavation conducted at the site had emphasized clearing surface vegetation and loose soil from the architectural features, and trenching of the exposed features. Obviously, clearing would only reveal the most recent occupation period, while trenches were, for the most part, fairly shallow, although some were to be excavated more deeply in subsequent excavation seasons. Thus most of the sampled contexts would date to relatively recent occupations of the site, but not exclusively so. A few test pits and trench sections were excavated through some of the features, in some cases, such as in the circle 1 patio, to the underlying bedrock. Therefore, samples from earlier contexts were obtained, including from sediment believed to predate occupation of the site. However, no clear identifications of earlier building episodes were visible at the time samples were collected.

Thus, suitable sediment samples for satisfying the first two goals of the project were collected. However, the pollen content of these samples failed to provide information pertinent to the first goal, and only negative information toward the second. If the pollen samples from the site of Teuchitlán are representative of pollen samples from Guachimonton sites, then this does not bode well for future archaeological palynology at these sites. In spite of using two quite different extraction methods – methods that have proven successful at a variety of other locations, including from within the study area – no archaeological context samples produced pollen concentrations of over 3000 grains per square centimeter. The question is, of course, why this may be so.

Most of the samples collected, and most of the samples analyzed, were obtained from fill (Table 1). It was recognized that the recovery of pollen from this context would be problematic for two reasons. First, transporting and/or mixing or otherwise working with the sediment apparently eliminates most of the pollen the sediment may once have contained. Second, the fill was probably fairly rapidly buried thereby precluding the presence of exposed surfaces upon which pollen could accumulate. Thus it was not too surprising that none of the fill samples contained more than 3000 grains / cubic centimeter, and only one contained more than 1000 grains / cubic centimeter.

Assuming that transport of the material for and the making of the adobe would also eliminate or severely reduce pollen content, the critical factor in whether or not pollen would be present in the adobe was how long it was exposed to pollen deposition while being allowed to dry. The very low concentration values for this material type suggests that burial was fairly rapid, or at least rapid enough to preclude deposition of sufficient quantities of pollen for analysis.

The low concentration values for the original soil was thought a possibility because aeolian soils are often palynologically depauperate. Unfortunately this did prove to be the case.

What did come as a surprise was the very low pollen concentrations for the floor samples. Floors are generally exposed to the air for relatively long periods of time, and routinely have pollen concentration levels sufficient for analysis. Perhaps the low pollen concentration values for the Teuchitlán ballcourt floor samples relate to the way the surface was manufactured, or used, or exposed. At this point in time, it is not possible to determine why these samples contain so little pollen.

Research currently underway at another site in the study area will help to indicate whether or not these results are typical of Guachimonton sites in particular, and habitation or ceremonial sites in general. Shortly after I collected these samples, excavation commenced at the site of Llano Grande (Figure 1), and samples for palynological analysis were obtained and are going to be analyzed. I am unsure of the contexts from which these samples were obtained, or how they are being processed, but it will be interesting to see what sort of results are obtained.

Probably the most important goal of the research was to establish a sampling protocol, first to direct collection of sediment samples for palaeoethnobotanical analysis as excavations continue at Teuchitlán, and second to guide assessment of sampling contexts at other archaeological sites within the study area. Such a protocol would help to ensure that depositional contexts from which sediment samples were collected had similar cultural and natural formation processes. This would help to ensure that variations seen in the pollen, and macrobotanical, assemblages could be related to and help identify variations in site type, feature type, chronological period, and geographic location. Such variations would also provide information in regard to domestic activities associated with processing, storage, and preparation of plant resources and how this may have varied both within and between sites, and across time. If samples being compared witness different formation processes, then variation in their assemblages would also relate to such processes. In some instances these are the sort of data wanted, such as in comparing samples from wetland agricultural systems to habitation / ceremonial sites, but different formation processes makes many intra-site and inter-site comparisons more problematic.

Samples obtained from floors are particularly suitable as floors represent surfaces that are exposed to pollen deposition for extended periods of time while the site is occupied. In addition to airborne pollen, pollen adhering to the surfaces of harvested and collected plants is commonly dispersed onto the floor during the processing or storage of these plants. It is assumed that over time, a basically random sample of this pollen becomes incorporated into the floor itself. Yet, in this study, samples collected from a ballcourt floor or floors failed to yield adequate counts for analysis. Furthermore, excavations conducted at Teuchitlán, or at least excavations that had been conducted up to the time of my arrival, failed to uncover very many floors. However, only very limited excavation had been conducted on the platforms, the most likely location for floors, so floors may yet be discovered. Still, given the apparent lack of floors and the very low pollen concentrations from the floor(s) that was sampled, and the low concentration of pollen from fill context samples, it would seem that collection of samples from any surface that may have been exposed during the site's occupation is essential.

In sum, this research did not provide the sort of data that was anticipated. Nevertheless, as excavation has continued, so has the collection of sediment samples for palaeoethnobotanical analysis. Given the results of current analysis, the importance of obtaining samples from any surface thought to have been exposed during occupation of the site is being emphasized. Hopefully, analysis of these contexts will prove more rewarding.

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			In Pollen Sum																								
Teuchitlán Samples	Depth (cms. bs) or Proven-ience	Material	Pinus	Que-rcus	Salix	Cupres-saceae	TCT	Celtis	Myrica	Pros-opis	Legum-inosae spp.	Myrta-ceae	Lilia-ceae	Cheno-Am	Hi-spine Compo-sitae	Low-spine Compo-sitae	Gram-ineae x<40	Gram-ineae 40<x<60	Cruci-ferae	Solan-aceae: Physalis-type	Umbel-liferae	Zea (Gram-ineae > 60)	Cyper-aceae (?)	Indeter-minate	Lycop-odium marker grains	Sum	Lycop-odium added	Cubic cms. of sediment processed
Circle 1 Patio Trench 1 Cala 1 Sample 1																												
	5-Feb	Fill	5	6		1		1			3	1		127	16	10	29						2	1	28	201	24200	5
Percent			*2*	*3*		*0*		*0*			*1*	*0*		*63*	*8*	*5*	*14*						*1*	*0*		*100*		
Concentration			778	1037		173		173			519	173		21953	2766	1729	5013						346	173	4840	34658		
Circle 1 Patio Trench 1 Cala 1 Sample 11																												
	100-105	Fill	2		1									11	1		3		1						100	19	24200	5
Percent			*8*		*5*									*59*	*5*		*16*		*5*							*100*		
Concentration			73		48									532	48		145		48						4840	895		
Circle 1 Patio Trench 1 Cala 1 Sample 16																												
	150-155	Fill									5					1	2								103	8	24200	5
Percent											*63*					*13*	*25*									*100*		
Concentration											235					47	94								4840	376		
Circle 1 Patio Trench 1 Cala 1 Sample 22																												
	210-215	Fill									1						2								100	3	24200	5
Percent											*33*						*67*									*100*		
Concentration											48						97								4840	145		
Circle 1 Patio Trench 1 Cala 1 Sample 22 (M2)																												
	210-215	Fill	1	1											2		7								301	11	32037	30
Percent			*9*	*9*											*18*		*64*									*100*		
Concentration			4	4											7		25								1068	39		

Ballcourt 1 Trench 1 Cala 1 Sample 10																												
	40-45	Adobe									1			4			12								101	17	24200	5
Percent											*6*			*24*			*71*									*100*		
Concentration											48			192			575								4840	815		
Ballcourt 1 Trench 1 Cala 1 Sample 10 (M2)																												
	40-45	Adobe		1		2								5	2	2	15	1							47	28	32037	30
Percent				*4*		*7*								*18*	*7*	*7*	*54*	*4*								*100*		
Concentration				23		45								114	45	45	341	23							1068	636		
Ballcourt 1 Floor 1																												
	top of floor	Floor													1		2								103	3	24200	5
Percent															*33*		*67*									*100*		
Concentration															47		94								4840	141		
Ballcourt 1 Floor 1 (M2)																												
	top of floor	Floor		1											3	3	3								19	10	32037	30
Percent				*10*											*30*	*30*	*30*									*100*		
Concentration				56											169	169	169									562		
Ballcourt 1 Floor 2																												
	top of floor	Floor	1						1		1				2	1	2								100	8	24200	5
Percent			*13*						*13*		*13*				*25*	*13*	*25*									*100*		
Concentration			48						48		48				97	48	97								4840	387		
Ballcourt 1 Floor 2 (M2)																												
	top of floor	Floor													1										24	1	32037	30
Percent															*100*											*100*		
Concentration															44										1068	44		
Ballcourt 1 Floor 3																												
	top of floor	Floor												5	1	1	2								138	9	24200	5
Percent														*56*	*11*	*11*	*22*									*100*		
Concentration														175	35	35	70								4840	316		

Ballcourt 1 Floor 3 (M2)																												
	top of floor	Floor												8	5	5	13			1					101	32	32037	30
Percent														*25*	*16*	*16*	*41*			*3*						*100*		
Concentration														85	53	53	137			11					1068	338		
Circle 2 Platform 1 Trench 3																												
	original soil	Soil	1								1		1	1	1		2	1							103	8	24200	5
Percent			*7*								*13*		*13*	*13*	*13*		*27*	*13*								*100*		
Concentration			23								47		47	47	47		94	47							4840	352		
Circle 2 Platform 1 Trench 3 (M2)																												
	original soil	Soil	2	1			1							8	1	1	9								171	23	32037	30
Percent			*7*	*4*			*4*							*36*	*4*	*4*	*40*									*100*		
Concentration			9	6			6							50	6	6	56								1068	141		
Circle 2 Platform 1 Trench A																												
	original soil	Soil									2			1	1		5								47	9	24200	5
Percent											*22*			*11*	*11*		*56*									*100*		
Concentration											206			103	103		515								4840	927		
Circle 2 Platform 1 Trench A (M2)																												
	original soil	Soil	2	1		2					2			2	2	1	8								100	20	32037	30
Percent			*10*	*5*		*10*					*10*			*10*	*10*	*5*	*40*									*100*		
Concentration			21	11		21					21			21	21	11	85								1068	214		
Circle 2 Platform 1 Trench A Sample 11																												
	trench wall	Adobe															1								100	1	24200	5
Percent																	*100*									*100*		
Concentration																	48								4840	48		

Circle 2 Platform 1 Trench A Sample 11 (M2)																												
	trench wall	Adobe														1	1								5	2	32037	30
Percent																*50*	*50*									*100*		
Concentration																214	214								1068	427		
Circle 2 Platform 3 Cleared Surface Sample 9																												
	ca. 5-10	Sediment	1			2					3			14	8		42	3				2	1		183	76	24200	5
Percent			*1*			*3*					*4*			*19*	*11*		*56*	*4*				*3*	*1*			*100*		
Concentration			13			53					79			370	212		1111	79				53	26		4840	1997		
Circle 2 Platform 3 Cleared Surface Sample 10																												
	ca. 5-10	Sediment	4	2		1					1			6	12	1	27				1		1		229	56	24200	5
Percent			*6*	*4*		*2*					*2*			*11*	*22*	*2*	*49*				*2*		*2*			*100*		
Concentration			74	42		21					21			127	254	21	571				21		21		4840	1173		
Pyramid 2 Trench 4 Sample 3																												
	trench wall	Fill / Adobe	1											1	1		1								136	4	24200	5
Percent			*14*											*29*	*29*		*29*									*100*		
Concentration			18											36	36		36								4840	125		
Pyramid 2 Trench 5 Sample 4																												
	trench wall	Fill	3	2		1				1	1			3	11		30	1							235	53	24200	5
Percent			*5*	*4*		*2*				*2*	*2*			*6*	*21*		*57*	*2*								*100*		
Concentration			51	41		21				21	21			62	227		618	21							4840	1081		
Pyramid 2 Trench 7 Sample 26																												
	rise	Fill	2	1													5								93	8	24200	5
Percent			*25*	*13*													*63*									*100*		
Concentration			104	52													260								4840	416		
Total			21	16	1	9	1	1	1	1	21	1	1	196	71	27	223	6	1	1	1	2	4	1	2667	606	643496	320
		Percent	*3*	*3*	*0*	*1*	*0*	*0*	*0*	*0*	*3*	*0*	*0*	*32*	*12*	*4*	*37*	*1*	*0*	*0*	*0*	*0*	*1*			*100*		
		Concentration	16	12	1	7	1	1	1	1	16	1	1	148	54	20	168	5	1	1	1	2	3	1		457		