BOTANICAL REMAINS FROM THE

CALCHAQUI ARCHAEOLOGICAL PROJECT 1990

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INTRODUCTION

To aid in the greater project goal of understanding the interaction of Inka and indigenous peoples, botanical material was recovered and analyzed from excavations of four site in the Calchaqui Valley in 1990. Substantial numbers of samples were recovered from two of these sites, Valdez (n=96 samples) and El Potrero de Payogasta (n=313 samples). The sites of Cortaderas and La Paya were subject to smaller test excavations, producing only 6 and 11 samples respectively.

The strategy for the paleoethnobotanical analysis was to obtain an accurate representation of the plant remains within the sites, without expending excess time recovering repetitive information or analyzing samples from disturbed contexts. During the 1990 field season C. Heyne, S. Arnott, C. Hastorf, and their crew processed 448 samples. In the laboratory at the University of Minnesota we analyzed 354 (79%) samples. Because Cortaderas (Site 65) and La Paya (Site 1) were represented by a small number of samples all were analyzed. From Valdez (Site 12) and El Potrero (Site 42) 77 to 83% of the samples brought back were utilized. In these cases, a number of samples from non-cultural deposits such as sterile soil and disturbed contexts had been collected but very few were analyzed.

Other samples excluded from analyses include proveniences with duplicate samples. The general sampling design was to collect one bag of site matrix per provenience, but at times excavators sampled more intensively. For this study it was deemed more important to have each cultural deposit represented equally, therefore we normally analyzed only one sample per provenience.

METHODS

Field methods

In general, botanical material found in the Calchaqui Valley sites are preserved by charring. There are some uncharred materials that were collected by the excavators that were recorded as prehistoric, but the latter are rare and their actual age uncertain.

Plant specimens were recovered both from 1/4"(6.35mm)-mesh screens and from samples of site matrix subjected to flotation. This report is based on results of the flotation samples as they are more systematically processed and recover materials as small as 0.5 mm.

Samples of site matrix were of a fairly uniform size, with an average of 5.7 l and a median value of 5.9 l. This standardization aids in the interpretation of results as it removes biases that can be introduced by unequal representation of differing contexts. For this reason we have confidence in all quantification schemes, including UBIQUITIES (frequencies, see below), which are often heavily influenced by sample size (Lennstrom 1991).

Botanical remains were separated from site matrix using a motorized flotation system, modified from the design of the Shell Mound Archaeological Project (SMAP) machine published by Watson (1976). The basic principal for the system is the fact that charred material is lighter than water. As the charred plants float on the surface they can easily be collected as the heavier materials sink and the soil particles wash away. The machine used in 1990 was built from a 55 gallon drum with water pumped in through a shower head in its center. Inside the drum is a removable inner bucket with a 0.5 mm mesh bottom. This inner bucket catches rocks, artifacts, bones and larger plant materials that do not float. This "heavy fraction" is then dried and the cultural material sorted out. All material from the heavy fractions that is larger than 2 mm is collected; our tests found that analysis of the smallest portion of the heavy fraction is time-consuming and the results are negligible.

The charred plant remains floating on the water's surface are poured off through a spout into fine meshed chiffon (aperture <0.3mm). This material, termed the "light fraction", is allowed to dry and then packaged in plastic bags for shipment to the archaeobotany lab along with floral remains from the heavy fractions.

An average of 17 samples were processed per day. Each day the crew was instructed to randomly select one sample to which 50 charred, commercial poppy seeds (*Papaver*) were added to check on the recovery rate of the machine. This type of seed is used as it is small (ca. 0.4 X 0.6mm) and is not a species that is native to the New World (Wagner 1982; 1988). These tracers allow us to estimate the amount of small material that is lost during the flotation procedure. The recovery rate for the 1990 Argentine field season was 90%, with the mean, median, and mode of recovered seeds were equal at 45 (90%). The range of values was narrow, at 38 to 50 (76-100%).

Laboratory methods

Analysis of the charred plant materials from the light fraction began with the separation of all carbon, bone, and fish scales from other materials that floated (such as modern plant roots and soil). Analysis of the material in the laboratory was done using low power (6-25X) stereoscopic microscopes with fiber optic light sources. Trained lab personnel extracted the charred remains and made some preliminary identifications of plant taxa. H. Lennstrom checked all samples, making final identifications and scanned remaining material for any identifiable material that was missed. Identifications were made with the aid of C. Hastorf's South American reference collection.

Material from each flot was examined twice, systematically, under the microscope. For ease of sorting, the samples were split using 2mm, 1.18mm, 0.5mm, and 0.3mm geologic sieves, keeping materials of the same size together in separate trays. All charred material greater than 2 mm was recovered for identification, whereas wood was not removed from the <2 mm portion of the light fraction as it is known to be too small for identification purposes (Asch and Asch 1975). Originally, all other plant material down to 300 microns (0.3 mm) was collected and identified.

During the analysis of these materials sample processing did not progress quickly enough and in the Spring of 1991 we discontinued analysis of materials between 0.5 and 0.3 mm to save time and increase the number of samples that could be analyzed. Work by M. Wright with Bolivian samples had demonstrated that there are some taxa that have seeds smaller than 0.5 mm that will be lost in this procedure. Unfortunately the percentage of such seeds (Small Poaceae, *Juncus*, *Nicotiana*, etc.) lost was not the same from sample to sample leaving no systematic method of calculating this loss. In general the loss is small and very few taxa will be lost completely. 42% of the 1990 PAC samples were sorted to 0.3 mm and 58% were sorted only to 0.5mm.

In some cases, when charred plant remains were particularly dense, it was not possible nor necessary to examine the entire sample. We used experimental results from Lennstrom's (1992) work with Peruvian flot samples which found that a 10-25% sub-sample could be used to represent the sample as a whole, if the sample contained several thousand plant fragments and had a total volume of over 0.5 liter of charred botanical remains. Samples were split using a riffle box, in order that the sub-samples were divided without bias (Pearsall

1989). Only two of the 354 PAC samples were split whereas the remaining samples were sorted in their entirety.

Each sample was recorded on a data sheet, containing information on its provenience, type of sample, cultural context, volume of flot sample, amount of sample analyzed, counts of all the plant taxa that could be identified, and counts of those items that could not be identified. Counts were chosen over weights as a quantification scheme for recording because some seed taxa are very small and their weights are negligible. Material from the heavy fractions was identified in the same manner, and tallied on the same data sheet as the light fraction.

Upon completion of the sample information was transferred from the data sheets to the IBM 4381 mainframe computer and analysis was carried out using the SAS statistical package (SAS Institute 1985a; 1985b; 1985c; 1985d).

Analytical methods

In this research we report the different plant taxa recovered from the samples using three different quantification schemes employed to help interpret the botanical remain (DENSITY, UBIQUITY, and PERCENTAGES). Density is expressed as the number of seeds (or seed fragments and other parts) per liter of site matrix. This standardizes the counts of material, in order to compare samples of differing original volume (Pearsall 1989; Popper 1988). Also, each taxon can be considered independently, and density values seem least biased when comparing samples of different original soil volume (see Lennstrom 1991).

Ubiquity is expressed as a percentage, and is calculated as the percentage of samples which contain each taxon (Hubbard 1975; Popper 1988). For example, if maize is identified in 10 of 30 samples it has a ubiquity value of 33%. The advantage of ubiquity scores is that each taxon is considered separately, and the amount of each does not affect the others. Also, the amount of each taxon in a sample does not affect the ubiquity value, so that 1 or 1000 of the same seed in a single sample carries the same weight.

The third quantification method we present is called percentage or relative proportion (Popper 1988). These values are expressed as the percentage each taxon makes up relative to the number of items in an individual sample, and can be displayed as a pie diagram. The advantage of this scheme is that all taxa can be considered simultaneously, and the relative proportions of taxa from different samples can be compared, regardless of the original volume of the sample, or the density of charred plant remains.

The use of these three schemes in concert with other common statistics will provide a clearer picture of past plant use, and help separate robust, meaningful patterns from spurious "noise" in the data.

ARCHAEOLOGICAL SITES IN THE CALCHAQUI VALLEY

Introduction

In the following sections we describe the botanical findings from the four sites excavated during the 1990 field season. The emphasis is on Valdez and El Potrero as they were more intensively investigated, but summaries of Cortaderas and La Paya are included as well. We start the investigation of the plant remains from each site at a most general level and work to more areas specific details. In this way we hope to illuminate general site-wide patterns as well as spatial variability in differing parts of each site. Working at these different levels may also help us to discern whether there are similarities and/or differences between sites, within sites, or within periods of occupation within single architectural groups.

Valdez (12)

This site consists of a large number of mounds and mound groups, known to be inhabited by the indigenous peoples prior to and during Inka occupation. The clusters were judged to be domestic areas and five groups were investigated. It had been thought that mounds were the remains of domestic structures while the low areas in between would have been open patio or work spaces. Upon excavation this theory was modified, as it appeared that in some cases the low, flat areas contained evidence of domestic spaces whereas the mounds appeared to be large, outdoor middens with no evidence of architectural remains.

Plant material from the site of Valdez is the densest of the four sites tested. When all the charred remains are considered, the average number of fragments and seeds per sample is 832, with a median of 704 (Table 1a). Comparing these figure with those from El Potrero it appears that the charred plant material at Valdez is not only denser but also more evenly spread. Discounting wood, the average number of items per sample is lower than El Potrero, yet the median values are similar (Table 1b). Again, the range of values and the similarities of the mean and median suggest that the non-woody component of the site's deposits was widely and evenly distributed.

The differences in the distribution of botanical materials between Valdez and El Potrero appear significant and may stem from the differing contextual structure or make-up of each site. These differences may in turn relate to differences in lifestyles and habits of the groups that lived in the two towns. As seen in Table 2, the relative proportion of midden contexts at Valdez is nearly ten times that of El Potrero; midden is the most common cultural context defined at Valdez, whereas occupation areas and floors are less commonly found. This difference in contexts may also be a function of the type of houses and habitation structures that were used. At Valdez housing materials and/or construction techniques led to more ephemeral structures that left fewer well-defined floors for excavators to discover. El Potrero, conversely, had more substantial architecture which still stand today. The difference in housing materials and construction techniques may hint at deeper differences. Perhaps the more labor-intensive and planned architecture of El Potrero may have made a statement about the power and wealth of the Inka personnel. Whether this was the case or not, different lifestyles, especially trash location and "tidiness" have affected the patterns found in the botanical remains. The density and even spread of plant trash suggests little concern with the disposal of this material at Valdez, perhaps coupled with a longer occupation than at El Potrero.

The flotation samples from Valdez are composed largely of wood fragments. This fact is generally true for all the PAC samples but Valdez have the highest average proportion (Table 3) and average density (Table 4a). Again, this abundance of wood may be a function of longer-term habitation or different habits concerning spent fuel and housing material. This preponderance of wood, some of it sizable, suggests that the indigenous population was not without access to trees and shrubs for use in cooking, heating, and construction, even in this arid environment.

Plant remains apart from wood are also present in the Valdez samples. Tables 4a and 4b display quantifications of the major domesticated food sources along with some wild and non-plant resources. As was found for wood fragments, Valdez contains some of the highest densities and ubiquities of food remains. This again suggests a longer-term and/or denser occupation than at other sites or more careless disposal of food refuse.

All the major domesticated food sources found in the PAC samples were recovered from Valdez. These foods include maize (*Zea mays*), *Chenopodium* sp. (likely quinoa, *Chenopodium quinoa*), tubers, legumes (beans), and Chili peppers (*Capsicum* sp.). Assuming that the distribution of plant remains in the sites represents access to and consumption of foods, we suggest that all domesticated food resources were available to the indigenous population under the Inka domination. Because these same foods were also discovered at the administrative site, El Potrero, it is apparent that the diets of the two groups were not qualitatively different.

As commonly found in Andean botanical samples, maize cob fragments (cupules) at Valdez are more widespread and found in denser concentrations than remains of kernels. The ratio of kernel to cupule density is roughly ten to one. This is not surprising as the kernels are meant to be consumed whereas cobs are used as fuel and/or discarded. Given that many of the contexts excavated at Valdez were judged to be trash mounds the high ubiquity values for maize cupules are as predicted.

Yet the preponderance of cob fragments also confirms that maize was brought to the sites unshelled, which may mean it was grown nearby. The low ratio of kernels to cupules suggests that a fair bit of processing took place at Valdez and/or the residents were especially careful with maize kernels (see Sikkink 1988).

The high ubiquity value for *Chenopodium* demonstrates that these seeds worked their way into nearly all contexts. This is as expected, given the small size of the seeds. These seeds are usually 2mm in diameter or less and are easily lost and remain hidden in floors as well as trash. While detailed measurements of these *Chenopodium* seeds have not yet been made, the general large size and shape suggests they are domesticates, probably the species *C. quinoa*.

It is difficult to compare densities between the taxa given the vagaries of preservation of different species and plant parts but it is not uncommon for *Chenopodium* to be one of the most widespread and densest food remains. This is indicative of *Chenopodium* use, but it does not necessarily mean that it was a more important food staple than the others.

The tuber remains encountered in the sites are likely potatoes (*Solanum* spp.) or one of several other indigenous Andean domesticates. The size of the specimens is taken as an indication of their status as domesticates, though the use of wild tubers in not unknown. Their appearance in the context of other cultivated food plants also lends support to the assumption that they are domesticates.

The occurrence of identifiable tuber remains in the samples is low, both in terms of ubiquity and density. Oddly, it is the only plant taxa less common at Valdez than at El Potrero. This is not as predicted, as we expected the Inka center to have higher proportions of maize not tubers, given the higher status of maize in the Inka culture.

The density and frequency of domesticated legumes (possibly *Lupinus mutabilis* and/or *Phaseolus* spp.) are very low. This may be a function of infrequent use or processing techniques that do not lead to preservation. Legumes, such as tarwi (*Lupinus mutabilis*) are often boiled in soups or ground into flour which might make them invisible in the archaeological record. Yet, legumes are also often toasted, a process likely to include them in site deposits (Gade 1975; NRC 1989; Meyerson 1990).

Non-domesticate remains include a wide variety of wild seeds, wood, and dung. Some of the most common wild plants at Valdez include small- and large-seeded grasses (Gramineae), sedges or tortora (Cyperaceae), cacti (Cactaceae, *Opuntia* in particular), and small bean family taxa (Leguminosae), as well as a large amount of small seeds (almost certainly wild) that could not be identified (Table 5). These types of seeds are common in archaeological sites in the Andean highlands (e.g.: Hastorf 1983; Lennstrom et al. 1991; Pearsall 1988).

The functions of the wild taxa recovered from Valdez are varied. Many types of grasses can be used as food, thatch, fuel, and fodder (Gade 1975; Pearsall 1988). Some species of wild legumes are also used as fodder for domestic animals (Gade 1975). Sedges are employed in construction, rope making, and are used as ornaments and the seeds and underground portions can be eaten (Garcilaso de la Vega 1966:57; Soukup 1979:309; Yacovleff and Herrera 1934). It is likely that cactus fruits were collected as food and the plants can be grown as thorny boundaries around property. Many wild Andean plants also have medicinal properties in addition to value as food or raw material for construction (Bastien 1987; Yacovleff and Herrera 1934; 1935). It is likely that many wild species were brought to the site intentionally but they may also have been included incidentally as they came in attached to clothing or animals, in dung, or mixed with crops (Pearsall 1988).

The high proportions of these wild seeds indicates that a wide range of domestic activities took place at Valdez and that casual food sources were utilized in addition to domesticates.

To further investigate the activities at Valdez we now turn to a closer look at the five individual mound groups excavated during the 1990 field season. To compare the contents of the flotation samples from individual cultural contexts we graphed each locus as a pie-chart, to show relative proportions of plant remains across samples of differing densities. We discovered that if we used all plant taxa together the wood remains heavily dominated the samples (75-100%) and obscured the non-wood components. To examine the other parts of the samples we recalculated the charts without the wood out in order to make conclusions on the other elements of the samples. In the discussion below we will discuss relative proportions of individual samples without the woody component.

Architectural Division 12=1. In this ArcDiv two areas were investigated; one mound was tested (ASD 40), as well as part of the open, low-lying area between the mounds (ASD 50). During the excavation it was determined that the mounds represented piles of trash whereas the open area was where the habitation structure would have been. Remains of metal slag and scoria suggest that the area may have been used for metal production though general domestic refuse suggests it was a habitation zone as well.

Examination of the archaeobotanical materials shows average to slightly low ubiquity and density values when compared to other areas of Valdez (Tables 6a and 6b), though tubers are more well represented than in other ArcDivs. A breakdown of the ArcDiv into its two largest cultural contexts (trash vs. living surfaces) shows a marked difference in botanical remains (Tables 7a and 7b). Here we find that crops, wild seeds, wood, and dung are all most common in the midden. In fact, dung does not occur in ASD 50 at all. This suggests that materials were probably cleaned from the inside living areas and deposited in the trash piles close by. We can suggest that either these plants were charred accidentally and later removed as garbage or that the trash dumps were periodically burned as is seen in some traditional Andean households today (Sikkink 1988).

Fourteen middens samples were collected from a single unit spanning levels 2 through 13 in ASD 40. These samples show a higher number of different taxa (higher diversity) than the samples from ASD 50, although this may be a function of the higher number of specimens in individual midden samples. Most samples are not dominated (<33%) by a single taxon, except for *Chenopodium*, which dominates in 5 of 14 samples. This may suggest that trash was not highly segregated.

The samples from ASD 50 come from four units, varying in depth from 2 to 6 levels each. As with the midden loci, each sample is somewhat unique in the relative proportions of its contents, though the same taxa are common here as they are throughout the site (see Table 5).

Architectural Division 12=2. Two units in one of the mounds (ASD 40) of this ArcDiv were sampled for botanical remains. Cultural contexts defined include fill, ash deposits, and possible occupation zone. Artifacts include various pieces of malachite that may indicate stonework took place in this ArcDiv. Quantities of domesticates in this area (Tables 7a and 7b) are relatively high, and this mound contained the highest density and ubiquity of maize kernels and the only occurrence of *Capsicum* (Chili pepper) in the site. These are probably high prestige crops and may signal high status for the individuals using this area. Overall, the archaeobotanical materials look similar to 12=1-40, suggesting to us that this too may have been some type of rubbish heap, and not the remains of a domicile per se.

Again, individual samples are quite different from one another, and very few are dominated by a single taxon. Cobs, *Chenopodium*, and unidentifiable seeds figure prominently in a few cases, but in general the patterns appear somewhat random.

Architectural Division 12=3. Two mounds from this group were excavated, ASD 40 and ASD 41. The former contained a large amount of Inka and fine Santa Mariana pottery, but was also heavily disturbed by modern road construction. Excavation of ASD 41 revealed a series of occupation zones, prepared surfaces, and a portion of a tapia wall. In appears that it may have originally functioned as a house and was later used as a trash dump.

Samples from 12=3-40 are like most others. They contain similar taxa to those throughout the site, and there are no dense concentrations nor pure deposits of seeds. Samples in close proximity to one another are no more likely to look the same than those several levels apart. One exception is the dominance of an unknown wild seed (#284) in adjacent levels 2 and 3. Overall densities and ubiquities of food crops are average to low when compared to other mound contexts (ASD 40s), especially for maize kernel density. Individual samples from this mound are similar to many of the others.

Mound 12=3-41 was investigated more extensively and one of the two units was excavated down 14 levels. In general some of the plants remains--such as *Chenopodium*, small grass, unidentifiable seeds, small twigs, and dung--are much less dense below level 8. This is below both the midden deposit and the occupation levels, and therefore does not correspond to a shift in mound function. Densities of most crops are fairly high and this mound contains more different categories of food plants than any of the others in the site. Some individual occupation samples also contain proportions of domesticated legumes and maize kernels that are over 5%, which is unusually high.

Individual samples from ASD 41 show more patterning than some other areas of the site. The midden portion in the upper levels of the two excavated units show high variability and a wide range of different taxa. Many of the samples from the occupation levels are dominated by *Chenopodium* and show remarkable similarity to one another. These finds suggest a number of possibilities. One is that the range of activities in the home may have been restricted. It may also be that food preparation was carried out in ASD 41. And last, it may be that general trash was deposited haphazardly in midden piles.

Architectural Division 12=4. A single mound (ASD40) from this cluster was investigate with four units ranging from 1 X 1 to 1 X 0.5 meters. Surface find of finished obsidian artifacts and a crucible led excavators to determine the mound warranted further investigation. All units appear to have a midden overburden and floor and/or floor contact contexts, suggesting a living space with garbage either associated with the occupation or dumped in the area after the compact surface was in use.

Samples from this mound cluster contain denser material than any other area in the four sites investigated. This is due mainly to dense wood remains. Other taxa, such as the food crops show ubiquity values similar to other mounds at Valdez (see Table 7a). Densities of maize kernels and *Chenopodium* are similar to the overall site average whereas cupules are denser than anyplace else at Valdez.

Inspection of individual flot samples show that cob fragments are especially prevalent in the floor and overlying midden of Unit 1; maize kernels make their biggest showing in floor of Unit 4 and the midden of Unit 2. A concentration of an unidentified wild seed (#305) is located in the midden and underlying floor in of Units 1 and 2.

These data suggest food may have been prepared or consumed in this area and--as with other mounds--that a great deal of refuse may have dumped here after the occupation area was no longer in use. The dense wood and cob fragments may suggest discard of spent fuel. Alternatively the wood might represent burned structural remains and the cobs the remains of corn shelling and subsequent trash burning.

Architectural Division 12=5. The excavation in this area was restricted to a single 2 X 2 meter unit centered on a "hundimiento" originally thought to be a tomb [?little sink hole or depression? cc="general feature", these notes are particularly difficult to figure out]. Only a few levels were excavated and samples from only two usable proveniences were available. In general, the samples are low in density. There are no domesticates, save *Chenopodium*, and even very little wood. It would appear that the activities or functions of this feature did not involve charred plant materials (i.e., it does not appear to be midden nor the type of burial or offering that include burned plants). We suggest that the function of this area was not like those of other areas at Valdez, either mounds (ASD40s) or open spaces (ASD50s).

El Potrero de Payogasta (42)

The architectural remains at this site represent the remains of the provincial Inka capital of the area. The standing remains include stone and adobe constructions. Different structures found at the site include walled habitation compounds, an ushnu, and a kayanka.

Excavations were carried out in all types of architectural units, both inside structures and in adjacent open spaces. This sampling strategy was aimed at recovering information on daily household activities as well as aspects of ceremonial life at this Inka installation.

Excavations at El Potrero were carried out across the site in 11 different ArcDivs. Plant remains were collected from all these areas, with the number of samples dependent upon the extent of excavation.

Examination of Table 1a suggests that charred plant material is plentiful in El Potrero. The average density of archaeobotanical remains is only slightly lower than that of Valdez. Yet, the median value and the range of density values for El Potrero samples demonstrate that plant material is highly clustered and not as evenly spaced as at Valdez.

Differences can also be seen in the density and proportion of woody materials. When wood counts are removed from the average density figures

(Table 1b) the average density of materials is higher than at Valdez, with a median value that is similar. Table 2 shows that the average percentage of wood in El Potrero samples is only 70, opposed to 90% at Valdez. In sum, the data demonstrate that botanical content of the samples are from El Potrero less dense, but that a higher proportion of the plant remains are material other than wood.

As noted above, these differences, as well as others, may stem from the different types of contexts encountered at the two sites (Table 2). These differences, especially differing amounts of midden, are in turn linked to differences in habit and attitudes that likely existed between the local Santa Mariana peoples and the intrusive Inka society.

Due to the predominance of wood in the El Potrero samples, as in the others, we suggest that similar domestic activities were carried out at all sites. The Inka peoples at the provincial capital apparently had no special access to fuel resources.

The crop plants recovered from El Potrero include maize kernels and cob fragments, *Chenopodium*, tubers, domestic legumes, and peppers. All of these food remains are at lower densities and ubiquities than at Valdez, except for tubers. As noted above, this is not as expected. The higher status Inka residences were predicted to have greater abundances of maize, the higher status crop. It may be that tubers were collected and redistributed by the Inka in this case.

Distributions of cob and kernel fragments also show differences at El Potrero and Valdez. At the former, the average kernel to cob ratio is approximately 5 to 1, whereas the latter is closer to 10 to 1. This may demonstrate that less maize processing took place at the Inka installation. This is as predicted as Inka overlords might be expected to receive corn already shelled as tribute. ?

The amounts of *Chenopodium*, peppers, and legumes recovered from El Potrero are similar, although slightly less that found in Valdez samples. Again, it is likely that the *Chenopodium* represents quinoa, and that its distribution is linked both to its common use as a food and the small size of its seeds. Legume distribution may again be a function of infrequent use or preparation techniques that render them impossible to identify. They are also not a food staple, but only a condiment. It is surprising that peppers occur in both the Inka and indigenous settlement. Again, there is no difference in the types of crops each population had access to.

The occurrence of the same types of wild seeds in both sites indicates that the use of raw materials, fuel, and medicines may have been similar in the daily lives of Inka and local populations.

Our examination of the eleven areas tested at El Potrero follows the same format as Valdez. We will look at each architectural cluster, open space vs. inside structures, and individual loci. Quantification schemes employed are the density and ubiquity of major crops and other important plant taxa broken down by ArcDivs and further by ASDs, as well as pie-charts (relative proportions) of taxa from single flot samples. Given the same problem of overwhelming amounts of wood, the pie-charts are calculated on non-wood taxa only.

Architectural Division 42=4. This area was made up of a large open patio area and three structures. One rectangular structure (ASD 20) and one area of the patio (ASD 50) were partially excavated. Artifactual remains from the structure include lithics, ceramics, bones, burned dung, scoria, and part of a crucible. It is suggested that in addition to functioning as a residence that the area may also have been used for metal production.

This patio cluster contains denser material than all other at El Potrero and most of those at Valdez. It also has the highest average density of dung of all. These factors may be related to metalworking. First, such production would require larger quantities of fuel than in an ordinary household, and second, there would be a greater chance for charring of plant remains to take place.

Food remains in ArcDiv 4 are also denser than in many of the other patio groups. Maize kernels are denser here than elsewhere, although they are equally widespread (similar ubiquity values) in ArcDivs 42=5 and 42=16. Food remains also include cob fragments, *Chenopodium*, and tubers. No legumes or peppers were found. This suggests that maize, *Chenopodium*, and tubers were the staples and that the other crops were either rare or not preserved. The high density of wild seeds may also be linked to metal production. Small seeds could easily be included with shrubbery used as fuel in the production process.

ArcDiv 42=4 is one of six patio groups where both indoor and outdoor contexts were excavated. Four units were excavated in ASD 20 and a single 1 X 2 m unit was dug in the patio (ASD 50). The two types of maize remains show a difference in distribution; kernels are most common in the patio samples whereas cupules are nearly equally represented indoors and out. Tubers and dung fragments are only found inside the structure, suggesting they were only burned or disposed of inside. *Chenopodium* is widespread (high ubiquity) but denser outside in the patio. These pattern suggest a wide range of cooking and trash disposal activities took place in all areas of the house compound. It may be that a few--such as tuber cooking and using dung as fuel--were more restricted in location.

Comparison with other ArcDivs, especially those which also represent habitation areas, shows that this area is similar to others, although no two are alike. It appears that there is a fair amount of variation in patterns of production, consumption, and disposal of plant resources. Apparently there were no strict rules dictating where different activities relating to plant use were carried out.

Architectural Division 42=5. This area is a large walled space, containing a structure found only upon excavation. The entire structure was not uncovered but two 2 X 2 m units were opened, exposing two walls joined at right angles. Samples were collected from both sides of the walls, allowing both inside and outside areas to be investigated.

Artifacts recovered from 42=5 were 'exceptionally rich', especially in ceramics and bone found in an area of midden outside the structure. Red ocher and a pendant were recovered from the prehabitation fill. These data and the stratigraphic details suggest the structure was a domicile with no special functions.

ArcDiv 42=5 contains fairly dense charred plant material, with an average of 115 fragments per liter of site matrix. Several of the main crops were recovered from the area, including maize, *Chenopodium*, and tubers. As with most patio groups, legumes and peppers were did not occur. Dung, wood, and wild seeds were recovered in moderate amounts, suggesting normal household activities.

The distributions of taxa in and around the structure are similar to most of the other ArcDivs. Maize seem to be the only category that is regularly disposed of in the same areas, the open patios and not inside the structures. This is generally true for both kernel and cob fragments across most ArcDivs. In 42=5, as in general, *Chenopodium*, dung, and wild seeds do not appear to be disposed of preferentially in either place (inside or out). Wood is much filled pit inside ASD 1. Most individual patio and structure samples do not appear to be qualitatively or quantitatively different.

One unusual feature is a hearth in the patio, which contained a very dense concentration of materials, including maize cobs, *Chenopodium*, tubers, and cactus seeds. These remains suggest that these were all prepared as foods in this outdoor hearth.

Architectural Division 42=15. This ArcDiv represents a different type of space than most of the others. This area contains a religious structure, an Usnu, that would not be used in the same way as domestic areas. Excavations were carried out in five units. These units were placed in a line which started at the usnu and continued to the south-west. Contexts recorded were mainly fill and wall slump, thought there was a occupation surface running though most of the units which has an associated pit. This surface (level 4) had higher artifact density than other levels, with clusters of Inka-polish ware.

Plant remains are not varied and the ArcDiv contains small amounts of cupules, *Chenopodium*, and wild seeds. The average density is quite high, but this is overly influenced by a single 2.5-liter sample which contained over 8,400 wood fragments. In reality, plant remains are fairly sparse. This is not surprising given that the area was not domestic. The occurrence of a pit filled with charred wood also fits with the ceremonial nature of this ArcDiv, as ritual burning of offerings is well known throughout the Andes.

Individual samples confirm the patterns noted above. Samples are very sparse, and usually contain one or two different taxa.

Architectural Division 42=16. This ArcDiv was not a well defined walled patio group. Instead, it consisted of three structures and an intervening open area without a wall. One round structure (ASD 1) and part of the open area (ASD 50) were excavated. Upon excavation it was discovered that there was a structure wall in ASD 50, and as a result two of the units had to be reassigned as "inside" space (Tables 9a and 9b). Even the two units that were determined not to be inside the structure were probably the doorway, so the dichotomy of inside vs. outside space is weak in this instance.

The ArcDiv contained all the artifactual elements of everyday life, as well as materials that indicate the production of obsidian and mica artifacts. In contrast to near-by ArcDiv 42=7, this ArcDiv 16 has poorly executed architecture and fewer fine artifacts and was therefore hypothesized to be of low status craft producers, perhaps linked to elites in 42=7.

Average density of archaeobotanical remains is low, due mainly to a low density of wood fragments. This may be a function of contexts excavated; as noted above nearly all proveniences may be from inside structures, where wood density is generally less than in patios.

Crop remains from ArcDiv 16 include the usual maize kernels, cupules, and *Chenopodium*. Tubers and legumes are absent, but this area contains the only occurrence of pepper seeds in the entire site.

The breakdown of the ArcDiv into different ASDs paints an ambiguous pattern. Inside spaces do contain the lower amounts of maize kernels, as seen elsewhere, but the differences are small, and the two "inside" spaces do not show similar density and ubiquity values. In general, the two units inside ASD 50 contain more of nearly all other taxon categories. These results probably relate to random variation, and not differential use of space or differing activities. Instead, it is more reasonable to say that the plant remains suggest normal habitation activities which are not spatially distinct.

Inspection of individual samples shows that the sparser samples have fewer taxa, as is normally the case. Most of the ArcDiv 16 samples are dominated by unidentifiable charred materials, with smaller amounts of *Chenopodium*, and various weedy species. Again, no clear line can be drawn between inside and outside patterning.

Architectural Division 42=17. This area of El Potrero contained a special type of architectural feature, known as a kayanka. This was a large rectangular structure, with three extant walls, some 32 by 10 meters in size. The walls were oriented in the four cardinal directions. Materials recovered include ceramics, lithics, and bone. In the back of the structure a number of infant burials had intruded into the deposits, but were determined to be much more recent and therefore not related to the occupation of the kayanka.

Plant materials recovered from the three units excavated are fairly sparse. Maize cupules and *Chenopodium* are the only domesticates recovered from this ArcDiv. The *Chenopodium* is mainly from a dense deposit in Unit 1. This is the unit where the intrusive burials were recovered leaving the interpretation of this deposit difficult. Average wood density is also quite low. These remains suggest very little cooking took place in this area of the site, as both wood and burned, discarded food are a by-product of the cooking process. The wood which was found and the charred weed seeds may be a function of burning for heat, or the general lack of concern for the way in which plant refuse was discarded.

Many of the samples in the kayanka are dominated by unidentifiable fragments or *Chenopodium*. This is not an unusual pattern, suggesting heavy traffic that eroded much of the material and the ubiquitous nature of *Chenopodium* seeds.

Architectural Division 42=21. This patio group contained three rectangular structures enclosed within a wall. Excavations were carried out in the largest structure (ASD 20) and two different patio areas close to the door of ASD 20 (ASDs 50 and 51). Artifact content of the ArcDiv included small amounts of ceramics and bone. Most units were only extended down 4 levels, with the top levels composed of wall fall and the lowest of sterile soil, with very little cultural material in between. Excavators explained that they could not determine the type of occupation nor the activities carried out. From all evidence it looks like a habitation area of unknown status, with no indication of specialized production or consumption of goods.

Plant remains are few, and not highly varied. Food remains of cobs and *Chenopodium* are all that were found. A couple of dense *Chenopodium* deposits occurred near the surface in both the patio and the structure. These patterns, as well as other ubiquity and density values bear a stronger resemblance to the kayanka than to other households, though the sample is small and difficult to interpret.

The differences between the structure (ASD 20) and the two patio units (ASDs 50 and 51) is not similar to most other habitation areas. Here remains are most common inside the structure, whereas they are normally found in the patio areas. Again, this may indicate a different type of habitation or set of activities were associated with this ArcDiv, or it may be that the number or samples is too small to get an accurate reflection of what occurred there.

Individual samples are nearly all (9 of 11) dominated by *Chenopodium*. It appears there was a great deal of similarity shared by all the deposits investigated, both inside and out. This ArcDiv shows the greatest continuity across space. This suggests that either the activities throughout the patio group were the same in all places or that the deposits are well mixed. Given the domination by such a small seed and the sparse deposition of materials it may simply represent background "noise" found throughout the site.

only six flotation samples were recovered from one of the rectangular structures.

The samples from ASD 20 are mainly from roof and wall fall contexts. Excavators noted large burned roof beams, that show up as fairly dense wood remains in most of the samples. The only sample from a floor context below the roof has a smaller amount of wood (ca. 10% of the average wood density). Very small amounts of maize and *Chenopodium* occur in the samples, whereas wild seeds are fairly common (given the overall low density of material). Nearly all of the charred remains--crops, wood, and weeds--were recovered from the roof and wall fall samples. The floor had no seeds at all. It may be that the weeds were part of the roof and that the crops were on the roof at the time it burned. A more likely scenario may be that the crops and perhaps the weeds were inside, on top of the floor, and only burned when the roof did. Another likely possibility is that the crops are part of the background "noise" of the site, as these two occur in nearly every ArcDiv in all four sites.

From the botanical remains it is difficult to determine the function of the structure. Remains could be from domestic used, but the low density suggests the area was not a normal habitation structure.

SUMMARY

Plant remains from the PAC samples were plentiful and can add to the knowledge of Prehispanic lifeways of the Calchaqui Valley. The first startling observation in the preponderance of wood in the samples. In comparison with other late Prehispanic Andean highland areas--such as the Mantaro Valley of Peru and Tiwanaku of Bolivia--these samples contain far denser concentrations of wood and twig fragments, although the range of other plant remains are much more comparable. This is surprising given that today the area is very dry and there are very few trees. It may be that the environment was different at that time, and heavy removal of trees for fuel and construction had not yet occurred.

Other plant taxa from the four sites include a typical variety of Andean crops. These include maize, *Chenopodium*, tubers, and legumes. The occasional occurrence of pepper seeds is also known from other highland sites. Wild plants such as grasses, verbena, sedges, mallows, nightshades, and cactus suggest a varied plant community surrounding the sites. From their regular occurrence in the sites it appears that the inhabitants made use of wild plants for food, medicine, fuel, fodder, and construction in ways not unlike they do today.

The comparison of Valdez and El Potrero shows some differences and similarities. In general, they contain the same plant taxa. Each has samples that are dominated heavily by wood remains, with substantial amounts of unidentifiable plant fragments and *Chenopodium*. Maize, *Chenopodium*, and tubers are most widespread whereas legumes, and especially peppers are less common. There are no important food taxa that are restricted to one site or the other. From these data we suggest that there were no restrictions on the use of different foods and fuels imposed on the indigenous people by the intrusive Inka settlement.

Differences are found between the two settlements. Valdez has a higher overall density of material, because Valdez contains larger amounts of wood. On the other hand, El Potrero has more non-wood remains than Valdez. This difference stems from the difference in dung, which is far denser at El Potrero. It is possible that more dung was used for fuel by the Inka personnel as they had better access to camelids in state-owned herds.

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TABLE 1a: Density of Plant Remains: Average number of counts of charred material per sample (including seeds and wood)

	ALL SITES	SITE 1	SITE 12	SITE 42	SITE 65
Mean	711.0	51.0	832.0	700.0	402.0
Median	177.0	32.0	704.0	143.0	372.0
Range	0-30,000	0-191	0-3719	0-30,000	0-807
# Samples	353	11	96	240	6

TABLE 1b: Density of Plant Remains: Average number of counts of charred material per sample excluding wood

	ALL SITES	SITE 1	SITE 12	SITE 42	SITE 65
Mean	176.0	10.0	71.0	229.6	022.0
Median	19.0	3.0	29.0	20.0	11.0
Range	0-10,159	0-70	0-848	0-10,159	0-82
# Samples	353	11	96	240	6

TABLE 2: Number of Proveniences by Cultural Context

	Site Number			
Context	12	42	1	12
Roof/wall fall	7.4% (7)	18.9% (44)	39.6% (4)	80.0% (4)
Midden	32.9% (31)	3.9% (9)	0	0
Floor/Occupation	25.4% (24)	37.0% (86)	19.8% (2)	20.0% (1)
Hearth & ash	5.3% (5)	7.3% (17)	9.9% (1)	0
Pits	7.4% (7)	6.9% (16)	9.9% (1)	0
Burials	0	0.8% (2)	0	0
Fill/H20 deposit	21.2% (20)	25.4% (59)	29.7% (3)	0
Total # proven.	94	233	11	5

TABLE 3: Average percent of wood in samples by site

	ALL SITES	SITE 1	SITE 12	SITE 42	SITE 65
Mean	75%	52%	90%	70%	90%
Median	90%	67%	94%	70%	95%
# Samples	353	11	96	240	6

TABLE 4a: Average density of material per liter of excavated soil:
By site

Plant taxa	Site 12	Site 42	Site 1	Site 65
Zea mays kernels	0.24	0.10	0.08	0.07
Zea mays cupules	2.53	0.48	0.22	0.03
All maize together	2.77	0.58	0.30	0.10
Chenopodium	4.09	3.40	0.03	0.07
Tubers	0.02	0.07	0.00	0.00
Domestic Legumes	<0.01	<0.01	0.00	0.00
Capsicum	<0.01	<0.01	0.00	0.00
Wood	230.53	69.78	8.11	79.98
Wild seeds	5.93	3.53	0.16	1.30
Dung	1.71	25.04	0.00	0.15
Total charred items	248.00	109.93	9.66	84.70

TABLE 4b: Ubiquity of plant taxa by site:
Percentage of proveniences that contain each plant taxon

Plant taxa	Site 12	Site 42	Site 1	Site 65
Zea mays kernels	31%	15%	9%	33%
Zea mays cupules	80%	42%	36%	17%
All maize together	81%	43%	36%	50%
Chenopodium	80%	74%	18%	50%
Tubers	3%	5%	0%	0%
Domestic Legumes	1%	1%	0%	0%
Capsicum	1%	<1%	0%	0%
Wood	99%	96%	64%	100%
Wild seeds	81%	72%	18%	83%
Dung	46%	21%	0%	17%

TABLE 5a: Rank order of Most Common Plant Taxa in combined Cachi sites

Rank	Taxon	Count
1	Wood	188,068
2	Unidentified frags	11,453
3	*Chenopodium*	6,394
4	Unidentified seeds	2,415
5	Branches	1,670
6	Unk. 284	1,600
7	*Zea mays* cupules	1,470
8	Cactaceae	964
9	Tubers	958
10	Small Gramineae	828
11	Malvaceae	449
12	*Verbena*	423
13	Wild Leguminosae	228
14	Cyperaceae	221
15	*Zea mays* kernels	168
16	Unk. 305	152
17	Unk. 296b	131
18	Large Gramineae	88
19	*Zea mays* embryo	60
20	*Scirpus*	28
21	*Opuntia*	27
22	Caryophyllaceae	24
23	Solanaceae	21
24	*Juncus*	18
25.5	Polygonaceae	14
25.5	Unk. 297	14
27	Boraginaceae	13
28	Unk. 279	11

TABLE 5b and 5c:
Rank order of Most Common Plant Taxa by Site

Table 5b: VALDEZ

Rank	Taxon	Count
1	Wood	72,458
2	Unidentified frags	1,443
3	Unk. 284	1,434
4	*Chenopodium*	1,353
5	*Zea mays* cupules	655
6	Branches	647
7	Unidentified seeds	532
8	Small Gramineae	183
9	Unk. 305	152
10	*Zea mays* kernels	51
11	Cyperaceae	29
12	*Opuntia*	26
13	*Zea mays* embryo	21
14	Cactaceae	18
15	Large Gramineae	13
16	Tubers	7
17.5	Unk. 285	6
17.5	Wild Leguminosae	6
19.5	Malvaceae	4
19.5	Unk. 304	4
23	Polygonaceae	2
23	Scirpus	2
23	Solanaceae	2
23	Unk. 202	2
23	Unk. 303	2

Table 5c: EL POTRERO

Rank	Taxon	Count
1	Wood	112,458
2	Unidentif. frags	9,852
3	*Chenopodium*	5,037
4	Unident. seeds	1,868
5	Tubers	951
6	Branches	944
7	Cactaceae	942
8	*Zea mays* cupules	798
9	Small Gramineae	628
10	Malvaceae	443
11	*Verbena*	422
12	Wild Leguminosae	221
13	Cyperaceae	191
14	Unk. 284	166
15	Unk. 296b	131
16	*Zea mays* kernels	110
17	Large Gramineae	74
18	*Zea mays* embryo	38
19	*Scirpus*	26
20.5	Caryophyllaceae	19
20.5	Solanaceae	19
22	*Juncus*	18
23	Unk. 297	14
24	Boraginaceae	13
25	Polygonaceae	12

TABLE 6a: Ubiquity of Plant Taxa for Valdez (Site 12):
# of proveniences containing Plant Taxa

Plant Taxon	ArcDiv 12=1	ArcDiv 12=2	ArcDiv 12=3	ArcDiv 12=4	ArcDiv 12=5
Zea mays kernels	26%	67%	25%	38%	0
Zea mays cupules	71%	100%	89%	81&	0
All *Zea mays*	74%	100%	89%	81%	0
Chenopodium	74%	67%	86%	88%	100%
Tubers	6%	0	3%	0	0
Domestic Legumes	0	0	3%	0	0
Capsicum	0	11%	0	0	0
Wood	100%	100%	100%	100%	100%
Dung	39%	33%	56%	56%	0
Wild seeds	84%	89%	81%	75%	100%
Number of Proven.	31	9	36	16	2

TABLE 6b: Average Density of Plant Taxa for Valdez (Site 12):
Count per liter of floated site matrix
by ArcDiv

Plant Taxon	ArcDiv 12=1	ArcDiv 12=2	ArcDiv 12=3	ArcDiv 12=4	ArcDiv 12=5
Zea mays kernels	0.17	0.44	0.23	0.34	0.00
Zea mays cupules	1.11	1.64	2.30	6.76	0.00
All *Zea mays*	1.29	2.08	2.52	7.10	0.00
Chenopodium	3.27	2.61	5.01	5.18	0.19
Tubers	0.04	0.00	0.01	0.00	0.00
Domestic Leguminosae	0.00	0.00	0.01	0.00	0.00
Capsicum	0.00	0.02	0.00	0.00	0.00
Wood	125.34	121.63	169.00	674.63	20.92
Dung	2.57	0.35	1.90	0.72	0.00
Wild seeds	4.47	25.69	4.21	2.62	0.25
All charred items	142.84	154.27	184.63	690.88	21.54

TABLE 7a: Taxa Ubiquity at Valdez by ArcSub (ASD):
by provenience

Taxa	12=1-40	12=1-50	12=2-40	12=3-40	12=3-41	12=4-40	12=5-50
Maize	50%	6%	67%	29%	24%	38%	0
Cupules	93%	53%	100%	86%	90%	81%	0
All mz.	93%	59%	100%	86%	90%	81%	0
Quinoa	100%	53%	67%	86%	86%	88%	100%
Tubers	7%	6%	0	0	3%	0	0
Legumes	0	0	0	0	3%	0	0
Peppers	0	0	11%	0	0	0	0
Wood	100%	100%	100%	100%	100%	100%	100%
Dung	86%	0	33%	57%	55%	56%	0
Wild sd	100%	71%	89%	100%	76%	75%	100%
# prov	14	17	9	7	29	16	2

TABLE 7b: Average Density of Plant Taxa for Valdez (Site 12):
Count per liter of floated site matrix
by ArcSub (ASD)

Taxa	12=1-40	12=1-50	12=2-40	12=3-40	12=3-41	12=4-40	12=5-50
Maize	0.36	0.01	0.44	0.07	0.27	0.34	0.00
Cupules	1.99	0.39	1.64	1.73	2.43	6.76	0.00
All mz.	2.36	0.40	2.08	1.80	2.70	7.10	0.00
Quinoa	6.98	0.22	2.61	2.74	5.55	5.18	0.19
Tubers	0.05	0.03	0.00	0.00	0.01	0.00	0.00
Legumes	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Peppers	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Wood	234.95	35.08	121.63	94.57	186.97	674.63	20.92
Dung	5.68	0.00	0.35	2.23	1.83	0.72	0.00
Wild sd	7.41	2.04	25.69	11.15	2.53	2.62	0.25
All	267.44	40.24	154.27	116.06	201.18	690.88	21.54

TABLE 8a: Average Density of Plant Taxa for El Potrero (Site 42):
# of fragments per liter of floated site matrix
by ArcDiv

Prov	Kern	Cup.	Mz	Quin	Tuber	Legum	Pepp	Wood	Dung	Seeds	All
42=4	0.47	0.19	0.94	0.94	4.12	0.00	0.00	68.75	325.75	7.36	411.2
42=5	0.19	0.32	0.52	1.93	0.02	0.00	0.00	103.27	3.89	3.41	115.2
42=7	0.08	0.44	0.52	4.54	0.05*	0.00	0.00	185.49	0.45	4.72	247.2
42=9	0.00	0.50	0.50	1.63	0.00	0.00	0.00	6.33	0.00	2.40	11.8
42=14	0.09	1.22	1.31	4.61	0.23	0.01	0.00	39.75	5.38	4.92	58.2
42=15	0.00	0.02	0.02	0.22	0.00	0.00	0.00	155.96	0.00	0.18	156.7
42=16	0.17	0.26	0.42	0.80	0.00	0.00	0.01	32.75	0.07	1.44	37.9
42=17	0.00	0.01	0.01	9.44	0.00	0.00	0.00	24.03	0.53	5.64	40.2
42=21	0.00	0.09	0.09	9.16	0.00	0.00	0.00	23.91	1.28	5.00	39.6
42=40	0.05	0.00	0.05	0.12	0.07	0.00	0.00	56.53	0.01	0.66	59.8
42=41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.22	0.00	0.00	31.6

* 2.64 including single dense provenience

TABLE 8b: Ubiquity of Plant Taxa for El Potrero (Site 42):
Percentage of proveniences with Plant Taxon
by ArcDiv

Prov	Kern	Cup.	Mz	Quin	Tuber	Legum	Pepp	Wood	Dung	Seeds
42=4	31%	56%	63%	94%	19%	0%	0%	94%	50%	94%
42=5	38%	69%	69%	100%	8%	0%	0%	100%	31%	85%
42=7	15%	69%	69%	92%	19%	0%	0%	100%	31%	88%
42=9	0%	65%	65%	75%	0%	0%	0%	75%	0%	75%
42=14	17%	49%	53%	89%	4%	4%	0%	98%	38%	92%
42=15	0%	9%	9%	48%	0%	0%	0%	100%	0%	39%
42=16	32%	50%	50%	68%	0%	0%	4%	100%	4%	68%
42=17	0%	7%	7%	53%	0%	0%	0%	100%	20%	60%
42=21	0%	9%	9%	82%	0%	0%	0%	100%	18%	64%
42=40	6%	0%	6%	25%	6%	0%	0%	100%	6%	25%
42=41	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%

Number of Proveniences per ArcDiv:

42=4 n=16	42=5 n=13	42=7 n=26	42=9 n=20
42=14 n=53	42=15 n=28	42=16 n=28	42=17 n=11
42=21 n=15	42=40 n=16	42=41 n=1	

TABLE 9a: Ubiquity of Plant Taxa for El Potrero (Site 42):
Percentage of proveniences with Plant Taxon
by ArcSub (ASD)

Prov	Kern	Cup.	Mz	Quin	Tuber	Legum	Pepp	Wood	Dung	Seeds
4-20	29%	57%	64%	93%	21%	0%	0%	93%	57%	100%
4-50	50%	50%	100%	100%	0%	0%	0%	100%	57%	50%
5-20	38%	69%	69%	100%	8%	0%	0%	100%	31%	85%
20in	20%	60%	60%	100%	10%	0%	0%	100%	30%	30%
20out	100%	100%	100%	100%	0%	0%	0%	100%	67%	33%
7-20	11%	63%	63%	95%	21%	0%	0%	100%	26%	89%
7-50	29%	86%	86%	86%	14%	0%	4%	100%	43%	86%
9-50	0%	65%	65%	75%	0%	0%	0%	75%	0%	75%
14-1	20%	45%	50%	89%	2%	5%	0%	100%	36%	93%
14-50	0%	67%	67%	89%	11%	0%	0%	89%	44%	89%
15-90	0%	9%	9%	48%	0%	0%	0%	100%	0%	39%
16-1	8%	42%	42%	33%	0%	0%	0%	100%	0%	33%
16-50	50%	56%	56%	94%	0%	0%	6%	100%	6%	94%
50in	50%	60%	60%	100%	0%	0%	10%	100%	10%	100%
50out	50%	50%	50%	83%	0%	0%	0%	100%	0%	83%
17-20	0%	7%	7%	53%	0%	0%	0%	100%	20%	60%
21-20	0%	25%	25%	75%	0%	0%	0%	100%	50%	75%
21-50	0%	0%	0%	100%	0%	0%	0%	100%	0%	75%
21-51	0%	0%	0%	67%	0%	0%	0%	100%	0%	33%
40-1	8%	0%	8%	25%	8%	0%	0%	100%	8%	17%
40-20	0%	0%	0%	25%	0%	0%	0%	100%	0%	50%
41-50	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%

Number of proveniences per ArcSub (ASD)

42=4-20 n=14

42=4-50 n=2

42=5-20 n=13

42=5-20 (inside) n=10

42=5-20 (outside) n=3

42=7-20 n=19

42=7-50 n=7

42=9-50 n=20

42=14-1 n=44

42=14-50 n=9

42=15-90 n=23

42=16-1 n=12

42=16-50 n=16

42=16-50 (inside) n=10

42=16-50 outside n=6

42=17-20 n=15

42=21-20 n=4

42=21-50 n=4

42=21-51 n=3

42=40-1 n=12

42=40-20 n=4

42=41-50 n=1

TABLE 9b: Average Density of Plant Taxa for El Potrero (Site 42): # of fragments per liter of floated site matrix by ArcSub (ASD)

Prov	Kern	Cup.	Mz	Quin	Tuber	Legum	Pepp	Wood	Dung	Seeds	All
4-20	0.06	0.47	0.53	4.56	0.13	0.00	0.00	77.55	372.28	8.32	467.5
4-50	3.30	0.50	3.80	1.04	0.00	0.00	0.00	7.17	0.00	0.62	16.9
5-20	0.19	0.32	0.51	1.93	0.01	0.00	0.00	103.27	3.89	3.41	155.2
20in	0.08	0.23	0.31	2.12	0.02	0.00	0.00	23.89	5.06	4.19	36.8
20out	0.55	0.63	1.19	1.30	0.00	0.00	0.00	367.87	0.02	1.26	367.5
7-20	0.03	0.40	0.43	5.12	0.07	0.00	0.00	20.15	0.23	3.76	37.8
7-50	0.22	0.64	0.86	0.80	0.00*	0.00	0.00	716.68	1.04	7.33	815.6
9-50	0.00	0.50	0.50	1.63	0.00	0.00	0.00	6.33	0.00	2.40	11.8
14-1	0.11	0.47	0.58	4.67	0.01	0.01	0.00	38.38	4.84	3.24	53.1
14-50	0.00	4.90	4.90	4.28	1.31	0.00	0.00	46.47	8.01	13.16	82.9
15-90	0.00	0.02	0.02	0.22	0.00	0.00	0.00	151.96	0.00	0.18	156.7
16-1	0.13	0.18	0.30	0.10	0.00	0.00	0.00	12.73	0.00	0.12	14.4
16-50	0.19	0.32	0.51	1.32	0.00	0.00	0.01	47.76	0.12	2.42	55.6
50in	0.17	0.36	0.53	1.85	0.00	0.00	0.01	61.72	0.19	3.05	71.2
50out	0.24	0.24	0.48	0.45	0.00	0.00	0.00	24.48	0.00	1.37	29.6
17-20	0.00	0.01	0.01	9.44	0.00	0.00	0.00	24.03	0.53	5.64	40.2
21-20	0.00	0.24	0.24	20.4	0.00	0.00	0.00	24.43	3.52	12.10	61.1
21-50	0.00	0.00	0.00	0.79	0.00	0.00	0.00	24.92	0.00	0.16	25.9
21-51	0.00	0.00	0.00	5.33	0.00	0.00	0.00	21.87	0.00	1.98	29.3
40-1	0.06	0.00	0.06	0.11	0.09	0.00	0.00	74.78	0.02	0.82	78.9
40-20	0.00	0.00	0.00	0.15	0.00	0.00	0.00	1.76	0.00	0.20	2.3
41-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.22	0.00	0.00	31.6

* 9.62 including single dense provenience

Number of proveniences per ArcSub (ASD)

42=4-20 n=14

42=4-50 n=2

42=5-20 n=13

42=5-20 (inside) n=10

42=5-20 (outside) n=3

42=7-20 n=19

42=7-50 n=7

42=9-50 n=20

42=14-1 n=44

42=14-50 n=9

42=15-90 n=23

42=16-1 n=12

42=16-50 n=16

42=16-50 (inside) n=10

42=16-50 outside n=6

42=17-20 n=15

42=21-20 n=4

42=21-50 n=4

42=21-51 n=3

42=40-1 n=12

42=40-20 n=4

42=41-50 n=1