EXCAVATIONS ALONG NM 22:
AGRICULTURAL ADAPTATION FROM AD 500 TO 1900 IN THE NORTHERN SANTO DOMINGO BASIN, SANDOVAL COUNTY, NEW MEXICO

compiled by Stephen S. Post and Richard C. Chapman

VOLUME 5
ANALYTICAL STUDIES: FAUNA AND FLORA

Nancy J. Akins, Susan Moga, Pamela McBride,
Mollie Toll, Jessica Badner, Richard Holloway

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Archaeology Notes 385

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Contents

Figures

Tables

CHAPTER 20
UTILIZATION OF FAUNA

Nancy J. Akins

Over 10,000 specimens from six sites were analyzed from Peña Blanca and form the basis of this report. Assemblages range from just over 200 specimens for two sites (LA 249 and LA 115862) to 3,859 (LA 6169). The overwhelming majority come from unmixed Early Developmental period deposits (n = 7,802) with much smaller samples from the Late Developmental (n = 134) and Coalition (n = 572) periods. Mixed deposits account for the remainder of the sample. Rather than providing detailed accounts of the site assemblages, this section addresses the broader questions concerning subsistence and animal utilization through time and across the project area. Tables summarizing the fauna from site proveniences are included with the site descriptions. Site directors were given comments concerning each provenience grouping to incorporate into their discussions.

One goal of the original research design was to collect much needed data on economic and subsistence behavior in order to evaluate Cordell's (1979) hunter-gatherer refugium hypothesis. Under this model, at least early on when populations densities were low, farming was a minor component of a subsistence economy that focused on seasonally available wild foods. Thus, the adoption of agriculture was delayed primarily because the region was optimal for hunting and gathering (Ware 1997:47).

Building on the original goal, this report focuses on Early Developmental subsistence and animal utilization. Issues addressed tangentially throughout the taxa and site assemblage sections, and more indirectly, the section on research questions, examine the data from the perspective of mobility strategies. Hunting patterns are analyzed as they relate to garden and local hunting along with the evidence for long-distance hunting. Cooking and processing methods, deposition patterns with regards to site structure, seasonal resource use and distribution, and the nonsubsistence use of animals are also considered in addressing questions concerning which segment of the population may have inhabited the sites, when and how long they remained at these sites, and the nature of the activities that took place.

After faunal subsistence during the Early Developmental period has been examined, the later assemblages from these and the Cochiti Dam sites are evaluated for indications of continuity or changes in animal use and how these changes, or lack thereof, reflect on resource depletion, agricultural dependence, and mobility. Finally, Peña Blanca subsistence strategies are assessed with regards to practices throughout the Middle and Upper Rio Grande area.

METHODS

Sampling was necessary for all but the two smallest assemblages, LA 249 and LA 115862. Site directors generally selected the proveniences that were analyzed completely or sampled and the individual bags to be analyzed. At LA 265, where the assemblage was so large and the selection well beyond what could be accomplished in the time allotted, the analysts selected from within the site director's selection. Accounts of the reasoning and nature of the selections are found in the site assemblage section. In addition to the selected sample, all bags were examined for the presence of bone tools and ornaments. These were pulled, analyzed, and reported as tools but do not appear in the general faunal data base when they are not from a selected provenience. Similarly, all of the dog burials were inventoried, measured, and assessed for age and other pertinent information. Dog burials that were in selected proveniences appear in the data base while the others do not. Most of the bone recovered from flotation samples from proveniences selected for analysis was identified and included in the data base, materials recovered from dry screening unprocessed flotation samples, and those samples that were not processed until after the analysis was complete, were not analyzed.

Specimens chosen for analysis were identified using the Office of Archaeological Studies' comparative collection supplemented by those at the Museum of Southwest Biology Divisions of Fishes, Herps, Birds, and Mammals. Susan Moga identified the assemblages from LA 249, LA 265, LA 6169, LA 6171, and LA 115862 and the author that from LA 6170. To help overcome the inevitable differences in recording by different analysts, the author undertook extensive reviews of the data. All of the fauna from LA 249, LA 6171, and LA 115862 were checked on a bone-by-bone basis as were at least 70 percent of that from LA 265, and as much as 60 percent from LA 6169. Virtually all of the identified artiodactyls and herps, and most of the bird identifications were checked.

Recording followed the established OAS computer-coded format which identifies the animal and body part represented, how and if the animal and part was processed for consumption or other use, and how taphonomic and environmental conditions have affected the specimen. The following briefly describes and defines the variables.

Provenience-Related Variables

Detailed provenience, component, and ceramic dating information were linked to the data file through the LA and Field Specimen (FS) numbers. Components, or logical units of analysis, were assigned by the site director and the ceramic dating by C. Dean Wilson in consultation with the site director. Each line contains the provenience information, the FS number, and a lot number that identifies a specimen or group of specimens that fit the description recorded in that line. The count indicates how many specimens are described by that data line.

Taxon

Taxonomic identifications are made to the most specific level possible. When an identification is less than certain, this is indicated in the certainty variable. Specimens that cannot be identified to the species, family, or order are assigned to a range of indeterminate categories based on the size of the animal and whether it is a mammal, bird, other animal, or this cannot be determined. Unidentifiable fragments often constitute the bulk of a faunal assemblage. By identifying these as precisely as possible, the information gained supplements that from the identified taxa.

Each bone (specimen) is counted only once, even when broken into a number of pieces by the archaeologist. In most instances when the break occurred prior to excavation, the pieces are counted separately and their articulation noted in a variable that identifies conjoinable pieces, parts that were articulated when found, and pieces that appear to be from the same individual (e.g., virtually all pieces of a rabbit foot). Exceptions were made when deterioration has reduced a piece of bone or antler to a large number of pieces. Animal skeletons are considered as single specimens so as not to vastly inflate the counts for accidentally and intentionally buried taxa. Toads and frogs were often considered skeletons since most parts are so small that only a few are recovered by even smaller (1/8 inch) screens. When most of the larger parts were found in the same bag and appeared, on the basis of size, age, and taphonomic characteristics, to be from the same animal, these were counted as partial skeletons. This was occasionally done for small rodents.

Element (Body Part)

The skeletal element (e.g., cranium, mandible, humerus) is identified then described by side, age, and the portion recovered. Side is recorded for the element itself or for the portion recovered when it is axial, such as the left transverse process of a lumbar vertebra. Age is recorded at a general level: fetal or neonate, immature (a third to two-thirds mature size), young adult (near or full size with unfused epiphysis or young bone), and mature. Further refinements based on dental eruption or wear are noted as comments. The criteria used for assigning an age is also recorded, generally, the size, epiphysis closure, or the texture of the bone. The portion of the skeletal element represented in a particular specimen is recorded in detail for estimating the number of individuals represented in an assemblage and to discern patterns related to processing.

Completeness

Completeness refers to how much of that skeletal element is represented by the specimen (analytically complete, more than 75 percent complete but not analytically complete, between 50 and 75 percent complete, between 25 and 50 percent, or less than 25 percent complete). Completeness is used in conjunction with the portion represented to estimate the number of individuals present. It also provides information concerning whether a species is intrusive and on processing, environmental deterioration, animal activity, and thermal fragmentation.

Taphonomic Variables

Taphonomy is the study of preservation processes and how these affect the information obtained. The goal is to identify and evaluate at least some of the non-human processes affecting the condition and frequencies found in an assemblage (Lyman 1994:1). Taphonomic process expressly monitored in this analysis are environmental, animal, and some types of burning. Environmental alteration is recorded as degrees (light, medium, and heavy) of pitting or corrosion from soil conditions, sun bleaching from extended exposure, checking or exfoliation from exposure, root etching from the acids excreted by roots, and polish or rounding from sediment movement. Animal alteration is recorded by source or probable source and where it occurs on the element. Choices include carnivore gnawing and/or punctures, scatological or probable scat, rodent gnawing, and agent uncertain. Burning, when it occurs after burial, is also a taphonomic process and burning effects the preservation and completeness of individual bones. In addition, a bright yellow stain on all or portions of bones was noted in a comment variable for all sites but LA 6169, as was the purple staining that tends to occur on bone buried in the flesh and primarily observed on human, turkey, and dog bones.

Burning

Burning can occur as part of the cooking process, part of the disposal process, when bone is used as fuel, or after burial. The color, location, and presence of crackling or exfoliation were recorded. Burn color is a gage of burn intensity. A light tan color or scorch is superficial burning, while charred or blackened bone becomes black as the collagen is carbonized, and when the carbon is oxidized, it becomes white or calcined (Lyman 1994:385, 388). Burns can be graded, reflecting the thickness of the flesh protecting portions of the bone, or dry, light on the exterior and black at the core, indicating the burn occurred well after disposal when the bone was dry. Graded or partial burns can indicate a particular cooking process, generally roasting, while complete charring or calcined bone does not. Uniform degrees of burning are possible only after the flesh has been removed and generally indicate a disposal practice (Lyman 1994:387). Potential boiling is recorded in a separate variable as brown and rounded, brown with no rounding, rounded only, waxy, and brown and waxy. Unfortunately, highly processed and boiled bone resembles scatological bone in many respects: specifically, the fragmentation, rounding, and color so that distinguishing the two is too often somewhat arbitrary.

Butchering and Processing

Evidence of butchering is recorded as various orientations of cuts, grooves, chops, abrasions, saws, scrapes, peels, and intentional breaks.

The location of these on the element is also recorded. A conservative approach was taken to the recording of marks and fractures that could be indicative of processing animals for food, tools, or hides since many natural processes result in similar marks and fractures. Spiral fractures were recorded based on morphology, while recognizing there are other causes and that these can occur well after discard. Impacts require some indication of an impact, generally flake scars or evidence of percussion. These were not recorded when they were ambiguous or accompanied by carnivore gnawing.

Modification

Tools or ornaments, manufacturing debris, utilized bone, possible modification, and pigment stains are recorded as modification. The tools, manufacturing debris, and utilized bone are described in a separate section of this report (Moga, Chapter 21).

Data Analysis

Once the data were entered and checked, the site directors provided components and groups of components for table generation. Data were tabulated and analyzed using SPSS (pc version 8.0 and 10.1) and given to the site directors along with observations and interpretations. Most comments regarding particular provenience assemblages are integrated into the site reports. Some are included in this section when they illustrate a particular point or provide the basis for discussing a broader topic.

Taxa

A large variety of taxa was identified in the Peña Blanca faunal assemblages. This section considers the habitat and availability of the animals identified, how these may have been used by the prehistoric inhabitants, and their distribution in time and space. Table 20.1 gives the scientific name or description and the common names of those found along with the number of Peña Blanca sites where they were found and whether they are reported from the Cochiti Dam sites.

Unidentified Taxa

The amount of unidentifiable bone (small fragments of bone where only the size of an animal can be estimated) (Table 20.2) is determined in part by the overall bone preservation at a site and by the proveniences selected for analysis within a site. Poor preservation accounts for the large proportions of unidentifiable bone at LA 6171 and LA 115862 while selection for floor and trash deposits where a smaller screen size was used may account for some of that from LA 265. Another factor is the proportion of flotation bone, which is often very small unidentifiable crumbs of bone. Flotation bone ranges from 0.7 percent for LA 265 to 5.4 percent for LA 115862.

Correlations between the counts for small unidentifiable forms, the lagomorphs, the medium to large and large mammal, artiodactyl, and identified artiodactyls (Table 20.3) have several implications. The highest correlation is between the small and large forms, suggesting that whatever the cause of the fragmentation—environmental, provenience, or processing related, it influences both small and large animal bones. Other high correlations are as expected, the small unidentifiable group correlates best with the amount of lagomorph (rabbit) bone while the large mammal and artiodactyl groups correlate with the identifiable artiodactyl counts.

Rodentia *(Squirrels, Prairie Dogs, and Rodents)*

A diversity of rodents and a few squirrel species were found. Much of this can be attributed to the amount of screening and screening with 1/8-inch mesh. Table 20.4 summarizes the completeness, burning, and age distribution for the rodent taxa.

Squirrels. True squirrel specimens are rare in this collection and confined to two species, the spotted ground squirrel *(Spermophilus spiloso-*

Table 20.1. Summary of Taxa Recovered from Peña Blanca Sites

Scientific name or taxon	Common name or size	Count	Col %	No. of Peña Blanca Sites	No. of Cochiti Sites
Unknown small	Unknown small animal	3	0.0%	2	-
Unknown	Unknown animal	1	0.0%	1	-
Small mam./m-l bird	Smaller than jackrabbit or turkey	93	0.9%	6	-
Small mammal	Smaller than jackrabbit	1918	17.8%	6	-
Small-medium mammal	Dog or smaller	241	2.2%	5	-
Medium mammal	Jackrabbit to dog size	9	0.1%	2	-
Medium-large mammal	Dog size or larger	561	5.2%	6	-
Large mammal	Deer size or larger	526	4.9%	6	-
Very large mammal	Elk size or larger	1	0.0%	1	-
Small Sciuridae	Small squirrels	1	0.0%	1	-
Spermophilus spilosoma	Spotted ground squirrel	10	0.1%	2	4
Spermophilus variegatus	Rock squirrel	1	0.0%	1	4
size of *Cynomys ludovicianus*	Black-tailed or large prairie dog	23	0.2%	3	-
Cynomys gunnisoni	Gunnison's prairie dog	26	0.2%	3	5
Thomomys bottae	Botta's pocket gopher	61	0.6%	5	5
Pappogeomys castanops	Yellow-faced pocket gopher	172	1.6%	5	4
Perognathus sp.	Pocket mice	8	0.1%	2	1
Dipodomys ordii	Ord's kangaroo rat	49	0.5%	6	2
Dipodomys spectabilis	Banner-tailed kangaroo rat	106	1.0%	5	2
Castor canadensis	Beaver	7	0.1%	2	2
Cricetidae	Cricetid rodents	3	0.0%	2	-
Peromyscus sp.	*Peromyscus* sp.	44	0.4%	3	2
Onychomys leucogaster	Northern grasshopper mouse	19	0.2%	2	-
Neotoma sp.	Woodrats	80	0.7%	6	5
Neotoma albigula	White-throated woodrat	26	0.2%	4	3
Neotoma mexicana	Mexican woodrat	5	0.0%	2	-
Large *Neotoma*	Bushy-tailed or large white-throated	33	0.3%	3	-
Small rodent	Small rodents	19	0.2%	4	-
Medium-large rodent	Woodrat or larger	83	0.8%	6	-
cf. *Sylvilagus nuttalli*	Nuttall's cottontail	1	0.0%	1	-
Sylvilagus audubonii	Desert cottontail	3161	29.3%	6	5
Lepus californicus	Black-tailed jackrabbit	982	9.1%	6	5
Medium carnivore	Fox to badger size	3	0.0%	3	-
Large carnivore	Bobcat, coyote, wolf size	7	0.1%	2	-
Canis sp.	Canid, species unknown	8	0.1%	3	3
Canis latrans	Coyote	2	0.0%	1	-
Canis familiaris	Dog	223	2.1%	3	1
Ursus americanus	Black bear	1	0.0%	1	3
Mustela frenata	Long-tailed weasel	1	0.0%	1	-
Taxidea taxus	Badger	8	0.1%	3	3
Felis rufus	Bobcat	3	0.0%	1	4
Medium artiodactyl	Deer, pronghorn, bighorn	960	8.9%	6	-
Large artiodactyl	Elk or bison	21	0.2%	4	-
Medium to large artiodactyl	Medium-large artiodactyl	8	0.1%	3	-
Cervidae	Deer or elk	19	0.2%	4	2
Cervus elaphus	Elk	33	0.3%	3	-
Odocoileus hemionus	Mule deer	163	1.5%	6	4
Antilocapra americana	Pronghorn	91	0.8%	5	4
Bos bison	Bison	6	0.1%	2	-
Bos/Bison	Cattle or bison	42	0.4%	3	3
Ovis canadensis	Bighorn sheep	35	0.3%	5	4

Table 20.1. Continued.

Scientific name or taxon	Common name or size	Count	Col %	No. of Peña Blanca Sites	No. of Cochiti Sites
Ovis, Capra	Domestic sheep or goat	3	0.0%	2	-
Equus sp.	Horse, burro	1	0.0%	1	-
Small bird	Small passerine	2	0.0%	2	-
Medium bird	Quail or larger	18	0.2%	3	-
Large bird	Hawk or larger	72	0.7%	3	-
Medium-large bird	Medium-large bird	21	0.2%	3	-
Very large bird	Turkey or larger	70	0.6%	3	-
Egg shell	Eggshell	13	0.1%	2	-
Anatinae	Duck	2	0.0%	2	2
Accipiter striatus	Sharp-shinned hawk	1	0.0%	1	-
Aquila chrysaetos	Golden eagle	4	0.0%	4	-
Falco mexicanus	Prairie falcon	1	0.0%	1	-
cf. *Falco columbarius*	American kestrel/merlin	1	0.0%	1	-
Callipepla squamata	Scaled quail	13	0.1%	4	3
Meleagris gallopavo	Turkey	438	4.1%	3	4
Grus canadensis	Sandhill crane	1	0.0%	1	4
Bubo virginianus	Great horned owl	1	0.0%	1	1
Colaptes auratus	Flicker	18	0.2%	4	1
Eremophila alpestris	Horned lark	21	0.2%	3	-
Sturnella neglecta	Western meadowlark	10	0.1%	2	-
Passeriformes	Passerines/small perching birds	16	0.1%	3	-
Chrysemys picta	Painted turtle	4	0.0%	2	-
Terrapene ornata	Ornate box turtle	1	0.0%	1	-
Sauria	Lizards	9	0.1%	4	-
Phrynosoma sp.	Horned lizards	3	0.0%	2	-
cf. *Cnemidophorus* sp.	Whiptail lizards	1	0.0%	1	-
Ophidia	Snakes	2	0.0%	1	-
Colubridae	Nonvenomous snakes	40	0.4%	3	-
Salienta	Frogs and toads	5	0.0%	2	1
cf.*Scapiopus bombifrons*	Plains spadefoot	2	0.0%	2	-
cf. *Spea multiplicata*	New Mexico spadefoot	1	0.0%	1	-
Bufonidae	True toads	5	0.0%	3	2
cf. *Bufo cognatus*	Great plains toad	15	0.1%	3	-
Bufo cognatus or *woodhouseii*	Plains or Woodhouse's toad	24	0.2%	5	-
cf. *Bufo punctatus*	Red spotted toad	8	0.1%	2	-
Bufo cognatus or *punctatus*	Plains or red-spotted toad	3	0.0%	1	-
cf. *Bufo woodhousii*	Woodhouse toad	26	0.2%	4	2
cf. *Rana pipiens*	Northern leapord frog	4	0.0%	3	-
Catostomidae	Suckers	2	0.0%	1	-
Ictiobus bubalus	Small mouth buffalofish	1	0.0%	1	-
Totals		10790	100.0%	6	5

ma) and rock squirrel *(Spilosoma variegatus).* Both species are terrestrial burrowing squirrels (Tomich 1982:192). The spotted ground squirrel is found in arid grasslands and deserts throughout the state and hibernates from October through late March (Findley et al. 1975:121). Spotted ground squirrels were found at two of the sites. All but one are from LA 265 where scattered parts of what appear to be a single squirrel were found in an extramural pit, probably indicating an intrusive burrower.

Rock squirrels depend on broken terrain for cover and are not found in open areas. Most hibernate from October to April but may fail to hibernate in areas as far north as Albuquerque

Table 20.2. Proportion of Unidentifiable Elements (% of Assemblage), Flotation Contribution, and Environmental Alteration by Site

	LA 249	LA 265	LA 6169	LA 6170	LA 6171	LA 115862	Total
Total count	205	3473	3859	2259	770	224	10790
Unidentifiable taxa:	-	-	-	-	-	-	-
Unknown small	-	0	-	0.1	-	-	0
Unknown	-	-	0	-	-	-	0
Small mammal/medium to large bird	0.5	0.2	1.5	0.9	0.4	0.9	0.9
Small mammal	10.2	24	13.1	15.9	17.3	29	17.8
Small to medium mammal	0.5	2.6	3.3	0.8	0.3	-	2.2
Medium mammal	-	-	0.2	-	-	0.4	0.1
Medium to large mammal	8.8	6.6	3.6	2.9	9	17.4	5.2
Large mammal	4.9	6.2	2.2	6.9	7.1	2.7	4.9
Very large mammal	-	-	0	-	-	-	0
Total unidentifiable	24.9	39.6	23.9	27.5	34.1	50.4	31.1
Recovered from flotation samples	3.4	0.7	2.4	1.7	2.6	5.4	1.8
Environmental alteration:							
Pitted or corroded	35.1	14.2	10.2	22.9	58.4	70.1	19.3
Checked or exfoliated	1.5	2.5	1.5	5.5	0.5	3.6	2.7
Root etched	9.8	7.2	29.7	14.8	5.2	3.6	16.7
% heavily altered	14.6	7.1	5.3	1.8	37.4	23.7	8.0

Table 20.3. Pearson Correlations between Small and Large from Counts from Six Site Assemblages

	Small	Lagomorphs	Large Mammal	Artiodactyl	Identified Artiodactyls
Small	1				
Lagomorphs	.875*	1			
Large mammal	.983**	0.793	1		
Artiodactyl	0.647	0.699	0.673	1	
Identified artiodactyl	.834*	0.787	.869*	.871*	1

* significant at the 0.05 level
** significant at the 0.01 level

(Findley et al. 1975:125–126). The single rock squirrel specimen is a complete tibia from a ventilator shaft at LA 6169. This tibia is morphologically more similar to a rock squirrel than a prairie dog, but is not as large as comparative rock squirrel specimens. Harris reports larger quantities of this species for the Cochiti Dam sites: North Bank, LA 6462 (MNI=2); Alfred Herrera, LA 6455 (MNI=3) (Harris 1968:214, 230); LA 9154 (MNI = 3) (Harris 1971:76); and Pueblo del Encierro, LA 70 (MNI = 10) (Harris 1976:H-27), and occasional spotted ground squirrels.

Prairie Dogs. Two sizes of prairie dog were found, one in the size range of the black-tailed *(Cynomys ludovicianus)* and the other similar to the smaller Gunnison's *(Cynomys gunnisoni)*. For the purposes of this report, the large bones are classified as the black-tailed form, but may be no more than a large variety of Gunnison's prairie dog. While most specimens are clearly large or small, a few may have been misclassified when fragmentary. The black-tailed prairie dog was once abundant east of the Rio Grande in grasslands, open woodland, and semi-deserts in the southwestern part of the state. In the northern part of the state, they become fat in fall and hibernate for several months. Poisoning campaigns by ranchers have largely extirpated populations in parts of New Mexico (Findley et al. 1975:130–132). The

Table 20.4. Age, Burning, and Completeness for Rodent Taxa

	Age			Burning	Completeness		
	% neonate	% immature	% juvenile	% burned	% > 75%	% 25-75	% <25
Small squirrels	-	-	100	-	100	-	-
Spotted ground squirrel	-	-	50	-	40	40	20
Rock squirrel	-	-	-	-	100	-	-
Large prairie dog	-	-	4.3	8.7	34.8	30.4	34.8
Gunnison's prairie dog	-	-	7.7	-	50	34.6	15.4
Botta's pocket gopher	-	-	14.8	-	29.5	47.5	23
Yellow-faced pocket gopher	0.6	0.6	11.6	3.5	40.1	30.8	29.1
Pocket mice	-	12.5	62.5	-	75	25	-
Ord's kangaroo rat	-	4.1	32.7	10.2	53.1	30.6	16.3
Banner-tailed kangaroo rat	-	1.9	9.4	10.4	56.6	31.1	12.3
Beaver	-	-	-	14.3	57.1	28.6	14.3
Cricetid rodents	-	66.7	33.3	-	33.3	66.7	-
Peromyscus sp.	-	2.3	27.3	-	79.5	18.2	2.3
Northern grasshopper mouse	-	-	15.8	-	63.1	26.3	10.5
Woodrats	-	-	23.8	22.5	31.3	33.8	35
White-throated woodrat	-	-	3.8	7.7	50	19.2	30.8
Mexican woodrat	-	-	40	-	40	40	20
Large woodrat	-	-	33.3	18.2	51.6	33.3	12.1
Small rodent	-	-	5.3	5.3	5.3	52.6	42.1
Medium-large rodent	-	2.4	16.9	10.8	18	32.6	49.4

smaller Gunnison's prairie dog generally lives in the northern areas of the state where the black-tailed prairie dog does not occur, occupying grassland habitats ranging from low valleys to montane meadows as well as mixed shrub, sage, and juniper habitats in some areas. Populations have been reduced by control practices and by sylvatic plague (Biota Information System of New Mexico [BISON-M] species accounts n.d.; Findley et al. 1975:133–134).

Since these two species generally do not overlap in range, the possibility that both were found in these site assemblages may suggest that Peña Blanca was at or near the edges of their respective habitats, or again, that the larger bones represent a large variety of the Gunnison's form. Relatively small numbers indicate that neither the prairie dogs nor any of the squirrels were actively sought out as food items. Proportions of the larger form remain relatively stable from the Early Developmental through the Coalition assemblages. The smaller or Gunnison's prairie dogs are absent from more assemblages and seem to peak in the Coalition assemblages. Only two prairie dog bones are burned, both larger or black-tailed prairie dogs from Early Developmental period assemblages. A cranium fragment from this same period and species has an impact or percussion scar. Otherwise, the near absence of burning and processing along with the presence of a partial Gunnison's prairie dog skeleton found in a large pit at LA 265, suggest that at least a portion of the prairie dog bone is intrusive rather than the remains of food items. Evidence for consumption is better for the larger variety, which may suggest it was imported to the sites. In addition to burning, more of the larger or black-tailed prairie dog specimens are associated with roof fall and structure floors, while most of the smaller Gunnison's prairie dog is found in extramural areas followed by equal numbers in structure fill and structure floor associations.

Harris (1968, 1971, 1976) does not report the larger form from any of the Cochiti Dam sites. It is possible that he identified the larger specimens as either rock squirrels (which occur in all but one of his assemblages) or Abert's squirrel, which occurs at one site, or considered them a large variant of Gunnison's prairie dog. He apparently did not consider the black-tailed prairie dog as a possibility because it generally occurs to the east, beyond the mountains or across the valley, some distance to the south (Harris 1976:H-13).

Pocket gophers. Both the smaller Botta's pocket gopher *(Thomomys bottae)* and yellow-faced pocket gopher *(Papogeomys castanops)* occur in most of the site assemblages with a slight numerical advantage for the larger form. It is rare for two species of pocket gopher to occupy the same area (Chase et al. 1982:239), however, both species are consistently present throughout the time span, often in the same provenience unit. Currently, the yellow-faced pocket gopher is not found anywhere near the project area. The closest reported find is an old skull found on the west bajada of the Sandia Mountains (Findley et al. 1975:155). Yet, its larger size and single groove in the upper incisor readily distinguishes it from the smaller Thomomys and definitely suggests a change in the range of this species. Yellow-faced pocket gophers prefer deep, sandy soils that are free of rocks but are also found in rocky, caliche soils (BISON-M n.d.). Botta's pocket gopher is found in almost every habitat from the western edge of the eastern plains where soil conditions allow burrowing (Findley et al. 1975:144–145).

Pocket gophers are solitary and spend almost all of their time underground, surfacing to push up excavated soil or look for food in the immediate area. Burrows generally range from 10 to 30 cm underground with deep vertical tunnels averaging 46 to 61 cm deep. Their burrows also serve as homes for salamanders, spadefoot toads, box turtles, lizards, snakes, cottontail rabbits, and a variety of mice (Chase et al. 1982:246).

A good number of the pocket gopher bones found in these sites are complete skulls and mandibles suggesting most are the remains of post-occupational burrowers. This is reinforced by our finding a live pocket gopher just above the floor of Structure 50 at LA 6170, at a depth of nearly 2 m below the ground surface. Burning on six yellow-faced pocket gopher bones suggests they were occasionally roasted and eaten. All but one of those burned are from Early Developmental period deposits and all are lightly burned or scorched, more often (n = 4) on an end or margin rather than an even scorch. None has evidence of potential processing. Botta's pocket gophers are most often found in extramural features (32.8 percent) followed by structure fill (29.5 percent). The larger form was most often recovered from structure fill (41.3 percent) followed by floor associations (23.8 percent).

Pocket Mice. At least four species of pocket mice inhabit the Peña Blanca area. *Perognathus flavus* (silky pocket mouse) is ubiquitous in grasslands and deserts and occurs up into juniper woodland environs. *Perognathus flavescens* (Plains pocket mouse) has a similar range but prefers sandy soils. *Perognathus hispidus* (hispid pocket mouse) is found in taller grasses and annual forbes, and *Perognathus intermedius* (rock pocket mouse) is rarely found outside rock habitats in lower grasslands and deserts (Findley et al. 1975:159–169). No attempt was made to identify the pocket mice to the species level. However, at least two, a smaller and a larger form, are present in the faunal assemblage. One of these is about the size of and probably is *Perognathus flavus,* the other is larger. None of the pocket mouse bones is burned. All were recovered from near floor or floor feature contexts suggesting they either burrowed down to floor level, occupied the structures (LA 6170 Structures 5 and 50, LA 6171 Structure 60) along with the humans, or moved in soon afterwards.

Kangaroo Rats. At least two species of kangaroo rat were found, *Dipodomys ordii* (Ord's kangaroo rat) and *Dipodomys spectabilis* (banner-tailed kangaroo rat). The smaller kangaroo rats agree well with comparative specimens of Ord's kangaroo rat, however, *Dipodomys merriami* (Merriam's kangaroo rat) occurs in the southern part of Sandoval county and is another possibility. Ord's kangaroo rats lives almost everywhere below mid-woodland where there is friable soil. The banner-tailed kangaroo rat inhabits well-developed grasslands preferring heavier soils that can support their complex and deep burrow systems. Merriam's kangaroo rats prefer warm deserts and grasslands and when their range overlaps that of Ord's kangaroo rats, they are excluded from the more friable soils (Findley et al. 1975:174–185).

One or both species of kangaroo rat are found in all but the mainly Classic period deposits. The larger form is usually the more numerous. More kangaroo rat bones are burned than for most the other rodents. Most of the burning is in the Early Developmental assemblages where 18.5 percent of Ord's and 23.1 percent of the banner-tailed kangaroo rat bone is burned, ranging from scorched to calcined. The only other time period with burned kangaroo rat bones is the "mainly Coalition" where the larger kangaroo rat has scorched bone (n = 2 or 8.3 percent). Both kangaroo rats are found more often in extramural areas (49.0 percent of Ord's and 62.9 percent of the banner-tailed). In structures, nearly equivalent proportions are found in fill and roof fall but more Ord's (26.5 percent) than banner-tailed (11.4 percent) are associated with structure floors.

Beaver. Beavers once lived along most permanent streams in New Mexico but have been exploited out of several drainages (Findley et al. 1975:187–188). The only aquatic mammal found in the Peña Blanca assemblage, beaver parts were found in low numbers at two sites, three pieces of scapulae from a single beaver in mainly Late Developmental deposits at LA 249 and a phalanx and a burned scapula fragment from Early Developmental deposits and another phalanx and a partial radius from mainly Early Developmental deposits at LA 6170. Even though the parts suggest a single animal, these were recovered from the lower fill of Structure 5 west of NM 22 and from SU 15, a sheet midden area east of the road, suggesting they are from different animals. Two of the Cochiti Dam sites had this species, LA 6462 or North Bank (Harris 1968:209) and Alfred Herrera (Harris 1968:226).

Peromyscus. A variety of mice from this genera are common in or near the project area: *Peromyscus maniculatus* (deer mouse), *Peromyscus leucopus* (white-footed mouse), *Peromyscus boylii* (brush mouse), and *Peromyscus truei* (piñon mouse). The deer mouse is found in most habitats from ponderosa forest down to desert communities, the white-footed mouse prefers soft soil along arroyos and grasslands below the woodland, especially arroyo sides under shrubs, the brush mouse prefers warm rocky hillsides with stands of oak or other shrubby species, and the piñon mouse favors piñon-juniper woodlands (Findley et al. 1975:204–220).

No attempt was made to identify the *Peromyscus* to the species level. At least two species are represented in the Peña Blanca assemblage, one the size of and resembling the deer mouse, and the other the white-footed mouse. Strictly nocturnal, these mice readily move into the abandoned tunnels of pocket gophers and other rodents, buildings, or any shelter (Bailey 1971:144), including the tarps or the plastic used to protect archaeological features. Found in most (four of six) of the site assemblages, these occur in deposits from all time periods except for the mainly Classic, due in part to the small size of that assemblage. Over half were found in structure fill, which includes intrusive features and vent shaft fill, followed by extramural areas, perhaps suggesting a good portion had occupied the burrows of other rodents. None of the bone is burned and a considerable proportion are complete or nearly complete elements.

Grasshopper Mouse. The northern grasshopper mouse *(Onychomys leucogaster)* lives in sand grasslands and subsists on arthropods and small vertebrates including lizards and mice (Findley et al. 1975:227). This small mouse is an unlikely food source or human commensal and may have burrowed into the site deposits or been left by predators. None was found in structure floor associations and it was found at only two of the sites, a single element from the upper fill of a pit structure (Structure 4) at LA 6169 and 18 from at least two mice in a single extramural pit at LA 6171. None is burned and all come from mainly Coalition deposits.

Woodrats. At least two species of woodrat occur in the Peña Blanca assemblages. Except for the large specimens identified as large woodrat and mandibles and maxilla retaining at least the first molar, no attempt was made to identify the woodrats to the species level. Features of the molars can distinguish species in most cases (Hoffmeister and Torre 1960:477) while long-bone size overlaps considerably. The white-throated woodrat *(Neotoma albigula)* is widespread and common ranging from desert to mixed coniferous forest environs and overlaps with the more montane Mexican woodrat *(Neotoma mexicana).* The bushy-tailed woodrat *(Neotoma cinerea)* is primarily a mountain species but does occur in piñon-juniper woodlands near cliffs and rock outcrops. Probably the closest record for this species is in the Valle Grande. The Southern Plains woodrat *(Neotoma micropus)* is a grassland species that has been reported south and east of Peña Blanca and Stephens' woodrat *(Neotoma stephensi),* which inhabits rock accumulations in the piñon-juniper zone just north of the project area, are other possibilities (Findley et al. 1975:238–251).

The specimens called large woodrat are considerably larger than the white-throated woodrats examined at the Museum of Southwest Biology and well within the size range for the bushy-tailed woodrat specimens. Teeth on the large specimens are generally quite worn so that tooth shape could not be used to distinguish species. Since diet and habitat make it unlikely but not impossible that these are bushy-tailed woodrats, these large specimens are labeled large woodrat to distinguish them from the more typical-sized woodrats in the assemblage.

One or more species of woodrat are found in all but the Coalition and mainly Classic deposits. Post-cranial remains left at the woodrat level are the most common throughout. In the Early Developmental deposits, mandibles and maxilla that could be identified to the species level are predominantly white-throated woodrats. This and the recovery of two partial skeletons of Mexican woodrats suggest at least these two species were present in the general area. Burning is not as common as with the kangaroo rats and tends to be light or light to heavy burns suggestive of roasting as opposed to heavy or calcined or discard burns. No other evidence of processing was observed. However, considerable proportions of all woodrat taxa are found in structure floor associations (ranging from 30.3 to 52.5 percent depending on taxon), another indication that some were eaten.

Unidentifiable rodent. Most of the unidentifiable rodent bones are too fragmentary to determine a species or genus or are elements such as vertebrae. A few are burned and nearly half are fragmentary (Table 20.4). Small rodents are found mainly in extramural (47.4 percent) and structure fill (31.6 percent) contexts while large rodent remains are mostly in floor associated contexts (42.7 percent) followed by extramural areas (29.3 percent).

Lagomorphs (Cottontails and Jackrabbits)

Cottontail rabbits. The desert cottontail *(Sylvilagus audubonii)* is by far the most common species recovered at all sites. Nuttall's cottontail *(Sylvilagus nuttalli)* may also be present. Considerable variability in the size of cottontail specimens further suggests that a variety are represented. Desert cottontails are common to abundant from desert into woodlands, including cottonwood/willow habitats along rivers and agricultural land (BISON-M n.d). Nuttall's cottontail is found in the northern mountain ranges and is smaller than the desert cottontail. The single element, a complete metatarsal identified as Nuttalls cottontail, is mature but about 20 percent smaller than desert cottontail comparative specimens and most cottontail in this assemblage. Other specimens recorded as desert cottontail could also fall within the size of this rabbit. Some suspect that none of the New Mexico cottontails are distinct biological species, and instead are morphological responses to their respective ecological conditions (Findley 1975:83). If true, the variability observed suggests that cottontail rabbits were taken from a variety of ecological niches.

Short-lived but prolific breeders, cottontail rabbits produce up to five litters of three to four a season. Young are born from late March into September, becoming sexually mature at 80 days and generally dying at about 1.5 years of age. Gestation is 28 days and the young are ready to leave the nest at two weeks of age and disperse at three weeks (BISON-M n.d.). The

Table 20.5. Summary of Cottontail Rabbit Age, Burning, and Completeness by Time (Percentages)

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
N =	2482	118	32	80	111	315	9
Age:							
Fetal/neonate	0.1	-	-	-	0.9	0.3	11.1
Immature	0.4	0.8	-	-	0.9	0.3	22.2
Juvenile	6.9	7.6	-	10	8.1	4.1	11.1
Burning:							
Scorch/light graded	14.2	10.2	9.4	5.1	0.9	2.9	11.1
Heavy to calcined	7.1	4.2	3.1	6.3	6.3	0.6	-
Completeness:							
> 75%	27.6	27.1	59.4	27.5	37.8	31.5	11.1
25-75%	33.7	31.4	28.1	47.6	37.8	37.8	44.4
< 25%	38.8	41.5	12.5	25	24.3	30.8	44.4

annual number of young per female ranges from 22 for Nuttall's to 39 for the eastern cottontail in Oregon (Chapman et al. 1982:96). Rapid breeding and a propensity to invade agricultural fields, make cottontail rabbits an ideal food animal. Historically, cottontails flourished and extended their range during periods of pioneer agriculture and retained high densities in areas of abandoned and fallow farmland (Chapman et al. 1982:99).

Cottontail rabbits are by far the most abundant animal represented in the Peña Blanca faunal assemblages, regardless of the site or time period. Age, burning, and completeness vary over time (Table 20.5) with more immature animals in the Early Developmental and Coalition assemblages. The proportion of complete or nearly complete bone is greatest in the Late Developmental and Coalition assemblages, perhaps suggesting that more processing occurred in the Early Developmental and Classic or that the Late Developmental and Coalition deposits contain more waste products—such as feet—and this results in greater proportions of complete elements. Due to their small size, cottontail rabbits require little effort for rendering into a useful size for cooking. Thus, it is not surprising that few cottontail bones exhibit marks, breaks, impact breaks, or other unambiguous evidence of butchering or processing. Cottontail bones are found in nearly all proveniences in proportions quite close to the assemblage as a whole.

Jackrabbits. Jackrabbits *(Lepus californicus)* are much less common in these assemblages but are still the second most common species and third most numerous taxon. Generally found in all habitats below the ponderosa forest zone (Findley et al. 1975:93), numbers increase when juniper-woodland is replaced by grass (BISON-M n.d.), and they tend to concentrate in cultivated fields during periods of drought (Dunn et al. 1982:130). This has led some researchers (e.g., Szuter and Gillespie 1994:70) to suggest that jackrabbit proportions can be used as an index of disturbed or modified environment. Cottontails are often the more abundant rabbit when an area is first settled, but as settlement size and, possibly, when field areas increase, jackrabbits become more numerous relative to cottontails.

Jackrabbits are not as prolific as cottontails, averaging about 14 young per female annually (Dunn et al. 1982:128). Breeding occurs from January through July, gestation is about 45 days, and the two to seven litters per year range in size from one to five. Most females do not breed during their first year. Adult size is reached by seven months (BISON-M n.d.).

While not as common as cottontails, jackrabbits maintain a consistent presence in all the sites. Proportions increase slightly through the Late Developmental then decrease with the lowest proportion in the mixed Classic deposits. Very young or neonatal jackrabbits are found only in the mainly Early

Table 20.6. Summary of Jackrabbit Age, Burning, and Completeness by Time (percentages)

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
N =	750	47	16	41	34	83	3
Age:							
Fetal/neonate	-	2.1	-	-	-	-	-
Immature	0.9	-	-	2.4	-	-	-
Juvenile	5.2	4.3	-	-	2.9	6	-
Burning:							
Scorch/light graded	11.3	8.6	6.3	-	-	1.2	-
Heavy to calcined	8.9	2.1	-	7.3	14.7	3.6	-
Completeness:							
> 75%	17.4	14.9	18.8	17	23.5	36.1	66.7
25-75%	21.5	19.1	25	26.9	32.3	25.1	-
< 25%	61.1	66	56.3	56.1	44.1	39.8	33.3

Developmental deposits and immature and juvenile animals are more common in the Early Developmental, mainly Early Developmental, and mainly Coalition deposits (Table 20.6). Burning changes from predominantly light or roasting burns in the Developmental period deposits to discard burning in the mainly Coalition deposits.

As with the cottontails, proportions of highly fragmented bone decrease during the Coalition as if these animals were no longer processed to the same degree. Jackrabbits have low levels but slightly more diverse evidence of processing, probably due to their larger size. These including chops (n = 1) and peels (n = 2), which were not observed on cottontail bones. Unlike cottontails, there is also a tendency for more than the expected number of specimens to be found in structure floor contexts and fewer in extramural areas.

Carnivores

With the exception of the dog *(Canis familiaris)*, very few carnivore bones were recovered. At least six species are found and the most diversity occurs in the two sites with the largest samples (LA 265 with four and LA 6169 with three) and in the Early Developmental deposits (with five). A few specimens are diagnostically carnivore but could not be identified beyond the size of the animal. These are often tooth fragments, rib shaft fragments, or immature bone. One medium carnivore bone from a mainly Late Developmental deposit is heavily burned.

Canids. Because of the similarities in dog and coyote bones, fragmentary canid bones are considered *Canis* sp. (dog, coyote, wolf). The more complete or diagnostic portions of elements were generally identifiable as dog or coyote and immature canid bones as dog. Coyotes are larger and more gracile than the variety of dog present at these sites. Furthermore, much of the dog occurs as complete skeletons or scattered but complete elements that represent parts of dog burials, disturbed burials, or discarded skeletons. None of the bones are burned or broken in a manner that would indicate consumption. Two of the specimens (a maxillary canine fragment and a mandible fragment) left at the canid level are burned, one heavy and one graded light to calcined. Both are from Early Developmental deposits.

Only two bones (mandible fragments) could be identified as coyote *(Canis latrans)*, both from mainly Coalition deposits. Coyotes are most common in grasslands but are found in all habitats (Findley et al. 1975:281) and are commonly found in archaeological faunal assemblages.

Articulated dogs were found at three of the Peña Blanca sites, some as deliberate burials and others placed in structures as part of closing rituals. The only burning is on a dog that was tossed into a structure (Structure 5 at LA 6170) while the roof was smoldering and burned parts of some bones. Ages range from one- to two-month-old puppies to older individuals.

The Hopi considered dogs to be warriors, hunters, and watchers. They hunted rabbits, deer, and antelope, catching antelope by the leg. They also watched the fields, driving away coyotes (Bradfield 1973:242). Dogs are further discussed in the research questions portion of this report.

Bear. The black bear *(Ursus americanus)* mandible fragment from the floor of Structure 4 at LA 6169 is unusual in the part found and its provenience, both of which suggest ceremonial disposition. Black bears are found in all of the New Mexico montane forests and occasionally wander away from montane areas (Findley et al. 1975:293–294). Harris tentatively identified a burned phalanx as bear from LA 70 (1976:18), a partial humerus from North Bank as bear, and several foot bones as black bear from Alfred Herrera (Harris 1968:210, 227).

Weasel. A long-tailed weasel *(Mustela frenata)* mandible from a sealed floor feature, a possible posthole in Structure 4 at LA 265, is a rare archaeological find. Ranging from valleys, including the Rio Grande, to brushy field borders and montane meadows, their preferred prey are ground squirrels and woodrats. While not specifically noted for the Peña Blanca area, this species is currently found just to the south around Albuquerque and in the Sandia Mountains, around Santa Fe, and in the Jemez Mountains (Findley et al. 1975:304). Weasels are small but bold and courageous, willing to face almost any animal, including humans. Reports of attacks on humans generally involve someone trying to take prey away. Their grip is powerful and tenacious (Svendsen 1982:624), so it is not surprising that prehistoric hunters rarely collected this species.

Badger. Low frequencies of badger *(Taxidea taxa)* bones were identified from three Peña Blanca and several Cochiti Dam sites. Most common in grasslands, but ranging into other nonforested areas, badger presence is generally related to that of burrowing rodents (Findley et al. 1975:308). Principally nocturnal and solitary, they generally forage at night and remain underground during the day (Lindzey 1982: 656). Badgers are considered medicine animals by the Hopi. They raid cornfields and if too much damage is done, they are killed (Bradfield 1973:220). Burned badger bones include a calcined partial radius from a dog burial (Feature 110) in the upper fill of Structure 1 and a heavily to calcined burned phalanx from a keyhole structure (Feature 27) at LA 265. The other badger parts are a rib in the roof fall of Structure 1, an auditory bulla in the upper fill of Structure 4, and a partial ulna in Feature 23 at LA 265; a metacarpal from the roof fall in Structure 47 at LA 6169; and a maxilla and occipital portion of a crania from sheet deposits in Area 2 at LA 6170.

Badger bones were also recovered from the Cochiti Dam sites. Harris reports remains from North Bank (Harris 1968:210), LA 9154 (Harris 1971:72), and LA 70 (Harris 1976:H 19).

Bobcat. Bobcats *(Felis rufus)* are found throughout the state in almost all habitats (Findley et al. 1975:320). Found only at LA 265, one is an atlas vertebra from an immature animal and the others are a rib and an ulna from a mature individual. All are from different structures or features. Bobcats were more consistently found at the Cochiti Dam sites. Harris reports bobcat from North Bank (MNI = 2) and Alfred Herrera (MNI = 3) (Harris 1986:214, 230), possible bobcat (MNI = 1) from LA 9154 (Harris 1971:77), and bobcat (MNI = 3) from LA 70 (Harris 1976:H-28).

Artiodactyls

Determining prehistoric ranges and habitats for prehistoric artiodactyls is somewhat problematic. Most were hunted to near extinction in the nineteenth century and the subspecies or varieties reintroduced may not have the same behavior as the natives. Furthermore, competition with domestic ungulates, habitat degradation, intensive management practices, and occupation of some areas by humans have also altered their distribution.

Artiodactyl. Much of the artiodactyl bone could not be identified beyond the size of the animal (Table 20.7). Medium-sized artiodactyl bone, or that from deer, pronghorn, or bighorn sheep, is the most common. A few pieces could have come from a medium or large artiodactyl (elk or bison), while others were definitely from a large artiodactyl. Small pieces of antler were classified as Cervidae, as both deer and elk are present at the sites. Neonatal or very young medium artiodactyl parts were found at LA 265, LA 6169, and LA 6170, mainly (15 of 16) in Early Developmental deposits, providing evidence of spring to early summer (May and June) hunts.

Medium and large artiodactyl bone is more often heavily burned than lightly or graded burning (Table 20.8), especially in the early period and Coalition assemblages. Almost all are small fragments (Table 20.9) and the exceptions are often neonatal or very young animals. Potential evidence of processing observed on medium artiodactyl bone is most often impacts (n = 78) followed by cuts (n = 16) and spiral

Table 20.7. Proportion of Artiodactyl Bone by Time

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
Medium artiodactyl	8.1	9.6	19.4	19.6	2.6	5.7	48.1
Medium-large artio	0.1	0.2	-	-	-	0.1	-
Large artiodactyl	0.2	0.2	-	-	-	0.1	-
Elk	0.4	-	0.7	-	-	0.1	-
Deer or elk antler	0.1	0.2	0.7	-	0.3	1	-
Deer	1.4	0.7	6	3.7	0.5	1.6	1.2
Pronghorn	0.7	1.8	1.5	2.4	0.9	0.8	-
Bison	0.1	-	-	-	-	-	-
Cattle or bison	0	-	-	-	3.1	-	-
Bighorn	0.3	0.5	1.5	0.8	0.2	0.3	1.2
Assemblage size	7802	437	134	593	572	976	81

Table 20.8. Summary of Artiodactyl Burning by Time Period (percent of taxon)

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
Light or light graded burns							
Medium artiodactyl	15.2	7.2	7.7	10.3	6.7	1.8	7.7
Medium-large artio	20	-	-	-	-	-	-
Large artiodactyl	36.9	-	-	-	-	-	-
Elk	-	-	-	-	-	-	-
Deer	13.2	-	12.5	4.5	-	-	-
Pronghorn	33.3	-	-	-	-	-	-
Bison	-	-	-	-	-	-	-
Cattle or bison	-	-	-	-	-	-	-
Bighorn	4.8	-	-	-	-	33.3	100
Total artiodactyl	15.5	5.1	7.5	8.3	2.3	2.1	9.8
Heavy to calcined burns							
Medium artiodactyl	29	23.8	7.7	15.5	26.7	7.2	7.7
Medium-large artio	-	-	-	-	-	-	-
Large artiodactyl	52.7	100	-	-	-	-	-
Elk	-	-	-	-	-	-	-
Antler	20	-	-	-	-	-	-
Deer	21.7	-	-	4.5	-	-	-
Pronghorn	22.3	12.5	-	14.2	-	-	-
Bison	-	-	-	-	-	-	-
Cattle or bison	-	-	-	-	-	-	-
Bighorn	28.6	-	-	-	-	33.3	-
Total artiodactyl	26.8	20.7	5	13.4	9.1	5.2	7.3

Table 20.9. Summary of Artiodactyl Completeness by Time Period (percent of taxon)

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
Medium artiodactyl	631	42	26	116	15	56	39
> 75%	0.7	-	-	0.9	-	-	-
25-75%	4.6	-	-	0.9	6.7	3.6	-
< 25%	94.8	100	100	98.3	93.3	96.4	100
Large artiodactyl	19	1	-	-	-	1	-
> 75%	-	-	-	-	-	-	-
25-75%	5.3	-	-	-	-	100	-
< 25%	94.7	100	-	-	-	-	-
Medium-large artiodactyl	5	1	-	-	-	1	-
> 75%	-	-	-	-	-	100	-
25-75%	-	-	-	-	-	-	-
< 25%	100	100	-	-	-	-	-
Elk	31	-	1	-	-	1	-
> 75%	71	-	-	-	-	-	-
25-75%	6.5	-	-	-	-	-	-
< 25%	22.6	-	100	-	-	100	-
Mule deer	106	3	8	22	3	16	1
> 75%	18	33.3	25	36.3	-	25	-
25-75%	26.4	33.3	37.5	18.1	33.3	18.8	100
< 25%	55.7	33.3	37.5	45.5	66.7	56.3	-
Pronghorn	54	8	2	14	5	8	-
> 75%	27.8	62.5	-	21.4	20	25	-
25-75%	7.4	12.5	-	21.4	20	12.5	-
< 25%	64.8	25	100	57.1	60	62.5	-
Bison	6	-	-	-	-	-	-
> 75%	16.7	-	-	-	-	-	-
25-75%	50	-	-	-	-	-	-
< 25%	83.3	-	-	-	-	-	-
Cattle or bison	2	-	-	-	18	-	-
> 75%	-	-	-	-	27.8	-	-
25-75%	-	-	-	-	11.1	-	-
< 25%	100	-	-	-	61.1	-	-
Bighorn	21	2	2	5	1	3	1
> 75%	9.5	50	50	40	-	-	-
25-75%	38.1	-	-	-	-	-	-
< 25%	52.4	50	50	60	100	100	100
Total artiodactyl *	880	58	40	157	44	96	41
> 75%	7.2	12.1	7.5	8.9	13.7	6.3	-
25-75%	8.2	3.4	7.5	5.1	11.4	7.3	2.4
< 25%	84.7	84.5	85	86	75	86.5	97.6

*includes deer/elk antler

breaks (n = 18). Other kinds found include portions cut off (n = 1), abrasions (n = 2), bone flakes (n = 11), and peels (n = 6). For the large artiodactyl taxon, evidence is more limited and includes cuts (n=4), a spiral break, and portions cut off (n = 2). Almost twice the expected number of artiodactyl bones were found in roof fall associations (22.4 percent of the medium artiodactyl and 71.4 percent of the large artiodactyl compared to 12.5 percent for all fauna).

Elk. Primarily grass eaters that once occupied all of the major montane areas in New Mexico (Findley et al. 1975:328), elk *(Cervis elaphus)* summer in mountain meadows and coniferous forests, descending to piñon-juniper woodlands, plains grassland, or even desert scrub in winter (BISON-M n.d). It is difficult to estimate the prehistoric range of this species. However, the proportions of this species in faunal assemblages from Tijeras Canyon (< 0.2 percent, Young 1980:101), from the Galisteo Basin site of LA 3333 (0.1 percent, Akins n.d.a), and from Arroyo Hondo (a maximum of 0.2 percent in AD 1300–1315 deposits, Lang and Harris 1984:155) are slightly lower than for the Peña Blanca sites (0.4 percent in Early Developmental deposits, 0.7 percent in Late Developmental deposits, and 0.1 percent in mainly Coalition deposits). This may suggest that elk were not as abundant to the east and southeast, and that the source was in the Jemez Mountains to the west and northwest, although the Santa Claras claim that in historic times, elk did not occur in their hunting range (Hill 1982:53).

Elk has a small but consistent presence in the Peña Blanca fauna. Parts are largely feet (72.7 percent), including an articulated hind foot found in the fill of a structure at LA 6170, but also include a tooth and parts of a vertebra, ribs (n = 4), scapulae (n = 2), a distal tibia, and a femur. Most (93.9 percent) are from Early Developmental deposits with single specimens from a Late Developmental and a mainly Coalition deposit. Evidence of processing is relatively common. The partial articulated foot from LA 6170 has impact breaks that resulted in separating the distal end of the tibia from the shaft and separating the proximal end of the metatarsal from its shaft and the phalanges. The femur has an impact fracture from separating the proximal end from the shaft, a metacarpal also has an impact separating the proximal end from the shaft, and one rib has chops and cuts. None are burned and over half (51.5 percent) were recovered in extramural areas.

Deer. Mule deer *(Odocoileus hemionus)* range throughout all elevations and habitats in New Mexico. As browsers, their most important foods are shrubs and trees (Findley et al. 1975:328–329). In some areas, deer move to higher altitudes in hot weather, returning to the foothills and valleys in the winter. Fawns are born late May into September (BISON-M n.d.).

Deer are by far the most numerous and probably the closest and most available of the artiodactyl species for prehistoric hunters. Yet, proportions in the larger site samples range from only 1.1 to 2.1 percent. More (42.0 percent) were found in structure fill and extramural (23.5 percent) than roof fall (16.0 percent) and floor (18.5 percent) contexts. When time is considered, the proportion is low in the Early Developmental deposits (1.4 percent), increases substantially in the Late Developmental (6.0 percent), and falls again in the Coalition (0.5 percent) and mainly Classic (1.2 percent) deposits. As for parts, the vast majority of the Early Developmental deer is limb and foot parts (81.1 percent) followed by cranial (including antler) (17.0 percent), and ribs (1.9 percent). Mixed Early Developmental deer specimens (n=3) are from feet. Parts are more diverse in the Late Developmental deposits and include two vertebrae and six foot parts. In the larger mixed Late Developmental sample, parts are again more diverse and include cranial (18.2 percent), vertebrae (9.1 percent), ribs and sternum (9.1 percent), with the rest being limb and foot parts. The few Coalition parts are cranial (n = 2) and front foot (n = 1). Mainly Coalition parts are largely limb and foot parts (68.8 percent) and cranial (25.0 percent), but also include an axis vertebra. The single Classic deer specimen is part of an innominate.

Fragmentation, evidence of processing, and burning all indicate that those deer parts returned to the sites were often heavily processed. Burning is greatest in the Early Developmental assemblage (Table 20.8). The amount of highly fragmented bone (Table 20.9) varies with the highest proportions in the Early Developmental, Coalition, and mostly Coalition deposits. Impacts are by far the most common direct evidence of processing (n = 21), but also found are cuts (n = 4), spiral breaks (n = 2), chops (n = 2), splits (n = 2), and a peel.

Pronghorn. Open grassland dwellers, pronghorn *(Antilocapra americana)* were once numerous but declined markedly by the early 1900s. In Arizona, they prefer areas with grass and scattered shrubs in rolling or dissected hilly or mesa areas. In southern New Mexico young are born in June and July but in Arizona peak fawning is from May to June in the northern part of the state (BISON-M n.d.). While it is possible that pronghorn occurred in the vicinity of the Peña Blanca sites, as is suggested by Lange (1990:130) who states that the Cochitis used a box canyon just above Cochiti as a trap for pronghorn and deer, pronghorn could also have been hunted in the Galisteo Basin to the east. The Early Coalition site of LA 3333 has abundant pronghorn (10.4 percent of the assemblage as compared to 2.4 percent deer), while proportions from the Classic period component at Tijeras Pueblo, pronghorn slightly outnumbers deer (4.4 to 3.7 percent) (Young 1980:101). San Antonio (Akins 2004), in the Tijeras Canyon area, is similar. Pronghorn considerably outnumbers deer in the lowest two levels of the midden, which date to the Coalition and Early Classic periods (4.3 to 2.2 percent and 2.7 to 0.8 percent). Proportions for Arroyo Hondo range between 0.2 and 0.6 percent for pronghorn compared to 0.5 to 2.6 percent for deer (Harris 1984:154–176).

For Peña Blanca, the proportion of pronghorn bone is never very large and probably peaked in or around the Late Developmental period (Table 20.7). This suggests the source was not in the immediate area. Parts attributed to the Early Developmental period are mainly limb and foot bones (79.6 percent) but also include cranial (20.4 percent) fragments. All of the mixed Early Developmental deposit pronghorn is foot and lower limb bones as are the two Late Developmental specimens. The mainly Late Developmental sample is larger and more diverse. It includes mandible parts (14.3 percent), vertebrae (21.4 percent), a single rib and innominate, and limb and foot parts (50.0 percent). The Coalition deposit parts include mandible fragments (n = 3) and front foot parts (n = 2) as does the mainly Coalition deposits (two cranial and six foot and limb). Like deer, pronghorn specimens were most commonly found in structure fill (42.9 percent), however relatively few came from extramural contexts (14.3 percent compared to 23.5 percent of the deer).

Pronghorn bone is more likely to be burned than deer bone (Table 20.8) and greater proportions are fragmentary in most time periods (Table 20.9). Potential processing includes impacts (n = 6), spiral breaks (n = 4), a cut, and a chop.

Bison. Bison *(Bos bison)* is definitely present at two sites in Early Developmental deposits, and probably at one other in Coalition and undated deposits. Several specimens are fragmentary or nondiagnostic and could represent either bison or domestic cattle. These were left at the *Bos* level unless the context was indisputably prehistoric.

Bison were essentially gone from New Mexico by 1860 (Findley et al. 1975:335). Most biologists believe that bison was a grassland animal confined to the eastern Plains. Bailey (1971:12–23) skeptically recounts an 1853 account by a Tewa whose father had killed two bison at Santo Domingo and a Mexican from San Juan Pueblo who claimed to have seen buffalo on the Rio del Norte (Rio Grande) in 1835. He goes on to dismiss the archaeological evidence from west of the Rio Grande as small bands that may have strayed from their usual range, which he viewed as about half-way between the Rio Grande and Pecos River. This perception is perpetuated by Lang and Harris (1984:49–50) who state the bison found at Arroyo Hondo were occasional wanderers from the great herds of the plains to the east. However, more recent evidence, as well as the consistent presence of bison in assemblages from the west side of the Sandia Mountains, Tijeras Canyon, and the Galisteo Basin, and a Basketmaker III bison kill site east of Tomé (Akins 1987b:166–167), indicate a much closer presence for this species, probably the Estancia Basin and the west slopes of the Sandia and Manzano Mountains.

The bison from LA 265 is from a backhoe trench and is not accompanied by other cultural material but is also heavily disturbed and could predate or postdate the site occupation. The specimens are considerably larger than comparative cattle material and consistent with bison so are considered bison. The other Early Developmental period bison is a complete carpal found on or near the floor of Structure 50 at LA 6170. A cattle or bison femoral epiphysis was found in the trash area just north of this structure. A cattle or bison tooth from near the floor of the pit structure at LA 115862 could well be bison, but could also have been transported by burrowing rodents. Most of the cattle or bison is from Feature 8 at LA 6171 (Badner, Chapter 14) and consists of cranial pieces, thoracic vertebrae, rib, and foot parts from a neonatal bovid. These were found in what may be a natural feature but about a meter beneath the surface. Some of the remains were articulated and some were scattered. While this could be an historic burial of a domestic calf, the cranial attributes, specifically small horns, suggest it could be bison.

Bighorn. The Rocky Mountain bighorn sheep *(Ovis canadensis)* is another species whose original range is largely unknown. Until the early twentieth century, bighorn sheep were present in the higher mountains of north-central New Mexico in sizable numbers. Their last stronghold was the Sangre de Cristo Mountains northeast of Santa Fe. Bighorns inhabit rugged cliffs and extremely rocky areas near suitable feeding sites containing grass and browse plants. In the United States and Canada, bighorns winter above timberline on windswept ridges or southernly exposed slopes but may descend to lower foothills and river valleys, and are found in alpine or subalpine regions during summer (BISON-M n.d.). Historically, the Cochitis placed pits containing sharp stakes and covered with grass matting and dust on trails above Cañada de Cochiti and drove deer and bighorn sheep into the pits (Lange 1990:130). The Santa Claras also hunted bighorn in the vicinity of Cochiti Pueblo (Hill 1982:53).

The archaeological distribution of this species is interesting. It is persistently but variably present at the Peña Blanca sites, at Tijeras Pueblo (0.7 percent, Young 1980:101), and in the lower layers of the San Antonio midden (0.1 and 1.1 percent, Akins 2004) but was not specifically identified for Arroyo Hondo (Harris 1984:155–176) or LA 3333 (Akins n.d.a). This absence in sites to the east along with greater numbers and a wide distribution of body parts in the Peña Blanca sites, may indicate a Jemez Mountain origin for most of the bighorn sheep found.

Proportions of bighorn in the Peña Blanca assemblage are low but consistent with no evidence of a real peak in use (Table 20.7). Parts recovered from Early Developmental deposits are diverse: cranial (28.6 percent), vertebra (23.8 percent), rib (4.8 percent), sacrum (4.8 percent), and limb parts (33.3 percent) with only one foot part (4.8 percent). The two from mainly Early Developmental deposit parts are both foot elements, as are the two Late Developmental deposit specimens. Mainly Late Developmental period parts are largely front leg (80.0 percent) plus a phalanx. The single Coalition part is a tooth and the mainly Coalition deposit parts are from a limb and two phalanges. A femur fragment is all that represents the Classic period. Bighorn bones are occasionally burned (Table 20.8) and include a good number of nearly complete elements (Table 20.9). Potential processing includes impacts (n = 3) and a spiral break. More were found in structure fill contexts (42.9 percent) followed by roof fall (25.7 percent); few are associated with floors (14.3 percent) or extramural areas (17.1 percent).

Domestic ungulates. In addition to the native artiodactyls, small numbers of domestic sheep or goat, horse, and possible cattle bones were recovered. Some were surface or near surface finds, others were in fill and indicate historic disturbance. A badly weathered horse or burrow phalanx with an axe chop mark was found on the surface at LA 115862. Domestic sheep or goat parts include a metacarpal from Structure 13 and a metatarsal from the upper fill of Structure 1 at LA 265, and an astragalus from the upper fill of Structure 4 at LA 6169. Specimens that could be cattle or bison include the femur epiphysis from SU 14 at LA 6170, a fragment of a molar or premolar from on or near the floor of the structure at LA 115862, and the neonate parts from SU 8 at LA 6171.

Birds

Small pieces of bird bone were identified to the size of the bird: passerine or small birds, medium, large, or very large. Fragmentary remains that are probably turkey were coded as very large bird when associated with considerable amounts of turkey but generally were coded as large bird in contexts without turkey and where the size of the bird was less clear. No attempt was made to identify small passerines other than checking them against the horned lark specimens. Over 80 species of small passerines currently occur or are likely to occur in the Cochiti area (US Army Corps of Engineers 1990:A-7-A9). Egg shell is extremely rare, except for mixed Developmental and Classic dating deposits from LA 249 where the 12 specimens account for 5.9 percent of that small assemblage. Otherwise a single piece of eggshell was recovered from LA 265 and a second piece was found when dry screening an unanalyzed flotation sample from LA 6169.

Golden eagle, scaled quail, and flicker are present in most site assemblages (four each), followed by turkey and horned lark (three each). When broken down by time (Table 20.10), Early Developmental deposits have the most diversity and have all but two of the species identified for the project. The Cochiti Dam sites of North Bank and Alfred Herrera (Harris 1968:214, 230), LA 9154 (Harris 1971:76), and LA 70 (Harris 1976:H-26-27) are considerably more diverse in avian fauna.

Riverine birds. Water and shore birds are surprisingly sparse in these sites, given the proximity to the Rio Grande. At least 18 species of duck and goose, two herons, egret, and two cranes currently occur or are likely to occur along the Rio Grande in the Cochiti area (US Army Corps of Engineers 1990:A-4). Yet, only single bones from a mallard-sized duck were recovered from LA 6169 (radius) and LA 6170 (coracoid) and a sandhill crane *(Grus canadensis)* tibiotarsus from LA 6169. Harris reports Canada goose *(Branta canadensis),* snow goose *(Chen hyperborea),* duck, and sandhill crane from North Bank (Harris 1968:214); Canada goose, snow goose, shoveler, teal-sized duck, and sandhill crane from Alfred Herrera (Harris 1968:230); Canada goose, duck, and sandhill crane from LA 9154 (Harris 1971:76); and great blue heron (Ardea herodias), snowy egret *(Leucophoyx thula)* or American bittern *(Botaurus lentiginosus),* Canada goose, duck,

Table 20.10. Summary of Bird Taxa and Burning through Time

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
Small passerine	15	-	-	-	1	2	-
Medium bird	15	-	-	-	1	2	-
Large bird	26	-	1	8	31	6	-
Medium-large bird	7	-	-	5	1	1	-
Very large bird	66	1	-	2	-	1	-
Eggshell	1	-	-	7	-	-	5
Duck	2	-	-	-	-	-	-
Sharp-shinned hawk	-	-	-	-	1	-	-
Golden eagle	1	1	-	-	1	1	-
Prairie falcon	-	-	-	1	-	-	-
American kestrel/merlin	1	-	-	-	-	-	-
Scaled quail	9	-	-	-	-	3	-
Turkey	240	2	1	3	148	44	-
Sandhill crane	1	-	-	-	-	-	-
Great horned owl	-	1	-	-	-	-	-
Flicker	18	-	-	-	-	-	-
Horned lark	21	-	-	-	-	-	-
Western meadowlark	10	-	-	-	-	-	-
Number burned:	-	-	-	-	-	-	-
Turkey	-	-	1	-	5	-	-
Unidentifiable bird	3	-	-	-	5	-	-
Wild birds	3	1	-	-	-	1	-

Note: counts are used because of small sample sizes possible shoveler *(Spatula clypeata),* and sandhill crane from LA 70 (Harris 1976:26).

Herons, egrets, and bitterns are marsh or shore-line birds that feed on fish, snakes, crayfish, snails, and small rodents (Ligon 1961:29). Sandhill cranes and both the Canada and snow goose feed in agricultural fields near water during the day and return to aquatic locations at night (BISON-M n.d.). Most ducks and shovelers generally feed and rest in aquatic habitats (Ligon 1961:42–55).

The Pueblos associate some water birds with rain. Migratory habits of some ducks make them explorers in search of a spiritual home. Duck feathers are of great importance to the Rio Grande Pueblos and ducks are hunted for feathers, not for food. The Hopis consider the duck as the ancestor of all the kachina and of the Hopi. The Tewas offer loose duck feathers in shrines along with other feathers and cornmeal. Cranes bring seeds they like and clouds and rain. They are a combination of a water symbol, seeds, and a guardian who controls the activities of clowns and kachina dancers for the Tewa (Tyler 1979:113–129).

Birds of prey. Hawks, falcons, and golden eagles are more common than the water birds in the Peña Blanca assemblage, especially the golden eagle. The sharp-shinned hawk *(Accipiter striatus)* resides in mountainous areas throughout the state including the Jemez and Sangre de Cristo Mountains (Hubbard 1978:14). The element is a coracoid found in the upper fill of Structure 70 at LA 6169. The Zunis use the feathers of this species on prayer sticks placed for hunting success or as war offerings (Tyler 1979:195).

Golden eagle *(Aquila chrysaetos)* parts include talons from the floor of Structure 4 at LA 265, the roof and closing deposits in Structure 5 at LA 6170, the fill of Structure 9 at LA 6171, and an ulna awl from the upper fill of Structure 70 at LA6169. This species is found throughout the state, nesting on ledges and cliffs or in tall trees (Ligon 1961:74). Feathers of eagles were so important to the Pueblos that some groups trapped eagles and kept them in rooftop cages. Eagles are associated with clouds and the rain that is important in growing corn, with the underworld and the dead, with hunting, with curing, and with war (Tyler 1979:43–64).

Both the prairie falcon *(Falco mexicanus)* and a smaller form, probably a merlin or pigeon hawk *(Falco* cf. *columbarius),* are represented in the assemblage. Prairie falcons are found throughout the state, except for the higher forested mountains, in winter and require suitable cliffs or canyons walls for nesting (Ligon 1961:79). Merlins are not common in New Mexico and may occur only as migrants (Ligon 1961:83). Parts include a humerus from a merlin found on or near the floor in Structure 4 at LA 6169 and a femur from a prairie falcon in the roof and floor fill of Structure 76 at LA 6169. Falcons and small hawks are seen by the Pueblos as swift and tireless and are often associated with races, which are generally run for rain rather than for sport (Tyler 1979:193).

A talon from a great horned owl was found on the floor of Structure 26 at LA 6171. The largest of the owls, this species is found throughout the state and is most common in rugged foothills (Ligon 1961:144). Owls are associated with witches and witchcraft in the central Rio Grande pueblos, perhaps due to Spanish influence. In the Western pueblos, owls are associated with Skeleton Man, the god of death and a fertility symbol (Tyler 1979:156–157).

Birds of prey are also reported for the Cochiti Dam sites. North Bank had only possible hawk and possible owl (Harris 1968:214), Alfred Herrera had hawk and *Buteo* sp. (Harris 1968:230), LA 9154 had a larger and a smaller Buteo, a larger and a smaller falcon, and great horned owl (Harris 1971:76); and LA 70 had hawk, *Buteo* sp., possible eagle, and a small owl (Harris 1976:H-26).

Quail. Scaled quails *(Callipepla squamata)* are relatively common in the Peña Blanca assemblages, as well as in those from the Cochiti Dam sites of Alfred Herrera (Harris 1968:230) and LA 70 (Harris 1976:H-26). This species is widespread, living in most habitats except for high forested mountains and thriving in arid areas (Ligon 1961:96). Parts are diverse with a large number of wing bones (n = 7), fewer leg bones (n = 3), and a single sternum, coracoid, and scapula. Quail bones were mainly recovered from structure fill (46.2 percent) and extramural contexts (30.8 percent). This is one of only two species of bird that the Zunis do not use for food or feathers (Tyler 1979:71).

Turkey. Turkey *(Meleagris gallopavo)* bones were recovered at three of the Peña Blanca sites (LA 265, LA 6169, and LA 6170), and egg shell, presumably from turkeys, at another (LA 249). Counts are small for all but LA 6169. Given the lack of young birds and egg shell, it is likely that most or all of turkey bones are from wild birds killed for their feathers or as food or that were tamed and kept for their feathers. The only turkey burial, found at LA 265, was of a large male bird with a severely fractured but healed leg bone. Similarly, a femur from a turkey at LA 6169 was completely fractured but healed with the broken ends overlapping considerably. Neither of these birds was very mobile and probably could not have foraged for food.

The natural habitat for wild turkeys is the forested mountains, piñon-juniper forests, riparian woodlands and marshes, dense stands of shrubs, and desert scrub. Food items include piñon nuts, juniper berries, acorns, and other nuts, berries, and grass (BISON-M n.d.). Wild turkeys traveled in large flocks until the mid 1800s (Tyler 1979:72).

Very few of the turkey bones come from extramural areas (0.7 percent) with an almost equal split between structure fill (40.0 percent) and floor associated deposits (39.7 percent). Turkey bones were relatively abundant at all of the Cochiti Dam sites (Harris 1968: 214, 230, 1971:76, 1976:H-26). Chronology and domestication are discussed in the research question section of this report.

Flicker. A relatively large number of the bird specimens are from flickers *(Colaptes auratus).* Members of the woodpecker family, flickers occur statewide in summer, and are common year-round in Sandoval County. Feeding mainly on ants, they roost in cavities in trees. Their large size, slow flight, and ground feeding make them fairly easy prey (BISON-M n.d.; Ligon 1961:1967). This, and the red feathers under the wing and tail, may have made them attractive to prehistoric hunters. Both the parts and their proveniences suggest these birds were more than potential food items. An ulna was found in floor fill and floor deposits in Structure 50 at LA 6170 and parts comprising a right and a left wing were found with a human burial in Structure 13 at LA 265. Ulnas were recovered from Structure 4 roof fall and floor fill at LA 6169 and structure fill at LA 115862, and an ulna and carpometacarpus from an extramural feature (Feature 29) area at LA 6169. A carpometacarpus and wing phalanx were found in the area in or around the vent shaft opening for Structure 50 at LA 6170. Harris (1976:H-9) identified the remains of at least 11 flickers in the LA 70 faunal assemblage.

The Zunis occasionally ate flickers and the Tewa may have used this bird for food. For the Hopi, the red feathers represent the red dawn and they attach the feathers to a standard. Feathers are used on prayer sticks during the winter solstice ceremony and the water flute of the flute ceremony is entirely cased in flicker feathers (Tyler 1979:214–216).

Horned larks. The only lark found in the Americas, horned larks are one of the most abundant year-round birds in the state. They occupy short grass, arid, and desert plains, mesas, and valleys even in adverse conditions (Ligon 1961:188). Horned larks are often seen within, or in association with, fields or other relatively open habitats. They benefit most from dryland farming and utilize the crops until these get too tall or dense (BISON-M n.d.).

Not particularly valuable for its plumage, horned lark remains were found at three sites. Parts are largely wing elements (71.4 percent) but also include vertebrae (n=3), a sternum, a scapula, and a coracoid. Most were found in clusters indicating partial birds. The floor of Structure 47 at LA 6169 had three vertebra, a humerus, a pair of ulnas, and a carpometacarpus. In Structure 50 at LA 6170 an ulna was found in the ash pit (Feature 153) and a humerus and ulna in two sealed storage pits (Features 156 and 171). Just south of this structure in or above the vent shaft and trench were a sternum, scapula, humerus, and pair of ulnas. At LA 265, horned lark bones were found in the upper fill of Structure 1 (carpometacarpus), in Feature 24, a large bell-shaped pit (ulna) containing a human burial, and in the vent tunnel of Structure 4 (two humeri, a coracoid, and a carpometacarpus).

Use of this small bird varies among the Pueblos. The lark's habit of coming together in large groups when snow obscures most seeds, makes for large concentrations. The Rio Grande Pueblos trapped or snared these small birds when the weather was bad and meat was scarce. A special type of snare was used by the Tewa. The Zunis took larks in large numbers for food. These were roasted over an open fire and the feathers were not used for ritual purposes. Feathers were used on Hopi masks of the female attendant of the *Qoqlo* kachina involved in ushering in the winter season of masked dancing. The same attendant appears with the Hemis kachina at the close of the masked dance season (Tyler 1979:133–137).

Western meadowlarks. This species is found in Sandoval County from spring through fall and inhabits grasslands, fields, and agricultural areas at lower and middle elevations. During spring and summer, insects make up the bulk of their diet (BISON-M n.d.). Like the flicker, some of the parts are found in situations suggesting special use. The roof fall and floor fill of Structure 4 and the floor of Feature 47 at LA 6169 produced two tarsometatarsi. The vent shaft for Structure 13 at LA 265 held a cranium, and a human burial in that same structure had a humerus, three ulnas, two carpometacarpi, and a wing digit.

Reptiles and Amphibians

Turtles. Three species of turtles were recovered from the sites. The most common, the painted turtle *(Chrysemys picta),* was found in two of the site assemblages, the ornate box turtle *(Terrapene ornata*) in one, and the softshell turtle *(Trionx spiniferus)* in the unanalyzed assemblage from LA 6169.

Painted turtles are found in the Rio Grande (Degenhardt et al. 1996:100) and are likely to occur in the vicinity of Cochiti (US Army Corps of Engineers 1990:A-2). This species inhabits permanent waters including slow-moving portions of rivers, marshes, and ponds. Active during the day, they hibernate during November through March or into April (Degenhardt et al. 1996:100–101). Parts include entoplastron and hypoplastron pieces from the roof and floor fill and the floor of Structure 76 at LA 6169 and a hypoplastron piece from the structure fill at LA 249.

While not specifically noted for the Cochiti area (Degenhardt et al. 1996:107), the ornate box turtle is considered likely to occur (US Army Corps of Engineers 1990:A-2). Fairly widespread below 2,100 m elevation, the box turtle is absent from the northwestern portion of the state. Not dependent on standing water, their preferred habitat is grasslands with soil suitable for burrowing. Able to dig their own burrows, this species often enlarges the burrows of rodents. Like the painted turtle, the box turtle hibernates from at least November into April (Degenhardt et al. 1996:104–106). Only one specimen is attributed to this species, a marginal from the floor fill and floor of Structure 47 at LA 6169.

Softshell turtle was not present in the analyzed assemblage but was observed in a bag from the upper fill of Structure 76. Harris reports burned turtle limb bones, probably softshell, from a cooking pit at North Bank (1968:202). The spiny softshell is primarily a river dweller and occurs in the Rio Grande below 1,600 m in elevation. It spends little time on land and is extremely wary (Degenhardt et al. 1996:122–123).

Lizards. At least two genera of lizards were found, whiptails (*Cnemidophorus* sp.) and horned lizards (*Phrynosoma* sp.). The former was found as a partial skeleton on or near the floor of Structure 5 at LA 6170 and the horned toad as isolated elements and horned lizard as cranial fragments in Structure 6, fill, at LA 249 and SU

14 at LA 265. Other lizard specimens were not identified beyond the level of lizard. Most appear to be post-occupational additions to the site deposits, including a partial skeleton found on or near the floor of Structure 15 at LA 6169.

At least four species of whiptail are likely to occur in the Cochiti area: the New Mexico whiptail *(Cnemidophorus neomexicanus),* the little striped whiptail *(Cnemidophorus inornatus),* the plateau striped whiptail *(Cnemidophorus velox),* and the checkered whiptail *(Cnemidophorus grahamii)* (US Army Corps of Engineers 1990:A-2; Degenhardt et al. 1996:218–235). Whiptails burrow down about 30 cm to hibernate (Degenhardt et al. 1996:219, 222). Two species of horned lizard are found in the general area: the short horned lizard *(Phrynosoma douglasii)* and the roundtail horned lizard *(Phrynosoma modestum)* (Degenhardt et al. 1996:151–154).

Snakes. None of the snakes was identified beyond the level of snake or nonvenemous (Colubridae) snake. Most occur as one or more vertebrae, but two pit structures had entire skeletons. Structure 5 at LA 6170 had much of a snake, probably a gopher snake, in the same area as four dog skeletons considered to be part of a closing ritual. While this particular snake could have inhabited a rodent burrow and been accidentally deposited, it is also possible that it, too, was deliberately placed there. Similarly, another snake, probably a gopher snake, was found on the floor of Structure 1 at LA 265.

The venomous/nonvenemous distinction was made following Olsen (1968:80–81). Several members of the nonvenemous family Colubridae including: the western hognose snake *(Heterodon nasicus),* the coachwhip *(Masticophis flagellum),* gopher snake *(Pituophis melanoleucus),* glossy snake *(Arizona elegans),* longnose snake *(Rhinocheilus lecontei)*, gartersnake (*Thamnophis* sp.), and night snake *(Hysiglena torquata),* as well as the venomous western diamond back *(Crotalus atrox),* are likely to occur in the Cochiti area today (US Army Corps of Engineers 1990:A-2).

Toads and frogs. A variety of frogs and toads were found in the Peña Blanca assemblages, often as partial skeletons (Table 20.11). Some elements are distinctive enough to distinguish true frogs *(Rana),* true toads *(Bufo),* and spadefoot toads *(Spea).* Since the available comparative specimens do not cover the range of sizes and sexes, species identifications remain tentative. Identifications are based on a combination of current species distributions and reported size ranges as well as morphological attributes (relative size and shape of the more diagnostic elements). Specimens that could not be identified to genera are considered toad or frog. The term partial skeleton is used liberally when a fair representation of the same individual is indicated by the size, preservation, and maturity.

Spadefoot toads are well adapted to arid conditions. They are explosive breeders that form dense breeding aggregations during summer thundershowers. Males emerge from underground burrows at the sound or vibration caused by rainfall or thunder and arrive at flooded areas, setting up a loud breeding chorus to attract females (Degenhardt et al. 1996:35). Degenhardt et al. (1996:37–42) place all three of New Mexico's spadefoot toads in or near the project area while a US Army Corps of Engineers study reports only two species (Couch's and Plains) as likely to occur in the vicinity of Cochiti (US Army Corps of Engineers 1990:A-2).

Couch's spadefoot *(Scaphiopus couchii)* occupies arid grasslands between 900 and 1,800 m in elevation where soils are sandy and well drained. Most of its life is spent underground, emerging only during spring and summer rains. These spadefoots have been known to remain underground for as long as three years when rainfall was insufficient to stimulate emergence. Larger than the other spadefoots, Couch's spadefoot may reach a length of 90 mm. The Plains spadefoot *(Spea bombifrons)* is a grasslands species that avoids river bottoms and wooded areas. They remain in rodent or self-constructed burrows during the day and emerge only at night, especially after a summer rain. Smaller than Couch's spadefoot, their length rages between 40 and 48 mm. New Mexico spadefoots *(Spea multiplicata)* are found in a wide variety of habitats

Table 20.11. Distribution of Toads and Frogs in Peña Blanca Sites

	Toad or Frog	Plains Spadefoot	New Mexico Spadefoot	TrueToads		Great Plains Toad		Plains or Woodhouse's Toad	
	Parts	Skeleton	Skeleton	Skeleton	Parts	Skeleton	Parts	Skeleton	Parts
LA 249									
Structure 6 Fill, Stratum 50	-	-	-	-	-	-	-	1	1
LA 265									
St.1- infant burial-upper fill	-	-	-	-	-	-	-	2	-
St.1 - vent shaft	-	-	-	-	-	-	-	1	-
St. 1 floor	1	-	-	-	-	1	-	-	-
St. 4 vent shafts and tunnels	-	-	-	-	-	1	1	1	1
St. 4- floor features	-	-	-	-	-	1	-	-	-
St. 13- Feature 141	-	1	-	-	-	-	-	-	-
St. 13- floor	-	-	-	-	-	-	-	-	2
St. 13- vent shaft fill	-	-	-	-	-	-	-	-	-
St. 13- human burial-subfl.	-	-	-	-	-	-	-	-	-
SU 2- large bell-shaped pits	1	-	-	-	-	-	-	1	2
SU 3- Feature 14- large pit	-	-	-	-	-	-	-	-	-
SU 3- Feature 15- large pit	-	-	-	-	-	-	-	-	-
SU 3- hearths/roasting Pits	2	-	-	-	-	-	-	1	-
SU 9- other features	-	-	-	-	1	-	-	-	-
SU 12- hearths/roasting pits	-	-	-	-	-	-	-	-	1
SU 14- Small Pits	-	-	-	-	-	-	-	-	-
LA 6169									
St. 4 upper fill	-	-	-	-	1	-	-	-	-
St. 4 roof fall and floor fill	-	-	-	-	-	-	-	-	2
St. 4 floor	-	-	-	1	1	-	-	1	-
St. 47 upper fill	-	-	-	-	-	-	-	-	-
St. 47 floor	-	-	-	-	-	1	-	-	1
St. 76 st. collapse and trash	-	-	-	-	-	-	-	-	1
St. 76 roof and floor 1	-	-	-	-	-	-	-	-	-
St. 15 upper fill	-	-	-	-	-	-	-	-	-
St. 15 floor fill and floor	-	-	-	-	-	-	-	-	-
LA 6170									
Str 2 floor fill & contact	-	-	-	-	1	-	-	-	-
Feature 5	1	-	-	-	-	-	-	-	-
Str 5 roof & closing	-	-	-	-	-	-	1	-	-
Str 5 floor fill & contact	-	-	-	-	-	2	4	-	-
Str 5 pits w occup fill	-	1	1	-	-	-	-	-	-
Str 5 vent shaft	-	-	-	-	-	1	-	-	-
Area 2	-	-	-	-	-	-	-	-	1
Str 50 sealed features	-	-	-	-	-	2	-	-	-
SU 12	-	-	-	-	-	-	-	2	1
LA 6171									
SU 6 extramural features	-	-	-	-	-	-	-	-	-
Structure 60 fill	-	-	-	-	-	-	-	-	1
Earliest Dev. features	-	-	-	-	-	-	-	-	-
Total	5	2	1	1	4	9	6	10	14

Table 20.11. Continued.

	Red Spotted Toad		Plains or Red Spotted Toad		Woodhouse's Toad		Northern Leopard Frog		
	Skeleton	Parts	Skeleton	Parts	Skeleton	Parts	Skeleton	Parts	Total
LA 249									
Structure 6 Fill, Stratum 50	-	-	-	-	-	-	-	-	2
LA 265									
St. 1 infant burial-upper fill	-	-	-	-	-	-	-	-	2
St. 1 vent shaft	-	-	-	-	2	-	1	-	4
St. 1 floor	-	-	-	-	-	2	-	-	4
St. 4 vent shafts and tunnels	2	-	-	-	-	-	-	-	6
St. 4 floor features	-	-	-	-	-	-	-	-	1
St. 13 Feature 141	-	-	-	-	-	-	-	-	1
St. 13 floor	-	-	-	-	-	-	-	-	2
St. 13 vent shaft fill	-	1	-	-	-	-	-	-	1
St.13 human burial-subfloor	-	-	-	-	1	-	-	-	1
SU 2 large bell-shaped pits	-	-	-	-	-	-	-	-	4
SU 3 Feature 14-large pit	-	-	-	-	-	1	-	-	1
SU 3 Feature 15- large pit	1	-	-	-	1	1	-	-	3
SU 3 hearths/roasting pits	-	-	-	-	-	-	-	-	3
SU 9 other features	-	-	-	-	-	-	-	-	1
SU 12 hearths/roasting pits	-	-	-	-	-	-	-	-	1
SU 14small Pits	-	-	-	-	-	1	-	-	1
LA 6169									
St. 4 upper fill	-	-	-	1	-	-	-	-	2
St. 4 roof fall and floor fill	-	-	-	-	1	-	-	-	3
St. 4 floor	-	-	-	-	-	3	-	-	6
St. 47 upper fill	-	-	-	-	-	1	-	-	1
St. 47 floor	-	-	-	-	-	3	-	2	7
St. 76 st. collapse and trash	-	-	-	-	-	-	-	-	1
St. 76 roof and floor 1	-	-	-	-	-	1	-	-	1
St. 15 upper fill	-	-	2	-	-	1	-	-	3
St. 15 floor fill and floor	-	-	-	-	-	1	-	-	1
LA 6170									
Str 2 floor fill & contact	-	-	-	-	-	-	-	-	1
Feature 5	-	-	-	-	-	-	-	-	1
Str 5 roof & closing	-	-	-	-	-	-	-	-	1
Str 5 floor fill & contact	-	-	-	-	-	-	-	-	6
Str 5 pits w occup fill	1	-	-	-	-	-	-	-	3
Str 5 vent shaft	-	-	-	-	-	-	-	-	1
Area 2	-	1	-	-	-	-	-	-	2
Str 50 sealed features	1	-	-	-	-	-	1	-	4
SU 12	1	-	-	-	2	-	-	-	6
LA 6171									
SU 6 extramural features	-	-	-	-	-	3	-	-	3
Structure 60 fill	-	-	-	-	-	-	-	-	1
Earliest Dev. features					1				1
Total	6	2	2	1	8	18	2	2	93

ranging from grasslands to sagebrush flats, to river valleys, and agricultural land, as long as the soil is loose enough for burrowing, and over 90 cm deep for over-wintering. They are largely nocturnal and fall between the other two species in size, reaching 65 mm in length (BISON-M n.d.; Degenhardt et al. 1996:36–42). Specimens identified as spadefoot toads are all partial skeletons. Two of the spadefoot specimens are from the same structure, a New Mexico spadefoot from the ash pit and a Plains spadefoot plastered into the floor just east of the firepit in Structure 5 at LA 6170. A probable Plains spadefoot was found in Feature 141, a bell-shaped pit in the floor of Structure 13 at LA 265.

Size and morphology indicate that three species of *Bufo* are represented in the Peña Blanca assemblage. Distinctions were made mainly on the basis of size, with some on the shape of the ilium. Specimens that appeared mature but fell in the overlap in size ranges are considered as one or the other. Those labeled cf. Woodhouse's toad, are large and agree well with comparative specimens of this species. Woodhouse's toad *(Bufo woodhousii)* is the largest of the toads found in the area, often reaching 100 to 130 mm in length. It is found at lower elevations statewide and is most common in the Rio Grande Valley. It is confined to relatively mesic areas in the vicinity of water where it rests in shallow burrows during the day and feeds at dusk and after dark. The Great Plains toad *(Bufo cognatus)* is intermediate in size with males measuring between 63 and 103 mm and females between 49 and 112 mm. This toad is found in warmer grassland areas, including river bottoms and cultivated fields. A proficient burrower, it generally remains underground and is most active during summer rains when it is primarily nocturnal and breeds in shallow temporary pools of rain water. The smallest of the area toads, the red-spotted toad *(Bufo punctatus)*, averages 38 to 63 mm in length. It prefers dry rocky areas near springs and pools in arroyos but can be found in just about any habitat from ponderosa woodlands to desert scrub. Largely nocturnal, it is most likely to be found under large flat rocks (BISON-M n.d.; Degenhardt et al. 1996:51–59). Woodhouse's and the Great Plains toad are considered the most likely to occur in the Cochiti area (US Army Corps of Engineers 1990:A-2). At least 36 toad skeletons and numerous parts were recovered from the Peña Blanca sites. Possible Woodhouse's toad skeletons were also recovered from the Alfred Herrera site (MNI = 1) (Harris 1968:220) and LA 70 (MNI = 1, plus two toads and seven frogs or toads) (Harris 1976:H-3, H-26).

One true frog is present in the site assemblages. Recognized by their long and slim limb proportions and distinctive pelvic morphology, two species, the bullfrog *(Rana catesbeiana)* and northern leopard frog *(Rana pipiens)* are considered most likely to occur in the Cochiti area (US Army Corps of Engineers 1990:A-2). Bullfrogs are large, reaching a size of 203 mm in length. Associated with permanent freshwater habitats below 2,100 m elevation, they prefer large bodies of water deep enough for overwintering and must have sufficient shallows with vegetation for cover and breeding. Bullfrog days are spent hiding in vegetation, becoming active at night. Biologists are unsure whether bullfrogs are native to New Mexico west of the Continental Divide (BISON-M n.d.; Degenhardt et al. 1996:83–85). None of the Peña Blanca specimens are overly large and all of the specimens are the size of a northern leopard frog. Generally associated with streams and rivers but also found in beaver ponds, small springs, marshes, irrigation ditches, and wet meadows, male northern leopard frogs average 68.3 mm in length and the females 74.2 mm. They rest near the waters edge but forage long distances from water during wet periods (BISON-M n.d.; Degenhardt et al. 1996:88–89). True frogs have a limited distribution within these sites. Partial skeletons were found in a sealed storage pit in Structure 50 at LA 6170 and in the Structure 1 vent shaft at LA 265. A vertebra and partial cranium were found at LA 6169 on the floor of Structure 47.

A large number of toads and frogs were recovered as skeletons (n = 41). Equal numbers (n = 15) are from structure fill, which includes intrusive burial pits, and from floor associations, with slightly fewer in extramural areas (n = 10), and only one in a roof fall context. The possibility that some were deliberately placed in the sites is considered in a later section of this report.

Fish

Fish were not an important resource for the early occupants of the Peña Blanca area. A rib from a small mouth buffalofish and two vertebrae from an unidentified sucker are the only fish bones found in the site assemblages, and these could have been deposited by nonhuman predators. Both are from the upper fill of Structure 4 at LA 6169 deposits ceramically dated as mainly Coalition. In contrast, Harris reports fish remains were widely distributed and likely used for food at the Classic period site of LA 70 (Harris 1976:H-3). Additional evidence for late use of fish for food comes from Bandelier's journal of April 4, 1882 where he gives a detailed account of Cochitis using long nets stretched across the river to dredge shallow stretches of the river for fish (recounted in Lange 1990:140).

The small mouth buffalofish *(Ictiobus bubalus)* lives in the larger pools of rivers with low velocity current. Today it is native to the Rio Grande in Sierra and Doña Ana counties but Sublette and others (1990:219–222) suggest a more northern range in the past based on the recovery of this species in archaeological assemblages from the Palace of the Governors in Santa Fe and from the Cochiti Dam sites. Native suckers observed in the Cochiti area include the river carpsucker *(Carpiodes carpio)* and Rio Grande sucker *(Pantosteus plebeius)* (US Army Corps of Engineers 1990:A-1).

Site Assemblages

Site Samples

The two smallest site assemblages, LA 249 (n = 205) and LA 115862 (n = 224), were not sampled. All bone collected by regular recovery techniques and that from flotation processing completed before the faunal analysis are included in the analysis. The remaining sites were sampled to various extents. Information concerning how the site analysts chose the sample are included in the site sections of this report. The following is a brief description of the samples and some of the rationale involved.

Of the 469 FS entries in the LA 265 inventory indicating a bag of bones, slightly less than half (227 or 48.0 percent) were analyzed. The proportion is not completely accurate as some of the inventoried bags are human bone and others were rocks or other material mistaken as bone. In addition, two of the bags selected for analysis could not be found. Even though the sampling percentage is smaller than the other sites, the sample is large (n = 3,472) and representative of the site and time period involved. Proveniences with relatively low sampling fractions include the upper fill (21 of 78 FS entries) and roof fall (21 of 36 FS entries) in Structure 1, resulting in a sample size of 700; the upper (0 of 9 FS entries), middle (0 of 8 FS entries), and roof fall (6 of 10 FS entries) layers of Structure 13; SU 2 bell-shaped pit 26 (6 of 21 FS entries), SU 2 general fill (0 of 10 FS entries) and other features (4 of 15 FS entries); and the ash in the upper fill of Feature 3 (0 of 27 FS entries); SU 3 other features (0 of 15 FS entries). As with the smaller sites, bone from those flotation samples processed after the faunal identifications were completed are not included.

LA 6169 has a larger sampling fraction; 341 (69.7 percent) of the 489 bone entries in the inventory were analyzed for a sample size of 3,859 specimens. Again, human bone is included in the inventory bag tally. A larger proportion was analyzed because the site is multicomponent. Proveniences with low sampling fractions include: the upper fill of Structure 47 (4 of 14 FS entries); Structure 76 collapse and trash (5 of 51 FS entries); Feature 68 in the upper fill of Structure 4 (1 of 9 FS entries); SU 12 general fill (1 of 6 FS entries); SU 1 general fill (4 of 10 FS entries); SU 6, 7, 8 general fill (2 of 21 FS entries); general fill of SU 8 and 9 (0 of 7 FS entries); and general fill of SU 11 (4 of 17 FS entries). Bone from those flotation samples processed after the analysis was completed are not included.

An even larger proportion of bags inventoried from LA 6170 was analyzed (202 of 238 or 84.9 percent). Again, this site is multicomponent so a larger portion was analyzed to attain a sample size of 2,260 specimens. Materials not analyzed are generally those from mixed proveniences or structure overburden. Those with low sampling fractions include: the Structure 1 area (0 of 5 FS entries); SU 3 (0 of 2 FS entries); the Structure 5 overburden (0 of 15 FS entries), and the Structure 50 overburden (0 of 2 FS entries). Bone from those flotation samples processed after the analysis was completed are not included.

Another multicomponent site, LA 6171 has a large sampling fraction (158 of 183 bags or 86.6 percent) and a relatively small sample size (n = 769). Human bone and missing bags comprise a good number of those not analyzed. The others are from proveniences that were so mixed their analysis would provide little information. Proveniences with low sampling fractions are SU 1 (1 of 5 FS entries) and SU 2 (1 of 6 FS entries). Feature 85 (2 of 20 FS entries) is mostly point-plotted human bone. Bone from those flotation samples processed after the analysis was completed are not included.

Provenience Types

In order to examine the contextual distribution of taxa and other characteristics of the assemblages, the components were classified into four provenience types: structure fill, structure roof fall, structure floor (including floor fill, floor contact, and feature fill), and extramural. Assignments are based on the verbal descriptions of the components and consulting with site directors when a description is ambiguous. In some instances, the roof fall was not distinguished from structure fill so that the fill provenience inevitably contains a small amount of roof fall material. Similarly, when roof fall overlay a floor, the lower 10 cm was treated as floor fill. Burials are considered with the context in which they were found, that is, if in an extramural pit, the burial is considered extramural, if in an intrusive pit in structure fill, then as structure fill, and if subfloor, then as floor associated. Vent shaft fill is treated as structure fill and over burden, generally as extramural, unless this was not distinguished from structure fill. Extramural samples are largely from extramural feature fill rather than sheet trash.

When examined by site (Table 20.12), there are clear differences in the proportions recovered and analyzed from these sites. Structure fill contributes between 22.7 and 88.3 percent of a site sample. Roof fall specimens are absent from three sites and concentrated in the two sites with burned roofs. Floor association also varies considerably, between 3.9 and 43.3 percent. Similarly, the amount of extramural excavation and sampling produced a range of 6.7 to 41.4 percent.

Field recovery methods also influence the distribution of taxa within the provenience groups. Structure fill was generally screened through 1/4-inch mesh and floor and feature fill through 1/8-inch mesh. Most of the flotation bone was from floors and features. Experiments conducted at two Hohokam sites in southern Arizona (James 1997:386–391) compared the findings from adjacent excavation grids, one screened through 1/4-inch mesh and three through 1/8-inch mesh, and found that up to five times the amount of bone was recovered from the smaller screen size. Taxa that were particularly influenced by screen size are rodents and rabbits. Not only was the sample size and content affected, but the commonly used lagomorph index, or the ratio of cottontail to jackrabbit bones, was 0.45 in the larger smaller-sized screen sample, 0.57 in the smaller-sized screen, 0.75 in flotation samples, and 0.53 for the site overall. Rabbit and rodent frequencies for Peña Blanca may be similarly influenced by screen size.

Chronology

Components, and often times individual features, were assigned ceramic dates based on the ceramic assemblage associated with that unit. However, because rodent and other kinds of disturbance can introduce later ceramic wares and make the dating uncertain, the ceramic dating assignments are not always representative of when a feature filled. Yet it is a convenient, if not completely accurate, means of evaluating temporal changes in artifact distributions. In this analysis, the original 13 ceramic date assignments are reduced to 8. Combinations that were designated as mainly Early Developmental but also have Late Developmental (n = 181) or Coalition (n = 256) material are considered mainly Early Developmental. Similarly, those that are mainly Late Developmental with Early Developmental (n = 288) or Coalition (n = 180) or both (n = 125)

Table 20.12. Site Contribution to Provenience Types

		Structure Fill	Structure Roof Fall	Structure Floor Associated	Extramural	Totals
LA 249	Count	181	0	8	16	205
	Expected	72.6	25.6	60.2	46.6	205
	% within site	88.3%	0.0%	3.9%	7.8%	100.0%
LA 265	Count	1576	217	639	1015	3447
	Expected	1221	430	1012	784	3447
	% within site	45.7%	6.3%	18.5%	29.4%	100.0%
LA 6169	Count	1202	565	1336	753	3856
	Expected	1365.9	520.5	1092.6	877	3856
	% within site	31.2%	14.7%	34.6%	19.5%	100.0%
LA 6170	Count	513	559	855	332	2259
	Expected	800.2	281.8	663.2	513.8	2259
	% within site	22.7%	24.7%	37.8%	14.7%	100.0%
LA 6171	Count	224	0	221	314	759
	Expected	268.9	94.7	222.8	172.6	759
	% within site	29.5%	0.0%	29.1%	41.4%	100.0%
LA 115862	Count	112	0	97	15	224
	Expected	79.3	27.9	65.8	50.9	224
	% within site	50.0%	0.0%	43.3%	6.7%	100.0%
Total	Count	3808	1341	3156	2445	10750
	Expected	3808	1341	3156	2445	10750
	% within site	35.4%	13.5%	28.3%	22.7%	100.0%

Note: actual and expected counts based on site sample and provenience types, unknowns not included

are considered mainly Late Developmental while those that are mainly Coalition but also include Early Developmental (n = 908) or Early and Late Developmental (n = 68) become mostly Coalition. No pure Classic deposits were found. The mainly Classic deposits include some with Late Developmental (n = 80) and one that is mainly Classic with some Coalition and Early Developmental. The final or unknown group is comprised of components that were too mixed or had very small samples so that a ceramic date was not assigned (n = 195).

Only two of the six Peña Blanca sites are single component (Table 20.13), both Early Developmental. The others have components ranging from Early Developmental to Mixed Classic. Unfortunately, unmixed Late Developmental and Coalition deposits and deposits containing Classic period ceramics are rare, making temporal comparisons less reliable than if the sample sizes were more evenly distributed and the samples larger. As is, the Early Developmental period is well represented with 72.3 percent of the assemblage dating to this period and another 4.1 percent that are mainly Early Developmental. The sample comes from five different sites and a range of provenience types, which should make it a reliable reflection of activities during this period. Late Developmental deposits are not nearly as common with only a small sample that is unmixed (1.2 percent) and slightly larger mixed sample (5.5 percent). These are from three sites, but most of the sample is from LA 6169. Unmixed Coalition specimens (5.3 percent) are also rare while the mainly Coalition sample is the second largest (9.0 percent). Coalition deposits were found at only two sites, and again the sample is largely from LA 6169. Mixed Classic deposits are not well represented (0.8 percent) and all but one specimen are from a single site, LA 249. A small proportion of the assemblage (1.8 percent) is from undated deposits.

When the contribution of the provenience types is examined (Table 20.14), the Early

Table 20.13. Site Contribution to Temporal Groups (percent of temporal group)

	LA 249		LA 265		LA 6169		LA 6170		LA 6171		LA 115862		Time Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Early Developmental	-	-	3473	44.50%	2059	26.40%	2012	25.80%	34	0.40%	224	2.90%	7802	72.3
Mainly Early	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Developmental	-	-	-	-	-	-	181	41.4	256	58.6	-	-	437	4.1
Late Developmental	-	-	-	-	121	90.3	13	9.7	-	-	-	-	134	1.2
Mainly Late	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Developmental	125	21.1	-	-	432	72.8	36	6.1	-	-	-	-	593	5.5
Coalition	-	-	-	-	543	94.9	-	-	29	5.1	-	-	572	5.3
Mainly Coalition	-	-	-	-	680	69.7	-	-	296	30.3	-	-	976	9
Mainly Classic	80	98.8	-	-	-	-	-	-	1	1.2	-	-	81	0.8
Unknown	-	-	-	-	24	12.3	17	8.7	154	79	-	-	195	1.8
Site total	205	1.9	3473	32.2	3859	35.8	2259	20.9	770	7.1	224	2.1	10790	100

Table 20.14. Provenience Type Contribution to Temporal Groups

Time Group		Structure Fill	Structure Roof Fall	Structure Floor Associated	Extramural	Totals
Early Developmental	Count	2139	951	2683	2003	7776
	Expected	2754.5	970	2282.9	1768.6	7776
	% within time	27.5%	12.2%	34.5%	25.8%	100.0%
Mainly Early Developmental	Count	79	144	191	23	437
	Expected	154.8	54.5	128.3	99.4	437
	% within time	18.1%	33.0%	43.7%	5.3%	100.0%
Late Developmental	Count	13	0	121	0	134
	Expected	47.5	16.7	39.3	30.5	134
	% within time	9.70%	0.00%	90.30%	0.00%	100.00%
Mainly Late Developmental	Count	303	246	8	36	593
	Expected	210.1	74	174.1	134.9	593
	% within time	51.1%	41.5%	1.3%	6.1%	100.0%
Coalition	Count	387	0	153	30	570
	Expected	201.9	71.1	167.3	129.6	570
	% within time	67.9%	0.0%	26.8%	5.3%	100.0%
Mainly Coalition	Count	786	0	0	181	967
	Expected	342.5	120.6	283.9	219.9	967
	% within time	81.3%	0.0%	0.0%	18.7%	100.0%
Mainly Classic	Count	64	0	0	17	81
	Expected	28.7	10.1	23. 8	18.4	81
	% within time	79.0%	0.0%	0.0%	21.0%	100.0%
Unknown	Count	37	0	0	156	192
	Expected	68	24	56.4	43.7	192
	% within time	19.3%	0.0%	0.0%	80.7%	100.0%
Totals	Count	3808	1341	3156	2445	10750
	Expected	3808	1451	3156	2445	10750
	% within time	35.4%	12.5%	2940.0%	22.7%	100.0%

Note: actual and expected counts based on the temporal group and provenience types, unknowns not included

Developmental sample is largely from structure floor and fill and extramural proveniences with respectable amounts from roof fall contexts. This contrasts with the Late Developmental sample, which is primarily associated with floors (90.3 percent) and the Coalition, which is mostly from structure fill (67.9 percent).

Sample Strengths and Weaknesses

Sample size is not the only factor to consider when evaluating the representativeness of an assemblage. Having a range of provenience types can be critical to producing an even somewhat representative sample. For example, the relative amounts of artiodactyl and lagomorph bone are commonly used to test a variety of hypotheses concerning the increase or decrease in use of one or the other over time. Looking at the Peña Blanca Early Developmental assemblage, different conclusions can be reached, depending on which subset of data is used. The commonly used indices and ratios (e.g., Szuter and Bayman 1989; Spielman and Angstadt-Leto 1996) vary depending on the provenience type, while the total reflects the relative contributions of the different provenience types (Table 20.15). The lagomorph ratio, which compares the relative numbers of cottontail and jackrabbit bones, ranges from 2.73 to 4.78 with a ratio of 3.31 for all provenience types, indicating a heavy reliance on cottontails, regardless of the provenience type. The lagomorph index, which compares the amount of cottontail to the amount of

Table 20.15. Comparison of Lagomorph, Artiodactyl, and Turkey Indices and Ratios by Provenience Type for Early Developmental Assemblages

	Structure Fill	Structure Roof Fall	Structure Floor and Association	Extramural	Total
Cottontail (S) (n=)	559	264	882	770	2482
Jackrabbit (L) (n=)	205	80	299	161	750
Lagomorph index (S/S+L)	0.73	0.78	0.75	0.83	0.77
Lagomorph ratio (S/L)	2.73	3.3	2.95	4.78	3.31
Artiodactyl* (n=)	463	247	252	295	1261
Artiodactyl index (A/A+S+L)	0.38	0.42	0.18	0.24	0.28
Artiodactyl ratio (A/S+L)	0.61	0.72	0.21	0.32	0.39
Turkey** (n=)	5	134	191	2	332
Turkey index (T/T+S+L)	0.01	0.28	0.14	0	0.09
Turkey ratio (T/S+L)	0.01	0.39	0.16	0	0.1

* total of large mammal, medium artiodactyl, medium to large artiodactyl, large artiodactyl, deer or elk, elk, deer, pronghorn, bighorn, bison, and cow or bison

** total of large bird, very large bird, and turkey

lagomorph bone, ranges from 0.73 to 0.83. The artiodactyl index, which is used as a gauge of the relative use of rabbits and artiodactyls, varies from 0.18 to 0.42, and is 0.28 for all deposits, while the artiodactyl ratio ranges from 0.21 to 0.72 and is 0.39 for all assemblages. While all of the indices indicate that rabbit bone is more common, conclusions regarding the relative use of artiodactyls could be quite different, depending on the kinds of deposits relied on. An assemblage dominated by floor fill, floor, and floor associated specimens could suggest far less reliance on artiodactyls than one dominated by roof fall or structure fill. The results are even more dramatic when the turkey indices are compared (ranging from 0.00 to 0.28). Turkey and potential turkey bones are very rare in structure fill and extramural contexts, intermediate in floor-associated proveniences, and high in roof fall, resulting in a low overall index (0.09) and ratio (0.10).

While combining the sites could mask some of the variability between sites, it probably results in a far more representative view of animal utilization for the area as a whole. Comparing these same indices and ratios (Table 20.16) by site for the Early Developmental period deposits results in a similar range for the lagomorph index if the very small sample from LA 6171 is discounted, a larger range for the lagomorph ratio, larger ranges for the artiodactyl index and ratio, and a considerably greater range for the turkey ratio. LA 6169 is given as a total and a total without Feature 29, an extramural pit that contributes over half of the rabbit for that site and arguably represents a single depositional episode that has an inordinate effect on the overall sample. Greater ranges for most indices are largely due to the sample composition rather than inherent differences in the sites. Two of the site assemblages have many of their samples drawn from structure fill while two have no structure fill. Only two have representative samples from roof fall, two are heavily drawn from floor associations, and only two have much of a sample from extramural contexts. Figures 20.1 through 20.3 graphically show the range of variation by plotting the lagomorph or turkey index on one axis and artiodactyl index or turkey index on the other for each site except LA 6171 and for the provenience types. This shows that interpretations of Early Developmental period subsistence could vary considerably depending on the site and whether an assemblage is dominated by a particular fill type. Any interpretation of subsistence must not only consider the sample size, but also the content and whether it is at all representative.

Overall, the Early Developmental sample is

Table 20.16. Comparison of Lagomorph, Artiodactyl, and Turkey Indices and Ratios by Site for Early Developmental Assemblages (percent of all taxa in provenience type)

	LA 265	LA 6169	LA 6169 w/o F. 29	LA 6170	LA 6171	LA 115862	Total
Cottontail S (n=)	960	899	396	545	6	72	2482
Jackrabbit L (n=)	366	170	123	179	10	25	750
Lagomorph index (S/S+L)	0.72	0.84	0.76	0.75	0.37	0.74	0.77
Lagomorph ratio (S/L)	2.62	5.29	3.22	3.04	0.6	2.88	3.31
Artiodactyl* (n=)	549	123	107	565	9	15	1271
Artiodactyl index (A/A+S+L)	0.29	0.1	0.17	0.44	0.36	0.13	0.28
Artiodactyl ratio (A/S+L)	0.41	0.12	0.21	0.78	0.56	0.15	0.51
Turkey** (n=)	10	321	321	1	0	0	332
Turkey index (T/T+S+L)	0.01	0.23	0.38	0	-	-	0.09
Turkey ratio (T/S+L)	0.01	0.3	0.81	0	-	-	0.13
% from structure fill	45.7	-	-	22.4	-	50	27.5
% from roof fall	6.3	15.5	23.1	20.6	-	-	13.6
% from floor associations	18.5	51.6	76.9	42.5	88.2	43.3	33.1
% from extramural	29.4	32.9	-	14.5	11.8	6.7	25.8

* total of large mammal, medium artiodactyl, medium to large artiodactyl, large artiodactyl, deer or elk, elk, deer, pronghorn, bighorn, bison, and cow or bison

**total of large bird, very large bird, and turkey

the largest and most representative in terms of site and provenience type contribution (Table 20.17). While structure contents, particularly fill and floor associations comprise much of this sample (62.0 percent), extramural and roof fall context samples are large enough to compare and contrast with better-represented provenience groups. Mainly Early Developmental deposits contribute little in the way of a sample, given that the Early Developmental sample is so large and the provenience types are well represented.

The Late Developmental sample is not only small (n = 134) but it is dominated by structure floor deposits from one site (90.3 percent) with no roof fall or extramural specimens. The mainly Late Developmental sample is larger (n = 593), but is primarily from structure fill and floor (92.6 percent). Thus, in addition to the deposits being mixed, not all provenience types are well represented.

Coalition deposits are not well represented (n = 570) and are largely from the structure fill at one site (67.9 percent). Extramural specimens are sparse (n = 30) and no deposits were specifically designated as roof fall. The mainly Coalition sample is larger (n = 967) but is entirely structure fill (81.3 percent) and extramural (18.7 percent) that is mainly from one site. Small amounts of roof fall material are included in the structure fill provenience from this site.

Mainly Classic deposits are from a single site and are mostly structure fill that has washed in from the Classic period pueblo upslope, with a small number from extramural contexts that are also washed in. The size of the sample, the context, and that all deposits are mixed, indicate it is not likely to be representative of this period.

Given the nature of the sample, the primary focus of this report must be subsistence and animal utilization during the Early Developmental period. This sample is robust and can provide the data needed to address questions concerning this period. Data from the later periods can be used to examine evidence for continuity or change in strategy, but cannot provide the same quality of information as the Early Developmental sample. Appendices 6.2 and 6.3 give the breakdown by ceramic date for each site and the totals for ceramic periods.

Early Developmental Period Animal Utilization

One of the primary issues for the Early Developmental period concerns the degree and form of mobility that characterizes groups

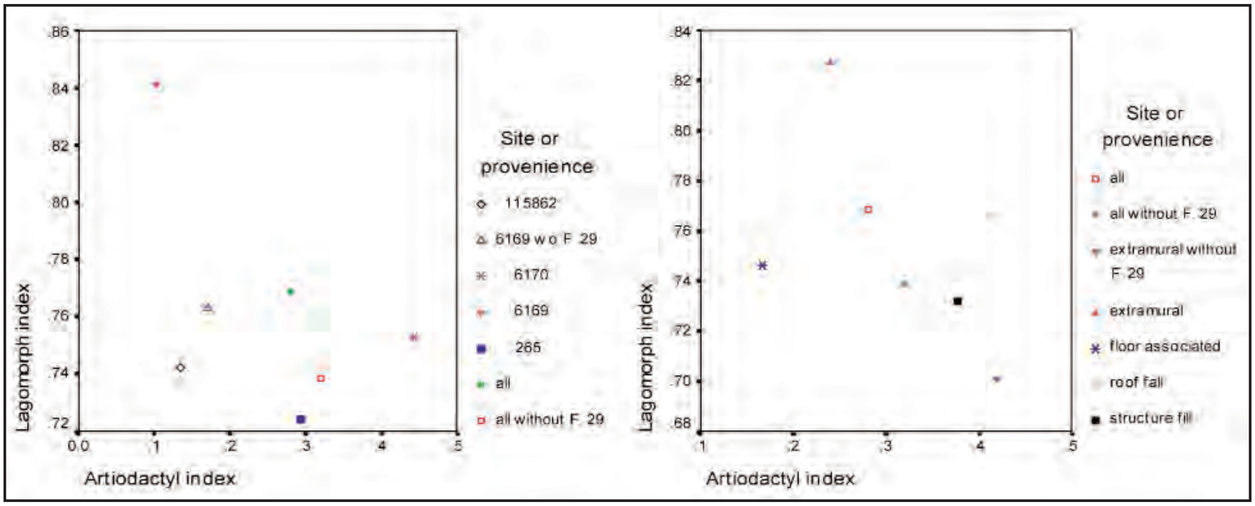


Figure 20.1. Scatterplots of lagomorph and artiodactyl indices for Early Developmental sites and provenience types.

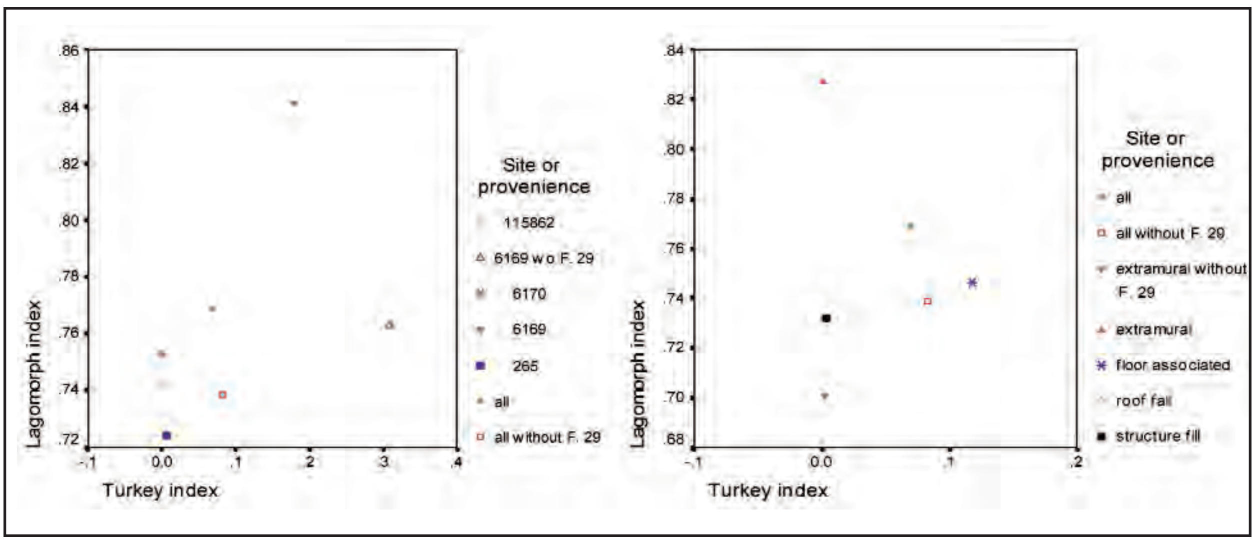


Figure 20.2. Scatterplots of lagomorph and turkey indices for Early Developmental sites and provenience types.

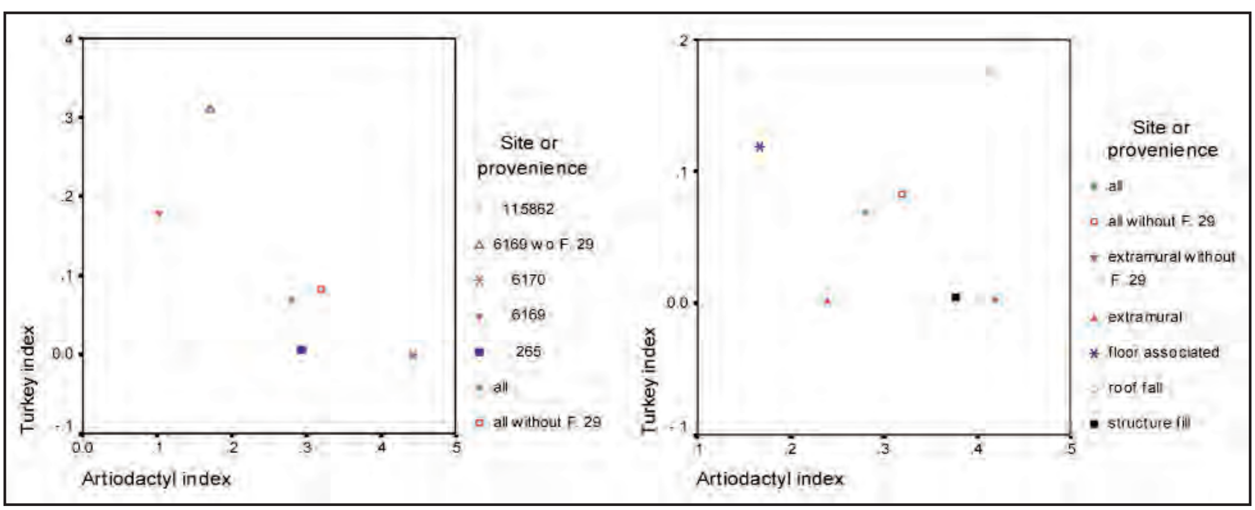


Figure 20.3. Scatterplots of artiodactyl and turkey indices for Early Developmental sites and provenience types.

Table 20.17. Faunal Sample, Site and Provenience Type Contribution to Ceramic Dates

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
LA 265	Count	1576	217	639	1015	3447
	Expected Count	948.2	421.6	1189.3	887.9	3447
	% within Site	45.7%	6.3%	18.5%	29.4%	100.0%
	% within Provenience type	73.7%	22.8%	23.8%	50.7%	44.3%
	% of Total	20.3%	2.8%	8.2%	13.1%	44.3%
LA 6169	Count	0	319	1062	678	2059
	Expected Count	566.4	251.8	710.4	530.4	2059
	% within Site	0.0%	15.5%	51.6%	32.9%	100.0%
	% within Provenience type	0.0%	33.5%	39.6%	33.8%	26.5%
	% of Total	0.0%	4.1%	13.7%	8.7%	26.5%
LA 6170	Count	451	415	855	291	2012
	Expected Count	553.5	246.1	694.2	518.3	2012
	% within Site	22.4%	20.6%	42.5%	14.5%	100.0%
	% within Provenience type	21.1%	43.6%	31.9%	14.5%	25.9%
	% of Total	5.8%	5.3%	11.0%	3.7%	25.9%
LA 6171	Count	0	0	30	4	34
	Expected Count	9.4	4.2	11.7	8.8	34
	% within Site	0.0%	0.0%	88.2%	11.8%	100.0%
	% within Provenience type	0.0%	0.0%	1.1%	0.2%	0.4%
	% of Total	0.0%	0.0%	0.4%	0.1%	0.4%
LA 115862	Count	112	0	97	15	224
	Expected Count	61.6	27.4	77.3	57.7	224
	% within Site	50.0%	0.0%	43.3%	6.7%	100.0%
	% within Provenience type	5.2%	0.0%	3.6%	0.7%	2.9%
	% of Total	1.4%	0.0%	1.2%	0.2%	2.9%
Total	Count	2139	951	2683	2003	7776
	Expected Count	2139	951	2683	2003	7776
	% within Site	27.5%	12.2%	34.5%	25.8%	100.0%
	% within Provenience type	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	27.5%	12.2%	34.5%	25.8%	100.0%
Mainly Early Developmental						
LA 6170	Count	32	144	0	5	181
	Expected Count	32.7	59.6	79.1	9.5	181
	% within Site	17.7%	79.6%	0.0%	2.8%	100.0%
	% within Provenience type	40.5%	100.0%	0.0%	21.7%	41.4%
	% of Total	7.3%	33.0%	0.0%	1.1%	41.4%
LA 6171	Count	47	0	191	18	256
	Expected Count	46.3	84.4	111.9	13.5	256
	% within Site	18.4%	0.0%	74.6%	7.0%	100.0%
	% within Provenience type	59.5%	0.0%	100.0%	78.3%	58.6%
	% of Total	10.8%	0.0%	43.7%	4.1%	58.6%
Total	Count	79	144	191	23	437
	Expected Count	79	144	190	23	437
	% within Site	18.1%	33.0%	43.7%	5.3%	100.0%
	% within Provenience type	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	18.1%	33.0%	43.7%	5.3%	100.0%

Table 20.17. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Late Developmental						
LA 6169	Count	0		121		121
	Expected Count	11.7		109.3		121
	% within Site	0.0%		100.0%		100.0%
	% within Provenience type	0.0%		100.0%		90.3%
	% of Total	0.0%		90.3%		90.3%
LA 6170	Count	13		0		13
	Expected Count	1.3		11.7		13
	% within Site	100.0%		0.0%		100.0%
	% within Provenience type	100.0%		0.0%		9.7%
	% of Total	9.7%		0.0%		9.7%
Total	Count	13		121		134
	Expected Count	13		121		134
	% within Site	9.7%		90.3%		100.0%
	% within Provenience type	100.0%		100.0%		100.0%
	% of Total	9.7%		90.3%		100.0%
Mainly Late Developmental						
LA 249	Count	117	0	8	0	125
	Expected Count	63.9	51.9	1.7	7.6	125
	% within Site	93.6%	0.0%	6.4%	0.0%	100.0%
	% within Provenience type	38.6%	0.0%	100.0%	0.0%	21.1%
	% of Total	19.7%	0.0%	1.3%	0.0%	21.1%
LA 6169	Count	186	246	0	0	432
	Expected Count	220.7	179.2	5.8	26.2	432
	% within Site	43.1%	56.9%	0.0%	0.0%	100.0%
	% within Provenience type	61.4%	100.0%	0.0%	0.0%	72.8%
	% of Total	31.4%	41.5%	0.0%	0.0%	72.8%
LA 6170	Count	0	0	0	36	36
	Expected Count	18.4	14.9	0.5	2.2	36
	% within Site	0.0%	0.0%	0.0%	100.0%	100.0%
	% within Provenience type	0.0%	0.0%	0.0%	100.0%	6.1%
	% of Total	0.0%	0.0%	0.0%	6.1%	6.1%
Total	Count	303	246	8	36	593
	Expected Count	303	246	8	36	593
	% within Site	51.1%	41.5%	1.3%	6.1%	100.0%
	% within Provenience type	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	51.1%	41.5%	1.3%	6.1%	100.0%
Coalition						
LA 6169	Count	387		153	1	541
	Expected Count	367.3		145.2	28.5	541
	% within Site	71.5%		28.3%	0.2%	100.0%
	% within Provenience type	100.0%		100.0%	3.3%	94.9%
	% of Total	67.9%		26.8%	0.2%	94.9%
LA 6171	Count	0		0	29	29
	Expected Count	19.7		7.8	1.5	29
	% within Site	0.0%		0.0%	100.0%	100.0%
	% within Provenience type	0.0%		0.0%	96.7%	5.1%

Table 20.17. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
	% of Total	0.0%		0.0%	5.1%	5.1%
Total	Count	387		153	30	570
	Expected Count	387		153	30	570
	% within Site	67.9%		26.8%	5.3%	100.0%
	% within Provenience type	100.0%		100.0%	100.0%	100.0%
	% of Total	67.9%		26.8%	5.3%	100.0%
Mainly Coalition						
LA 6169	Count	610			70	680
	Expected Count	552.7			127.3	680
	% within Site	89.7%			10.3%	100.0%
	% within Provenience type	77.6%			38.7%	70.3%
	% of Total	63.1%			7.2%	70.3%
LA 6171	Count	176			111	287
	Expected Count	233.3			53.7	287
	% within Site	61.3%			38.7%	100.0%
	% within Provenience type	22.4%			61.3%	29.7%
	% of Total	18.2%			11.5%	29.7%
Total	Count	786			181	967
	Expected Count	786			181	967
	% within Site	81.3%			18.7%	100.0%
	% within Provenience type	100.0%			100.0%	100.0%
	% of Total	81.3%			18.7%	100.0%
Mainly Classic						
LA 249	Count	64			16	80
	Expected Count	63.2			16.8	80
	% within Site	80.0%			20.0%	100.0%
	% within Provenience type	100.0%			94.1%	98.8%
	% of Total	79.0%			19.8%	98.8%
LA 6171	Count	0			1	1
	Expected Count	0.8			0.2	1
	% within Site	0.0%			100.0%	100.0%
	% within Provenience type	0.0%			5.9%	1.2%
	% of Total	0.0%			1.2%	1.2%
Total	Count	64			17	81
	Expected Count	64			17	81
	% within Site	79.0%			21.0%	100.0%
	% within Provenience type	100.0%			100.0%	100.0%
	% of Total	79.0%			21.0%	100.0%

and individuals during this time period and how this relates to animal procurement. This topic is approached in a number of ways. First, the faunal assemblage is evaluated in terms of whether it represents a garden hunting strategy, a long-distance hunting strategy, or both and whether either of these strategies is seasonal. Cooking methods, particularly in regards to potential boiling, roasting, and discard are then considered. Next, site structure is examined by looking for differences in context such as trash, roof fall deposits, and occupational debris. Nonsubsistence and ceremonial uses of animals and animal parts are then assessed, followed by a summary of the implications for mobility and an evaluation of whether the observed patterns are consistent with the findings and conclusions concerning other early agricultural populations in the Southwest.

Hunting Strategies

Maize-based diets need the addition of high-quality protein. Maize is considered a low-quality protein because it is deficient in three essential amino acids and in niacin, and iron absorption is low (Larsen 1997:16; Speth and Scott 1989:74). High or balanced proteins, such as meat and eggs, contain amino acids in the proportion required by the human body. Deficiencies in the quality of protein can be compensated for, but only by providing other proteins to supply the deficient amino acids (Wing and Brown 1979:27). Since amino acids cannot be stored, high-quality protein must be obtained in regular quantities and all of the essential amino acids and nitrogen must be ingested at the same time in order to synthesize protein (Reitz and Wing 1999:245). Adding meat to an otherwise carbohydrate diet, also significantly enhances iron absorption (Larsen 1997:29).

Some form of hunting was necessary to provide the consistent supply of the high-quality protein needed by prehistoric groups. Both the role and pattern of hunting vary with the overall subsistence strategy and the degree of mobility. We know much more about the strategies employed by mobile hunters and gatherers and by sedentary agriculturalists than we know about transitional and early agricultural groups, but some of the same principals may apply depending on whether the mobile or the sedentary aspects are examined. For example, when the size of the subsistence area is constrained, historic era hunter-gatherers generally rely less on larger-sized animals and more heavily on fewer animals of smaller body size. Fewer large animals are supported by a given area and mobile hunters are forced to turn to short-lived species that grow and reproduce rapidly (Binford 2001:366–367; Speth and Scott 1989:76). Sedentary groups tend to exploit a wider variety of animals, depend more on smaller animals, and use more traps, ambush hunting, and long-distance hunting than more mobile groups in the same general area. While sedentary groups often heavily rely on garden hunting, hunters may travel considerable distances to procure large animals (Kent 1989:3; Speth and Scott 1989:76). Hunting a wide range of small animals also helps sedentary populations avoid over-exploiting resources within the immediate catchment area (Reitz and Wing 1999:253).

Agricultural sites occupied by only part of a group on a year-round basis (non-traditional agricultural groups) should have faunal assemblages that resemble those of the more sedentary agriculturalists since these sites represent that aspect of their economy. What may be different, but difficult to demonstrate, is how the larger animals were used. We might expect non-traditional agricultural groups to use the most local of the artiodactyls along with select parts of animals brought to the site by the more mobile members when they returned to the site. Archaeological differences between this and the logistic hunts of sedentary groups may be few and subtle. The mobile group members should return to the site when their labor is most needed in the late spring to prepare the fields and plant and in the fall for harvesting and might also spend some of the coldest months there. If these groups returned with parts of large animals, these should represent late summer, and perhaps spring procurement. Logistic hunters from sedentary groups should concentrate their hunting efforts during times when their labor is not needed, e.g., mid summer and after the harvest, when large animals are in their best condition (summer and fall), or when stored resources are depleted (early spring). Also indicative of non-traditional agricultural groups may be cooking patterns that show periodic influxes of people but with little change in the kinds of animals eaten other than parts of animals brought with the mobile group members. Use of riverine resources and communal hunting of small mammals may also be more characteristic of sedentary groups, unless it is a seasonal strategy used to feed influxes of population in non-traditional agricultural groups.

Southwestern researchers have long recognized the impact of agriculture on animal populations. By disturbing the existing habitat and creating new ones that support higher densities of small mammals, one consequence of farming is an increase in the availability of small mammals for hunting (Speth and Scott 1989:80; Szuter and Gillespie 1994:69–70). Some have argued that as groups become more dependent on cultivars and more residentially stable, they increasingly focus on small mammal procurement. While this may be true for some areas, Speth and Scott have examined the data from a number of regions with time depth and conclude that in many the relative amount of artiodactyl bone actually increases over time (Speth and Scott 1989:71–73). They propose that this increase is not due to environmental or climatic conditions, is not driven by population in the sense that packing results in the depletion of local resources, and is not associated with technological innovations. Rather, it reflects a tendency for hunters to travel further and focus on species with the highest return as communities grow and the dependence on cultivars increases. Alternatives to this strategy include the use of fish and other aquatic resources, altering crop mixes, using domestic animals, intergroup exchange, or even reducing the commitment to agriculture by increasing mobility and shifting to a more generalized pattern of hunting and gathering by either segments or entire communities (Speth and Scott 1989:76–78).

While the preceding studies consider the type and changes in the pattern of hunting, other researchers are beginning to factor in gender relationships. Rather than relegating all hunting to the male sphere of activities, there is growing recognition that women and children engaged in hunting, particularly of small mammals, while long-distance hunting of large mammals may have been primarily a male activity (e.g., Nelson 1997:98; Reitz and Wing 1999:241; Szuter 1994:60, 2000:199–205). Hunting small mammals is a low-risk strategy that takes simple expedient technology for capture, such as snares and traps, capture from burrows, and the use of stones and sticks, and can be accomplished embedded with other activities. Large game hunting is a high-risk activity that involves a wider range and more specialized technology and often includes ceremonies and rituals as part of the process (Reitz and Wing 1999:241; Szuter 2000:200–204). With increased agricultural intensification, and as hunting grew more and more specialized, women may have devoted less time to hunting as food processing occupied more of their time (Szuter 2000:220). Given this perspective, changes in the kind and proportions of animals used may not be the result of availability or choices made by hunters, rather these changes could reflect who does the hunting. An apparent shift away from garden hunting may indicate men assumed a greater role in providing animals for subsistence.

It may well be that in the early stages of the agricultural transition, women and children were responsible for much of the garden hunting and men for taking large mammals, mainly through long-distance hunts. This is consistent with one view of sedentism, that is, the entire group was at least seasonally sedentary (e.g., Kelley 1992:49) and males ventured out to hunt large game. However, it is also consistent with the kind of sedentism suggested by the Peña Blanca burial data, one of simultaneous sedentism and mobility, a phrase borrowed from Varien (1999:11), but used quite differently. As used here, it refers to a form of sedentism where older and less mobile women, the infirm, and children tended the fields and occupied the sites on a more or less permanent basis while the more mobile females, males, and older children maintained a largely hunter and gatherer strategy, returning to the permanent residences seasonally or when their labor was needed for agricultural pursuits. Varien uses the concept of simultaneous sedentism and mobility to describe the relatively high frequency residential movement of households within and among communities that have persisted within established areas (Varien 1999:194).

Demonstrating that a group practiced garden hunting accompanied by the use of large game procured at a distance is relatively easy. Distinguishing between the different types of sedentism is far more difficult (e.g., Kelley 1992:59) and requires considering how a mainly logistic strategy employed by a largely sedentary population would differ from one where a part of the population remains mobile so that residential site artifact assemblages reflect seasonal influxes of population. This can be approached by examining the seasons when large and small animals were procured and through methods of initial and culinary processing. It may also be evident in some aspects of chipped stone technology and with evidence for a high degree of mobility in the human burial population.

The species most likely to benefit from cultivation are rabbits, rodents, and birds. Clearing wooded areas may promote an increase in jackrabbits, who depend on visibility and speed for survival. Jackrabbits are also more likely to be hunted communally using rabbit drives and nets, especially when settlement size and population size has increased (e.g., Szuter 2000:201; Szuter and Gillespie 1994:70). Cottontails and some rodents would find the food and cover provided by crops and weedy species advantageous. Since it is unlikely that any woodlands or dense brush were cleared to plant the Peña Blanca fields, jackrabbit abundance in the general vicinity should not have changed greatly. Rather, a focus on cottontail rabbit procurement and an age distribution that reflects the growing season may be the best indicator of a garden hunting strategy.

Ample evidence for the use of small mammals, especially cottontails, is found in the Early Developmental assemblage. There are more cottontail rabbit bones (n = 2,482 or 31.8 percent of the assemblage) than any other taxon. Jackrabbit bones are far less common (n = 750 or 9.6 percent), while small mammal bones comprise the second largest taxon (n = 1,529 or 19.6 percent). Squirrels and rodents are far less numerous (n = 445 or 5.7 percent) but enough are burned (n = 56 or 12.6 percent) to suggest that some were dietary items.

The body part distribution for cottontail and jackrabbits is somewhat different (Table 20.18), which could reflect different hunting strategies for the two species or that the larger rabbits required more processing resulting in fewer pieces recognizable as jackrabbit. Proportionately more jackrabbit leg elements were recovered but fewer crania and pelvises. Examining the completeness of the body parts by species finds that all parts are more likely to be highly fragmented in jackrabbits. Overall, 19.9 percent of cottontail bones are complete compared to 13.7 percent of the jackrabbit bones while 38.8 percent of cottontail bones are highly fragmented (less than 25.0 percent of the element) compared to 61.1 percent of the jackrabbit. Yet burning patterns are remarkably similar with 78.6 percent of the cottontail bone unburned and 79.9 percent of the jackrabbit bone unburned. Proportions of burns indicative of roasting (light scorches and light

Table 20.18. Rabbit Body Part Distribution for Early Developmental Period

	Cottontail		Jackrabbit	
	Count	Percent	Count	Percent
Cranium	562	22.6	137	18.3
Vertebrae	139	5.6	41	5.5
Ribs and sternum	108	4.4	36	4.8
Pelvis	195	7.9	30	4
Front limb*	330	13.3	149	19.9
Front foot	25	1	17	2.3
Rear leg	568	22.9	220	29.3
Rear foot	537	21.6	106	14.1
Front or rear foot	18	0.7	14	1.9
Totals	2482	100	750	100

* includes scapula

to heavy burns) are also similar, 14.2 percent for cottontails and 11.3 percent for jackrabbits. When provenience type and just these two taxa are considered, the relative proportions are similar in all provenience types with cottontails comprising 73.3 percent of the rabbit in structure fill, 76.7 percent in roof fall, 74.7 percent of floor associations, and 82.7 percent of extramural contexts. Furthermore, there are no components that suggest communal rabbit drives aimed at jackrabbits, that is, where counts are large and jackrabbit bones far outnumber those of cottontails. The relatively uniform distribution and similarities in burning are not consistent with different procurement patterns for the two species. Rather, they suggest both were taken in a similar manner and that differences in the body part distribution are most likely due to the additional processing required for the larger body size. Both species were probably taken as part of a garden hunting strategy and by individuals hunting near the sites. In at least one episode documented at LA 6169, a number of rabbits, mostly cottontails, were caught, roasted, and deposited in a single feature. This pit is considered in detail in the cooking methods section of this report.

Accounts of rabbit hunting are a common feature of Pueblo ethnographic reports. However, these reports emphasize communal hunts with little or no description of the day-to-day procurement that must have characterized prehistoric hunting patterns. The Hopis are said to have hunted rabbits communally, most often in early summer and fall to protect fields from rabbits and less frequently in winter when hunts provided a chance to get outdoors. Hunts were also held in connection with ceremonies in order to provide meat for feasting (Beaglehole 1936:11–12). The Santa Claras also held communal hunts for rabbits. When the hunts were economic, men and women participated. Individuals commonly hunted rabbits near the pueblo using dogs and bows and arrows or clubs. Rabbits were tracked in the snow and cottontails removed from their burrows by flooding or with a stick (Hill 1982:52). At Cochiti, communal rabbit hunts were held in early spring in conjunction with planting. Men and women participated in a surround throwing sticks or shooting rabbits and digging up those that ran into a hole (Goldfrank 1927:89–90). Specific references to garden hunting (e.g., Linares 1976:331) on an ongoing basis to protect the growing crops are absent in the ethnographic literature reviewed. Communal efforts aimed at reducing the number of crop predators before planting and throughout the growing season may have become a more common strategy when men and domestic animals assumed larger roles in providing animal protein, and the communal hunts assumed an integrating and socioreligious function.

If small-scale garden hunting was the predominant hunting method for hunting both rabbits, most deposits should have a range of ages since both cottontails and jackrabbits reproduce throughout the growing season, from at least February or March through September (BISON-M n.d.). We might also expect that summer or growing season deposits would have the greatest number of immature rabbits as young rabbits would be easier to snare and stone. Yet, relatively few components have a substantial amount of young rabbits (Table 20.19) and the prevalence differs between species. Fewer young cottontails were found in disposal contexts (extramural and structure fill) than roof and floor associations while more structure fill contexts have young jackrabbit bones. The proportion of components with young rabbits is not significantly correlated with the mean sample size (from Table 20.19) for cottontails (Pearson Correlation 0.985, sig. 0.205), jackrabbits (Pearson Correlation 0.480, sig. 0.520), or all rabbits (Pearson Correlation 0.936, sig. 0.064).

Certainly the ubiquity of rabbits suggest they were an important resource and one that was utilized throughout the year. At least one feature (Feature 29 at LA 6169) has evidence of communal rabbit hunting, and it has no immature and very few juvenile bones (1.3 percent) suggesting a late fall or even winter event rather than one associated with clearing the area of rabbits before planting or during the growing season when some very young rabbits would be expected. Most deposits have smaller proportions of rabbits mixed with other animal bone more indicative of regular trash deposition. Garden hunting undoubtedly provided a portion of the rabbit found in these sites, but the extent is difficult to estimate. The predominance of cottontails may be the best evidence of such as strategy.

Few bird remains were found. Evidence for use of aquatic birds is negligible, only two duck bones, and indicates no concerted effort was made to obtain birds on and along the river. Species that could have been killed or snared in or near fields (quail, cranes, horned larks, flickers, meadowlarks, and passerines) also have relatively limited counts and distributions. Of the 20 structure fill components, 5 (25.0 percent) have one or more of these taxa. Slightly more floor components (8 of 18 or 44.4 percent) have bird bones than roof fall (3 of 7 or 42.9 percent) or extramural contexts (4 of 31 or 12.9 percent). In terms of the co-occurrence that might be expected from indiscriminate trapping, the quail and horned lark combination is most common (n = 4 components) followed by flicker and meadowlark (n = 2). Only two components have more than two of these species, one with quail, flicker, and horned lark (a general extramural area at LA 6170) and another from the floor of Structure 47 at LA 6169 with quail, crane, horned lark, and meadowlark. The later is both a very large sample (n = 656) and a floor context with possible ceremonial deposition.

Long-distance artiodactyl hunting patterns are more difficult to discern, due in part to relatively small sample sizes (Table 20.20). In theory, most elements from species living near the site will be returned to the site while those taken at a greater distance will be represented by the more desirable and transportable parts. In addition to parts used for food, elements that offer convenient handles, serve as raw material for tools, or crania, which house brains used in dressing leather and are used in ceremonial gear, would have been transported and may be recovered in archaeological contexts (Reitz and Wing 1999:204).

In the Peña Blanca assemblage, almost all of the artiodactyl taxa are represented by cranial parts, some with evidence of ceremonial deposition. With the exception of bighorn, vertebrae are rare enough to suggest these parts were not returned to the site. Even if all of the medium to large and large mammal flat bones

Table 20.19. Early Developmental Period Rabbit Age Distribution, Percent of Components Within Provenience Type

	Number of Components	Mean Count for Components	% with Immature	% with Juvenile	% with Both
Cottontail	64	39	15.6	48.4	12.3
Structure fill	18	31	5.5	50	5.5
Structure roof fall	6	44	33.3	83.3	33.3
Structure floor associations	17	52	23.5	64.7	23.5
Extramural	23	33	17.4	26.1	8.7
Jackrabbit	56	13	8.9	33.9	5.3
Structure fill	16	13	18.7	31.2	12.5
Structure roof fall	7	11	0	57.1	0
Structure floor associations	16	19	12.5	50	6.2
Extramural	17	9	0	11.8	0
Rabbit	66	49	21.2	53	16.7
Structure fill	18	42	22.2	61.1	16.7
Structure roof fall	7	49	14.3	85.7	14.3
Structure floor associations	17	69	29.4	70.6	29.4
Extramural	24	39	16.7	25	8.3

were vertebra fragments, these would not account for the missing vertebrae. Ribs and sternums are fairly well represented while pelvises are virtually absent and again may not have been returned to the site. Vertebrae and pelvises are parts that carry more meat than grease (e.g., Lyman 1994:227) so that the meat could have been removed and the bones left at the kill site. Alternatively, these parts could have been removed from the site area by carnivores and/or were deposited outside the areas excavated. Overall, the most common parts are foot elements, which comprise 77 percent of the elk parts, 66 percent of the deer parts, 54 percent of the pronghorn parts, all of the bison parts, but only 5 percent of the bighorn and 8 percent of the medium artiodactyl parts. Phalanges, tarsals, and carpals are low in utility in that they are associated with little meat or grease. However, these articulate with metapodials, which have considerable marrow and some grease (e.g., Lyman 1994:227) and were commonly used in making bone tools. The presence of these low utility bones along with a good number of metapodials, indicates that feet came back as packages and the phalanges, carpals, and tarsals were discarded while the metapodials were broken and boiled or used for tools. Most artiodactyl bones were heavily processed, as indicated by the counts for large mammal and medium artiodactyl long and flat bone fragments and comparatively few parts that are complete enough to identify the species. Relative numbers, the ubiquity, and the distribution of parts suggests that deer was the most commonly taken artiodactyl, followed by pronghorn, elk, and bighorn.

When co-occurrence of species in components is considered (Table 20.21), it is clear that deer is not only the most numerous of the artiodactyls, but also the most widespread. Concentration on any one species, which we might expect of logistic hunts from sedentary agricultural communities, is not apparent, unless that species is deer. Rather, components with concentrations of artiodactyl bones tend to have more than one species. When relatively large numbers of bones from a single species occur within a component, either the component has a large sample size so that more parts are expected or the concentration of parts is from articulated feet discarded as units.

Pronghorn and deer have fairly similar distributions across the provenience types (Table 20.22), as does the general artiodactyl taxon. Bighorns have the most unusual part distribution and are concentrated in a few locations, mainly (17 of 21) at one site (LA 265) where 10 of the specimens (cranial, axis vertebrae, and front limb and foot parts) are from the same structure (SU or Structure 1) and another 5 (a tooth, axis vertebrae, and a sacrum fragment) are from a keyhole structure at the same site (Structure 27). The remaining two (an axis vertebra and a rear leg part) are from a large bell-shaped pit (Feature 60) at that site. The axis vertebrae are from three different animals. Elk is mainly from two sites (LA 265 and LA 6170) with a single specimen from a third (LA 6169). Parts from LA 6170 are an articulated foot found in the fill of a structure. Those from LA 265 are from five separate structures or features with the most (n = 6) from Feature 26, a large bell-shaped pit where they represent a single foot. A scattering of parts (tooth, scapula, metacarpal, femur, and rib fragments) were found in the other features. Bison was found at two sites, a metacarpal from the floor of Structure 50 at LA 6170 and several foot parts from a provenience with no associated artifacts at LA 265.

All of the sites with Early Developmental deposits have deer and the three largest sites have pronghorn. Proportionately more pronghorn are found at LA 6169 and LA 6170 than at LA 265, which has about twice as much deer as pronghorn and more bighorn and elk. The part distribution is somewhat different (Table 20.23); feet are always the most abundant. This is due in large part to a high degree of identifiability and less breakage in these small compact elements. Vertebrae, ribs, and long bone shafts are almost always highly fragmented so that few can be identified to the species level. Overall, the species distribution seems to suggest a greater focus on southeastern grassland species at LA 6169 and LA 6170 and a more northern montane focus at LA 265.

Table 20.20. Distribution of Early Developmental Period Large Mammal and Artiodactyl Body Parts

	Med-Lrge Mammal	Large Mammal	Medium Artio.	Med-Lrg Artio.	Large Artio.	Deer or Elk	Elk	Deer	Pronghorn	Bison	Bison or Cow	Bighorn Sheep
Unknown	4	5	1	-	-	-	-	-	-	-	-	-
	1.1%	1.3%	0.2%									
Long bone	210	281	345	3	-	-	-	-	-	-	-	-
	58.7%	73.9%	54.7%	60.0%								
Flat bone	103	58	27	1	-	-	-	-	-	-	-	-
	28.8%	15.3%	4.3%	20.0%								
Horn or antler	-	-	1	-	-	5	-	4	4	-	-	-
			0.2%			100.0%		3.8%	7.4%			
Cranium	16	3	32	-	-	-	1	14	7	-	1	6
	4.5%	0.8%	5.1%				3.2%	13.2%	13.0%		50.0%	28.6%
Vertebra	1	-	15	-	-	-	-	-	-	-	-	5
	0.3%		2.4%									23.8%
Ribs and sternum	24	33	125	1	19	-	3	2	-	-	-	1
	6.7%	8.7%	19.8%	20.0%	100.0%		9.7%	1.9%				4.8%
Pelvis	-	-	1	-	-	-	-	-	-	-	-	1
			0.2%									4.8%
Front limb	-	-	15	-	-	-	1	10	5	-	-	4
			2.4%				3.2%	9.4%	9.3%			19.0%
Front foot	-	-	8	-	-	-	1	20	8	3	-	1
			1.3%				3.2%	18.9%	14.8%	50.0%		4.8%
Rear leg	-	-	16	-	-	-	2	10	9	-	1	3
			2.5%				6.5%	9.4%	16.7%		50.0%	14.3%
Rear foot	-	-	18	-	-	-	7	33	15	3	-	-
			2.9%				22.6%	31.1%	27.8%	100.0%		
Front or rear foot	-	-	27	-	-	-	16	13	6	-	-	-
			4.3%				51.6%	12.3%	11.1%			
Total	358	380	631	5	19	5	31	106	54	6	2	21
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 20.21. Co-occurrence of Artiodactyl Species in Early Developmental Period Components (percent of row)

	Elk	Deer	Pronghorn	Bighorn	Bos
Elk	7	6	5	4	0
	100.0%	85.7%	71.4%	57.1%	0.0%
Deer	6	36	14	8	2
	16.7%	100.0%	38.9%	22.2%	5.5%
Pronghorn	5	14	16	5	0
	33.3%	87.5%	100.0%	31.2%	0.0%
Bighorn	4	8	5	8	0
	50.0%	100.0%	62.5%	100.0%	0.0%
Bos	0	2	0	0	3
	0.0%	66.7%	0.0%	0.0%	100.0%

Table 20.22. Provenience Type Distribution for Large Mammal and Artiodactyls in Early Developmental Deposits

		Structure Fill	Roof Fall	Floor Associated	Extramural	Total
Large mammal	Count	129	60	72	119	380
	Expected count	139.8	74.7	76.5	88.9	380
	% within taxon	33.9%	15.8%	18. 9%	31.3%	100.0%
Artiodactyl	Count	244	128	142	114	628
	Expected count	231	123.5	126.5	147	628
	% within taxon	38.9%	20.4%	22.6%	18.2%	100.0%
Large artiodactyl	Count	2	15	1	1	19
	Expected count	7	3.7	3.8	4.4	19
	% within taxon	10.5%	78.9%	5.3%	5.3%	100.0%
Medium-large artiodactyl	Count	0	1	1	3	5
	Expected count	1.8	1	1	1.2	5
	% within taxon	0.0%	20.0%	20.0%	60.0%	100.0%
Deer or elk antler	Count	0	3	2	0	5
	Expected count	1.8	1	1	1.2	5
	% within taxon	0.0%	60.0%	40.0%	0.0%	100.0%
Elk	Count	4	9	1	17	31
	Expected count	11.4	6.1	6.2	7.3	31
	% within taxon	12.9%	29.0%	3.2%	54.8%	100.0%
Deer	Count	46	15	21	23	105
	Expected count	38.6	20.6	21.2	24.6	105
	% within taxon	43.8%	14.3%	20.0%	21.9%	100.0%
Pronghorn	Count	24	11	10	9	54
	Expected count	19.9	10.6	10.9	12.6	54
	% within taxon	44.4%	18.5%	18.5%	16.7%	100.0%
Bison	Count	0	0	1	5	6
	Expected count	2.2	1.2	1.2	1.4	6
	% within taxon	0.0%	0.0%	16.7%	83.3%	100.0%
Bos/Bison	Count	0	0	1	1	2
	Expected count	0.7	0.4	0.4	0.5	2
% within taxon		0.0%	0.0%	50.0%	50.0%	100.0%
Bighorn	Count	13	5	1	2	21
	Expected count	7.7	4.1	4.2	4.9	21
	% within taxon	61.9%	23.8%	4.8%	9.5%	100.0%

Table 20.23. Deer and Pronghorn Parts Recovered from Early Developmental Period Assemblages

	Deer					Pronghorn		
	LA 265	LA 6169	LA 6170	LA 6171	LA 115862	LA 265	LA 6169	LA 6170
Horn or antler	2	-	2	-	-	-	-	4
	4.0%		4.4%					12.5%
Cranial	7	4	3	-	-	6	-	1
	14.0%	50.0%	6.7%			35.3%		3.1%
Ribs and vertebrae	2	-	-	-	-	-	-	-
	4.0%							
Front leg (and scapula)	8	1	1	-	-	2	1	2
	16.0%	12.5%	2.3%			11.8%	20.0%	6.3%
Front foot	8	1	8	1	2	-	1	7
	16.0%	12.5%	17.8%	100.0%	100.0%		20.0%	21.9%
Rear leg	6	-	4	-	-	2	-	7
	12.0%		8.9%			11.8%		21.9%
Rear foot	11	-	22	-	-	6	2	7
	22.0%		48.9%			35.3%	40.0%	21.9%
Front or rear foot	6	2	5	-	-	1	1	4
	12.0%	25.0%	11.1%			5.9%	20.0%	12.5%
Total	50	8	45	1	2	17	5	32
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Fetal and neonate artiodactyl bones provide evidence of hunting females from late spring into fall. Sources vary on when fawning occurs. Some place it in late May and early June, while in parts of Arizona it occurs from early July until September (BISON-M n.d.). Fawning on a limited scale may begin as early as March and continue until late November in the Sangre de Cristo Mountain area (Lang and Harris 1984:51). Deer grow rapidly in the first six months of life. Weighing less than 5 kg at birth, by six months of age they average 30 kg and by 12 months weight 50 to 60 kg (Mackie et al. 1982:863). Pronghorn in central Arizona are born between April and June (BISON-M n.d.), and are leanest during the fawning season and in their best condition in late summer during the rainy season. Large herds form during winter, breaking up into bachelor and nursery herds then into even smaller groups or solitary animals in late summer (Kitchen and O'Hara 1984:963–965).

Neonatal medium artiodactyl, deer, and pronghorn elements indicating summer or fall procurement occur in a limited number of Peña Blanca Early Developmental period components. At LA 6169, the Structure 47 floor assemblage contains a long bone fragment, five ribs, a metacarpal shaft, a tibia shaft, and a metapodial shaft fragment from a medium artiodactyl. A pit in the floor of Structure 50 at LA 6170 had a pronghorn tooth and a deer mandible fragment was found in the ventilator shaft. At LA 265, Structure 1 fill had a medium artiodactyl distal metacarpal and a deer distal radius, and Structure 13 a medium artiodactyl rib. Only 5 (7.6 percent) of the 66 components with artiodactyl bones have neonatal remains while 59 (89.4 percent) have more than 90.0 percent mature bones and only 12 (18.2 percent) have any from near full sized or juvenile animals. This suggests that while artiodactyls may have been hunted year-round, they either selected full-sized and mature animals, spent more time hunting when young animals were absent or not as common, or the remains of very small artiodactyls were rarely transported to the sites.

Shedding stages for mule deer antler provide another seasonal indicator. Small bulbs appear in April or May with growth completed by late summer. Antlers are usually shed in late January and early February but occasionally as late as March (Mackie et al. 1982:864). Few antlers were found in the Peña Blanca sites. At one site, as part of closing ritual, a partial deer cranium was placed on the floor of Structure 50 at LA 6170. The antler was in the process of detaching, suggesting this deer was killed shortly before January or February when antler is shed. A partial cranium found in the fill of Structure (SU) 1 at LA 265 is from a deer that had already shed its antlers and had not begun to grow a new set, and was killed between January and April. The vent shaft of Structure 4 at LA 6169, an Early Developmental structure (but coded as mainly Coalition), had a partial cranium with fully formed antler attached, suggesting it was killed during the fall. The rest of the antler (n = 8) is pieces that could be from fully formed racks or shed racks. While ceremonial deposition is probably a poor indicator of the season a structure was abandoned, this and the other antler indicate that deer were killed throughout most of the year. This is not contradicted by the two deer mandibles complete enough to age based on tooth wear (following Severinghaus 1949 criteria for white-tailed deer). One from a bell-shaped pit at LA 265 (SU2, Feature 26) was approximately 1.5 years old and one from the floor of Structure 47 at LA 6169 was approximately 2.5 years, suggesting both were killed between October and May.

If deer hunting was a logistic strategy of sedentary agriculturalists, we might expect that hunts would be rare in spring and late summer/early fall when males were occupied with agricultural chores and would be directed at animals in their best condition, probably after the harvest. On the other hand, local hunting by permanent or seasonal residents could have been opportunistic, occurring at any time or reflecting the colder months when animals move to lower elevations. Both male and female artiodactyls are in their poorest, fat-depleted condition in late winter (March, males) and early spring (April, females) (Speth and Spielmann 1983:3) when they weight about 20 percent less than at their peak (Mackie et al. 1982:863). Ethnographic accounts agree somewhat. The Santa Claras hunted deer in small groups during fall when animals were in better condition and the pressure of other economic activities was minimal. Pronghorn were hunted communally (Hill 1982:49, 51). Hopi logistic hunts of deer and pronghorn took place in August and October when the animals were fattest, in December when snow slows the animals down and they are easy to track, and in March and April when the animals have their young with them (Beaglehole 1936:4–8). Although hunting practices have more than likely changed from prehistoric times, the rational involved when animals were hunted may resemble that of prehistoric groups. March and April hunts would seem unlikely if animals are in poor condition, but these could have augmented stored resources.

The Early Developmental period Peña Blanca faunal data shows a high reliance on cottontail rabbits with deer, the most commonly taken artiodactyl. This in itself suggests that garden hunting provided a large part of the animal subsistence during this period. Deer appear to have been hunted year-round with most parts returned to the sites and heavily processed. Pronghorn may have been taken less often but the part and age distributions are similar to deer, again suggesting that most parts were returned to the sites and heavily processed. Elk and bison are less common and are mostly lower limb and foot elements indicating only parts were brought back and suggesting more distant procurement locations. The abundance of bighorn crania and vertebra along with few foot elements is difficult to explain, especially since this species was probably transported. None of the elk or bighorn elements are from immature or juvenile animals, suggesting that either the hunters selected mature animals or they were hunted during seasons when the number of young animals was limited. Unfortunately, small sample sizes and heavy processing for the Peña Blanca artiodactyls have not provided clear patterns that would indicate whether these animals were hunted from a sedentary base or in part by more mobile groups returning to aid in agricultural endeavors. Also perplexing is the near total absence of riverine birds and mammals, which may simply mean that adequate animal resources could be obtained without exploiting riverine species.

Cooking Methods

Cooking and processing patterns also provide information concerning the residents of these early sites. When cooking involves boiling, as in stews, it is generally done by women. When men participate, it is usually in roasting or baking, methods that are also more common when preparing for feasts or ceremonials rather than in routine food preparation (Crown 2000:223; Speth 2000:102). Meat that is roasted in a pit oven will have no evidence of burning while over half of the bones can show burning when meat is spitted over an open fire (Speth 2000:89). Day-to-day domestic activities should result in deposits with evidence of animals being rendered into pot-sized units and with little of the graded burning caused by roasting over an open fire. When pit roasting of large parts of animals did occur, this should have resulted in a fair number of complete bones and a good representation of body parts. Substantial trash deposits should have a mix of cooking techniques that reflects the composition of the resident population as well as taphonomic considerations such as bone preservation and the effect of dogs.

Before examining the components for evidence of different cooking methods, one particular feature is considered in detail. Much of the fauna deposited in Feature 29 at LA 6169 was probably the result of a single event (see Post, Volume 2, for a description of this pit). At least 21 cottontails, 2 to 4 jackrabbits, perhaps a woodrat and a flicker, and artiodactyl parts were roasted and the bones discarded in a pit that may have already contained some waste parts. Feature fill was screened through 1/8-inch mesh and 55 (8.1 percent) of the 678 specimens are from flotation samples (11 small mammal and 44 cottontail bones). One of the most unusual aspects of this feature is the concentration of cottontail bones (n = 503 or 74.2 percent of the feature assemblage). Jackrabbits bones are much less common (n = 47 or 6.9 percent) as are unidentifiable small mammal bones (n = 87 or 12.8 percent). The cottontail part distribution (Table 20.24) definitely indicates selection of parts and uniform processing of those parts deposited in Feature 29. None of the cottontail bones and only one bone (from a medium artiodactyl) is heavily burned. Instead, a large proportion of the cottontail (26.5 percent), jackrabbit (14.9 percent), and medium artiodactyl (13.3 percent) bones are scorched or have graded burns generally indicative of roasting or baking. Given that baking or even open-fire roasting of parts with a thick layer of flesh can show no signs of roasting, the amount of roasted bone is undoubtedly much higher.

The cottontail part and portion distribution suggests that the parts roasted and deposited in Feature 29 were mainly heads and rear legs with rear feet sometimes roasted and sometimes just disposed of in the pit. The most consistent breakage and burning pattern is on distal tibiae, which are almost always broken at the distal end with slight scorches or scorches grading into heavier burns on the broken distal ends. Mandible bodies are largely intact and either lightly scorched or scorched along the lower margin. Virtually no vertebrae, ribs, scapulae, and very few front limb elements were found (Table 20.24). Complete (39.2 percent) and nearly complete (9.9 percent) elements are common. No immature and only nine (1.3 percent) of the cottontail bones are recorded as juvenile animals. If this age distribution reflects the rabbit population at the time they were captured, this lack of young animals indicates a winter event, too late to suggest protecting crops and too early for clearing fields of potential crop predators.

Jackrabbits have a different part distribution as well as a much smaller sample size. No mandibles were found. The most numerous parts are hind foot elements (19.1 percent) but even this is less than half the proportion for cottontails (41.5 percent). Cranial fragments are more common (17.0 percent compared to 10.5 percent) and more ribs and ulnas were found (10.6 percent each compared to 1.4 percent for cottontail ribs and 1.0 percent for cottontail ulnas). However, the burning pattern is similar, all scorches (12.8 percent) or graded (2.1 percent) burns, and complete (29.8 percent) or nearly complete (6.4 percent) bones are common.

When compared to a much larger sample of cottontail (n = 3,975, MNI = 128) and prairie dog (n = 877, MNI = 64) bones from the

Table 20.24. Summary of Cottontail Rabbit Parts, Fragmentation, and Burning for Feature 29 at LA 6169

Element	Fragmentation	Burning	Count
Cranium	face or case fragment	none	32
	maxilla	none	21
Mandible	partial to fragmentary body	none	33
	complete to fragmentary body	completely scorched	8
	body fragment	margin scorched	3
Lumbar vertebra	complete	none	3
	partial	none	4
Ribs	shafts, some with one end	none	7
Scapula	glenoid	none	4
	blade fragment	none	3
Innominate	complete	none	4
	fragment including acetabulum	none	22
		completely scorched	7
		graded superior	1
	ilium	none	2
Humerus	complete	none	2
	proximal	none	1
	distal and shaft	none	1
	shaft	completely scorched	1
Radius	complete	none	1
	proximal and shaft	completely scorched	2
	distal and shaft	completely scorched	1
Ulna	proximal and shaft	none	3
		completely scorched	1
	distal and shaft	none	1
Metacarpal	complete	none	1
Manus phalanx	complete	none	2
Femur	shaft fragment	none	8
		completely scorched	3
		scorch distal end	1
	proximal shaft fragment	none	2
		completely scorched	3
	distal shaft fragment	completely scorched	2
	end fragment	graded	1
	proximal and partial shaft	none	5
		completely scorched	1
	distal	completely scorched	1
		none	1
	distal and partial shaft	none	12
		completely scorched	4
Tibia	complete	none	2
		scorch distal end	2
	shaft or shaft fragment	none	5
		completely scorched	9
		distal scorched	6
		distal graded	2
	proximal fragments	none	3

Table 20.24. Continued.

Element	Fragmentation	Burning	Count
Tibia	proximal and partial shaft	none	3
		completely scorched	4
		distal scorched	9
		distal graded	4
		shaft graded	1
	proximal shaft fragment	none	2
		distal scorched	1
	distal fragments	none	2
	distal and partial shaft	none	4
		shaft scorched	1
		graded distal	2
	distal shaft	completely scorched	1
Fibula	shaft fragment	none	1
	proximal fragment	none	1
	proximal and partial shaft	none	5
Tarsal	complete	none	1
Astragalus	complete	none	10
Calcaneus	complete	none	17
		completely scorched	9
		graded distal	1
	fragment	none	2
Metatarsals	complete	none	60
		completely scorched	11
	proximal and partial shaft	none	15
		completely scorched	6
		graded distal	1
	distal and partial shaft	none	8
		completely scorched	3
		scorched margin	1
	shaft	scorched margin	1
Pes phalanges	complete or nearly so	none	51
		completely scorched	13
Carpal or tarsal	complete	none	8

Henderson site in southeastern New Mexico (Speth 2000), the Feature 29 assemblage is distinctive in many aspects of element distribution (Table 20.25). Comparing the percent of the total MNI represented by a particular element or element portion for jackrabbits, cottontails, prairie dogs, and pocket gophers, Speth uses ethnographic descriptions of cooking practices of Southwestern groups to infer that the part distribution pattern for cottontails found at the Henderson site results from boiling and that for prairie dogs from roasting and heavy attrition by dogs (Speth 2000:102). While the Feature 29 part distribution may be more similar to that of the Henderson site prairie dogs than of the cottontails, there are still considerable differences. Some could be due to greater interference from dogs at that site or other factors may be involved. The relative absence of vertebrae and front limbs in Feature 29 could be because those parts were used in stews, discarded elsewhere, or even fed to dogs with only parts of the rabbits being roasted. If the deposits in Feature 29 pit are characteristic of a roasting event, either a ceremonial hunt and feast or an influx of persons, and males did the cooking, then what we should look for in other deposits is a concentration of

Table 20.25. Comparison of Percent of MNI Represented for Henderson Site Boiled Cottontail and Roasted Prairie Dog Assemblages and LA 6169 Feature 29 Roasted Assemblage

	Henderson Cottontail % MNI (128)	Henderson prairie dog % MNI (64)	LA 6169, F. 29 % of MNI (21)
Mandible	97.7	100	100
Atlas	2.3	-	-
Axis	2.3	-	-
Cervical	0.8	-	-
Thoracic	0.8	-	-
Lumbar	8.6	-	4.8
Scapula	100	53.1	14.3
Proximal humerus	21.9	7.8	9.5
Distal humerus	86.7	54.7	4.8
Proximal radius	47.7	31.2	9.5
Distal radius	25	9.4	4.8
Proximal ulna	31.2	64.1	9.5
Distal ulna	-	-	4.8
Proximal metacarpal	4.7	-	4.8
Distal metacarpal	3.9	-	-
Innominate	83.6	67.2	76
Proximal femur	35.9	29.7	19
Distal femur	53.9	9.4	38.1
Proximal tibia	42.2	3.1	66.7
Distal tibia	92.2	48.4	38.1
Astragalus	9.4	-	33.3
Calcaneus	72.7	-	85.7
Proximal metatarsal	45.3	-	90.5
Distal metatarsal	25	-	100

Note: vertebrae, metapodials, carpals, and tarsals not coded for Henderson (Speth 2000:100) prairie dog and distal ulna not reported for cottontails or prairie dogs

one or a few species, a relatively large proportion of complete or nearly complete bones, and greater than usual amount of scorched and graded burns, but not necessarily a similar part distribution.

Unfortunately, only 6 other Early Developmental components have sample sizes of 100 or more cottontail specimens and virtually all are multiple-event fill deposits or include a number of features. None of the 6 has more than 26.8 percent complete to nearly complete elements (compared to 49.1 percent for Feature 29). The highest proportion of roasting-like burns is 29.4 percent from a burned roof layer with a small sample (n = 17) followed by 28.6 percent for another small sample (n = 7) (compared to 26.4 percent for Feature 29, n = 503). If the mere presence of roasting-like burns on cottontails is considered, then 3 of 6 or 50.0 percent of the Structure fill, 11 of 18 or 61.1 percent of the roof fall, 12 of 17 or 70.6 percent of the floor associated, and only 5 of 22 or 22.7 percent of the extramural components (other than Feature 29) with cottontail bones have this type of burning. The small proportion for extramural contexts is mainly due to small samples, 18 have sample sizes of 7 or less and 10 of these have only one cottontail bone. High proportions for the roof fall and floor associations are in part taphonomic burns. Burned roofs result in a larger amount of burned and scorched bone and both are common in fire and ash pits where these are essentially dis-

Table 20.26. Proportion of Roasting and Discard Burns for Rabbit/Small Mammal and Artiodactyl/Large Mammal

	N =	% Roasting-like Burn	% Discard Burn
Rabbit/small mammal			
Early Developmental	4823	11.8	8.5
Mainly Early Developmental	229	8.3	5.2
Late Developmental	63	6.3	3.2
Mainly Late Developmental	184	2.7	8.7
Coalition	256	1.2	21.9
Mainly Coalition	544	2.2	1.8
Mainly Classic	16	12.5	12.5
Artiodactyl/large mammal			
Early Developmental	1622	11	22.7
Mainly Early Developmental	121	5	16.5
Late Developmental	54	7.4	3.7
Mainly Late Developmental	250	7.2	10.4
Coalition	84	1.2	14.3
Mainly Coalition	191	4.7	7.3
Mainly Classic	57	7	7

Note: Roasting-like burns include light and graded light to heavy burns discard burns are dry burns and heavy to calcined burns

card burns. Still, the fact that so many components have roasting-like burns suggests this was a fairly common cooking practice during the Early Developmental period.

Later dating components have roasting-like burns but generally in much smaller proportions, except when sample sizes are low. Grouped by provenience type, only the Mixed Early Developmental period deposits have anything near the amount of potentially roasted bone (Table 20.26) and only the Coalition period structure fill has the amount of complete bone. While sample sizes for the later periods are smaller, there does seem to be a reduction in the amount of roasting for cottontails after the Early Developmental period.

Proportions of roasting-like burns (light or scorched and graded light to heavy) are greatest in the Early Developmental period deposits and smallest during the Coalition for both the rabbits and likely rabbits and the artiodactyls and likely artiodactyls (Table 20.26, Fig. 20.4), increasing at the end of the occupation but based on relatively small sample sizes. Discard burns (heavy to calcined and graded combinations) proportions peak during the Coalition for the rabbits and likely rabbits and in the Early Developmental for the artiodactyl and likely artiodactyls. Coalition deposits are mainly structure fill that could contain some roof fall (67.9 percent) and floor (26.8 percent) and predominantly from one site (94.0 percent) and may not be all that representative since few components contribute to these totals. Overall, these data suggest that roasting was a more common cooking practice for both small and large forms early in the occupation. If this does indicate more cooking by males, it could be interpreted as influxes in population that required more expedient cooking practices.

Site Structure

Rarely is cultural material uniformly deposited throughout a site. Ethnoarchaeological studies from the Mayan area find that refuse disposal is structured by how much effort it takes to dispose of an item, its potential value for reuse, and how much of a problem or hindrance the items are if not disposed of. Discard behavior is

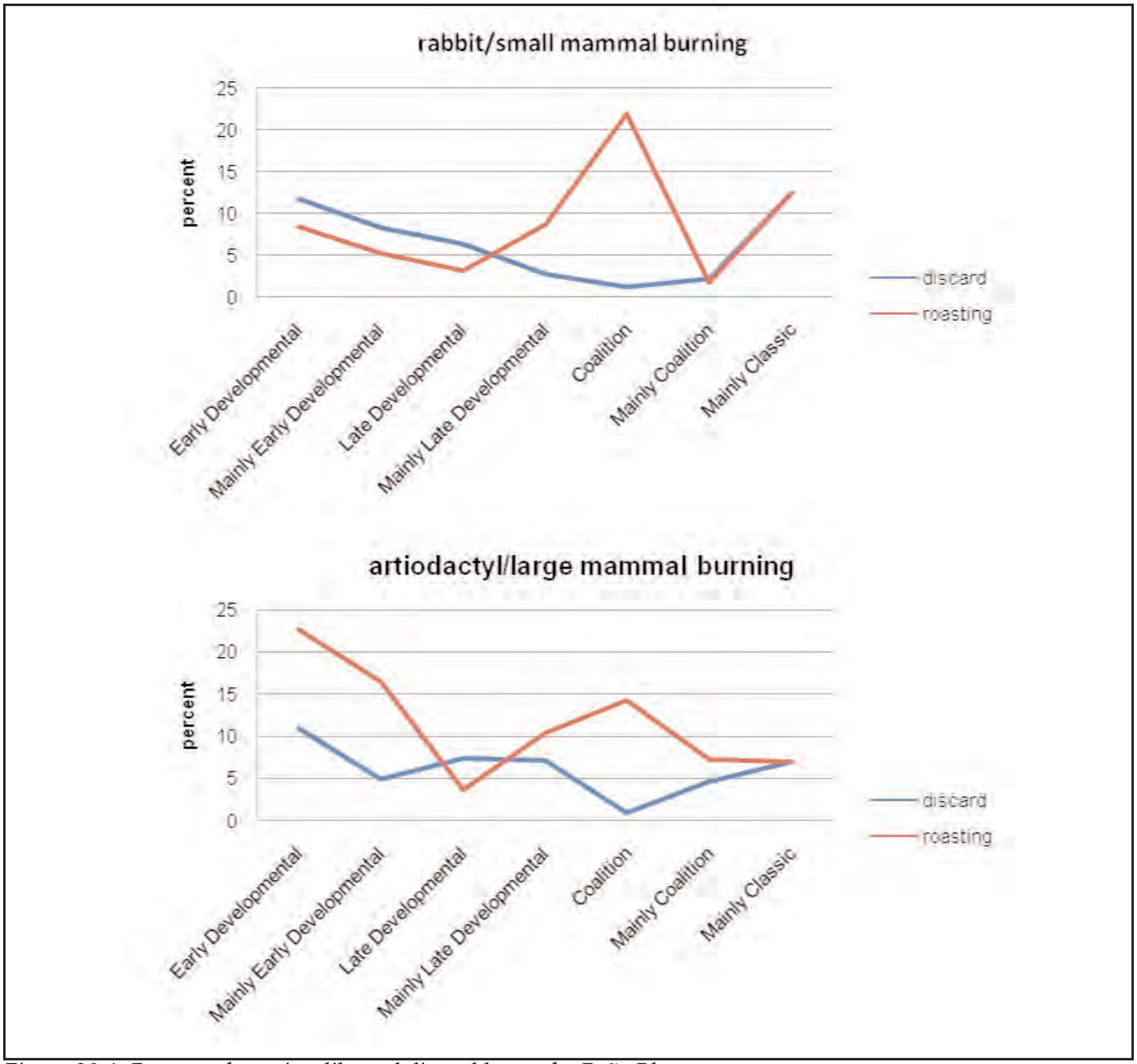


Figure 20.4. Percent of roasting-like and discard burns for Peña Blanca.

also strongly influenced by the length of occupation (Hayden and Cannon 1983:117–118), along with factors that alter the disposition of an object before it is permanently discarded or once it reaches the discard location, e.g., children playing, recycling, animal breakage and dispersal, and idiosyncratic human actions (Hayden and Cannon 1983:154–155). As the length of occupation and number of occupations increase, so should the formalization of space use and the amount of site maintenance (Schmader 1994:59).

While the historic Pueblos were undoubtedly more sedentary and less dependent on hunting than the prehistoric inhabitants of the Upper Middle Rio Grande Valley, some of their disposal practices may have roots in prehistory. Pueblo ethnographic reports frequently contain accounts of special treatment of artiodactyl bones. For example, the Hopis divided communally hunted deer, pronghorn, and bighorn among the hunters, drying most of the meat but reserving some for a feast following the hunt. Bones from the feast were carefully placed aside, were not broken or given to the dogs, but were streaked with ochre and placed on a shrine near the village, as were skulls with antlers (Beaglehole

1936:7–8, 11). At Santa Clara, pronghorn bones were saved and deposited in the river (Hill 1982:52), as were deer bones at Cochiti (Goldfrank 1927:86). The Zia threw deer bones on refuse dumps and did not allow dogs to gnaw them (White 1974:304).

These accounts suggest that practical matters and/or ceremonial practices could result in the differential distribution of faunal remains at a site. Bones with reuse potential (as in tools) could have been cached in roof beams, on floors, or in features while those with hindrance potential (large, sharp, smelly, or vermin attracting) would be deposited away from living and working areas. Common refuse and floor and feature sweepings with neither use nor hindrance potential would again be deposited away from the living and working areas but not necessarily in the same place as the larger hindrance bone. We might also expect that the more substantial the occupation, the more structure will be displayed in refuse treatment, that is, refuse would be placed in pits and depressions or in mounds rather than generally broadcast across the area.

Distributional differences in animal groups, parts, and treatment (completeness and burning) are examined by provenience type. As described in an earlier section of this report, the site components were classified as structure fill, structure roof fall, structure floor and floor associated, or extramural. These divisions are not completely exclusive and subject to different strategies for screening and sample selection. Floor and feature excavations were screened with finer mesh and include some flotation bone. Furthermore, the site component divisions rarely reflect the nature of the deposit, e.g., whether it is trash, wind and water, mixed, or primary deposition. The extramural samples are largely from extramural feature fill with non-feature or sheet trash comprising only 11.3 percent of the Early Developmental extramural sample (n = 2,003), 8.7 percent of the mainly Early Developmental extramural deposits (n = 23), 26.7 percent of those from the Coalition (n = 30), 19.9 percent of the mainly Coalition (n = 181), and 5.9 percent of the mostly Classic (n = 17). Material dumped or washed into pits is far better represented than sheet midden material.

Even with the above-mentioned problems, these divisions should produce somewhat different faunal assemblages if there was some form of order in refuse disposal. Structure fill and extramural deposits are the most likely to contain regular refuse and some refuse with hindrance potential. Those with hindrance potential or from the earlier phases of butchering and discard should have been dumped farther from the current habitation structures, probably in pits. Roof fall layers could contain tools and raw material cached for future use. Floor and floor feature deposits could contain both the remains of caches and small pieces of bone that were missed during routine cleaning or had been tossed into floor features that were not cleaned out when the structure was abandoned.

Since artiodactyl/large mammal bones have the most potential for reuse and for hindrance, their distribution is unlikely to be completely random. When the Early Developmental assemblage is examined by part and provenience type, few parts appear to be randomly or uniformly distributed (Table 20.27). Small pieces of long bones and front limbs occur more frequently than expected in structure fill, roof fall, and floor deposits while flat bones, vertebra, ribs, and front or rear foot elements are more likely to be found in extramural deposits. Front limbs and front and rear feet (mostly metapodials) are disproportionately found in structure fill while rear limbs are found in roof fall and extramural deposits. This seems to confirm that some artiodactyl bone was cached in roof beams and on floors for further use and that potential hindrance bone or waste (flat bones, vertebrae, ribs, and phalanges) was disposed of in extramural pits. Extramural contexts also have far less burning than expected (Table 20.28) possibly because butchering waste with high hindrance potential (feet, ribs, and vertebra) was disposed of before cooking, which also results in a greater than expected number of complete bones (Table 20.29). In addition, bones from most of the larger artiodactyls (including the medium to large artiodactyl, elk, and bison) are

Table 20.27. Actual and Expected Counts for Artiodactyl/Large Mammal Parts by Provenience Type

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Unknown	Count	2	0	0	4	6
	Expected Count	2.2	1.2	1.2	1.4	6
Longbone	Count	239	141	130	120	630
	Expected Count	231.7	123.9	126.9	147.5	630
Flat bone	Count	22	10	21	33	86
	Expected Count	31.6	16.9	17.3	20.1	86
Horn or antler	Count	3	5	3	3	14
	Expected Count	5.1	2.8	2.8	3.3	14
Cranial	Count	28	8	12	16	64
	Expected Count	23.5	12.6	12.9	15	64
Vertebral	Count	8	1	1	10	20
	Expected Count	7.4	3.9	4	4.7	20
Thorax	Count	63	31	38	50	182
	Expected Count	66.9	35.8	36.7	42.6	182
Pelvis	Count	1	0	0	0	1
	Expected Count	0.4	0.2	0.2	0.2	1
Front limb	Count	18	10	4	3	35
	Expected Count	12.9	6.9	7.1	8.2	35
Front foot	Count	20	6	9	6	41
	Expected Count	15.1	8.1	8.3	9.6	41
Rear leg	Count	10	11	7	12	40
	Expected Count	14.7	7.9	8.1	9.4	40
Rear foot	Count	31	17	12	17	77
	Expected Count	28.3	15.1	15.5	18	77
Front or rear foot	Count	17	7	16	20	60
	Expected Count	22.1	11.8	12.1	14	60
Total	Count	462	247	253	294	1256
	Expected Count	462	247	253	294	1256
Mainly Early Developmental						
Longbone	Count	19	6	23	2	50
	Expected Count	15.2	8.4	23	3.4	50
Flat bone	Count	1	4	8	1	14
	Expected Count	4.2	2.4	6.4	0.9	14
Horn or antler	Count	1	0	0	0	1
	Expected Count	0.3	0.2	0.5	0.1	1
Thorax	Count	0	2	2	0	4
	Expected Count	1.2	0.7	1.8	0.3	4
Front limb	Count	1	0	0	1	2
	Expected Count	0.6	0.3	0.9	0.1	2
Front foot	Count	2	0	5	0	7
	Expected Count	2.1	1.2	3.2	0.5	7
Rear leg	Count	1	0	1	0	2
	Expected Count	0.6	0.3	0.9	0.1	2

Table 20.27. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Rear foot	Count	1	3	1	1	6
	Expected Count	1.8	1	2.8	0.4	6
Front or rear foot	Count	1	0	1	1	3
	Expected Count	0.9	0.5	1.4	0.2	3
Total	Count	27	15	41	6	89
	Expected Count	27	15	41	6	89
Late Developmental						
Longbone	Count	0		11		11
	Expected Count	0.5		10.5		11
Flat bone	Count	1		7		8
	Expected Count	0.4		7.6		8
Horn or antler	Count	0		1		1
	Expected Count	0		1		1
Cranial	Count	0		1		1
	Expected Count	0		1		1
Vertebral	Count	1		5		6
	Expected Count	0.3		5.7		6
Thorax	Count	0		3		3
	Expected Count	0.1		2.9		3
Pelvis	Count	0		1		1
	Expected Count	0		1		1
Front limb	Count	0		8		8
	Expected Count	0.4		7.6		8
Front foot	Count	0		3		3
	Expected Count	0.1		2.9		3
Rear foot	Count	0		3		3
	Expected Count	0.1		2.9		3
Total	Count	2		43		45
	Expected Count	2		43		45
Mainly Late Developmental						
Unknown	Count	1	0	0	0	1
	Expected Count	0.3	0.6	0	0	1
Longbone	Count	13	59	0	4	76
	Expected Count	26.1	46.2	0.4	3.2	76
Flat bone	Count	7	13	0	2	22
	Expected Count	7.6	13.4	0.1	0.9	22
Cranial	Count	7	3	0	0	10
	Expected Count	3.4	6.1	0.1	0.4	10
Vertebral	Count	12	7	0	0	19
	Expected Count	6.5	11.6	0.1	0.8	19
Thorax	Count	11	11	1	0	23
	Expected Count	7.9	14	0.1	1	23
Pelvis	Count	0	1	0	0	1
	Expected Count	0.3	0.6	0	0	1

Table 20.27. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Front limb	Count	5	13	0	0	18
	Expected Count	6.2	11	0.1	0.8	18
Front foot	Count	1	2	0	1	4
	Expected Count	1.4	2.4	0	0.2	4
Rear leg	Count	2	1	0	0	3
	Expected Count	1	1.8	0	0.1	3
Rear foot	Count	4	2	0	0	6
	Expected Count	2.1	3.7	0	0.3	6
Front or rear foot	Count	2	3	0	1	6
	Expected Count	2.1	3.7	0	0.3	6
Total	Count	65	115	1	8	189
	Expected Count	65	115	1	8	189
Coalition						
Longbone	Count	12		4	5	21
	Expected Count	7.2		4.8	9	21
Flat bone	Count	1		3	1	5
	Expected Count	1.7		1.1	2.1	5
Horn or antler	Count	3		0	0	3
	Expected Count	1		0.7	1.3	3
Cranial	Count	2		3	11	16
	Expected Count	5.5		3.7	6.8	16
Vertebral	Count	1		0	2	3
	Expected Count	1		0.7	1.3	3
Thorax	Count	1		2	6	9
	Expected Count	3.1		2.1	3.8	9
Front foot	Count	1		2	0	3
	Expected Count	1		0.7	1.3	3
Front or rear foot	Count	0		0	1	1
	Expected Count	0.3		0.2	0.4	1
Total	Count	21		14	26	61
	Expected Count	21		14	26	61
Mainly Coalition						
Longbone	Count	32			28	60
	Expected Count	33			27	60
Flat bone	Count	7			8	15
	Expected Count	8.3			6.7	15
Horn or antler	Count	12			0	12
	Expected Count	6.6			5.4	12
Cranial	Count	5			6	11
	Expected Count	6.1			4.9	11
Vertebral	Count	0			3	3
	Expected Count	1.7			1.3	3
Thorax	Count	5			4	9
	Expected Count	5			4	9
Front limb	Count	3			0	3
	Expected Count	1.7			1.3	3

Table 20.27. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Front foot	Count	0			3	3
	Expected Count	1.7			1.3	3
Rear leg	Count	5			2	7
	Expected Count	3.9			3.1	7
Rear foot	Count	5			5	10
	Expected Count	5.5			4.5	10
Front or rear foot	Count	2			3	5
	Expected Count	2.8			2.2	5
Total	Count	76			62	138
	Expected Count	76			62	138
Mainly Classic						
Longbone	Count	21			2	23
	Expected Count	20.5			2.5	23
Flat bone	Count	4			1	5
	Expected Count	4.5			0.5	5
Vertebral	Count	3			0	3
	Expected Count	2.7			0.3	3
Thorax	Count	10			2	12
	Expected Count	10.7			1.3	12
Pelvis	Count	1			0	1
	Expected Count	0.9			0.1	1
Rear leg	Count	1			0	1
	Expected Count	0.9			0.1	1
Rear foot	Count	1			0	1
	Expected Count	0.9			0.1	1
Total	Count	41			5	46
	Expected Count	41			5	46

frequently found in extramural pits, suggesting their larger size increased the hindrance potential and caused these to be placed in pits more often than expected. Both structure fill and roof fall have more burned and roasted bone than expected, some of which is due to the burned roofs in a number of the early structures. Floor bone is more likely to be unburned. As for fragmentation, both structure fill and roof fall bone tend to be slightly more fragmentary than expected while the floor-associated bone is fairly close to the expected numbers and the extramural bone less fragmented than expected.

All but two of the other assemblages have sample sizes of artiodactyl/large mammal bone that are too small to consider. The mainly Late Developmental assemblage is comprised almost totally of structure fill and roof fall. Here the fill has more than the expected counts for vertebra and ribs while the roof fall has more long bone and front limb fragments (Table 20.27). This suggests that structure fill during this period was like that of extramural deposits during the Early Developmental, and could indicate a change in refuse disposal in extramural features to abandoned structures. Also similar is the greater than expected amount of complete bone in structure fill (Table 20.29). Burning is much less common in mainly Late Developmental deposits with slightly more unburned bone than expected in the fill and slightly more in the roof fall (Table 20.28). Mainly Coalition deposits are almost evenly divided between structure fill and extramural, and because both are likely disposal locales, great differences should not be

Table 20.28. Actual and Expected Counts and Chi-Square Values for Burn Type of Larger Samples of Artiodactyl/Large Mammals by Provenience

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Unburned	Count	251	106	173	224	774
	Expected Count	284.7	152.2	155.9	181.2	774
Roasted	Count	78	36	34	12	160
	Expected Count	58.9	31.5	32.2	37.5	160
Discard burn	Count	133	105	46	38	322
	Expected Count	118.4	63.3	64.9	75.4	322
Total	Count	462	247	253	294	1256
	Expected Count	462	274	255	294	1256
Pearson Chi-square=119.19, df=6, sig=.001						
Mainly Late Developmental						
Unburned	Count	56	89	1	8	154
	Expected Count	53	93.7	0.8	6.5	154
Roasted	Count	4	9	0	0	13
	Expected Count	4.5	7.9	0.1	0.6	13
Discard burn	Count	5	17	0	0	22
	Expected Count	7.5	13.4	0.1	0.9	22
Total	Count	65	115	1	8	189
	Expected Count	65	115	1	8	189
Pearson Chi-square=4.501, df=6, sig=.609						
Mainly Coalition						
Unburned	Count	68			53	121
	Expected Count	66.6			54.4	121
Roasted	Count	2			7	9
	Expected Count	5			4	9
Discard burn	Count	6			2	8
	Expected Count	4.4			3.6	8
Total	Count	76			62	138
	Expected Count	76			62	138
Pearson Chi-square=5.271, df=2, sig.=.072						

expected. Horn or antler and long bones are disproportionately found in structure fill and cranial parts and vertebra in extramural deposits, otherwise the expected numbers are quite close to the actual counts (Table 20.27). The same is true for burning (Table 20.28) and fragmentation (Table 20.29).

Poor preservation of the more generally broadcast items or sheet trash and sampling that emphasizes fill of structures and features gives a less than complete picture of disposal behavior. Yet, in all three samples, the artiodactyl/large mammal bones are distributed in a manner that suggests removing those parts with the most hindrance potential while retaining those with the potential for use and basically ignoring those with little hindrance potential.

The distribution of rabbit remains is more likely to reflect day-to-day waste disposal since these are less likely to be reused and have somewhat less hindrance potential than the larger artiodactyl bones. Since it is unlikely that individual rabbits were widely shared and much less processing is needed than for larger animals, there should be fewer differences in

Table 20.29. Actual and Expected Counts and Chi-square Values for Completeness of Larger Samples of Artiodactyl/Large Mammals by Provenience

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Complete	Count	8	10	10	27	55
	Expected Count	20.2	10.8	11.1	12.9	55
>75%	Count	1	1	2	2	6
	Expected Count	2.2	1.2	1.2	1.4	6
50-75%	Count	8	2	2	3	15
	Expected Count	5.5	2.9	3	3.5	15
25-50%	Count	27	8	13	8	56
	Expected Count	20.6	11	11.3	13.1	56
< 25%	Count	418	226	226	254	1124
	Expected Count	413.4	221	226.4	263.1	1124
Total	Count	462	247	253	294	1256
	Expected Count	462	247	253	294	1256
Pearson Chi-square=31.904, df=12, sig=.001						
Mainly Late Developmental						
Complete	Count	7	4	0	1	12
	Expected Count	4.1	7.3	0.1	0.5	12
>75%	Count	0	1	0	0	1
	Expected Count	0.3	0.6	0	0	1
50-75%	Count	1	0	0	0	1
	Expected Count	0.3	0.6	0	0	1
25-50%	Count	5	3	0	0	8
	Expected Count	2.8	4.9	0	0	8
< 25%	Count	52	107	1	7	167
	Expected Count	57.4	101.6	0.9	7.1	167
Total	Count	65	115	1	8	189
	Expected Count	65	115	1	8	198
Pearson Chi-square=10.335, df=12, sig=.587						
Mainly Coalition						
Complete	Count	2			2	4
	Expected Count	2.2			1.8	4
>75%	Count	0			2	2
	Expected Count	1.1			0.9	2
50-75%	Count	0			1	1
	Expected Count	0.6			0.4	1
25-50%	Count	3			3	6
	Expected Count	3.3			2.7	6
< 25%	Count	71			54	125
	Expected Count	68.8			56.2	125
Total	Count	76			62	138
	Expected Count	76			62	138
Pearson Chi-square=3.932, df=4, sig=.415						

how they were distributed throughout the sites and time periods.

The Early Developmental period sample is by far the largest but is heavily influenced by Feature 29 at LA 6169, which comprises half of the extramural sample, so the numbers are given with and without this feature (Tables 20.30–31). In both samples, structure fill has considerably more small unidentifiable fragments than expected. The amount of roasted bone is less than expected in the whole sample and more in that without Feature 29. Both roof fall samples have fewer small unidentifiable pieces than expected and more limb and pelvis pieces and more roasting-like burns. Deposits associated with floors have an abundance of parts that are likely to be waste (cranial, vertebral, ribs) and more are unburned. As expected, the extramural samples differ the most. In the whole sample, unidentifiable fragments, waste (cranial, vertebral, and thorax parts), and front limbs are under-represented with an abundance of rear legs and rear feet, and considerably more than expected have roasting burns and are complete.

Without Feature 29, the extramural sample resembles the structure fill sample in that there is more unidentifiable and waste pieces than expected. They differ in the parts that are more common than expected. Structure fill has more front limbs while the extramural sample has more rear legs and has fewer roasting burns and more discard burns than expected. In sum, the more fragmented bone is often found in structure fill and extramural pits but recognizable waste parts (cranium, vertebral, thorax, and feet) are found in larger than expected numbers in floor-associated proveniences. This association suggests that some processing took place in the structures and/or that small pieces of bone were missed during routine cleaning, but this may also be influenced by the use of finer screens. Since structure fill from this period is often wind and water deposited with some cultural material being naturally deposited, the unidentifiable pieces may be more a result of poor preservation than of deliberate deposition of household waste. Roasting burns are more often found in structure fill and roof fall and it is quite likely that much is from burned roofs and imprecise delineation of these two provenience types. Discard or heavy burns are found in roof fall, as expected, and in extramural contexts where hearth sweepings may have been deposited. Complete and nearly complete bones occur in frequencies that are about as expected in structure fill and roof fall, are more frequent in floor deposits, and are relatively rare in extramural deposits. All of this may indicate a tendency to dispose of waste in extramural areas and indicates a degree of organization in the disposal of even these small remains.

Few other time groups have appreciable counts. The mainly Late Developmental sample compares structure fill with roof fall and finds small unidentifiable fragments of bone are more common in fill and recognizable parts in roof fall (Table 20.30). Similarly, the roof fall has more complete bones than expected while the fill has more very fragmentary bone (Table 20.32). Unburned bone is distributed about as expected but more from the roof fall is roasted or lightly burned while that in the fill is heavy or discard burns (Table 20.31). This suggests that the mainly Late Developmental period structure deposits are essentially day-to-day trash disposal while that from the roof fall is slightly different. At least some waste was placed in abandoned structures.

Coalition period deposits are predominantly from structure fill with some that are associated with floors. Like the Early Developmental period sample, the floor deposits contain more waste parts (cranial, vertebrae, pelvis, and front limbs) than expected (Table 20.30), some of which could be small pieces missed when cleaning or recovered by the finer screen size (Table 20.32). Differences in burning are not significant (Table 20.31). Mainly Coalition deposits are overwhelmingly from structure fill and are largely long bone and limb parts (Table 20.30). Vertebrae, thorax, and pelvis parts are rare enough to suggest these parts were deposed of elsewhere or missed by the larger screen size. Few bones are burned (Table 20.31) and are highly fragmented (Table 20.32). The small extramural sample has many small fragments

Table 20.30. Actual and Expected Counts for Rabbits/Small Mammal Parts by Provenience Type

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Unknown	Count	2	0	2	0	4
	Expected Count	1.1	0.4	1.4	1.1	4
Longbone	Count	376	83	402	247	1108
	Expected Count	304.1	103.2	401.3	299.4	1108
Flat bone	Count	129	13	93	89	324
	Expected Count	88.9	30.2	117.3	87.6	324
Cranial	Count	158	63	322	193	736
	Expected Count	202	68.6	266.5	198.9	736
Vertebral	Count	54	11	88	33	186
	Expected Count	51	17.3	67.4	50.3	186
Thorax	Count	38	13	93	35	179
	Expected Count	49.1	16.7	64.8	48.4	179
Pelvis	Count	54	40	64	71	229
	Expected Count	62.8	21.3	82.9	61.9	229
Front limb	Count	155	68	166	90	479
	Expected Count	131.5	44.6	173.5	129.4	479
Front foot	Count	9	3	19	11	42
	Expected Count	11.5	3.9	15.2	11.3	42
Rear leg	Count	178	102	257	247	784
	Expected Count	215.2	73	283.9	211.9	784
Rear foot	Count	137	46	202	255	640
	Expected Count	175.6	59.6	231.8	173	640
Front or rear foot	Count	12	0	10	11	33
	Expected Count	9.1	3.1	12	8.9	33
Total	Count	1302	442	1718	1282	4744
	Expected Count	1302	442	1718	1282	4744
Early Developmental without LA 6169 Feature 29						
Unknown	Count	2	0	2	0	4
	Expected Count	1.3	0.4	1.7	0.6	4
Longbone	Count	376	83	402	197	1058
	Expected Count	335.4	113.9	442.3	166.2	1058
Flat bone	Count	129	13	93	52	287
	Expected Count	91	30.9	120.1	45.1	287
Cranial	Count	158	63	322	88	631
	Expected Count	200	67.9	264	99.1	631
Vertebral	Count	54	11	88	26	179
	Expected Count	56.7	19.3	74.9	28.1	179
Thorax	Count	38	13	93	23	167
	Expected Count	52.9	18	69.9	26.2	167
Pelvis	Count	54	40	64	33	191
	Expected Count	60.6	20.6	79.9	30	191
Front limb	Count	155	68	166	59	448
	Expected Count	142	48.2	187.4	70.4	448
Front foot	Count	9	3	19	6	37
	Expected Count	11.7	4	15.5	5.8	37

Table 20.30. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental without LA 6169 Feature 29						
Front or rear foot	Count	12	0	10	0	22
	Expected Count	7	2.4	9.2	3.5	22
Total	Count	1302	442	1718	645	4107
	Expected Count	1302	442	1718	645	4107
Mainly Late Developmental						
Unknown	Count	1	0	0	0	1
	Expected Count	0.6	0.3	0	0.1	1
Longbone	Count	38	5	2	0	45
	Expected Count	24.9	15.2	1.2	3.7	45
Flat bone	Count	5	2	0	0	7
	Expected Count	3.9	2.4	0.2	0.6	7
Cranial	Count	10	10	2	2	24
	Expected Count	13.3	8.1	0.7	2	24
Vertebral	Count	7	3	0	1	11
	Expected Count	6.1	3.7	0.3	0.9	11
Thorax	Count	7	6	0	0	13
	Expected Count	7.2	4.4	0.4	1.1	13
Pelvis	Count	2	7	0	5	14
	Expected Count	7.7	4.7	0.4	1.2	14
Front limb	Count	7	12	0	2	21
	Expected Count	11.6	7.1	0.6	1.7	21
Front foot	Count	1	0	0	0	1
	Expected Count	0.6	0.3	0	0.1	1
Rear leg	Count	11	12	0	4	27
	Expected Count	14.9	9.1	0.7	2.2	27
Rear foot	Count	11	4	1	1	17
	Expected Count	9.4	5.7	0.5	1.4	17
Total	Count	100	61	5	15	181
	Expected Count	100	61	5	15	181
Coalition						
Unknown	Count	18	-	0	0	18
	Expected Count	13.2	-	4.7	0.2	18
Longbone	Count	41	-	17	0	58
	Expected Count	42.5	-	15	0.5	58
Flat bone	Count	6	-	2	0	8
	Expected Count	5.9	-	2.1	0.1	8
Cranial	Count	13	-	8	0	21
	Expected Count	15.4	-	5.4	0.2	21
Vertebral	Count	2	-	4	0	6
	Expected Count	4.4	-	1.6	0.1	6
Thorax	Count	5	-	3	0	8
	Expected Count	5.9	-	2.1	0.1	8

Table 20.30. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Coalition						
Pelvis	Count	5	-	8	0	13
	Expected Count	9.5	-	3.4	0.1	13
Front limb	Count	12	-	8	1	21
	Expected Count	15.4	-	5.4	0.2	21
Front foot	Count	10	-	0	0	10
	Expected Count	7.3	-	2.6	0.1	10
Rear foot	Count	36	-	5	0	41
	Expected Count	36	-	10.6	0.4	41
Front or rear foot	Count	2	-	0	0	2
	Expected Count	1.5	-	0.5	0	2
Total	Count	170	-	60	2	232
	Expected Count	170	-	60	2	232
Mainly Coalition						
Unknown	Count	4	-	-	0	4
	Expected Count	3.7	-	-	0.3	4
Longbone	Count	82	-	-	19	101
	Expected Count	94.1	-	-	6.9	101
Flat bone	Count	27	-	-	8	35
	Expected Count	32.6	-	-	2.4	35
Cranial	Count	56	-	-	4	60
	Expected Count	55.9	-	-	4.1	60
Vertebral	Count	19	-	-	0	19
	Expected Count	17.7	-	-	1.3	19
Thorax	Count	11	-	-	0	12
	Expected Count	7.9	-	-	1	12
Pelvis	Count	26	-	-	1	27
	Expected Count	25.2	-	-	0.8	27
Front limb	Count	59	-	-	1	60
	Expected Count	55.9	-	-	4.1	60
Front foot	Count	14	-	-	0	14
	Expected Count	13	-	-	1	14
Rear leg	Count	97	-	-	3	100
	Expected Count	93.2	-	-	6.8	100
Rear foot	Count	103	-	-	0	103
	Expected Count	96	-	-	7	103
Front or rear foot	Count	6	-	-	0	6
	Expected Count	5.6	-	-	0.4	6
Total	Count	504	-	-	37	541
	Expected Count	504	-	-	37	541

Table 20.31. Actual and Expected Counts and Chi-square Values for Burn Type of Larger Samples of Rabbits/Small Mammals by Provenience

		Structure Fill	Structure Roof	Structure Floor Association	Extramural	Total
Early Developmental						
Unburned	Count	1043	330	1394	1011	3778
	Expected Count	1036.9	352	1368.2	1021	3778
Roasted	Count	148	61	158	194	561
	Expected Count	154	52.3	203.2	151.6	561
Discard	Count	111	51	166	77	405
	Expected Count	111.2	37.7	146.7	109.4	405
Total	Count	1302	442	1718	1282	4744
	Expected Count	1302	442	1718	1282	4744
	Pearson Chi-square =42.412, df=6, sig=.000					
Early Developmental without LA 6169 Feature 29						
Unburned	Count	1043	330	1394	515	3282
	Expected Count	1040.5	353.2	1372.9	515.4	3282
Roasted	Count	148	61	158	53	420
	Expected Count	133.1	45.2	175.7	66	420
Discard	Count	111	51	166	77	405
	Expected Count	128.4	43.6	169.4	63.6	405
Total	Count	1302	442	1718	645	4170
	Expected Count	1302	442	1718	645	4170
	Pearson Chi-square =19.870 df=6, sig=.003					
Mainly Late Developmental						
Unburned	Count	87	55	4	15	161
	Expected Count	89	54.3	4.4	13.3	161
Roasted	Count	1	4	0	0	5
	Expected Count	2.8	1.7	0.1	0.4	5
Discard	Count	12	2	1	0	15
	Expected Count	8.3	5.1	0.4	1.2	15
Total	Count	100	61	5	15	181
	Expected Count	100	61	5	15	181
	Pearson Chi-square =10.741, df=6, sig=.097					
Coalition						
Unburned	Count	126	-	45	2	173
	Expected Count	126.8	-	44.7	1.5	173
Roasted	Count	1	-	2	0	3
	Expected Count	2.2	-	0.8	0	3
Discard	Count	43	-	13	0	56
	Expected Count	41	-	14.5	0.5	56
Total	Count	170	-	60	2	232
	Expected Count	170	-	60	2	232
	Pearson Chi-square =3.519, df=4, sig=.475					
Mainly Coalition						
Unburned	Count	487	-	-	32	519
	Expected Count	483.5	-	-	35.5	519
Roasted	Count	10	-	-	2	12
	Expected Count	11.2	-	-	0.8	12
Discard	Count	7	-	-	3	10
	Expected Count	9.3	-	-	0.7	10
Total	Count	504	-	-	37	541
	Expected Count	504	-	-	37	541
	Pearson Chi-square =10.608, df=2, sig=.005					

Table 20.32. Actual and Expected Counts and Chi-Square Values for Completeness of Larger Samples of Rabbits Small Mammals by Provenience

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Complete	Count	120	47	200	233	600
	Expected Count	164.7	55.9	217.3	162.1	600
>75%	Count	43	16	82	74	215
	Expected Count	59	20	77.9	58.1	215
50-75%	Count	51	30	110	91	282
	Expected Count	77.4	26.3	102.1	76.2	282
25-50%	Count	195	86	253	202	736
	Expected Count	202	68.6	266.5	198.9	736
< 25%	Count	893	263	1073	682	2911
	Expected Count	798.9	271.2	1054.2	786.7	2911
Total	Count	1302	442	1718	1282	4744
	Expected Count	1302	442	1718	1282	4744
	Pearson Chi-square = 99.603, df=12, sig=.000					
Early Developmental without LA 6169 Feature 29						
Complete	Count	120	47	200	22	389
	Expected Count	123.3	41.9	162.7	61.1	389
>75%	Count	43	16	82	21	162
	Expected Count	51.4	17.4	67.8	25.4	162
50-75%	Count	51	30	110	18	209
	Expected Count	66.3	22.5	87.4	32.8	209
25-50%	Count	195	86	253	96	630
	Expected Count	199.7	67.8	263.5	98.9	630
< 25%	Count	893	263	1073	488	2717
	Expected Count	861.3	292.4	1036.5	426.7	2717
Total	Count	1302	442	1718	645	4107
	Expected Count	1302	442	1718	645	4107
	Pearson Chi-square =80.043, df=12, sig=.000					
Mainly Late Developmental						
Complete	Count	6	7	1	2	16
	Expected Count	8.8	5.4	0.4	1.3	16
>75%	Count	3	5	0	5	13
	Expected Count	7.2	4.4	0.4	1.1	13
50-75%	Count	2	5	0	5	12
	Expected Count	6.6	4	0.3	1	12
25-50%	Count	26	13	0	1	40
	Expected Count	22.1	13.5	1.1	3.3	40
< 25%	Count	63	31	4	2	100
	Expected Count	55.2	33.7	2.8	8.3	100
Total	Count	100	61	5	15	181
	Expected Count	100	61	5	15	181
	Pearson Chi-square =49.583, df=12, sig=.000					

Table 20.32. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Coalition						
Complete	Count	36	-	6	0	42
	Expected Count	30.8	-	10.9	0.4	42
>75%	Count	4	-	4	0	8
	Expected Count	5.9	-	2.1	0.1	8
50-75%	Count	7	-	2	0	9
	Expected Count	6.6	-	2.3	0.1	9
25-50%	Count	33	-	12	1	46
	Expected Count	33.7	-	11.9	0.4	46
< 25%	Count	90	-	36	1	127
	Expected Count	93.1	-	32.8	1.1	127
Total	Count	170	-	60	2	232
	Expected Count	170	-	60	2	232
	Pearson Chi-square =7.383, df=8, sig=.496					
Mainly Coalition						
Complete	Count	96	-	-	0	96
	Expected Count	89.4	-	-	6.6	96
>75%	Count	33	-	-	0	33
	Expected Count	30.7	-	-	2.3	33
50-75%	Count	23	-	-	1	24
	Expected Count	22.4	-	-	1.6	24
25-50%	Count	116	-	-	1	117
	Expected Count	109	-	-	8	117
< 25%	Count	236	-	-	35	271
	Expected Count	252.5	-	-	18.5	271
Total	Count	504	-	-	37	541
	Expected Count	504	-	-	37	541
	Pearson Chi-square =32.018, df=4, sig=.000					

and more burned bone than expected.

At this level of analysis there is limited evidence for different disposal practices for rabbit/small mammal parts that cannot be at least partially attributed to sampling practices. However, the use of finer screens for floors, floor features, and extramural features may account for some of the observed differences between provenience types. Small mammals probably were heavily processed or broken into small fragments in the structures and disposed of after boiling or cooking in stews with fewer of the small waste parts finding their way into trash areas. Deposits such as that in Feature 29 at LA 6169 are a rare picture of a discrete event and far from the norm.

When the provenience distribution of the major taxa groups is considered (Table 20.33), there are distinct patterns for some animal groups and some time groups. Rabbit/small mammals are almost always more numerous than expected in structure fill and floor-associated deposits, fewer than expected in roof fall layers and if lacking in any other provenience, it is in extramural contexts. Rodents differ by time period, tending to be more frequent than expected in proveniences with fine screening in some time groups (Early Developmental, Coalition, mainly Coalition), but more common in roof fall in one (mainly Early Developmental) and in fill in another (mainly Late Developmental), probably reflecting the diverse array and distribution of rodents comprising this group. Early and Mainly Early Developmental period dog specimens are rarely found in struc-

Table 20.33. Counts and Expected Counts for Major Animal Groups by Time and Provenience Type

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Early Developmental						
Rabbit/small mammal	Count	1302	442	1718	1282	4744
	Expected Count	1274	590.7	1651	1228.3	4744
Rodent	Count	109	23	178	134	444
	Expected Count	119.2	55.3	154.5	115	444
Dog	Count	9	22	53	84	168
	Expected Count	45.1	20.9	58.5	43.5	168
Artioactyl/large	Count	463	247	252	295	1257
	Expected Count	337.6	156.5	437.5	325.5	1257
Wild bird	Count	11	17	45	18	91
	Expected Count	24.4	11.3	31.7	23.6	91
Turkey/large bird	Count	5	136	192	13	346
	Expected Count	92.9	43.1	120.4	89.6	346
Reptile	Count	12	3	23	10	48
	Expected Count	12.9	6	16.7	12.4	48
Toads and frogs	Count	15	3	35	21	74
	Expected Count	19.9	9.2	25.8	19.2	74
Total	Count	1926	893	2496	1857	7172
	Expected Count	1926	893	2496	1857	7172
Mainly Early Developmental						
Rabbit/small mammal	Count	42	61	109	15	227
	Expected Count	42.1	77.9	94.4	12.5	227
Rodent	Count	2	19	15	1	37
	Expected Count	6.9	12.7	15.4	2	37
Dog	Count	0	36	0	0	36
	Expected Count	6.7	12.4	15	2	36
Artioactyl/large	Count	27	15	41	6	89
	Expected Count	16.5	30.6	37	4.9	89
Wild bird	Count	0	1	1	0	2
	Expected Count	0.4	0.7	0.8	0.1	2
Turkey/large bird	Count	2	1	0	0	3
	Expected Count	0.6	1	1.2	0.2	3
Reptile	Count	0	3	0	0	3
	Expected Count	0.6	1	1.2	0.2	3
Toads and frogs	Count	1	1	0	0	2
	Expected Count	0.4	0.7	0.8	0.1	2
Total	Count	74	137	166	22	399
	Expected Count	74	137	166	22	399
Late Developmental						
Rabbit/small mammal	Count	9	-	54	-	63
	Expected Count	6.7	-	56.3	-	63
Rodent	Count	0	-	9	-	9
	Expected Count	1	-	8	-	9

Table 20.33. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Late Developmental						
Dog	Count	2	-	0	-	2
	Expected Count	0.2	-	1.8	-	2
Artioactyl/large	Count	2	-	43	-	45
	Expected Count	4.8	-	40.2	-	45
Turkey/large bird	Count	0	-	2	-	2
	Expected Count	0.2	-	1.8	-	2
Reptile	Count	0	-	2	-	2
	Expected Count	0.2	-	1.8	-	2
Total	Count	13	-	110	-	123
	Expected Count	13	-	110	-	123
Mainly Late Developmental						
Rabbit/small mammal	Count	100	61	5	15	181
	Expected Count	83.7	82.6	2.9	11.8	181
Rodent	Count	52	35	2	4	93
	Expected Count	43	42.4	1.5	6.1	93
Dog	Count	0	1	0	1	2
	Expected Count	0.9	0.9	0	0.1	2
Artioactyl/large	Count	65	115	1	8	189
	Expected Count	87.4	86.2	3.1	12.3	189
Wild bird	Count	0	1	0	0	1
	Expected Count	0.5	0.5	0	0.1	1
Turkey/large bird	Count	6	9	0	3	18
	Expected Count	8.3	8.2	0.3	1.2	18
Reptile	Count	1	1	0	0	2
	Expected Count	0.9	0.9	0	0.1	2
Toads and frogs	Count	3	1	0	1	5
	Expected Count	2.3	2.3	0.1	0.3	5
Total	Count	227	224	8	32	491
	Expected Count	227	224	8	32	491
Coalition						
Rabbit/small mammal	Count	170	-	60	2	232
	Expected Count	163.5	-	55.9	12.6	232
Rodent	Count	14	-	19	0	33
	Expected Count	23.3	-	7.9	1.8	33
Artioactyl/large	Count	21	-	14	26	61
	Expected Count	43	-	14.7	3.3	61
Wild bird	Count	4	-	0	0	4
	Expected Count	2.8	-	1	0.2	4
Turkey/large bird	Count	150	-	29	0	179
	Expected Count	126.2	-	43.1	9.7	179
Reptile	Count	1	-	1	0	2
	Expected Count	1.4	-	0.5	0.1	2

Table 20.33. Continued.

		Structure Fill	Structure Roof Fall	Structure Floor Association	Extramural	Total
Coalition						
Toads and frogs	Count	3	-	1	0	4
	Expected Count	2.8	-	1	0.2	4
Total	Count	363	-	124	28	515
	Expected Count	363	-	124	28	515
Mainly Coalition						
Rabbit/small mammal	Count	504	-	-	37	541
	Expected Count	441.2	-	-	99.8	541
Rodent	Count	47	-	-	53	100
	Expected Count	81.6	-	-	18.4	100
Dog	Count	15	-	-	0	15
	Expected Count	12.2	-	-	2.8	15
Artioactyl/large	Count	77	-	-	63	140
	Expected Count	114.2	-	-	25.8	140
Wild bird	Count	7	-	-	1	8
	Expected Count	6.5	-	-	1.5	8
Turkey/large bird	Count	51	-	-	1	52
	Expected Count	42.4	-	-	9.6	52
Reptile	Count	0	-	-	1	1
	Expected Count	0.8	-	-	0.2	1
Toads and frogs	Count	2	-	-	3	5
	Expected Count	4.1	-	-	0.9	5
Total	Count	703	-	-	159	862
	Expected Count	703	-	-	159	862
Mainly Classic						
Rabbit/small mammal	Count	10	-	-	5	15
	Expected Count	12.4	-	-	2.6	15
Rodent	Count	1	-	-	1	2
	Expected Count	1.7	-	-	0.3	2
Artioactyl/large	Count	41	-	-	5	46
	Expected Count	38.1	-	-	7.9	46
Reptile	Count	1	-	-	0	1
	Expected Count	0.8	-	-	0.2	1
Total	Count	53	-	-	11	64
	Expected Count	53	-	-	11	64

ture fill and many more than expected are from extramural contexts. After this period, counts are very low and most are found in structure fill. Artiodactyl/large mammal bone varies considerably with the only distinctive patterns being the greater than expected abundance in structure fill in the Early Developmental sample and in extramural contexts during the Coalition. Wild bird counts are low except in the Early Developmental sample where they are overwhelmingly found in roof fall and floor contexts. Turkey is disproportionately found in roof fall and floor associations in the Early Developmental deposits but in structure fill in Coalition and mainly Coalition deposits. Reptiles are rare and most often found associated with floors in Early Developmental deposits. Toads and frogs are considerably more likely to be associated with floor-associated proveniences in

Early Developmental deposits.

Overall, disposal practices closely adhere to many of the basic principals outlined in the beginning of this section. Bones with more hindrance potential were deposited farther away in structure or extramural fill while those with reuse value may have been cached. Where the larger bone is deposited changes through time. The artiodactyl/large mammal bone is disproportionately found in structure fill of the Early Developmental deposits and in extramural contexts during the Coalition. However, it is unlikely that this signals any major change in the structure of trash disposal and it more likely reflects a greater availability of structure depressions for disposal during the early period. Rabbit remains are small enough that they posed little hindrance. The presence of more small pieces of waste bone in floor associated proveniences does suggest that much of the processing and cooking took place in the structures. The use of larger screen sizes in structure roof and fill proveniences may limit the recovery of these parts when they were disposed of in those contexts.

Nonsubsistence and Ceremonial Use of Animals

Humans use and relate to animals in a variety of ways. This section explores how dogs, turkeys, toads, frogs, and reptiles and certain wild bird, artiodactyl, and carnivore parts were used by the Early Developmental and later populations. Non-food and special use are primarily inferred from the context and the distribution of parts.

Dogs. Mitochondrial DNA evidence indicates that dogs descended from wolves, becoming morphologically distinct between 10,000 and 15,000 years ago (Reitz and Wing 1999:284). Changes include an overall reduction in size, shortening of the facial region of the cranium, and large crowded teeth that are probably the result of selection for size reduction and alterations in reproductive timing associated with a domestic way of life (Morey 1992:182, 199). Domestic dogs probably entered the new world with humans. Modern-looking mandibles dating from 9500 to 8000 BC were found in a hunting camp in a cave in Idaho (Schwartz 1997:16). In the Southwest, relatively early evidence of dogs comes from Ventana Cave dating about 2000 BC (Reitz and Wing 1999:87). Haag (1948:253–254) suggests that dogs lost much of their importance with the advent of agriculture indicating they were primarily used by hunters. Where dogs survived in large numbers they were used for transportation, for food, or for companionship.

Dogs were relatively common in the Early Developmental period deposits at Peña Blanca. With the exception of several (n = 15) specimens from mixed Coalition deposits in the upper fill of an Early Developmental period structure that had two dog burials near the floor (LA 6169, Structure 4), Late Developmental (n = 2) and Mainly Late Developmental (n = 1) deposits within an Early Developmental structure containing four somewhat disturbed dog burials at LA 6170, and a single mainly Late Developmental period element from the roof and floor of Structure 76 at LA 6169, all of the partial and articulated dogs and dog elements are from either Early Developmental or mainly Early Developmental period deposits. Many of the Early Developmental period dogs were recovered as complete or partial animals (Table 20.34) placed in structures at abandonment or in extramural pits. None of the dogs was carefully placed and virtually all of the burials had considerable disturbance so that elements from individual dogs were found throughout the provenience. Comparing the loose elements with dogs from the same feature resulted in relatively few new individuals that are only represented by scattered bones. Table 20.35 summarizes the individuals and isolated parts by age and site. Measurements are given in Appendix 6.3. Only the three largest sites have dog bones and since all three were sampled, additional animals are possible as isolated elements. No dogs or elements have evidence of butchering and the only burning is on two dogs thrown or placed on a smoldering roof at LA 6170.

In the Middle and Upper Rio Grande region, dogs have a limited distribution weighted toward the early end of the time spectrum, and perhaps the result of a greater

Table 20.34. Complete and Partial Dogs Recovered from Peña Blanca

LA	FS	Provenience	Age and Sex	Comments
265	1017	St. 1 upper fill SE quad, midden deposits	5-6m, ♀?	Some parts articulated, others scattered or missing; pitted and etched; much breakage
265	1018	St. 1 upper fill NW quad, midden deposits	5-6m, ♂	Mostly complete, slight disturbance and disarticulated between cervical and thoracic vertebrae; diagonal breaks and peels on left ribs - carnivore disturbance?
265	1237	St. 13 fill	mature, ♂	Cranium and most of the upper body missing; limbs articulated; deeply etched
265	1307	St. 13 fill?	6+m, ?	In a hole and covered with rock but some disarticulation and missing parts; 2 punctures above orbits and puncture in ischium - probably by mature dog; etched and pitted
265	1395	SU 12, Feature 60 - bell-shaped pit	mature, ♂	Upper fill of pit, covered by slab and stones; mostly articulated but missing front limbs and much breakage; slightly arthritic; etched
265	1326	SU 12, Feature 60 - bell-shaped pit	3-4m, ?	Partial, no information on articulation or placement; healed fracture of right second metacarpal shaft
265	1478	St. 13 20 cm above floor, NE quadrant	8-14m, ♀?	Fairly complete, slight disarticulation; healed fracture of R proximal ulna; heavily etched
265	multiple	SU 2, Feature 26 -bell-shaped pit	older, ♂	Dogs A through E were scattered throughout a layer of cobbles and adobe; some parts were articulated but most were not; most are not included in the computer data base. Dog A: a very large dog with healed fractures of T9 & T10 spinous processes, 4 ribs, the distal ends of left tibia and fibula, and a distal phalanx; possible carnivore punctures in ischium; little breakage but etched
265	multiple	SU2, Feature 26 - bell-shaped pit	Young but mature?, ?	Dog B, fairly complete; carnivore gnaws and punctures left ilium, right tibia and femur; active infection T4-T6 anterior body; lesions distal right femur
265	1106	SU2, Feature 26, bell-shaped pit	4-6 m, ?	Dog C, cranium only; several (about 7) holes or punctures in case – all different sizes – carnivore punctures?
265	multiple	SU2, Feature 26, bell-shaped pit	4-5 m, ?	Dog D, fairly complete
265	multiple	SU2, Feature 26, bell-shaped pit	3-4 m, ?	Dog E, partial upper body

Table 20.34. Continued.

LA	FS	Provenience	Age and Sex	Comments
6169	487	St. 4, Feature 13, cobble concentration	young mature, ♀	Covered with cobbles; articulated just above floor; fairly complete
6169	488	St. 4 SW quad, Feature 13, cobble concentration	4-6 m, ?	Covered with cobbles; articulated just above floor; fairly complete; healed fractures on 2 right ribs and probable fracture 1 left rib; old spiral fracture on right humerus
6170	1619	St. 5 SW quad, roof fall and closing	1-2 m, ?	Partial, probably at least partially articulated; rib partially burned - probably from burned roof
6170	1685	St. 5 SE quad, roof fall and closing	1-2 m, ?	Partial, articulated; in a small pocket of sand
6170	1820	St. 5 SE quad, roof fall and closing	young mature, ♂	Large; fairly complete, mostly disarticulated, leg and left foot bones have burns from burned roof; healed fracture of right lower rib; osteophytosis of thoracic vertebra - probably traumatic
6170	1821	St. 5 SE quad, roof fall and closing	4-6 m, ?	Fairly complete; mostly articulated; root etched and pitted

Table 20.35. Summary of Dogs and Dog Elements Recovered from Early Developmental and Mixed Early Developmental Period Deposits

	LA 265		LA 6169		LA 6170		Total
	Individuals	Elements	Individuals	Elements	Individuals	Elements	
0-2 months	-	2	-	-	2	-	4
3-4 months	2	-	-	1	-	-	3
4-6 months	4	-	1	-	1	-	6
6+ months	1	-	-	-	-	-	1
8-14 months ♀	1	-	-	-	-	-	1
mature ♂	3	-	-	-	1	-	4
mature ♀	-	-	1	-	-	-	1
mature	1	-	-	1	-	1	3
Total	12	2	2	2	4	1	23

dependence on hunting and a more mobile lifestyle. None of the Cochiti Dam sites reports dog burials. Dog elements were generally few and with one exception left at the canid level of identification. Harris (1968:209) felt that one of the nine canid MNIs from the North Bank site was sufficiently different from the wild canids to tentatively identify as a dog. The counts or parts are not identified.

At LA 835, a Late Developmental period site on Pojoaque tribal land, about 20 dog skeletons ranging from new born to older individuals were found in the fill of a single pit structure. All three of the mature dogs and one near-mature male dog have damaged anterior teeth that could be the result of hunting and running down artiodactyls. Similar damage was not present on any of the immature dogs, a young female, or another young male. Another site from the same time period and that area, LA 103919, with a fair sample of bone (n = 1,865) had no canid burials and no elements that were diagnostically dog (Akins 2005). At LA 3333, a Late Developmental/Early Coalition site in the Galisteo Basin, a mature female and three puppies were placed in a pit containing a human burial. The pit also contained elements from an additional mature dog. An ulna, possibly from the adult female dog has several chop marks on the shaft and a piece of cranium has an impact fracture. The dog bones from this site were confined to the burial feature and one other feature (Akins n.d.a). At the Coalition and Classic period site of Arroyo Hondo, the only possible dog burial was a few bones from a small mature dog found in the backfill of a kiva excavated by N. C. Nelson in 1916. Otherwise, the MNI for dog was relatively low as was the amount of carnivore-gnawed bone. Elements identified as dog ranged from individuals between a fox and coyote in size to some that were larger and heavier than coyote but smaller than wolf. None of the definite dog bones have evidence of skinning or butchering but Lang and Harris felt that since their context and general condition did not differ from that of food animals, they were probably used for food, or at the very least did not receive preferential treatment upon death (1984:88–89).

To the south, Developmental period sites on the West Mesa of Albuquerque commonly have dog burials. Frisbie (1967:121–122) reports dog burials in cists and on a pithouse floor from the Artificial Leg site. Dogs were placed in the pits with no evidence of special preparation or offerings. Reviewing the reports of reported dog interments, Frisbie concluded that dogs were more important in the earlier period when hunting probably played a larger role in daily life and before increased agriculture made hunting less important (Frisbie 1967:127–129). Subsequent excavations in the same area have recovered additional dogs. At NM I:10:4:16, three dogs were found in the fill of pit structures and three in large pits (Akins 1986b). A dog was found on the floor of Pit Structure 2 at River House (Schmader 1993:54a, b). A few scattered canid bones were found at the Coors Road site, a Late Developmental/Early Coalition site in the South Valley (Sullivan and Akins 1994:132).

Emslie (1978:181) notes a similar trend for the Mancos Mesa Verde area. Dog burials were most common in the period from AD 900 to 975 and decreased after that time. By the Pueblo III period only scattered bones are found in sites in the Mesa Verde region. In the Chaco Center excavations, dog burials were most common during Pueblo II when dogs of all ages were found in pit structures and vent shafts. Only scattered dog bones were found at Pueblo Alto, and Judd reports finding only five articulated and reasonably complete dogs in the fill of kivas and rooms at Pueblo del Arroyo and Pueblo Bonito (Akins 1985:349–353). Frisbie (1967:128–129) also lists dog burials from the Basketmaker site of Shabikeschee and Pueblo II sites of Bc 50 and Bc 51.

The role of dogs at Peña Blanca underwent a similar change. Dog counts and the proportion of possible scatological bone are higher in the early deposits but the amount of carnivore gnawing and punctures on bone varies through time (Table 20.36). The latter suggests that dogs were present, but they were treated differently. Early on, dogs seem to have been more important and more esteemed so that when a dog died or was killed, it was placed in a pit with an attempt to protect the body. The amount of carnivore punctured dog remains (see Table 20.34), especially the puncture holes in the cranium of a four- to six-month-old dog, suggests that in some instances dog parts were rescued and buried to prevent further ravaging. Furthermore, a considerable number of the dogs have healed fractures including those of ribs, vertebral spines, an ulna, a tibia and fibula, and a metacarpal. And, in three instances, dogs were placed in structures in contexts suggesting they were part of closing rituals. At LA 265, a young female dog was found lying on the left side with head to the west just above the floor of Structure 13. Structure 4 at LA 6169 had a young mature male and a four- to six-month-old dog covered with cobbles, fire-cracked rocks, and ground stone just above the floor in the southwestern quadrant. The dogs were somewhat twisted but lying side by side, oriented east to west with heads in opposite directions. One was on the right side and the other on the left. At LA 6170, four dogs were found among the burned roof fall just above the floor in the south half of Structure 5. The mature dog was partially articulated but quite contorted. The older of the immature dogs was mostly articulated, lying the left side with the head to the northwest. The two youngest were so small and fragile they were not mapped. All this suggest that dogs played a much more important role in the Early Developmental period, perhaps due to a greater emphasis on hunting, especially of artiodactyls, or as guardians when fewer people occupied the residences.

Table 20.36. Carnivore Gnawed and Punctured Bone and Possible Scatological Bone

	Sample Size	% Gnawed and/or Punctured	% Possible Scatological
Early Developmental	7802	1.6	3.6
Mainly Early Developmental	437	0.7	0.7
Late Developmental	134	5.1	3.7
Mainly Late Developmental	593	2.5	3.4
Coalition	572	1.6	1.9
Mainly Coalition	976	3.8	0.6
Mainly Classic	81	1.2	-
Unknown	195	1	1
Total	10790	1.7	3

Turkeys. Turkeys have a more limited distribution than dogs in the Early Developmental period. Table 20.37 lists the components that have turkey as well as large and very large bird that could be turkey, but the pieces are not diagnostic. Large and very large bird in contexts that do not also have turkey are less likely to be turkey and are suspect. LA 265, SU3, Feature 14, has no other bird, but two turkey elements were found in mainly Early Developmental deposits in higher fill units of Structure 5 at LA 6170 and another was in the fill of Feature 5 overlying Structure 5, making the very large bird bone from that structure more likely to be turkey. None of the Peña Blanca Early Developmental turkey bones is burned. Carnivore gnawing and tooth punctures are present on turkey bones from two structures. The impacts and spiral breaks are also from one of those structures and most likely are the result of carnivores crunching and breaking the bones.

Considerable debate surrounds the use and domestication of turkeys in the Southwest. Domestication dates back to at least AD 700 to 900 (Schorger 1966:20) with abundant and often conflicting archaeological evidence as to whether or not turkeys were eaten. Both Coronado in 1540 and Oñate in 1598 observed that the inhabitants of Hawikuh raised a few

Table 20.37. Peña Blanca Early Developmental and Mainly Early Developmental (*) Period Components with Turkey and Probable Turkey Remains

Site/component	Taxon	Count	Comments
LA 265			
Structure 1 upper fill	turkey	3	Humerus and tarsometatarsus shaft fragments; 1 with carnivore gnaws and punctures
	large bird	2	long bone fragments
Structure 1 roof fall	turkey	3	tibiotarsus fragments and muscle splints
SU 3, Feature 14	large bird	1	rib shaft
SU 3, Feature 34 or 15/19	turkey	1	turkey burial; male with fractured tibiotarsus
LA 6169			
Structure 4 roof fall, floor fill	large bird	10	long and flat bone fragments; 4 with impact-like breaks and 1 spiral break
	very large bird	41	long and flat bone fragments; 4 with spiral breaks
	turkey	79	scattered parts of at least 2 birds; 8 with carnivore punctures; 10 with spiral breaks
Structure 4 floor	large bird	13	long and flat bones
	very large bird	24	long and flat bones
	turkey	153	scattered parts of at least 4 birds (2 could be the same as in roof fall & floor fill; 26 with carnivore gnaws, punctures, or both; 1 with a spiral break
Structure 47 roof fall, floor fill	turkey	1	ulna shaft fragment
LA 6170			
Structure 5 wind, water deposits*	very large bird	1	flat bone fragment
	turkey	1	tarsometatarsus fragment
Structure 5 roof, closing*	turkey	1	phalanx
Structure 5 floor fill, contact	very large bird	1	long bone shaft fragment; juvenile

turkeys mainly so their feathers could be used for religious purposes and that rabbits furnished most of their meat and skins (Schorger 1966:34). Turkeys were more abundant at the Rio Grande Pueblos as Espejo found abundant turkeys in and around Puaray at Bernalillo and Rodriguez observed large flocks of turkeys in the Galisteo area pueblos. Early Spanish accounts either make no mention of the Pueblos eating turkeys or repeat claims that turkeys were not eaten, yet the near universal list of food items contributed to the Spanish was corn, beans, pumpkins, and turkeys (Schorger 1966:36–39). Although feathers were undoubtedly important, some archaeological evidence indicates turkeys were eaten, perhaps when other sources of animal protein became scarce or when sufficient crops were available to provision larger numbers of birds.

Evidence of turkey husbandry at Peña Blanca is virtually absent except in deposits from the very latest time period at LA 249. A single piece of egg shell was recovered from Area 2 at LA 265 in a large irregular pit of indeterminate function. A piece of egg shell was also recovered in a flotation sample from a mainly Late Developmental period deposit in the fill of Structure 76 at LA 6169. The lack of egg shell and young birds strongly suggest that turkeys were not bred and raised at these sites, at least until the very end of the prehistoric occupation as represented at these sites. Finding only mature birds and mostly males is consistent with keeping birds for their feathers rather than for eating. The single turkey burial, a male from LA 265, was in the fill of a bell-shaped pit and had a double fracture of the left tibiotarsus. The upper fracture had never reunited but the ends of the bones were rounded from friction. The lower fracture had slipped considerably and a large callous unites the bone. This was not a very mobile turkey and it is doubtful that it was able to forage for itself. Pollen recovered from among the gizzard stones, and well protected from contamination within the stomach cavity, was largely economic species including cactus, cholla, corn, and globemallow (Holloway, Chapter 23), This, the injury, and formal burial all indicate this was a kept bird who was provisioned and given treatment similar to a dog when it died. A similar fracture, a femur that was completely fractured, slipped, and callused together, was found near the floor in a Coalition period pit room (Structure 70) at LA 6169. Again, this bird would have had limited mobility and was probably fed and kept for feathers. In this instance, the bone has a carnivore puncture in the shaft so it may have been killed by or fed to the dogs.

Turkeys from the Early Developmental period and possibly the Coalition were probably tamed rather than domestic birds, tamed in the sense that some restraint was necessary to keep them at the site (e.g., Schorger 1966:20). Penning and broken legs would have prevented birds from returning to nearby riverine and piñon-juniper environs. It takes only a few turkeys to provide a family with a supply of feathers for making blankets. Wild turkeys have up to 400 suitable feathers and turkeys molt twice a year providing a harvest of feathers. Blankets made from turkey feathers are warmer than rabbit fur blankets and last much longer (Blinman 2001:21). Keeping a few tamed or domesticated turkeys to provide a steady supply of feathers seems to be the strategy employed at Peña Blanca, as there is no evidence they were eaten, at least by humans.

Turkey and large bird remains occur mostly in relatively small numbers after the Early Developmental period occupation (Table 20.38) . The only exceptions are the Coalition period deposits in the fill of Structure 70 at LA 6169 (n=135) and the mainly Coalition period deposits in the fill of Structure 4 at that same site (n=49). No more than two birds are represented by the specimens from Structure 70 and about a quarter (26.6 percent) are muscle splints, an indication that some parts were discarded while still covered with flesh, and even some of the large and delicate elements are complete. Carnivore gnawing and tooth punctures are relatively rare. None of those from the fill of Structure 70 have gnawing or punctures recorded but one of each was observed from Structure 4 as were 4 impact and 15 spiral breaks that could result from the carnivores or

Table 20.38. Summary of Late Developmental, Coalition, and Classic Period Large Bird and Turkey Bones

Time/site/component	Large Bird	Very Large Bird	Turkey	Total
Late Developmental				
LA 6169, St. 76 floor	1	-	1	2
Mainly Late Developmental				
LA 249, St. 6 fill	1	-	-	1
LA 6169, St. 76 roof & floor fill	5	-	2	7
LA 6169, burials in St. 76 fill	2	-	-	2
LA 6170, Feature 5	-	2	1	3
Coalition				
LA 6169, St. 10 fill	1	-	-	1
LA 6169, St. 10 floor fill & floor	1	-	1	2
LA 6169, St. 15 fill	2	-	2	4
LA 6169, St. 15 floor fill & floor	4	-	2	6
LA 6169, St. 16 fill	2	-	7	9
LA 6169, St. 16 floor fill & floor	2	-	9	11
LA 6169, St. 70 fill	16	-	119	135
LA 6169, St, 70 floor fill & floor	2	-	8	10
LA 6169, SU 10	1	-	-	1
Mainly Coalition				
LA 6169, St. 4 fill	6	-	43	49
LA 6170, SU 12	-	-	1	1
LA 6171, St. 9 fill	-	1	-	1

from processing. Burning is relatively rare and found only in the Late Developmental (one of two) and the Coalition (7 of 177 or 3.9 percent) specimens.

For the Cochiti Dam sites, at LA 9154 (Late Coalition/Early Classic period) turkey bones were abundant and at least one bone was burned and several had cut marks or evidence of use (Harris 1971:70) with no mention of turkey burials. Turkey bones were also recovered from the Coalition period sites of LA 6461 (15 percent in a sample of 59) and North Bank or LA 6462 where they were abundant and included a fractured tibiotarsus that had healed but at a slight angle and a fractured humerus that had slipped before healing, as well as young birds and egg shells. A few were charred and Harris presumes that turkeys were used as food (Harris 1968:198–199, 204–205). Alfred Herrera or LA 6455 (Classic period) also had abundant turkey remains including at least eight young birds and egg shell. Three turkey bones had healed fractures and one distal tibiotarsus was burned (Harris 1968:222). LA 70 (Classic period) has the only mention of a turkey burial. Otherwise, turkey comprised 20.5 percent of the identifiable bone. Some bone was burned and several had evidence of utilization (Harris 1976:H-7, H-26).

To the east, at the Galisteo Basin Late Developmental/Early Coalition period site of LA 3333, turkey bones are fairly sparse (2.0 percent) but widespread. Juvenile birds and a few eggshells (n = 9) were found suggesting some birds were raised at that site. Enough processing and fragmentation and infrequent burning suggest that turkeys may have been eaten (Akins n.d.a). At Arroyo Hondo, slightly north and dating later, evidence for raising turkeys is abundant. Egg shell, an egg clutch with unhatched poults, immature turkeys, healed fractures of wing and leg bones, and pens containing manure provide good evidence of husbandry throughout the occupation. Turkeys were presumably eaten (Lang and Harris 1984:101, 107) and feather cord textiles were commonly found with human burials (Lang 1984:255). Like Arroyo Hondo, Pindi Pueblo (Late Coalition/Early Classic) had turkey bins, egg shell, numerous turkey bones, and human burials wrapped in feather cloth. These, too, were presumed to have been eaten, based on large numbers and their scattering throughout the refuse (Stubbs and Stallings 1953:47).

Thus, while keeping turkeys has a long history in the Cochiti area, raising turkeys appears to have come later, perhaps in the Coalition but with the best evidence in the Classic period. Likewise, turkeys were not eaten early on and were probably much more important for the feathers that the live birds provided. In sites with evidence of domestication and of relatively large scale production of birds, these may also have been used for food and provided an alternative or substitute source of protein when wild resources became scarce or difficult to obtain. A near absence of large animals at the Cochiti Dam site of LA 9154, led Harris (1971:74) to suggest that domestic turkeys, along with local small game, provided meat for the site inhabitants.

Wild Birds. Early accounts document the ceremonial use of feathers at all of the Pueblos (Schroeder 1968; Tyler 1979), as do archaeological remains and other evidence at prehistoric sites. At Pottery Mound, a Classic period site just south of Albuquerque, as many as 50 species of bird were identified in the faunal remains (Emslie 1981:853) and painted kiva murals frequently display bird images or feathers (73 of the 105 murals) (Roler 1999:36–37) suggesting that birds and feathers were as important in prehistoric rituals as they are to the modern Pueblos. Birds also played an important ritual role in the northwestern part of the state. At Pueblo Alto, wing elements were almost always the most common parts found (Akins 1987a:479) and a single extramural pit from that site contained 17 left and 12 right wings, 5 left and 7 right legs, and few axial parts from several species of hawk and eagles along with other offerings of calcite, argilite, and shell (Akins 1985:382).

Unlike the turkey remains, wild bird parts at Peña Blanca were often found in locations suggesting ceremonial deposition (Table 20.39). Provenience types with one or more bird wing elements, cranial parts, or talons include roof fall and closing deposits, structure floors, vent shafts and tunnels, occasional floor features, and human burials. The most consistently found birds are the scaled quail, horned lark, western meadowlark, and flicker. Birds of prey are rare and elements are often talons found on floors or in closing deposits. Wild bird parts were occasionally found in the upper fill of structures (n = 1 horned lark carpometacarpus from the upper fill of Structure 1 at LA 265) or in extramural areas (n = 1 horned lark ulna from SU2 Feature 24 at LA 265 and n = 11 from the area around the vent shaft for Structure 50 at LA 6170). Those from LA 6170 were found in excavations to locate the vent shaft and could have been ceremonially deposited. Elements include a partial left wing, a right ulna, and sternum from a horned lark, a duck coracoid, a scaled quail humerus and ulna, and bones from a partial left wing of a flicker.

Later assemblages from Peña Blanca have few wild bird bones and these are almost always single elements rather than parts suggesting wings or other ceremonial use. The two exceptions are a scaled quail scapula and humerus from the upper fill of Structure 4 at LA 6169 and a scorched golden eagle talon from the fill of Structure 9 at LA 6171. Both are from mainly Coalition deposits.

While none of the bird elements have distinctive processing marks indicating disarticulation or removal of feathers, many could be the remains of bird wing fans or skins. Lang and Harris (1984:73–74) describe a raven skin from Arroyo Hondo that retained the legs, wings, and bill and other instances of disarticulation they believed were examples of manufacture of wing fans. The main differences between the Peña Blanca bird remains and those from Arroyo Hondo are in the abundance and the kinds of birds recovered. Wild birds comprised between 7.7 and 17.3 percent

Table 20.39. Possible Ceremonial Disposition of Wild Bird Parts in Early Developmental Period Deposits

	Species	Parts
LA 265		
Structure 4 floor	golden eagle	talon
Structure 4 vent shaft 1	scaled quail	sternum
	horned lark	R & L humerus
Structure 4 vent shaft 2	scaled quail	R coracoid
	horned lark	L coracoid
Structure 4 vent tunnel	horned lark	R carpometacarpus
Structure 13 vent shaft	western meadowlark	beak
Structure 13, subfloor human burial	flicker	R humerus to carpometacarpus
		L radius to wing digit
	western meadowlark	L humerus to wing digit
SU2, F. 23 bell-shaped pit w/	scaled quail	R tarsometatarsus
human burial	horned lark	L ulna
LA 6169		
Structure 4 roof and floor fill	flicker	L ulna
	western meadowlark	L tarsometatarsus
Structure 4 floor	merlin	R humerus
Structure 4 vent, F. 66	scaled quail	scapula & R humerus**
Structure 47 roof fall & floor	duck	L radius
Structure 47 floor	sandhill crane	L tibiotarsus
Structure 47 ash pile	horned lark	vertebrae (3)
		L humerus to carpometacarpus
		R ulna
	Passeriformes	R ulna
Structure 47 vent tunnel	scaled quail	L humerus - scorched
	western meadowlark	tarsometatarsus
SU 1, Feature 29	flicker	L ulna and carpometacarpus
LA 6170		
Structure 5 roof fall & closing*	golden eagle	talon
Structure 5 ashpit	Passeriformes	sternum, R ulna & coracoid
Structure 5 vent tunnel	scaled quail	L ulna
Structure 50 floor fill & floor	flicker	R ulna
Structure 50 ashpit	horned lark	L ulna
	Passeriformes	R humerus – scorched
St. 50 sealed storage pit, F. 156	horned lark	L ulna
St. 50 sealed storage pit, F. 171	horned lark	L humerus
LA 6171		
Structure 26 floor*	great horned owl	talon - burned

*coded as Mainly Early Developmental period ** coded as Mainly Coalition period

of the MNI for the eight Arroyo Hondo components and are far more diverse (Lang and Harris 1984:59–62). Similar MNI calculations have not been made for Peña Blanca but the proportion would be much lower.

Bird parts found at the Late Coalition/Early Classic Cochiti Dam site of LA 9154 were commonly wing elements. Five pairs of raven wings and a pair of crow wings were found in the same field specimen bag, and hawk and owl bones from this site were mainly wing elements with some lower legs and feet. Harris interprets the wings as likely ceremonial, probably traded from the south or east. An abundance of lower legs from a variety of hawks suggests these, too, were ceremonial (Harris 1971:69–70, 73). At LA 3333, pieces of a sternum, wings, and lower legs from a red-tailed hawk were found during surface stripping. Other bird elements include hawk talons, eagle ulnas made into whistles, a kestrel wing bone, a horned lark ulna, raven wing and leg elements, and a crow beak and ulna, some or all of which could have been ceremonial deposits (Akins n.d.a).

At Peña Blanca, potential ceremonial use of bird wings and feet or talons occurs throughout the occupation. Frequencies seem to decrease through time but the lack of comparative data from other regional sites makes it difficult to determine whether this is a function of smaller sample sizes or a real trend that could indicate changes in ritual practices or in the populations inhabiting these sites.

Artiodactyls. Some artiodactyl parts appear to have been ceremonially deposited (Table 20.40). This is especially true of the burned antler and partial cranium of a deer with a corn cob inside the cranial case and kernels scattered around it on the floor of Structure 50, a partial bighorn cranium with the horn on the floor of Structure 9 at LA 6171, a partial deer cranium with antler in the vent shaft fill of Structure 4 (Feature 66) at LA 6169, and possibly the complete mandible left on the floor of Structure 47 at LA 6169. Other finds in components that commonly have potential ceremonial deposition are usually teeth or mandible or maxilla fragments that may or may not have any significance. Unlike the wild bird wing parts, artiodactyl teeth and associated bone are commonly found elsewhere in the site deposits. However, cranial parts with attached antler or horn are not and could well represent the remains of ceremonial head dresses left behind when a structure was abandoned. Henderson and Harrington (1914:14) report that bighorn skulls were found in ruins on the Pajarito Plateau. Burned antler and horn, often attached to cranial parts, and mandibles have also been found on floors of some large pit houses in Hohokam sites (Szuter 2000:211–213). According to Hill, the Santa Claras used deer antlers and pronghorn horns for dance costumes, and antlers were placed on shrines (Hill 1982:50, 52). Zia hunters placed decorated deer heads with horns on the roofs of houses, burying them when they got very old (White 1974:304).

Other parts may also have been used in ceremonies like feet and hoofs that could have been used on ceremonial canes, but again, few of these were found and could also represent no more than disposal of feet. The more suggestive occurrences include much of an elk foot from SU2 bell-shaped storage pit Feature 26 at LA 265; a first and second phalanx from a deer on the floor of Structure 4 at LA 6169; an articulated left hind foot of an elk (distal tibia, tarsals, and the proximal third of the metatarsal) and an articulated partial right rear foot of a deer (distal tibia and two tarsals) from the roof fall layer of Structure 2, LA 6170; and second and third phalanges from a mule deer on or near the floor in Structure 50 at LA 6170. Little of the LA 265, Feature 26 fauna was analyzed, but it did contain parts of several dogs.

Only one similar find came from later dating deposits. In Structure 76 at LA 6169 a partial deer cranium (face region) was found in the roof fall and floor fill component (mainly Late Developmental). No combinations of foot elements that could suggest use of feet were analyzed.

At the Cochiti Dam site of the North Bank site (LA 6462) in a Late Developmental period pit structure (Unit IV pithouse), two bison horns were found on the floor and a deer mandible on the hearth (Lange 1968a:39). A photo of the bison horn in situ (1968a:39) looks suspiciously like bighorn and the only mention of *bos*/bison in the accompanying faunal report is of a phalanx and tooth fragment where the species could not be determined (Harris 1968:200–218). Unfortunately, no other similar information is reported for the Cochiti Dam excavations or Arroyo Hondo.

Carnivore Parts. A few carnivore parts also suggest ceremonial deposition. These include the partial bear mandible on the floor of Structure 4, a carnivore tooth on the floor of

Table 20.40. Possible Ceremonial Disposition of Artiodactyl Cranial Parts in Early Developmental Period Deposits

	Species	Parts
LA 265		
Structure 1 F. 18 human burial	bighorn sheep	mandible fragment
SU 2 F. 23 bell-shaped pit with human burial	pronghorn	mandibular premolar
LA 6169		
Structure 4 roof & floor fill	deer	maxillary molar
Structure 4 floor	deer	mandibular molar
Structure 4 vent, F. 66**	deer	partial cranium with antler (coded Mainly Coalition)
	pronghorn	mandibular tooth fragment
Structure 47 floor	deer	complete L mandible
St. 47 F. 121 storage bin	deer	R mandible - partial
LA 6170		
Structure 50 roof & closing	pronghorn	horn shaft
Structure 50 floor	deer	basioccipital and parietal with attached antler
Structure 50 vent shaft	deer	mandible fragment
LA 6171		
Structure 9 floor	bighorn sheep	R posterior vault with horn
LA 115862		
Structure floor	cow or bison	molar or premolar fragment

** coded as Mainly Coalition period

Structure 47 at LA 6169, and a canid canine tooth with a human burial in the fill of Structure 1, a badger ulna in an extramural pit containing a human burial, a badger radius on the floor of Structure 1, and a weasel mandible in a sealed pit in Structure 4 at LA 265. The other carnivore parts were found in fill or extramural contexts with no other evidence they were deliberately placed.

Amphibians and Reptiles. Both the proveniences and the habits of some species suggest that some toads, frogs, and snakes may have been ceremonially deposited. A conceptual link between rain and water and toads and frogs seems natural but no references to their use has been found in the ethnographic literature reviewed. However, horned snakes, lizards, and frogs or tadpoles are found on the Zia medicine bowls of the Koshari society (White 1974:316–317). At Peña Blanca, toads, frogs, and sometimes snakes and lizards (Table 20.41) were found as complete or partial skeletons. Partial skeletons are generally those that were not recognized in the field so have passed through screens retaining only the largest elements.

Some of these animals could have reached their final resting place by burrowing, inhabiting the burrows of other animals, or accidentally falling into pits and structures. Woodhouse's toads in the North Valley of Albuquerque have a propensity to fall into deep holes and more than one can be found in the same posthole left uncovered overnight. However, this propensity does not account for the toads, spadefoots, and frogs found in sealed pits and plastered into floors nor does it account for the diversity of species and the consistent presence in components with other potential offerings at Peña Blanca. Two of the three spadefoot toad species found in the vicinity were tentatively identified in the Early Developmental deposits, both from the same structure (Structure 5 at LA 6170). The Plains spadefoot toad occupies rodent or self-constructed burrows, emerging at night after a

Table 20.41. Possible Ceremonial Disposition of Reptile and Amphibian Parts in Early Developmental Period Deposits

	Species	Part
LA 265		
Structure 1 F. 238 burial in upper fill	Plains or Woodhouse's toad	2 partial skeletons
Structure 1 floor	nonvenomous snake	skeleton
	Great Plains toad	partial skeleton
	Woodhouse's toad	L femur and tibiofibula
Structure 1 vent shaft	Woodhouse's toad	2 partial skeletons
	Plains or Woodhouse's toad	partial skeleton
	northern leopard frog	partial skeleton
Structure 4 sealed floor pit F.76	Great Plains toad	partial skeleton
Structure 4 vent shaft 1	red-spotted toad	2 partial skeletons
Structure 4 vent shaft 2	Great Plains toad	partial skeleton
Structure 4 vent tunnel	Plains or Woodhouse's toad	partial skeleton
Structure 13 floor	Plains or Woodhouse's toad	both tibiofibulae
Structure 13, subfloor human burial	Woodhouse's toad	skeleton
Structure 13 vent shat	red-spotted toad	R innominate
SU 2, F 23 bell-shaped pit with human burial	Plains or Woodhouse's toad	partial skeleton
	lizard	maxilla
	snake	4 vertebrae
SU 3 F. 14 large pit	red-spotted toad	partial skeleton
	Woodhouse's toad	partial skeleton
SU 3 F. 11 large thermal feature	Plains or Woodhouse's toad	partial skeleton
LA 6169		
Structure 4 roof fall and floor fill	Woodhouse's toad	partial skeleton
Structure 4 floor	true toads	partial skeleton
Structure 4 cobble concentration	Plains or Woodhouse's toad	partial skeleton
Structure 4 vent, F. 66**	Plains or red-spotted toad	radio-ulna
Structure 47 F. 119 storage bin	box turtle	carapace marginal
Structure 47 F. 121 storage bin	northern leopard frog	cranium and vertebra
Structure 47 vent tunnel and shaft	Great Plains toad	partial skeleton
	Woodhouse's toad	cranium and tibia
Structure 47 second vent tunnel	Woodhouse's toad	vertebra
LA 6170		
Structure 2 floor	true toads	atlas vertebra
Structure 5 roof & closing*	nonvenomous snake	ribs and throacic vertebra
	Great Plains toad	R innominate
Structure 5 floor	nonvenomous snake	skeleton
	Great Plains toad	pelvis and 2 R humeri
Structure 5 vent tunnel	whiptail	partial skeleton
	Great Plains toad	2 partial skeleton
Structure 5 floor plaster	Plains spadefoot	partial skeleton
Structure 5 ashpit	New Mexico spadefoot	partial skeleton
	red-spotted toad	partial skeleton
	nonvenomous snake	2 thoracic vertebrae
Structure 50 roof and closing	nonvenomous snakes	3 thoracic vertebrae
Structure 50 F. 166 sealed storage pit	Great Plains toad	2 skeletons
	red-spotted toad	partial skeleton
	northern leopard frog	partial skeleton
SU12 F. 69 large bell-shaped pit	Plains or Woodhouse's toad	2 partial skeletons
	red-spotted toads	partial skeleton
	Woodhouse's toad	2 partial skeletons

* coded as Mainly Early Developmental period

** coded as Mainly Coalition period

summer rain. New Mexico spadefoot toads burrow as deep as 90 cm in loose soils and are largely nocturnal (BISON-M n.d.; Degenhardt et al. 1996:36–42). While these habits could allow for natural deposition, one was plastered into the floor and the other was in the ashpit, both of which are unlikely locations if the deposition was natural. Of the three potential toad species, Woodhouse's toad is found in mesic areas near water and rests in shallow burrows. The terraces where the Peña Blanca sites are located are neither mesic nor that near water but this species seems to be one of the more likely to have been accidentally deposited and is one of the more common in both skeletons and parts. They were found on floors, in vent shafts, with human burials, in pits, and in roof fall layers, most of which contained some other potential ceremonial items. Great Plains toads are proficient burrowers and may be more likely to be found in situations like at these sites. They are also nocturnal. The most common toad found as skeletons, Great Plains toads were found on floors, in sealed pits, in vent shafts, and in roof fall and closing deposits. Probably the least numerous of the toads, red-spotted toads, prefer rocky areas near springs and pools in arroyos and are largely nocturnal and often live under large flat rocks (BISON-M n.d.; Degenhardt et al. 1996:51–59). Again, this species is not impossible for the site area but is unlikely in deep deposits. Here they were found in vent shafts, extramural pits, sealed floor pits, and an ashpit, most or all of where accidental deposition is unlikely. Northern leopard frogs live in wet environs but will venture some distance during wet periods (BISON-M n.d.; Degenhardt et al. 1996:88–89) making this species an unlikely natural find in the Peña Blanca sites. Relatively rare, frogs were found in a vent shaft, a storage bin, and a sealed pit.

Like the toads, snakes and lizards occupy rodent burrows and could be accidental additions to the archaeological deposits. It is largely the presence of complete snakes and lizard crania in contexts with other potentially ceremonial deposits that suggests that these, too, could have been intentionally placed with human burials, on floors, in roof and closing deposits, in ash pits, and in a vent tunnel.

Summary of Ceremonial Use

When the presence or absence of potential ceremonial deposition of animal remains is considered (Table 20.42), less than half (20 of 43) have only one of the animal groups considered. Dogs were always found with at least one other animal group. Of the 12 components with artiodactyl crania parts, 2 (16.7 percent) had no other animal group. Bird parts were found in 20 components and had no other animal group in 6 (30 percent). Carnivore parts appear in only 5 and were always with some other group. Snakes were relatively rare, found in only seven components and only once (14.3 percent) without another animal group. Toads and frogs are the most common, found in 29 components and with no other animal group 10 times (34.5 percent). Components with two animals groups (n = 16) are most likely to have bird and toad or frog (n = 5) with several groups having two each (artiodactyl and toad or frog, artiodactyl and bird, artiodactyl and toad or frog, and carnivore and toad or frog), and single incidences of artiodactyl crania and carnivore, artiodactyl crania and snake, and of snake and toad or frog. When three are found (n = 4), the most common combination is artiodactyl, bird, and toad or frog (n = 2) with single instances of bird, snake, and toad or frog and of carnivore, snake, and toad or frog. Only three components have four, a human burial with artiodactyl, bird, snake, and toad or frog, a structure floor with artiodactyl, bird, carnivore, and toad or frog, and a roof fall and closing layer with dog, bird, snake, and toad or frog. Sample size alone cannot account for the variation as two of those with four animal groups have relatively small samples, 21 and 141, and those with only one animal group have sample sizes ranging from 1 to 678 specimens.

The frequent occurrence of potential ceremonially deposited animals or animal parts in

Table 20.42. Summary of Early Developmental Components with Potential Animal Ceremonial Deposition (from Tables 20.34, 20.39-20.41)

	Sample Size	Dog Burial	Artiodactyl Cranial	Bird Cranium, Wing, or Talon	Carnivore	Snake Skeleton or Vertebrae	Toad/ Frog
LA 265							
Structure 1 F. 18 human burial	107	-	X	-	X	-	-
Structure 1 F. 238 human burial	82	-	-	-	-	-	X
Structure 1 floor	277	-	-	-	X	X	X
Structure 1 vent shaft	266	-	-	-	-	-	X
Structure 4 floor	28	-	-	X	-	-	-
Structure 4 F. 76 sealed pit	19	-	-	-	X	-	X
Structure 4 vent shaft 1	77	-	-	X	-	-	X
Structure 4 vent shaft 2	169	-	-	X	-	-	X
Structure 4 vent tunnel	21	-	-	X	-	-	X
Structure 13 floor	6	X	-	-	-	-	X
Structure 13 subfloor human burial	21	-	X	X	-	X	X
Structure 13 vent shaft	26	-	-	X	-	-	-
SU 2 F. 23 bell-shaped pit w. human burial	154	-	-	-	X	-	X
SU 3 F. 14 large pit	50	-	-	-	-	-	X
SU 3 F. 11 large thermal pit	19	-	-	-	-	-	X
LA 6169							
Structure 4 roof fall and floor fill	255	-	X	X	-	-	X
Structure 4 floor	328	-	X	X	X	-	X
Structure 4 floor cobble concentration	68	X	-	-	-	-	X
Structure 4 vent, F. 66**	217	-	X	X	-	-	X
Structure 47 floor	74	-	X	X	-	-	-
Structure 47 ash pile	231	-	-	X	-	-	-
Structure 47 F. 121 storage bin	26	-	X	-	-	-	X
Structure 47 vent tunnel & shaft	158	-	-	X	-	-	X
Structure 47 second vent tunnel	61	-	-	-	-	-	X
SU 1, Feature 29	678	-	-	X	-	-	-
LA 6170							
Structure 2 floor	1	-	-	-	-	-	X
Structure 5 roof fall & closing*	141	X	-	X	-	X	X
Structure 5 floor	79	-	-	-	-	X	X
Structure 5 ashpit	144	-	-	X	-	X	X
Structure 5 vent shaft	17	-	-	-	-	-	X
Structure 5 vent tunnel	30	-	-	X	-	-	X
Structure 5 floor plaster	1	-	-	-	-	-	X
Structure 50 roof & closing	503	-	X	-	-	X	-
Structure 50 floor	30	-	X	X	-	-	-
Structure 50 ashpit	163	-	-	-	-	X	-
Structure 50 sealed storage pit 156	1	-	-	X	-	-	-
Structure 50 sealed storage pit 166	13	-	-	-	-	-	X
Structure 50 sealed storage pit 171	63	-	-	X	-	-	-
Structure 50 vent shaft	57	-	X	-	-	-	X
SU 12, F. 69 bell-shaped pit	45	-	-	-	-	-	X
LA 6171							
Structure 9 floor	9	-	X	-	-	-	-
Structure 26 floor*	63	-	-	X	-	-	-
LA 115862							
Structure floor	48	-	X	-	-	-	-

* Mainly Early Developmental period ** coded as Mainly Coalition period

similar proveniences is certainly suggestive. It is possible that time is a factor in what kinds of animals were used in closing rituals. Structures that have dogs in the closing deposits (LA 265, Structure 13 and LA 6170, Structure 5) may have been abandoned earlier than those with horn or antler (LA 6170, Structure 50 and LA 6171, Structure 9), while the one structure with both (LA 6169, Structure 4) seems to date in between. Data on ceremonial use of animals needs to be integrated with other kinds of material to explore and confirm the ceremonial nature of these deposits.

Implications for Mobility Strategies

Several aspects of the Peña Blanca Early Developmental period faunal assemblage suggest that these early residents were more mobile than most of those who followed. Any conclusions are somewhat problematic in that the faunal samples from later periods are not as large and often come from a limited number of sites and provenience types. Yet, it is within a comparative framework that the evidence for mobility and changes in animal utilization is best evaluated.

The Early Developmental period faunal data provides evidence for both a heavy reliance on garden hunting, consistent with a population that was at least seasonally sedentary, and for hunting at a distance (Fig. 20.5). If the relative proportion of cottontail to jackrabbits (a high lagomorph index) is an indication of garden hunting, which it seems to be for at least this general area, then reliance on garden hunting during the Early Developmental period was high, but surpassed by that during the Coalition and perhaps the Classic, a very small and mixed sample. Relative to rabbits, the number of artiodactyl bones (artiodactyl index) is almost always fairly small (Fig. 20.5), but the proportions of identified species vary. Residents of the Early Developmental sites may have frequented different areas for artiodactyl hunting either logistically or before returning to the residential sites. LA 6169 and LA 6170 have more southeastern grassland species (pronghorn) while LA 265 has more highland species (bighorn and elk).

With few exceptions, deer is the most numerous of the artiodactyl species and is almost always followed by pronghorn. Elk, bighorn, and bison are rare. The exceptions are the mainly Early Developmental and Coalition deposits, disregarding the large contribution of

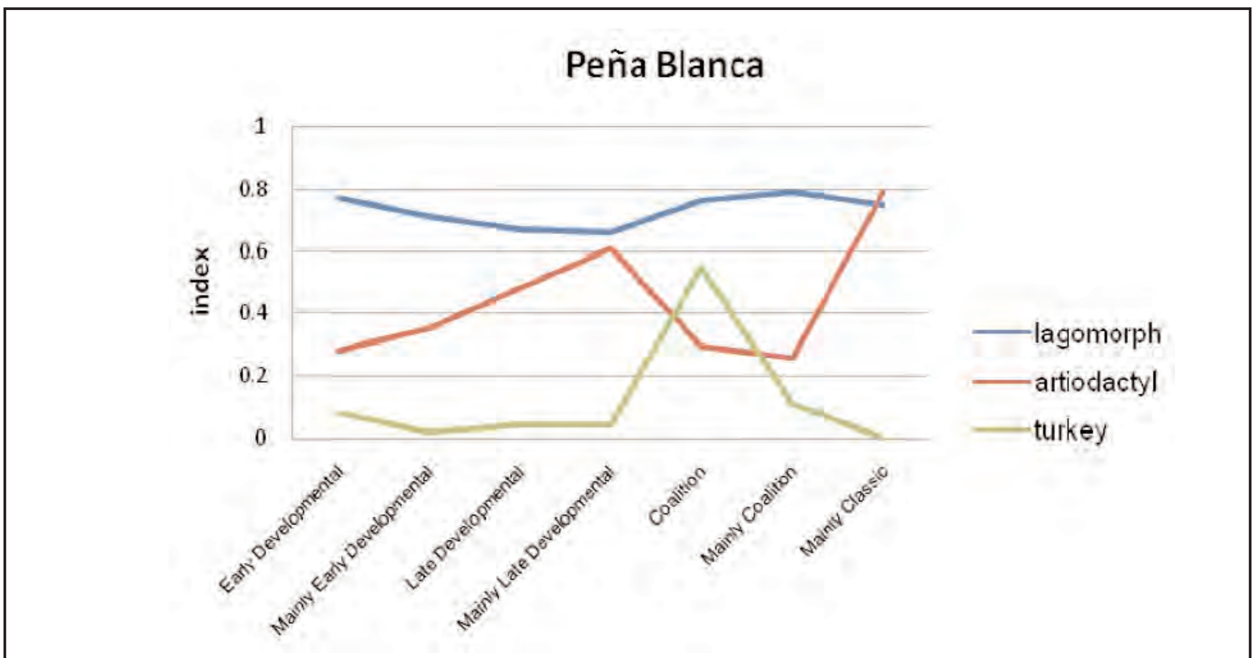


Figure 20.5. Peña Blanca faunal indices.

Table 20.43. Summary of Identified Artiodactyl Specimens by Time Period for Peña Blanca (percent of identified)

	N =	Elk	Deer	Pronghorn	Bighorn	Bison	Bos/ Bison
Early Developmental	220	14.1	48.2	24.5	9.5	2.7	0.9
Mainly Early Developmental	13	-	23.1	61.5	15.4	-	-
Late Developmental	13	7.7	61.5	15.4	15.4	-	-
Mainly Late Developmental	41	-	53.7	34.1	12.2	-	-
Coalition*	10	-	30	50	10	-	10
Mainly Coalition	28	3.6	57.1	28.6	10.7	-	-
Mainly Classic	2	-	50	-	50	-	-

* pieces of the same immature bovid counted as one element

a single cow or bison in the later deposit (Table 20.43). When viewed in terms of percent of identified artiodactyl bone and discounting the very small sample sizes, the proportion of deer is lowest in the Early Developmental period (48.2 percent), increases in the mainly Late Developmental period deposits (53.7 percent) and again in the mainly Coalition (57.1 percent). Pronghorn and bighorn both increase then decrease slightly (pronghorn 24.5, 34.1, 28.6 percent; bighorn 9.5, 12.2, 10.7 percent). Elk comprises a significant proportion of the Early Developmental period identified artiodactyl (n = 31 or 14.1 percent) and is present as single specimens in the mainly Late Developmental (7.7 percent) and mainly Coalition (3.6 percent) deposits. Because the sample sizes are small and very uneven, statements regarding the significance of these changes in the proportions of artiodactyls are tentative. One possible interpretation is that the smaller proportion of deer and more use of species hunted at a distance reflects a more mobile strategy during the Early Developmental period. Women and children are likely to have done much of the garden hunting, especially early in the time sequence when some men and women were more mobile. Male mobility may have changed from a more general or seasonal mobility to one of logistic mobility by the Coalition accounting for the apparent decrease in artiodactyl use and perhaps a return to more garden hunting as males assumed more of a role in local hunting, field protection, and tending the turkeys, and less time was devoted to long-distance hunting.

Greater mobility and the importance of hunting are also indicated by other aspects of the faunal assemblage. More evidence of male cooking (roasting) is found in the early deposits (see Fig. 20.4), which could indicate influxes of people during certain times of the year. The episode documented at LA 6169 was most likely a winter event, suggesting that the more mobile group members spent winters at the residential sites, staying until the fields were cleared and planted. Most cooking was by boiling or stewing, a method usually attributed to women, but influxes of people or ceremonial events often alter day-to-day cooking practices.

Dogs must have had a much greater significance for the earliest settlers. All of the dog burials and most of the dog elements were found in either Early Developmental or mainly Early Developmental period deposits or in mixed deposits that contain Early Developmental period material. Dogs were found in contexts suggesting ritual placement and even scattered and carnivore damaged parts were placed in pits. These findings are consistent with an early emphasis on hunting artiodactyls that declined as males played a greater role in agriculture.

Artiodactyl hunting generally has a ritual aspect so that finding more evidence for the ritual use of animal parts is consistent with a greater importance for hunting regardless of the amount of hunting. Ritual placement of artiodactyl crania, carnivore parts, and bird wings are almost all confined to Early Developmental period deposits.

Taken together, garden hunting paired with procurement of a greater diversity of artiodactyls, more roasting, and the greater importance of dogs and hunting ritual, can be interpreted as supporting greater mobility at the early end of the time spectrum. The same may be true of what seems to have been a complete disregard of the nearby riverine resources, these resources either were not needed or too costly and were not pursued. At the same time, substantial permanent structures with little evidence of the kinds of remodeling found when the entire population abandons a site on a seasonal basis, evidence for occupation during the cold months, and virtually no change in refuse disposal in later periods suggest an essentially sedentary community. Probably the best, but far from definitive faunal evidence, for dual or simultaneous sedentism and mobility may be in the greater amount of male cooking or roasting that took place early on. Other sources of data, such as the robusticity of the females and near absence of males in the burial population, add credence to this interpretation.

Other Southwest Assemblages

Comparable data sequences covering the transition to and progressive intensification of agriculture are rare for the Southwest. Working with Hohokam assemblages from southern Arizona, Szuter and Bayham (1989:92) conclude that variability in the lagomorph index depends on site function (small farmsteads versus village-hamlets) and the length of occupation. Based on the premise that jackrabbits prefer open spaces with high visibility and cottontails prefer dense brush cover where they can hide, they propose that clearing land for farming or collecting wood and depleting the brush cover should favor jackrabbits. The same would be true for larger communities where communal hunting is expected (e.g., Szuter and Gillespie 1994:70–71). Indeed, in their data set the lagomorph index decreases from 0.53 to 0.12 through time. Smaller sites have higher indices, an average of 0.36 for farmsteads compared to 0.19 for village-hamlets (Szuter and Bayham 1989:93). As for artiodactyls, lowland sites have very low indices, between 0 and 0.16 while the range for upland sites is from 0.19 to 0.75. Most upland sites were small farmsteads, hamlets, fieldhouses, or seasonal occupations while residents of the lowlands practiced more farming and had larger populations. The authors believe the difference depends largely on the greater availability of artiodactyls and lesser commitment to horticulture in the uplands along with the scheduling constraints imposed by intensive horticulture in the lowlands (Szutzer and Bayham 1989:90–92).

Results from the Colorado Plateau differ somewhat from the Arizona study due in part to environmental conditions that favor denser vegetation and presumably cottontails. At both Dolores Project sites (ignoring the first period with a very small sample size and much uncertainty as to its nature) and Chaco Canyon (Table 20.44, Fig. 20.6), initially high lagomorph indices decrease with time and population growth, increasing again as the population declined. In both areas only the lowest of the lagomorph indices overlap the highest Arizona index, stressing the importance of environmental parameters.

A high lagomorph index paired with a low artiodactyl index is found in the Colorado Plateau and the Peña Blanca samples (Table 20.44) during the initial period of agricultural commitment, regardless of environmental setting. The fact that the Peña Blanca lagomorph index is always heavily weighted towards cottontail rabbits may also suggest that the population, at least as represented in these sites, was never great enough to increase the use of jackrabbits to the extent indicated by the samples from Arizona, Dolores, and Chaco Canyon where the amount of jackrabbit is greatest in and around the periods of maximum human populations.

Considering that the Dolores area is optimum for artiodactyl procurement, Chaco Canyon much less so, and Peña Blanca falls somewhere in between, the curves for the artiodactyl indices are remarkably similar (Fig. 20.6). All indicate an initial increase in the proportion of artiodactyl with respect to rabbit bone, and if

Table 20.44. Comparisons of Lagomorph, Artiodactyl, and Turkey Indices for Peña Blanca, Dolores, and Chaco Canyon

Peña Blanca				Dolores				Chaco Canyon			
Time	Lag.	Artio.	Turkey	Time (AD)	Lag.	Artio.	Turkey	Time	Lag.	Artio.	Turkey
Early Developmental (700-950)	0.77	0.28	0.09	600-700	0.64	0.58	0.03	Early BM (500-600)	0.86	0.16	0
Mainly Early Develop.	0.71	0.35	0.02	720-800	0.73	0.20	0.03	Late BM (600-820)	0.55	0.1	0.01
Late Developmental (1080-1225)	0.67	0.48	0.04	800-840	0.64	0.36	0.02	Pueblo I (850-950)	0.44	0.15	0.05
Mainly Late Develop.	0.66	0.61	0.04	840-880	0.58	0.48	0.08	E.P. II (920-1050)	0.53	0.31	0.03
Coalition (1225-1325)	0.76	0.27	0.55	880-920	0.41	0.43	0.13	L.P. II (1050-1080)	0.51	0.37	0.03
Mainly Coalition	0.79	0.26	0.11	920-980	0.73	0.42	0.05	E.P. III (1100-1200)	0.42	0.42	0.25
Mainly Classic (1325+)	0.75	0.79	0	980-1250	0.73	0.26	0.05	L.P. III (1220-1250)	0.69	0.03	0.41

Sources of raw data: Dolores, Neusius 1986:212-253; Chaco Canyon, Akins 1985, Appendix 2

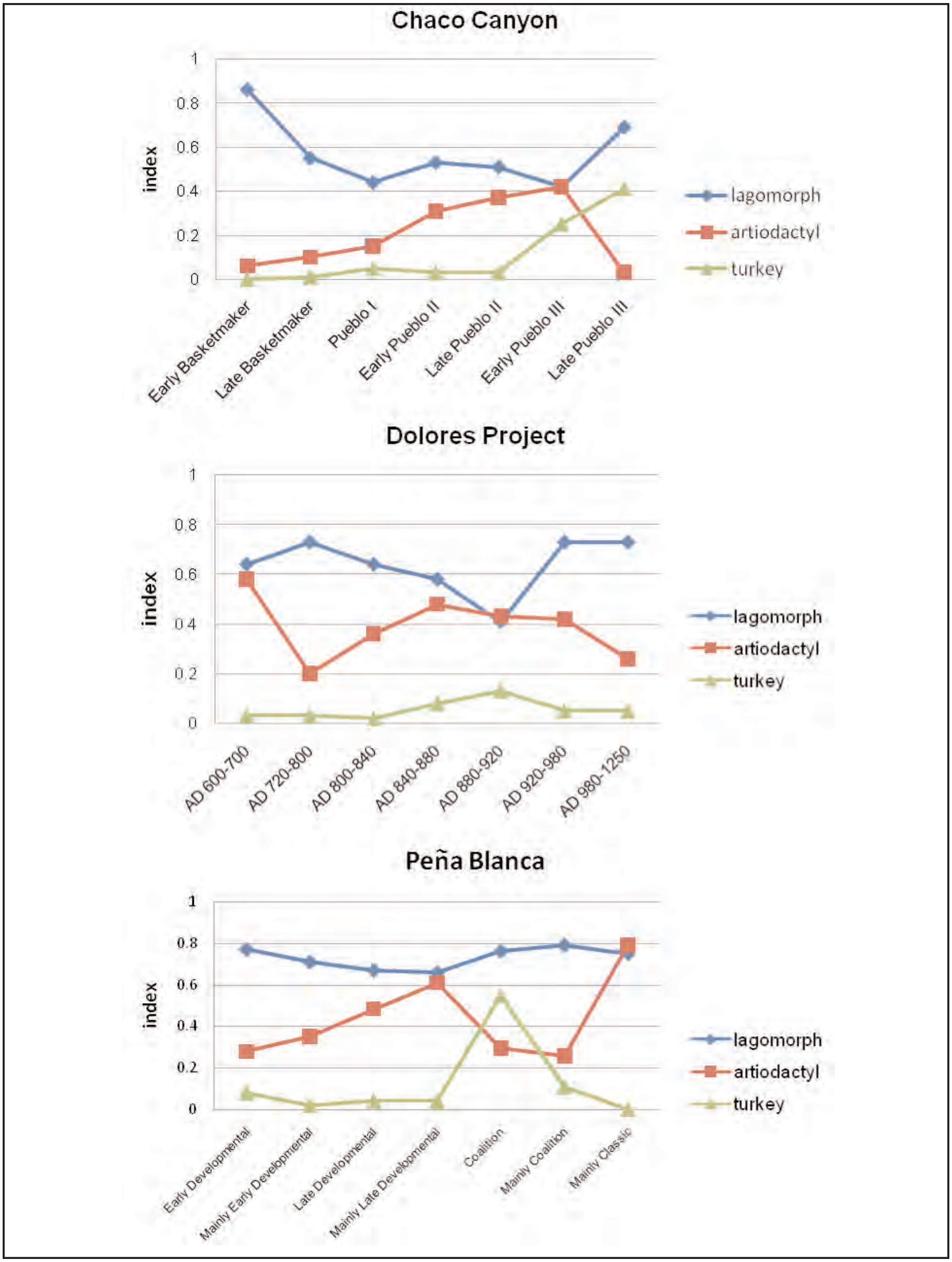


Figure 20.6. Comparison of Chaco Canyon, Dolores, and Peña Blanca indices.

we ignore the very small Peña Blanca Classic sample, all fall toward the end of the sequences reported. Yet the dynamics are quite different. At Chaco Canyon, the increase, as well as a change in the mix of artiodactyls from greater amounts of pronghorn in late Basketmaker assemblages to a more even mix of deer, pronghorn, and bighorn in early Pueblo II, overwhelming amounts of deer in late Pueblo II, and a more even mix of deer, pronghorn, and bighorn slightly favoring bighorn in early Pueblo III may indicate a change in hunting strategy from communal or group hunting to specialized deer hunting as the population increased and then to an unspecialized form of logistic hunting paired with a substantial use of turkeys. The index increases with population growth and the lowest lagomorph index occurs in conjunction with the highest artiodactyl index. At Dolores, the maximum population and peak artiodactyl use occurs with the least amount of fauna overall (Blinman 1986:596–598) and, like Chaco Canyon, the lowest lagomorph index. Deer are always the most common artiodactyl but the proportion of deer bone is lowest in the first two periods, increases in the next three, then begins to decline in the final two (Neusius 1986:224–249), suggesting the response to human population growth was to use more deer and perhaps more fully utilize what was available.

Peña Blanca is unique in several respects (Fig. 20.6), some of which could be related to different analysis methods and sampling strategies. The lagomorph index is always high, never falling as in the other areas. At the same time, the artiodactyl index is surprisingly high early in the sequence and unlike either Chaco Canyon or Dolores, it falls during the Coalition when population is supposedly increasing. Also at Chaco Canyon and Dolores, when the turkey index rises, the lagomorph index falls. At Peña Blanca the lagomorph index rises and the artiodactyl index falls when that for turkey increases. Also intriguing is the similarity in resource mix in the Chaco Canyon late Pueblo III or Mesa Verde occupation and that of the Peña Blanca Coalition. Regardless of the apparent similarity, this should not be interpreted as the direct result of immigrants from the San Juan Basin settling along the Rio Grande and assuming the same resource mix as they had before. Both samples are small and therefore not particularly reliable. In addition, the role of the turkeys was quite different. During this period most evidence suggests turkeys were eaten and provided a substantial amount of the animal protein at Chaco Canyon. There is no such evidence for Peña Blanca where the birds appear to have been kept in small numbers but not eaten. Instead, this particular patterns could reflect use of similar strategies, such as seasonal farmstead occupations.

Summary of Subsistence in Later Time Periods

Much of the data from the later time periods are presented in previous sections of this report. This section summarizes the differences and similarities in the economic fauna resource mix as well as in the absolute amounts as gauged by an independent commodity such as ceramic utility wares. Table 20.45 summarizes the index and ratio data for all time periods and Figures 20.5 and 20.7 depict these relationships. Table 20.46 and Figures 20.8 and 20.9 compare the density of rabbit/small mammal and artiodactyl/large mammal bones with those of gray and brown utility ware ceramic counts and weights. Since the ceramics and fauna were not sampled exactly the same, especially for the large Early Developmental period sites, these figures include only those components that have similar sampling (although the curves are remarkably similar when the entire samples are used). This resulted in eliminating all of the LA 265 sample, the overburden and some extramural study units from LA 6170, and the upper fill of Structure 47, Structure 76 collapse and trash, SU 6, 7, 8, and 12 from LA 6169 in both databases. In Table 20.46, the ratio divides the counts for the two primary faunal groups by the ceramic count or weight, thus, the more bones relative to sherds, the higher the ratio. The Early Developmental (with and without LA 6169, Feature 29) and mainly Early Developmental samples have among the highest ratios regardless of the faunal group or whether the ceramic counts or weights are used. In the later periods, the results differ considerably depending

Table 20.45. Summary of Lagomorph, Artiodactyl, and Turkey Indices and Ratios by Period and Provenience Type (n=sample size for these taxa only)

	N =	Lag index	Lag ratio	Artio index	Artio ratio	Turkey index	Turkey ratio
Early Developmental	4807	0.77	3.31	0.28	0.39	0.09	0.1
Structure fill	1231	0.73	2.73	0.38	0.61	0.01	0.01
Structure roof fall	725	0.78	3.3	0.42	0.72	0.28	0.39
Structure floor assoc.	1624	0.75	2.95	0.18	0.21	0.14	0.16
Extramural	1228	0.83	4.78	0.24	0.32	0	0
Extramural w/o F. 29	661	0.7	2.34	0.42	0.73	0	0
Total without F. 29	4259	0.74	2.82	0.32	0.46	0.08	0.1
Mainly E. Developmental	257	0.71	2.51	0.35	0.54	0.02	0.02
Structure fill	68	0.74	2.9	0.41	0.69	0.02	0.05
Structure roof fall	71	0.74	2.93	0.21	0.27	0.02	0.02
Structure floor assoc.	103	0.68	2.1	0.4	0.66	-	-
Extramural	15	0.67	2	0.4	0.67	-	-
Late Developmental	95	0.67	2	0.48	0.94	0.04	0.04
Structure fill	11	0.67	2	0.18	0.22	-	-
Structure floor assoc.	84	0.67	2	0.52	1.1	0.05	0.05
Mainly L. Developmental	323	0.66	1.95	0.61	1.56	0.04	0.1
Structure fill	119	0.67	2	0.56	1.27	0.05	0.06
Structure roof fall	175	0.6	1.52	0.68	2.17	0.12	0.13
Extramural	26	0.93	14	0.35	0.53	0.17	0.2
Coalition	384	0.76	3.26	0.3	0.42	0.55	1.23
Structure fill	275	0.78	3.57	0.17	0.2	0.41	1.42
Structure floor assoc.	81	0.76	3.22	0.27	0.37	0.43	0.76
Extramural	28	1	-	0.93	13	-	-
Mainly Coalition	586	0.79	3.78	0.26	0.35	0.11	0.13
Structure fill	515	0.79	3.69	0.16	0.2	0.11	0.13
Extramural	71	-	-	0.89	7.75	0.11	0.13
Mainly Classic	58	0.75	3	0.79	3.83	-	-
Structure fill	10	0.71	2.5	0.85	5.86	-	-
Extramural	10	0.8	4	0.5	1	-	-

on whether the count or weight is used. With counts, the Late Developmental deposits contain relatively more bone than the Coalition. The reverse is true when weights are used, indicating sherds were smaller later in time.

Late Developmental Period

Evidence (summarized in Ware 1997:10–12) suggests a population increase during the Late Developmental period, although our experience at Peña Blanca may alter earlier perceptions concerning Early Developmental period population levels. Assuming an increase, some believe migration from the San Juan Basin explains the growth and development during this period. However, as Ware (1997:11) points out, sites attributed to this period could be those of small family groups who inhabited the area on a seasonal basis for several generations before becoming year-round residents towards the end of this period. If the population was indeed immigrants from the northwest and they were initially seasonal residents, sites and subsistence remains could differ at least somewhat from those of the Early Developmental period.

Few proveniences in the Peña Blanca sample date from the Late Developmental period and most of those are mixed deposits also containing either Early Developmental or Coalition period material. Deposits dating to this period include the lower fill and floor of Structure 6 at LA 249, the lower fill and floor of Structure 76 at LA 6169, and the fill of Structure 5A and an extramural activity area (Feature 5) at LA 6170. The unmixed sample is small (n = 134) and is dominated by structure floor deposits from LA 6169. The mixed or mainly Late Developmental sample is larger (n = 593) but is mostly from structure fill and roof fall.

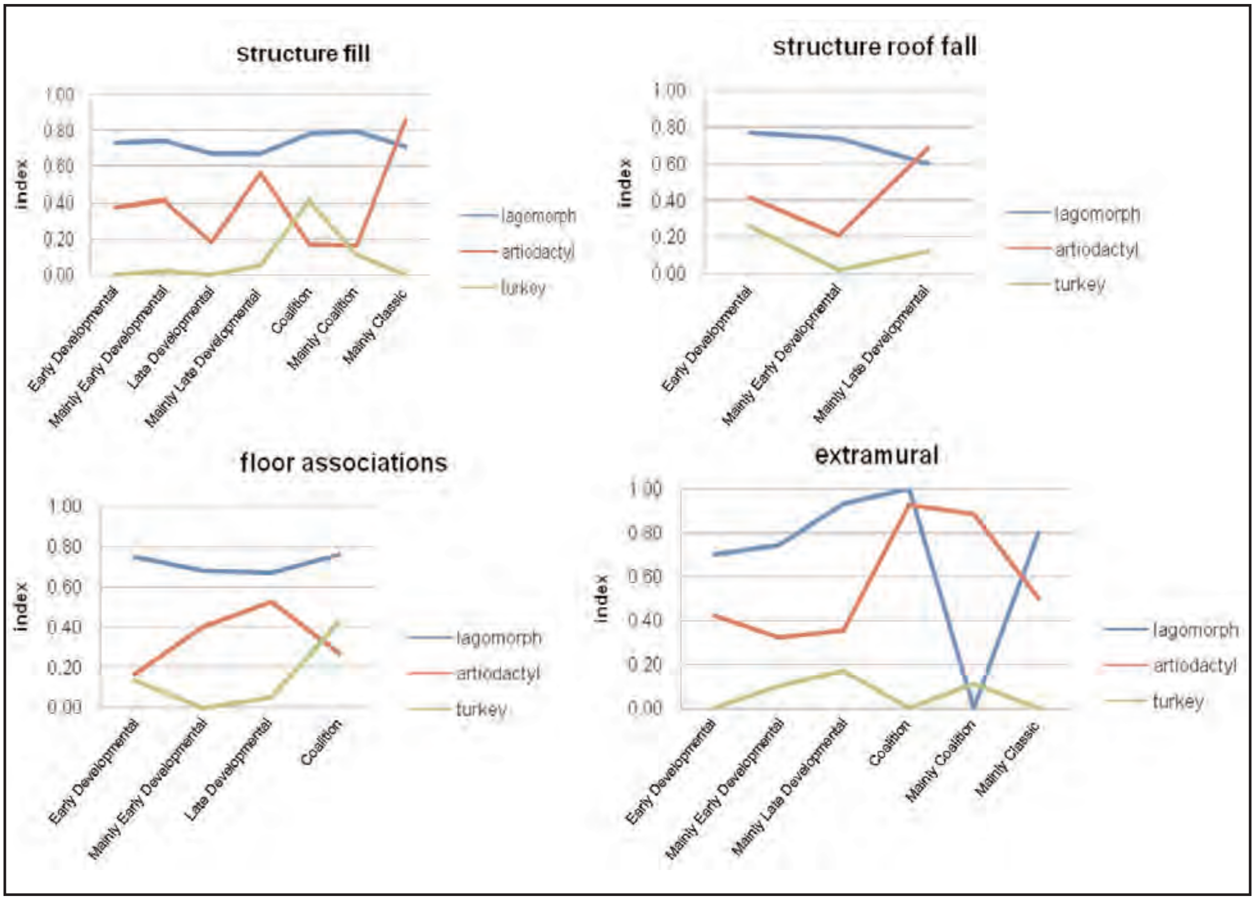


Figure 20.7. Peña Blanca faunal indices by provenience type.

The complete sample and all of the provenience divisions except the small extramural sample show a slight decrease in the lagomorph index for the Late Developmental period deposits (Table 20.45). At the same time the artiodactyl index increases significantly in all divisions with any sample size, again the extramural sample is very small, and the turkey index increases slightly in the mixed deposits, probably reflecting greater amounts in both the Early Developmental and Coalition aspects of the mixture. As for the mix of artiodactyls (Table 20.43), numbers are small but deer is the most common species in both the unmixed and mixed deposits. Again, the relatively large amount of pronghorn in the mixed deposits could result from larger amounts in the preceding and succeeding period deposits.

All this suggests little change in the garden hunting strategy employed at this time. The slight decrease in cottontail use is not sufficient to postulate great changes in rabbit procurement, yet the fairly drastic reduction in the amount of rabbit and small mammal bone relative to ceramic utility ware counts and weights suggests a reduction in the overall importance of rabbits as a food item (Table 20.46, and Figs. 20.8 and 20.9). At the same time, the dramatic and consistent increase in the artiodactyl index in all but one of the provenience types strongly suggests that artiodactyls contributed a greater portion of the resource mix. Relative to ceramics, there is proportionally less bone (see Fig. 20.9) than in the Early Developmental samples and either more or less than in the Coalition samples depending on whether counts or weights are used. This combination of a relatively high artiodactyl index and low bone counts is open to a number of interpretations. A high index could reflect a greater amount of processing due to competition for increasingly scarce artiodactyl

Table 20.46. Ratios of Rabbit/Small and Artiodactyl/Large Counts to Gray and Brown Ware Ceramic Counts and Weights for Similarly Sampled Components

	Early Developmental	Mainly Early Developmental	Late Developmental	Mainly Late Developmental	Coalition	Mainly Coalition	Mixed Classic
Ceramic count	3323	722	272	945	1387	3477	507
Ceramic weight (grams)	11291	2763	1773	6654	5035	5308	2177
Rabbit/small mammal count	2601 (1964)	197	63	168	232	539	15
Artiodactyl/large count	712 (696)	85	45	176	61	136	46
Rabbit/ceramic count	.78(.59)	0.27	0.23	0.18	0.17	0.15	0.03
Rabbit/ceramic weight	.23(.17)	0.07	0.03	0.02	0.05	0.1	0.01
Artiodactyl/ceramic count	.21(.21)	0.12	0.16	0.19	0.04	0.04	0.09
Artiodactyl/ceramic weight	.06(.06)	0.03	0.02	0.03	0.01	0.02	0.02

( ) without Feature 29

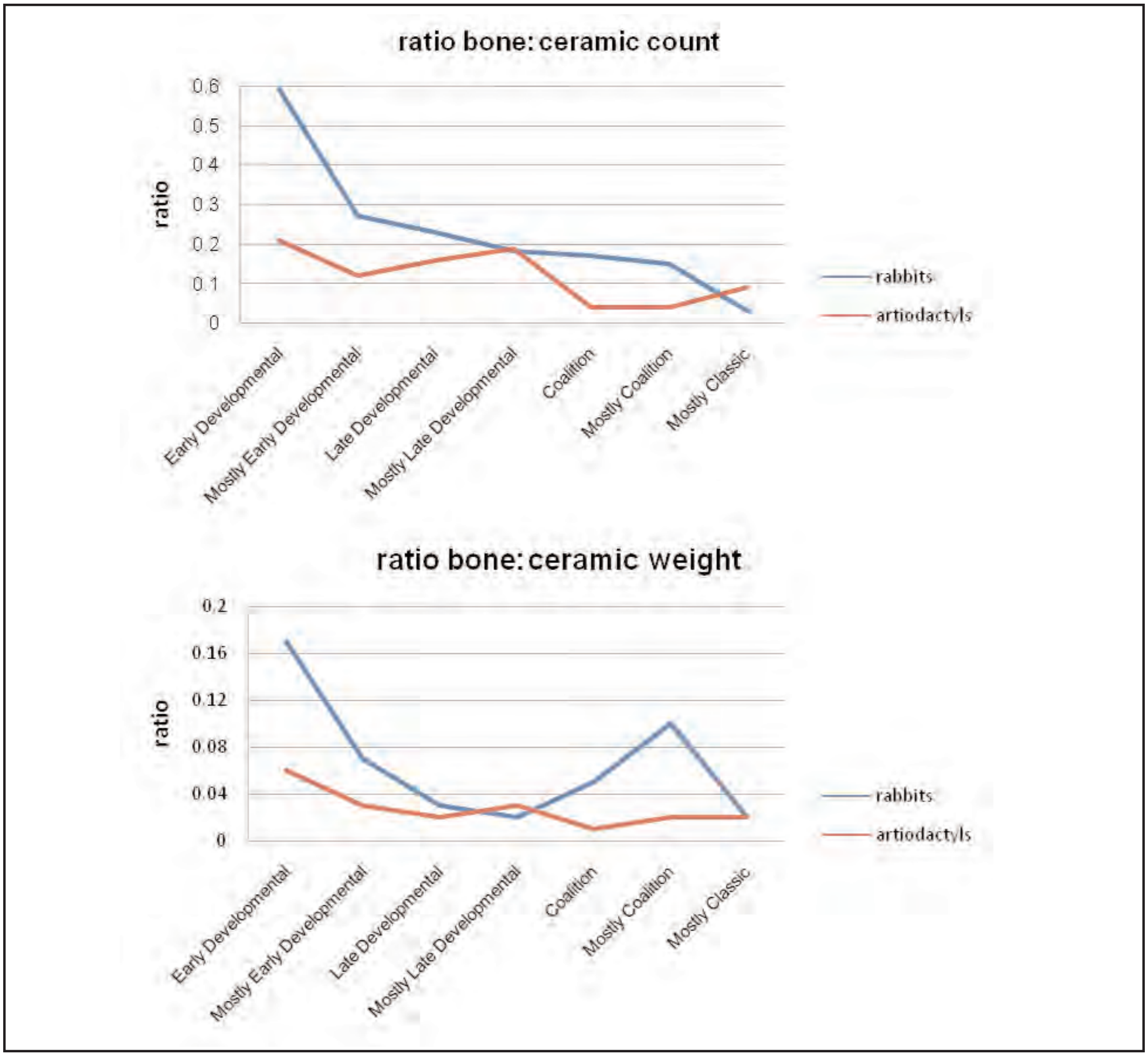


Figure 20.8. Peña Blanca ceramic and bone ratios for rabbit/small mammals and artiodactyl/large mammals.

resources or it could mean that there were few restrictions on hunting territories and more effort was made to procure artiodactyls during this time period. The low bone to ceramic ratio suggests a decrease in the overall importance of hunting from the Early Developmental.

A single fetal or neonate artiodactyl specimen is attributed to this time period. Juvenile animals are relatively common, occurring in six of the ten late and mainly Late Developmental components containing artiodactyl bone. The proportions of juvenile artiodactyls in these two samples are the highest in the Peña Blanca sequence (8.9 and 4.8 percent), a distribution that suggests more of the artiodactyl hunting took place in summer and fall than in any other time period. If true, this, too, may indicate a change to a more logistic form of hunting and reduction in overall mobility.

No dog burials were recovered and the few dog parts found in deposits from this period were either in mixed deposits or from an imprecisely defined pit room in the fill of an Early Developmental structure (Structure 5 at LA 6170) containing several dog burials. This lack of dog burials is inconsistent with a greater emphasis on artiodactyl hunting, which should have increased their value. Yet,

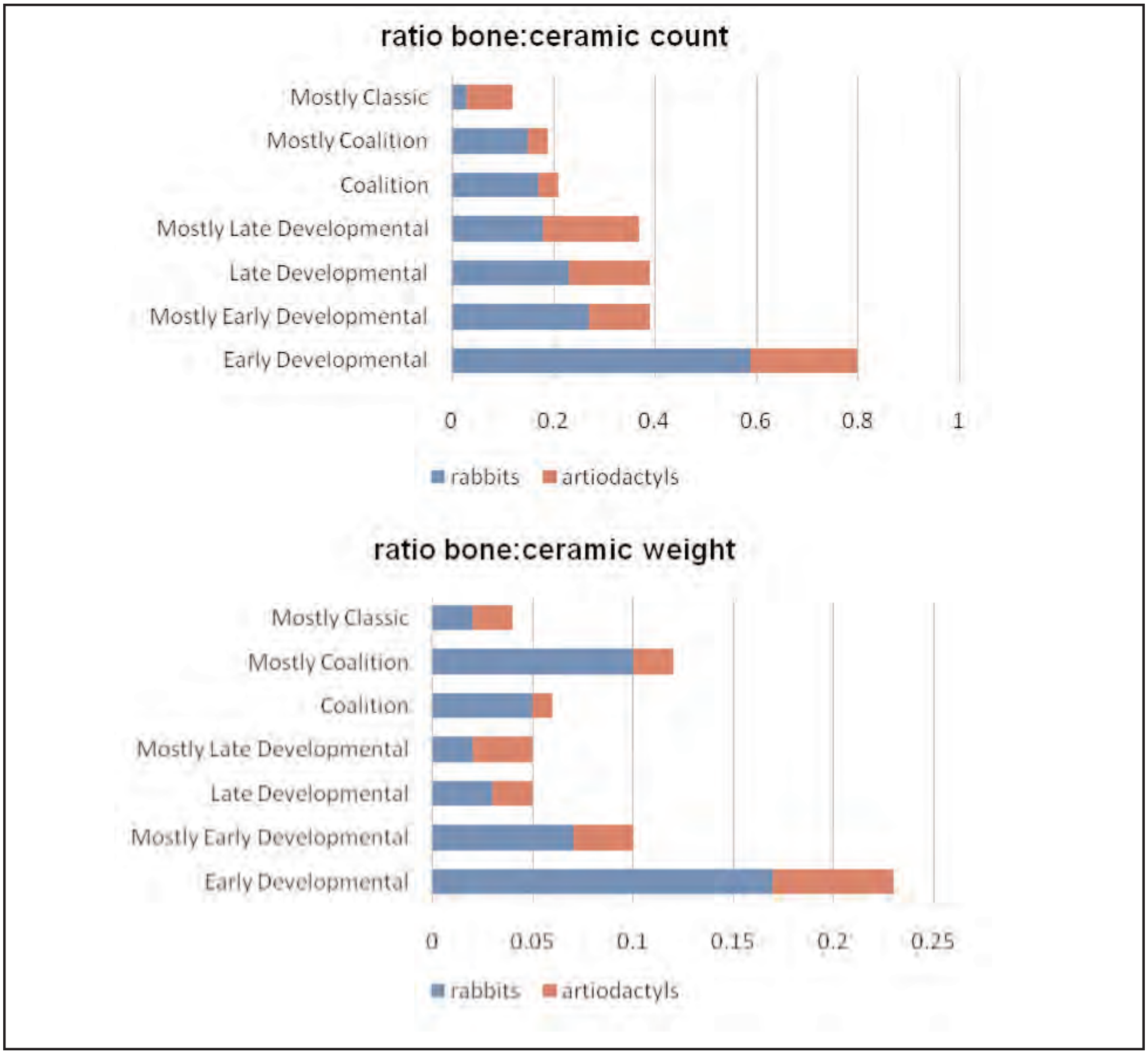


Figure 20.9. Bar graph of Peña Blanca ceramic and bone ratios.

the proportions of carnivore-gnawed or punctured bone in the Peña Blanca samples are greatest in unmixed deposits from this period and third greatest in the mixed deposits (see Table 20.36). If not a function of relatively small sample sizes and few proveniences, this suggests that dogs were present but played a diminished role regardless of the increased use of artiodactyls. Such a change in role could indicate a more logistic form of hunting by an increasingly sedentary population. Potential evidence of rituals associated with artiodactyls and their hunting continue into this period. A partial deer mandible was found in the fill of Structure 6 at LA 249 and a partial deer cranium in the roof and floor fill deposits of Structure 76 at LA 6169.

Roasting was less common as a cooking method (see Fig. 20.4), especially for rabbits. Indeed, decreases in the ratio of bones to ceramics could be another indication of the importance of boiling and stewing as the primary cooking method, regardless of the size of the animal. Much of the Late Developmental period waste was placed in structure fill. The apparent absence of trash-filled extramural features may or may not suggest a significant difference in disposal practices. Our excavations may have failed to locate extramural features from this period, such features may have been rare, or they were not filled with trash. This would be a departure from the previous period, but not necessarily a significant one, as structure depressions may have provided more accessible disposal locations.

Although fairly scant, the faunal data from this period suggest some changes from the earlier period. Rabbits seem to have been less important than in the earlier period while artiodactyls contributed more to the animal resource mix, the role of dogs may have changed, roasting as a cooking method decreased, and the amount of bone relative to ceramics is less. None of these are indicative of an immigrant population seasonally or even permanently occupying these sites. Instead, they may be more consistent with decreased mobility including a change in long-distance hunting practices as males employed a more logistic strategy, especially during the growing and harvest seasons, and as reliance on garden hunting decreased when women spent more of their time processing agricultural products, which had become more important in the overall subsistence mix.

Coalition

The population expanded dramatically during the Coalition along with an increased diversity in site size and location. Again, researchers disagree on whether this was the result of large-scale migration into the area or of the growth, expansion, and diversification of a local population (Ware 1997:14). Regardless of the source of the population, more people should result in additional pressure on the animal resource base and, at least in theory, an increase in the use of jackrabbits as land was cleared for farming and by wood collecting. At the same time, competition for artiodactyl hunting territories could result in more use of the closest artiodactyls (deer), in increased evidence for logistic hunts scheduled around agricultural activities, more use of aquatic resources, and more reliance on domestic animals (i.e., turkeys).

Unmixed Coalition deposits are relatively rare (n = 570) in the Peña Blanca sample and are almost all from structure fill and floor associations in three rooms and a pit structure at one site (LA 6169). Mixed Coalition specimens are more common (n = 967), but these are mainly from that same site and all are either structure fill or extramural deposits. While not the best samples, these may provide a reasonably reliable view of faunal subsistence at these sites for this time period.

Contrary to expectations that higher human population densities should result in increased jackrabbit use, the lagomorph index (Table 20.45, Fig. 20.5) actually increases and is even higher than that for the Early Developmental period deposits. Such an increase suggests that either the population was not so dense that the environment was modified to an extent that favors jackrabbits, that agricultural intensification favored cottontails enough to provide for much of their needs, that the premise that population increases favor jackrabbits does not work particularly well for this area, or that deposits at this site represent a farmstead rather than a year-round residence. The relatively flat curve for the ratio of rabbit/small mammal bones to ceramic utility ware counts or an increase relative to weights, are another indication that rabbits maintained or even increased as a contributor to the diet (Fig. 20.8).

At the same, the artiodactyl index is the lowest in the time sequence (Fig. 20.5). This is especially true of structure fill and floor contexts, while the indices are quite high in the small extramural samples (see Table 20.45). Relative to ceramics, fewer artiodactyl/large mammal bones were found in both samples whether based on counts or weights. Neither ratio indicates that artiodactyls underwent increasing amounts of processing to extract more nutrition from what appears to be a decreasing supply.

It is only in the unmixed Coalition deposits that the turkey index is higher than the artiodactyl index but this is true for only the structure fill and floor proveniences. Also troubling is the paucity of evidence that turkeys were used for food. Of the unmixed Coalition turkey and likely turkey, only one has a roasting-like burn (floor fill of Structure 16 at LA 6169) and nine have discard burns (one from the upper fill of Structure 16, seven from the upper fill of

Structure 70, and one from the floor and floor fill of Structure 70 at LA 6169). Instead, these bones represent a small number of birds that come from a very few proveniences, mainly from the fill of Structure 70 for the Coalition deposits and the Structure 4 fill in the mixed Coalition deposits. Many have evidence of carnivore breakage, large and fragile parts are often complete, and numerous muscle splints indicate these were buried with flesh attached. All this suggests that the spike in the index should not be interpreted as turkeys becoming an important part of the diet at these sites.

Overall, faunal remains from this period suggest a very high reliance on cottontail rabbits, and presumably garden hunting. When artiodactyls were hunted, it may have been a combination of local hunting for deer and logistic hunts for pronghorn, perhaps deer, and occasionally bighorn or elk. The sample of identifiable artiodactyl bone is small (see Table 20.43), but suggests that deer and pronghorn were the most commonly used species. No fetal, neonate, or immature animals came from this assemblage except for the bos/bison from LA 6171, and only one juvenile (1.6 percent). In such a small sample it is difficult to deduce when procurement took place. Antler occurs in greater than expected amounts (Coalition: n = 3, expected = 1; mainly Coalition n = 12, expected = 2.3 and based on large mammal and artiodactyl counts), but it comes from few features (upper fill of two structures n = 4, and a vent shaft n = 11). If the antlers were unshed, this would represent summer to fall and if shed, early spring.

The proportion of roasting-like burns continues to decline for both the rabbit/small mammals and artiodactyl/large mammals (see Fig. 20.4) while discard burns are especially high in the unmixed Coalition sample. Many of these are from structure fill and floor associations, especially the upper fill of Structure 70 at LA 6169 (n = 270, 22.6 percent discard burns) and floor fill and floor in Structure 16 of that same site (n = 55, 23.6 percent discard burns). The virtual absence of roasting-like burns in the unmixed sample may or may not be significant. Bone from upper fill is often more eroded so the subtle changes reflecting roasting may not have been observed.

Dog elements remain scarce but the crunched and punctured turkey bones attest to their presence, even if in a diminished role. Potential evidence of hunting ritual continues but instances are rare: a partial quail wing in the upper fill of Structure 4 and an eagle talon in the fill of Structure 9 at LA 6171.

Coalition assemblages suggest that the importance of garden hunting as a subsistence strategy may have increased from the Late Developmental period, particularly the taking of cottontail rabbits. However, it is not at all clear whether these deposits represent a year-round residence or a farmstead where we would expect a heavy reliance on garden hunting. Regardless, there is little evidence that this strategy was insufficient to meet their needs as the ratio of artiodactyl/large mammal bone to ceramics remains low with no indication of increasing amounts of processing to extract more nutrition from those resources represented. Virtually no aquatic resources are attributed to this period, although the only fish bones from the project are from mixed Coalition deposits. While turkey bones are relatively abundant, no egg shell or juvenile birds were found that would indicate a concerted effort to raise turkeys in order to provide an alternative protein source. Rather, the residents of this time period appear to have been concentrating on agricultural pursuits and were able to provide for most of their needs in the immediate vicinity, through occasional logistic hunts, and by increasing their dependence on agricultural products. Increases in regional populations may have constrained access to artiodactyl hunting territories and contributed to the low artiodactyl indices for this period.

Classic

Classic period sites in the Cochiti area include large villages with large-scale agricultural and water-control features as well as open camps and small architectural sites. The area population may have declined somewhat but it was demonstrably aggregated into the larger sites (Ware 1997:14–15). Some (e.g., Crown et al. 1996:198, 200) maintain that populations leaving the Pajarito Plateau settled in the Santa Fe District, which includes the Cochiti area.

The Classic period faunal assemblage from Peña Blanca is from mixed deposits comprised almost totally of slope wash from the large site of Tashkatze Pueblo (LA 249) on the terrace above. This later material was deposited in the upper fill of an earlier structure and in extramural contexts. Samples are very small (n = 64 and n = 17) and not likely to be representative of this period as a whole. The only noteworthy aspects are the relatively large counts for egg shell (n = 5), for artiodactyls and large mammals (n = 46), and for discard burns on smaller forms (Fig. 20.4). All of this points to relatively poor preservation where egg shell, small burned forms, and large mammal bones were better preserved. No attempt will be made to generalize from this sample.

Upper and Middle Rio Grande Subsistence

Quantified faunal data for the Cochiti area is generally scarce, especially for the early end of the time sequence. The Cochiti Reservoir Project recovered little prehistoric fauna (Schutt 1977:105). Some of the sites excavated in conjunction with constructing Cochiti Dam have fair sized samples that are reported in a series of volumes (Harris 1968, 1971, 1976). For the purposes of this discussion the well-documented assemblage from Arroyo Hondo (Lang and Harris 1984), the Cochiti Dam sites, and assemblages analyzed in a manner similar to that from Peña Blanca are included to better define subsistence practices in the Upper Middle Rio Grande area.

Sites along the Rio Grande in the Albuquerque area have produced a fairly small amount of quantified data. Earlier sites (ca. AD 650–1250) contain mostly rabbit bones, along with a wide range of other taxa including prairie dogs, squirrels, woodrats, deer, and pronghorn. Turkey, quail, duck, beaver, and turtle are occasionally found. Where quantified data is found, jackrabbits outnumber cottontails. In contrast, later sites often have proportionately more cottontails, turkeys can be a significant contributor, and fish, muskrat, and racoon suggest a greater reliance on riverine species (Akins 1987b:165–166). More recent excavations at Developmental period sites suggest a heavy dependence on wild plant foods and small mammals such as jackrabbits, cottontails, pocket gophers, and kangaroo rats as well as cranes, ducks, and turtles but only scant remains of antelope and deer (Schmader 1994:498–499).

Four Albuquerque area sites are considered, three on the West Mesa and one in the South Valley west of the Rio Grande. The sample from AL 12 or LA 35493 comes from midden deposits dating to the AD 1200s (Akins 1987c). That from NM I:10:4:8 includes fauna recovered from five pit structures and an extramural area with pits and probably represents a short term or seasonal early agricultural site (Akins 1986c). Further excavations at NM I:10:4:16 (Frisbie's Site II or LA 57025) included 12 structures, 29 pits, and 3 exterior areas and had a number of dog burials dating between AD 650 to 900 (Akins 1986b). The Coors Road site is located in the South Valley. Excavations uncovered three pit structures, a surface structure, posthole alignments, and assorted extramural pits dating between AD 1125 and 1250 (Sullivan and Akins 1994:11–35).

LA 3333 is a relatively recently excavated, but as yet unreported (Ware n.d.), Late Developmental/Early Coalition site located on the eastern slope of the Galisteo Basin. One of the earliest communities in the basin, structures were expedient and impermanent. Houses were built, maintained with minimum effort, abandoned, and filled with trash, suggesting an intermittent, possibly seasonal occupation over a time span of at least 20 years. While corn was present in most of the macrobotanical samples examined, there are few ground stone tools and those found have little evidence of manufacture or use. The faunal assemblage was dominated by pronghorn with more cottontail than jackrabbit and significant amounts of deer and turkey (Ware and Akins 1992).

Arroyo Hondo, a large aggregated site located about 53 km (33 miles) east of the Peña Blanca project location, has a large and well documented faunal assemblage broken down into eight chronological samples (Lang and Harris 1984). First occupied around AD 1300, the site underwent rapid construction, population growth, population decline into a small remnant population, continued decline, a second period of growth, decline, and final abandonment at about AD 1425 (Lang and Harris 1984:16–17). Later studies (e.g., Creamer 1993; Lang 1993) have refined the dating but interpretations of the sequence of events are similar. Since these later studies do not offer amended date ranges for the chronological samples used in the faunal report, the original dates are retained with the understanding that they do not represent the most current thoughts on dating.

Four of the Cochiti Dam sites have sample sizes large enough to consider. No screening was done at these sites and the data is presented in MNIs with no counts other than to indicate the overall amount of bone identified. While this undoubtedly influences any comparative analysis, these sites are too important to an interpretation of this area to ignore. North Bank (LA 6462) consists of eight architectural concentrations that include surface room blocks, pit rooms, and pit structures or kivas located on a terrace west of the Rio Grande (Bussey 1968a:13). Dendrochronology and ceramics suggest a date between AD 1100 and 1280 (Honea 1968:114). LA 9154 (the Ojito del Cañoncito site) is located on the north bank of the Santa Fe River and is comprised of three house blocks that form a U. Pit rooms and two pit structures or kivas are located underneath or adjacent to the rooms. In 1964, 11 rooms and 2 pit rooms dating between AD 1350 and 1450 were excavated (Snow 1971a, 1971b:32–33). LA 70 or Pueblo del Encierro is a large village comprised of 198 ground-floor rooms, 9 kivas, 7 pit rooms, and 2 pit structures. The site was continuously occupied from about AD 1275 to 1550 and is situated on a long ridge just east of the Rio Grande (Snow 1976:i, ix). Alfred Herrera (LA 6465) is located on a flat bench west of the Rio Grande and consists of two distinct room blocks, three kivas, and at least three pit rooms (Lange 1968:73–75) dating between AD 1350 and 1525 (Honea 1968:159–169).

Table 20.47 summarizes the index and ratio information for the above-mentioned sites and Figures 20.10 to 20.12 plot the relationships between the three indices for each area and time period. The Albuquerque area sites serve mostly to demonstrate that even at an early date, some sites have more jackrabbits largely because the local environment favors that species. This area may also favor a lesser commitment to agriculture until late in the time sequence when large aggregated communities practiced intensive agriculture and, apparently because none of the data is published or analyzed in a manner that can be evaluated, that is when cottontail use increases. Few artiodactyl or large mammal bones were recovered from sites on the West Mesa. The 1/4-inch screened site of Coors Road produced few identifiable artiodactyl (n = 10) or turkey (n = 5) bones, but had large numbers of large mammal/artiodactyl (n = 65), artiodactyl (n = 23), and large bird (n = 17), and relatively few rabbit bones (59 cottontail and 135 jackrabbit) (Sullivan and Akins 1994:130). This paucity of rabbit bones results in the larger indices for both artiodactyls and turkeys. Looking back at Figure 20.6, assemblages with the similar overall sequences (relatively low lagomorph and relatively high artiodactyl and turkey indices) occur at or near the height of population at Chaco Canyon and Dolores, and (Fig. 20.10) in three samples from Arroyo Hondo: the 1300 to 1315 period of rapid growth, and 1355 to 1365 and 1365 to 1370 when population was low and declining due to drought conditions (e.g., Lang and Harris 1984:16–17). This range of conditions under which this animal resource mix occurs suggests inattention to or the need to go beyond garden hunting caused by a variety of factors such as degradation of the local environment by either higher population densities or deteriorating climatic conditions, or that attention was diverted to other pursuits such as construction activities.

LA 3333 is distinctive in many respects as it seems to represent a seasonally occupied nonfarming site. The combination of high cottontail and high artiodactyl indices is unique as the only other similar combination is in the very small mixed Classic sample from Peña Blanca. The turkey index is on the low end for the Coalition and probably reflects both the seasonal or short-term use of the site and that it falls just before or at the early end of the Coalition. Most unusual is the very high artiodactyl index, which in this case illustrates the range of subsistence options employed during the Late Developmental/Early Coalition as populations moved into and began to utilize previously unoccupied or sparsely occupied portions of the Galisteo Basin.

When the three indices are graphed, Arroyo Hondo (Fig. 20.13) displays a more complex and dynamic sequence of animal resource mixes than seen at Peña Blanca, Chaco Canyon, or Dolores. Sample sizes should be adequate (see Table 20.47) and these generally come from a range of proveniences (Lang and Harris 1984, Appendix A). Interpretations based on this presentation of the data (Table 20.47 and Fig. 20.13) often suggest different relationships between resource groups than those presented by Lang and Harris. Much of their analyses is based on percentages of MNIs (e.g., Lang and Harris 1984:48, 55, 60). To evaluate the relative use of taxa they multiply the edible meat weight for rabbits, squirrels, artiodactyls, and turkey by the MNI for each period (Lang and Harris 1984:108). MNIs were calculated for each stratigraphic layer in a room, kiva, pit, plaza grid, or larger plaza excavation. Each feature, such as a hearth within a larger provenience was also treated as a stratigraphic layer (Lang and Harris 1984:20). As has been demonstrated many times (see Grayson 1984:27–49; Reitz and Wing 1999:194–199), MNIs, especially when calculated by fairly small units that undoubtedly violate the assumption that the units are independent, are largely determined by the number of provenience divisions and often result in over estimations of the rare taxa and under representation

Table 20.47. Comparative Indices and Ratios for Regional Sites

Site	Date	N =	Lag Index	Lag Ratio	Artio Index	Artio Ratio	Turkey Index	Turkey Ratio
LA 3333	1300	2083	0.75	3.02	0.86	6.13	.40*	.68*
Arroyo Hondo	1300-1315	625	0.44	0.77	0.59	1.46	0.51	1.04
	1315-1330	2010	0.47	0.88	0.32	0.46	0.57	1.31
	1330-1340	4339	0.6	1.49	0.39	0.63	0.4	0.67
	1340-1355	2355	0.59	1.43	0.31	0.46	0.44	0.8
	1355-1365	1881	0.43	0.75	0.57	1.32	0.33	0.5
	1365-1370	1592	0.43	0.75	0.49	0.96	0.4	0.66
	1380-1410	1809	0.65	1.83	0.26	0.35	0.19	0.23
	1410-1425	5319	0.65	1.85	0.31	0.44	0.18	0.21
Albuquerque Area								
4:16	650-900	1024	0.26	0.35	0.09	0.1	-	-
4:08	650-900	875	0.39	0.64	0.09	0.1	0.01	0.01
Coors Road	1125-1250	618	0.3	0.44	0.34	0.5	0.1	0.11
AL12-LA 35493	1200s	485	0.39	0.64	0.02	0.02	0.03	0.03
Cochiti Dam sites (based on MNIS)								
North Bank (LA 6462)	1100-1280	863	0.6	1.5	0.28	0.39	0.29	0.41
LA 9154	1350-1450	800	0.51	1.03	0.01	0.01	0.46	0.86
LA 70	1275-1540	5835	0.51	1.03	0.12	0.14	0.43	0.75
Alfred Herrera (LA 6455)	1410-1525	1232	0.52	1.1	0.2	0.24	0.51	1.05

Sources: LA 3333- Akins n.d.a; Arroyo Hondo-Lang and Harris 1984:Tab.16-23; AL12 -Akins 1987c; 4:16-Akins 1987b; 4:8-Akins 1986c; Coors Road-Sullivan and Akins 1994:130; North Bank- Harris 1968:214; LA 9154-Harris 1971:76-77; LA 70-Harris1976:H-26-H-28; Alfred Herrera-Harris 1968:230

Notes:

* adjusted for probably hawk contribution to large bird count

** surface bos/bison not included in artiodactyl count

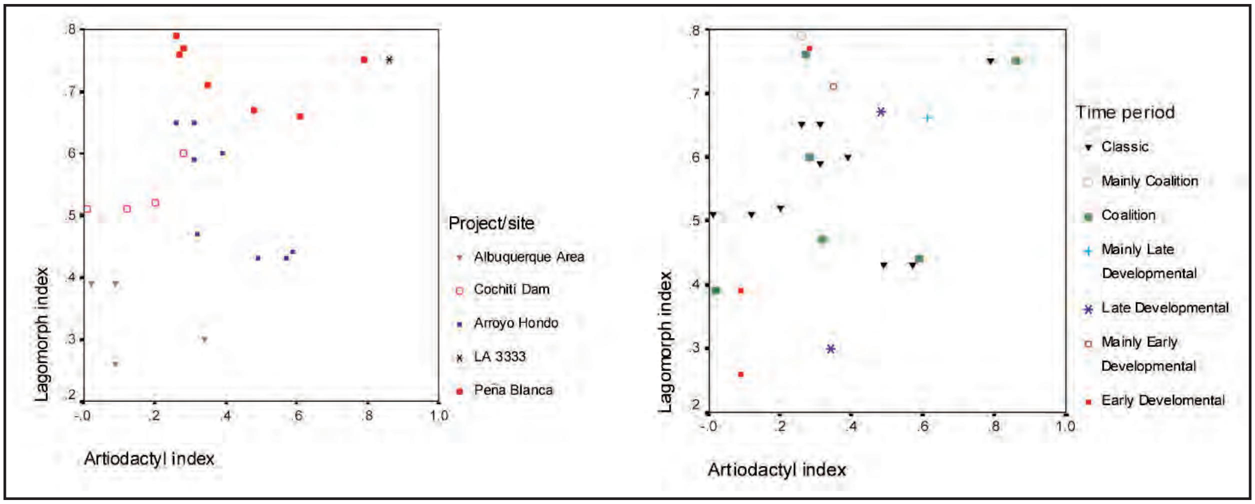


Figure 20.10. Scatterplots of lagomorph and artiodactyl indices for regional sites.

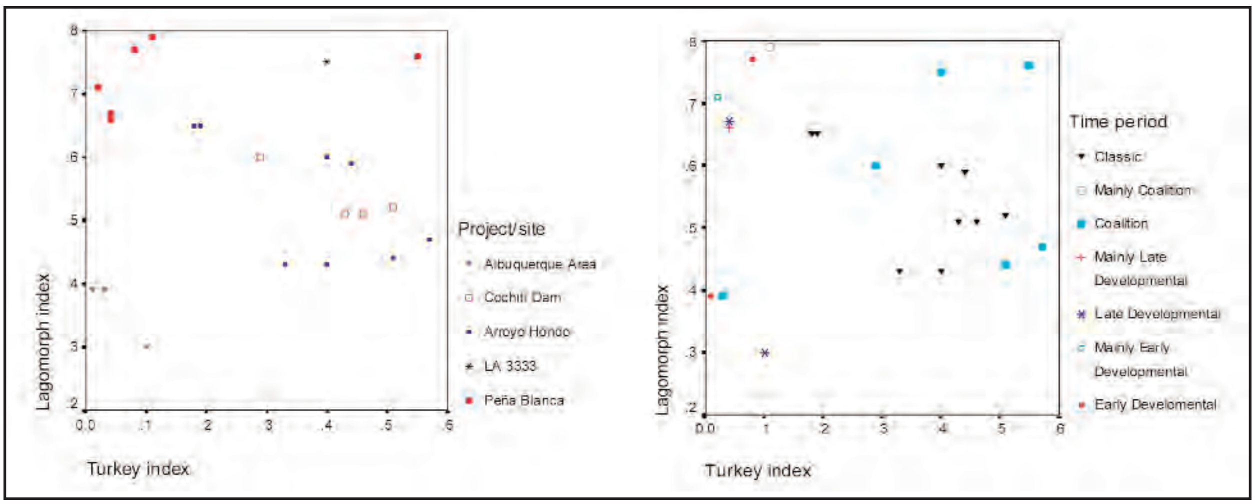


Figure 20.11. Scatterplots of lagomorph and turkey indices for regional sites.

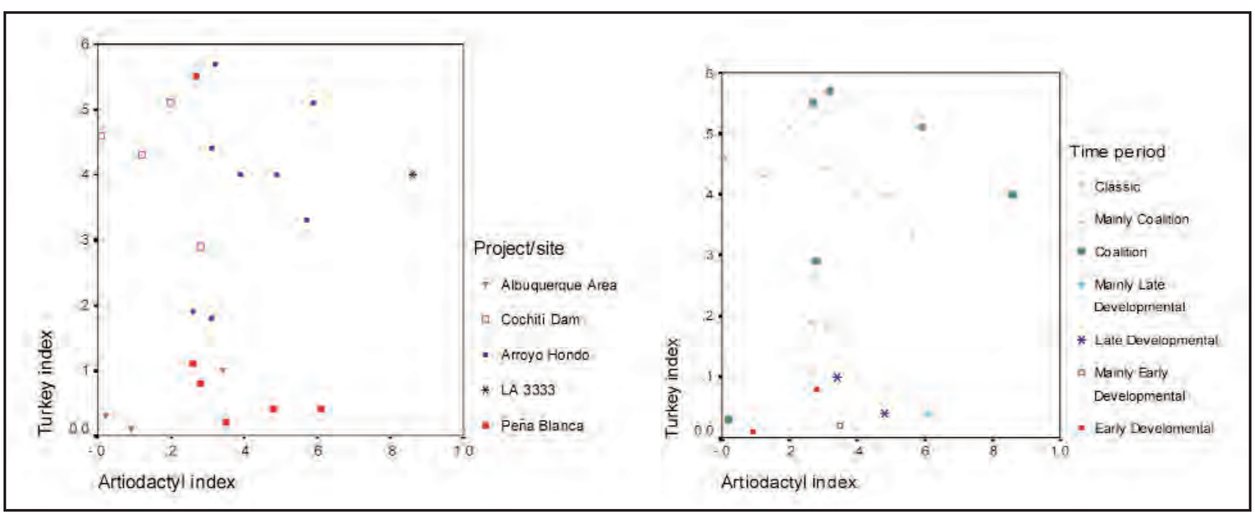


Figure 20.12. Scatterplots of artiodactyl and turkey indices for regional sites.

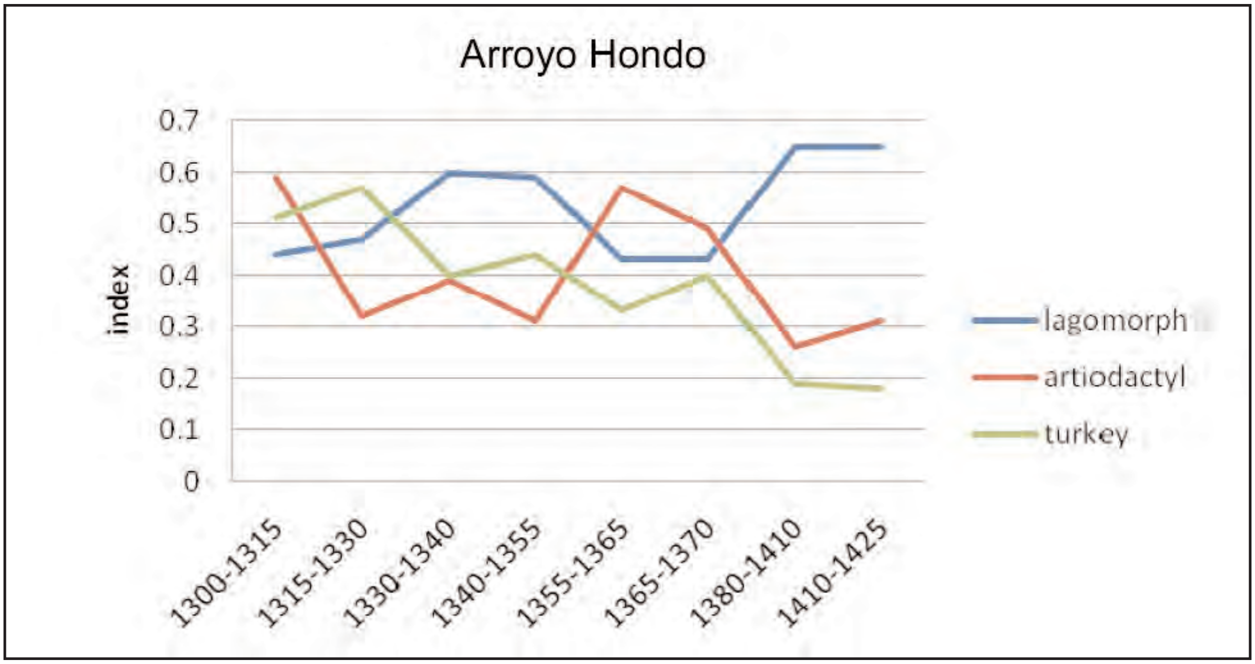


Figure 20.13. Indices for Arroyo Hondo.

of the more common taxa. Indeed, if the MNIs used to calculate the artiodactyl edible meat weight are compared to the actual bone counts, a low of 2.6 bones represents each MNI in Sample 2 (AD 1315–11330) and a high of 10.7 bones represent each MNI in Sample 5 (AD 1355–1365) with the second highest figure for Sample 1 (AD 1300–1315) at 5.6. Rabbits and turkeys are no better represented. Each rabbit MNI is represented by between 2.9 and 5.5 bones and turkeys by 2.6 to 7.3 bones. The overall effect of the Lang and Harris methodology is to dampen the variability so that the impression is one of little change (Fig. 20.14, top). The contribution of the smallest forms, rabbits and squirrels, appears to vary very little, turkey increases then decreases (Fig. 20.14 middle), and artiodactyl proportions decrease, gradually increase, then fall at the end (Fig. 20.14, bottom).

Ignoring the different measurement scales as well as what is being measured, the edible meat and index graph lines (Figs. 20.13 and 20.14) for turkeys and artiodactyls are vaguely similar in some respects but quite different in others. The edible meat graph suggests much less use of turkeys in the initial period but in this sample each turkey is represented by 7.3 bones, each artiodactyl by 5.6 bones, and each rabbit by only 2.9 bones. Because this sample is comprised of sheet trash and borrow pit fill (Lang and Harris 1984:135–136) preservation may have disproportionately affected the rabbit counts and MNIs. In the final period where the edible meat curve indicates more use of turkeys than the indices, each turkey is represented by 2.6 bones compared to 4.7 for rabbits and 5.3 for artiodactyls. This sample includes material associated with turkey pens that could further inflate the importance of this species, depending on how many subdivisions were used. The second peak in artiodactyl edible meat proportions in Sample 7 is not at all reflected in the index data. Here, each artiodactyl is represented by 4.4 bones, each rabbit by 5.5 bones, and each turkey by 5.3 bones and the sample is comprised of trash and midden material. Either scenario is plausible for the initial occupation where building activities could have resulted in less garden hunting and proportionately fewer rabbits with either domesticated turkeys or artiodactyl hunting providing the majority of the animal protein. Relatively high use of turkeys (edible meat graph) makes less sense in times of drought and low population as turkeys need to be fed and watered. Increased garden or artiodactyl hunting, as

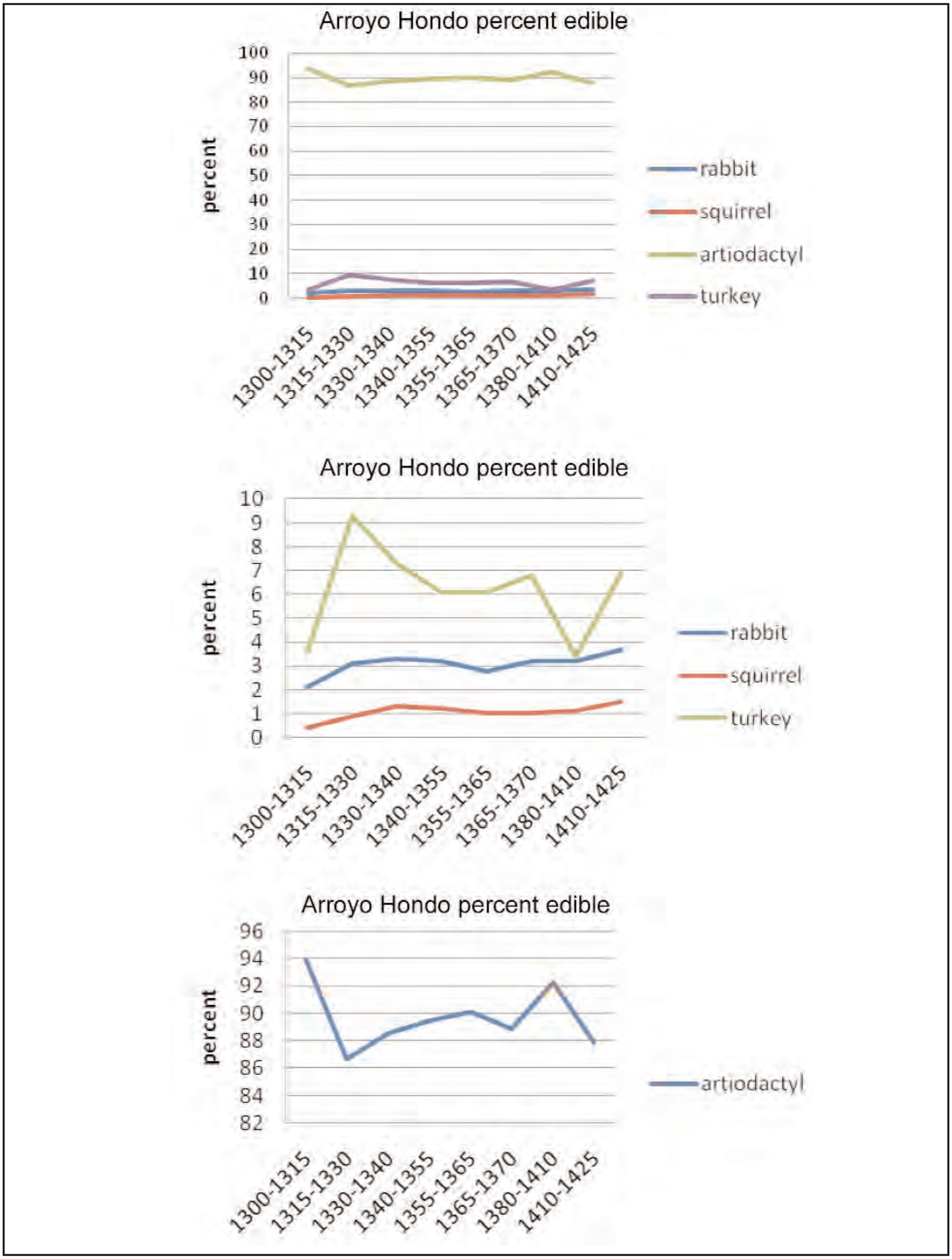


Figure 20.14. Arroyo Hondo percent of edible meat weight (after Lang and Harris 1984:108).

indicated by the high lagomorph indices in Periods 3 and 4 and high artiodactyl indices in Periods 5 and 6 are more likely responses. Because most of the Sample 7 material predates the major population growth and building (Lang and Harris 1984:142), the peak in artiodactyls (Fig. 20.4) may be a function of the origin of the sample, that is, midden and trash deposits, and a relatively large number of provenience divisions.

Fauna from the Cochiti Dam sites was also analyzed by Harris. Data are presented in MNIs calculated by archaeological unit. The lack of screening, use of MNIs, and method for grouping proveniences for MNI calculations should produce results that are somewhat different from the other sites, and they do, but not radically so (see Figs. 20.10–20.12). Proportions of cottontails with respect to jackrabbits are lower than for Peña Blanca but well within the range found at Arroyo Hondo. Using MNIs and the lack of screening undoubtedly favors jackrabbits so that the actual amount should be closer to Peña Blanca. Because the artiodactyl index calculations for these sites uses only those specimens identified to the species level (which is almost always a small minority of the sample), artiodactyls are undoubtedly underestimated. The turkey index for North Bank is less than for other Coalition sites but the lagomorph and artiodactyl indices are well within the range for other sites during this time. Regardless of the methodology, the results do not suggest a radically different mode of animal procurement at these later sites.

Compared with these regional site samples, Peña Blanca is probably most distinctive in the invariably high lagomorph indices. This is due in part to more thorough collection practices, primarily the use of fine screening and inclusion of flotation bone in the sample, to the site locations, and perhaps to a relatively sparse population during much of the occupation. The turkey index for the Coalition sample is among the highest for the regional sites but is based on a fairly small sample with a limited number of components contributing to the sample. The artiodactyl index varies considerably in all regions. In the Peña Blanca samples there is a weak inverse relationship between this index and the lagomorph index or contribution of cottontails (Pearsons correlation = -.450, sig [2-tailed] = .311), which is altered somewhat when the turkey index increases in the Coalition samples (see Fig. 20.5).

From a regional perspective, the assemblages considered in this report suggest that the lagomorph index reflects the location, commitment to agriculture, who does the hunting, and population density. More use of jackrabbits occurs when the commitment to agriculture is low due to environmental constraints or when the population density is high enough to have degraded the local resources. Cottontails are favored when the commitment to agriculture is moderate or better, the environment favors cottontails, women and children do much of the hunting, and the population is not so great as to have degraded the local resources. An interesting exception is the as yet unquantified, high use of cottontails in the Rio Grande Valley around Albuquerque in the late prehistoric period (Akins 1987b:166) where none of these conditions are met. Here, it may be that a change in farming technology allowed intensive agriculture for the first time and the expansion of field areas permitted cottontails to thrive in what had been jackrabbit habitat. Additional factors may be reflected in the Peña Blanca Coalition samples where the increase in cottontails paired with a low artiodactyl index and more turkey suggests an increased concentration on garden hunting either as a response to competition for artiodactyl hunting territories or decreases in the overall number of animals available or when agricultural intensification resulted in the increased use of seasonally occupied farmsteads.

Measures of artiodactyl use are always more complex. Hunting involves a greater range of strategies (e.g., communal, small group, individual, logistic, local), more disparity in the locations where the artiodactyl species can be exploited, seasonal patterns of animal group size and condition, and the possibility that groups from different areas utilize the same hunting areas. In Figures 20.10 and 20.12, a high artiodactyl index, which gages the amount of artiodactyl bone with respect to that for rabbits, (e.g., 0.5 or greater) is rarely combined with a low lagomorph index indicating more use of jackrabbits (e.g. less than 0.5) or a high turkey index indicating turkey counts are the same or greater than those of rabbits (0.5 or greater). This suggests that while there was a range of options for resource mixes, some are more improbable than others. Settled groups in the Rio Grande area rarely relied on a combination of artiodactyls and turkeys at the expense of rabbits. When it did occur, circumstances were fairly unique, as in the initial settlement of Arroyo Hondo. Similarly, few groups ignored the rapidly breeding and perpetual supply of cottontail that thrived in their presence.

Regardless of the proximity of the Rio Grande, populations seemed to have largely ignored river and river-edge animal resources until the Classic period. Neither the Peña Blanca Coalition deposits nor the Cochiti Dam site of North Bank show appreciable use of fish, water fowl, or riverine mammals. At North Bank, fish comprise only 0.9 percent and ducks 1.7 percent of the MNIs calculated by archaeological feature compared to 37.1 percent rabbit, 14.4 percent artiodactyl, and 15.3 percent turkey (Harris 1968:214). Fish increase to 2.4 and 2.5 percent at the Classic period sites of LA 70 and Alfred Herrera while ducks remain essentially the same at LA 70 (1.8 percent) but increase to 5.2 percent at Alfred Herrera. The rabbits comprise 27.4 percent at LA 70 and 23.4 percent at Alfred Herrera, the artiodactyls 4.1 and 5.8 percent, and turkeys 20.5 and 24.8 (Harris 1968:230, 1976 H 26-H 28). While these numbers suggest a slight increase in use of riverine resources, they also demonstrate a steady shift towards use of domestic turkeys at the expense of artiodactyls and, to a lesser extent, of rabbits.

Conclusions

This study finds little if any support for a hunter-gatherer refugium model (as described by Ware 1997:47). From the beginning, those occupying the Peña Blanca sites concentrated on garden hunting with little evidence that they relied on a more diverse array of animal resources than other early agricultural groups. Instead, the Early Developmental period faunal assemblage contains ample evidence that cottontail rabbits were the most consistently used animal resource and, if the relationship between ceramic counts and weights is an indication of the overall amount of animal use (Figs. 20.8 and 20.9), more rabbits were used than in any other period. Relative to both rabbits and ceramics, artiodactyl use was lower than in the Late Developmental but more than in the Coalition. This is not to say that artiodactyls were not important, but fewer parts, relative to rabbits and sherds, were deposited at these sites. Furthermore, site deposits indicate different areas of artiodactyl procurement. LA 265 has more evidence for the use of highland species (elk and bighorn) while LA 6169 and LA 6170 have more from the southeastern grasslands (pronghorn). The presence of dog burials, an indication of the importance of hunting relative to a commitment to agriculture (e.g., Frisbie 1967:127–129; Haag 1947:253–254) and evidence of hunting ritual (e.g., artiodactyl crania, carnivore parts, and bird wings) indicate that artiodactyl hunting played an important role.

One interpretation that is consistent with the importance of rabbits and relatively few but a good proportion of distant artiodactyls, is that only a portion of the population, mainly women and children, lived at these sites year-round and practiced agriculture and garden hunting. Other group members may have remained highly mobile, subsisting mainly on hunting and gathering but returning to the agricultural sites when their labor was needed and bringing parts of artiodactyl taken in distant areas. Periodic influxes of people are also suggested by cooking practices (Fig. 20.4). Roasting, a cooking method attributed to men (Crown 2000:223; Speth 2000:102) or made necessary by sudden increases in group size, is a more frequent cooking method for both rabbits and artiodactyls in the Early Developmental period. Rather than relying less on farming and more on hunting and gathering as in the refugium model, those who were best able to maintain a mobile lifestyle did so. At the same time, those who where less mobile became sedentary farmers who hunted in and around the gardens and at short distances. Stored resources helped to provide for the mobile group during winter and when they aided in the harvest and preparing fields for planting. Unconstrained by older and less mobile individuals, such a dual system would allow greater mobility for part of the group. At the same time, the sparsely inhabited residential sites would not have taxed the local animal populations and their needs could be met mainly through garden hunting. With the aid provided by the more mobile group, they could plant and harvest sufficient resources to feed the entire group for part of the year.

Population increases in the Late Developmental period seem to have resulted in some fundamental changes. In the Peña Blanca sample, cottontail rabbit proportions fall to the lowest level of the time sequence (Fig. 20.5) and rabbit counts relative to ceramic counts and weight decline significantly (Fig. 20.8). At the same time, the artiodactyl index increases considerably and the amount of artiodactyl bone relative to sherd counts and weight declines only slightly. While these two factors should suggest that artiodactyl hunting became more important or was at least as important as in the Early Developmental period, dogs were no longer buried suggesting their role changed or was diminished. In addition and based on a very small sample (Table 20.43), deer go from comprising 48.2 percent of the identifiable artiodactyl bones in the Early Developmental period sample to 61.5 percent in the Late Developmental period sample, perhaps suggesting an emphasis on more local resources or a greater concentration on this species. While these changes could indicate a decreased reliance on cultivars and garden hunting, these patterns could also reflect a shift in who did the hunting. Unable to remain as mobile as before, the entire group may have become sedentary. As women spent more time processing agricultural products, men assumed more of a role in protecting fields and garden hunting while still participating in logistic hunts, resulting in a more even resource mix.

Cottontail rabbits increase to their greatest proportions relative to jackrabbits in the Coalition deposits (Fig. 20.5). Overall, rabbit use either decreased slightly, as suggested by comparisons with ceramic counts, or increased significantly as compared to ceramic weights (Fig. 20.8). Both the artiodactyl index and ratio of artiodactyl bone to ceramics fall to an all time low as increases in the regional population may have reduced their ability to undertake long-distance hunts. Turkey counts increase significantly but with little evidence they were raised at these sites or used for food. If these sites were year-round residences, all this suggests that garden and local hunting was the primary strategy for providing animal protein during the Coalition. If the sites are farmsteads occupied during the growing season, then this pattern is entirely what is expected as it represents only those times when the population concentrated on farming and protecting fields and had less time for long-distance hunting.

Changes in animal procurement patterns at Peña Blanca can be attributed in large part to shifts in who did the hunting and the overall strategy employed as an increasingly large regional population increased the pressure on resources. As dependence on cultivars grew, as it often does when access to areas used for collecting wild resources is reduced, women spent more time processing plant products and less time tending the gardens and garden hunting. Men, who become more constrained in areas where they could hunt, spent more time tending the gardens and assumed the role of garden hunter. With this additional responsibility, hunts required planning to avoid scheduling conflicts and became increasingly logistic.

Chapter 21
Worked Bone Assemblages from Six Sites

Susan M. Moga

Worked bone was recovered from six of the Peña Blanca sites (Table 21.1), with sample sizes ranging in frequency from 2 to 45. The majority of the worked bone is from Early Developmental period deposits (65 percent) with few from any one of the later periods. This study identifies the taxon, classifies the artifact type, determines the function of 116 bone artifacts, and discusses the regional and chronological distributions of worked bone. Sixteen artifact types were recognized and the taxa used are 96.5 percent mammal and 3.4 percent bird.

Methods

Bones that display signs of modification were analyzed as manufacturing debris, tools, or ornaments. Virtually all of the worked bone was analyzed. Bags of fauna that were not selected for the general fauna analysis were examined and the worked bone pulled. While a few small fragments of tools and manufacturing debris were undoubedtly missed, most were recovered and reported here. Broken pieces that fit together are treated as a single object. All were observed under a microscope for modifications and use wear. Artifacts are recorded using an OAS computer format that includes the field specimen (FS), individual lot numbers, taxon, element (body part), condition, completeness of the object, thermal alteration, artifact type, kind and degree of modification, shape, cross-section, use wear, and a variety of measurements.

The condition of the artifact refers to the physical condition of the bone and visibility of the surface treatment. The range of surface treatment includes excellent, good, fair, and poor. Excellent indicates good preservation, where surface treatment can be determined on most of the surface of the object; good when only some of the surface is visible; fair when most surface treatment is obscured by weathering; and poor when little or no surface treatment remains. Fragmentary is used when an item is too fragmentary to determine the extent of the surface treatment.

Completeness is used to describe the portion of the object represented. Essentially complete was used for items that are complete or nearly so. Partial awls and awl-like objects are described as proximal, distal, or midsection/shaft fragments, and beads and tubes usually as fragmentary or incomplete. End is used when the proximal or distal portion is indistinguishable.

Thermal conditions or burning found in the Peña Blanca assemblage include light (tan to brown), lightly graded (tan to blackened), heavy (black), and calcined (white) burns. The color of the bone varies depending upon the length of time it is exposed to heat and the temperature of the fire.

Descriptions of the worked bone assemblages from Pecos Pueblo (Kidder 1932:195-271) and Arroyo Hondo Pueblo (Beach and Causey 1984:187-225) provided a substantial basis for defining artifact types, the terminology used, the overall descriptions, and functions used in the Peña Blanca analysis. Other Southwestern sources were also consulted.

Modification was recorded for the proximal or butt end, the shaft, and the distal or point end. Proximal ends can be unmodified natural ends, unmodified partial natural ends, or unmodified breaks. When modified, various degrees of polishing and grinding are recorded. Proximal ends can also have natural ends with minimal shaping. Shafts are generally unmodified, split, or display various degrees of polishing and grinding. Distal ends of the Peña Blanca artifacts generally have various

Table 21.1. Bone Artifacts by Site, Component, Completeness, Taxon, and Element

Site and Component	Feature	Artifact Type	Completeness	Taxon	Element	FS	Count
LA 249							
Structure 6 Fill		Bead or tube fragment	Midsection	Small mammal	Long bone	282	1
Structure 6 Fill		Fine-point awl	Distal	Medium artiodactyl	Ulna	316	1
Structure 6 Fill		Awl - no tip	Fragment	Medium artiodactyl	Metatarsal	321	1
		Bead or tube fragment	Fragment	Small mammal	Long bone	323	1
LA 265							
NONE ASSIGNED!		Awl - no tip	Essentially complete	Medium artiodactyl	Metapodial	1301	1
Structure 1- Upper Fill		Manufacturing debris	Midsection/shaft	Deer	Metatarsal	1011	1
		Awl - no tip	Incomplete	Large mammal	Long bone	1011	1
			Midsection/shaft	Medium artiodactyl	Long bone	1011	1
Structure 4 Floor Contact		Fine-point awl	Essentially complete	Medium artiodactyl	Metapodial	1054	1
Structure 13- Upper Fill		Fine-point awl	Essentially complete	Medium artiodactyl	Long bone	1213	1
Structure 13- Roof Fall		Utilized split metapodial	Essentially complete	Deer	Metacarpal	1477	1
Structure 13- Structure Floor Contact		Fine-point awl	Essentially complete	Medium artiodactyl	Metapodial	1306	1
Structure 13 - floor pit	141	Fine-point awl	Essentially complete	Deer	Metacarpal	1344	1
					Metatarsal	1344	1
Structure 13- Human Burial-subfloor	131	Fine-point awl	Essentially complete	Deer	Metatarsal	1547	1
		Matting-weaving tool	Essentially complete	Medium artiodactyl	Long bone	1547	1
Keyhole Structure	27	Fragmentary	Fragment	Medium to large mammal	Long bone	1139	1
		Unknown function	Incomplete	Elk	Rib	1138	1
SU 2- Large Bell-shaped Pit with infant burial	23	Bead or tube fragment	Midsection	Cottontail rabbit	Tibia	1077	1
SU 2- Large Bell-shaped Pit with adult burial	24	Split metatarsal(preform)	Essentially complete	Deer	Metatarsal	1489	1
		Four-sided object	Essentially complete	Medium artiodactyl	Metatarsal	1493	1
		Awl - no tip	Essentially complete	Deer	Metatarsal	1490	1
		Fine-point awl	Essentially complete	Medium artiodactyl	Metatarsal	1495	1
				Deer	Metatarsal	1492	1
						1494	1
SU 2- Large Bell-shaped Pit with dog burials	26	Awl preform	Essentially complete	Deer	Metatarsal	1115	1
SU 2- Large Bell-shaped Pit with dog burial	155	Fine-point awl	Midsection/shaft	Medium to large artiodactyl	Rib	1395	1
SU 3- Feature 14-NW Large Pit	14	Matt-weaving tool	Shaft fragment	Medium to large artiodactyl	Long bone	1162	1

Table 21.1. Continued.

Site and Component	Feature	Artifact Type	Completeness	Taxon	Element	FS	Count
				Medium to large artiodactyl	Long bone	1167	1
SU 14- Possible Structure with Features	56	Fragmentary	End	Medium artiodactyl	Metapodial	1433	1
LA 6169							
Structure 4 upper fill		Matt-weaving tool	Essentially complete	Medium to large artiodactyl	Long bone	497	1
		Fragmentary	Fragment	Deer	Metatarsal	301	1
Structure 4 vent shaft	66	Fine-point awl	Fragment	Small mammal	Long bone	1404	1
Structure 4 human burial in upper fill	75	Fragmentary	Fragment	Large mammal	Long bone	1158	1
Structure 4 floor fill and floor		Fine-point awl	Incomplete	Small mammal	Long bone	662	1
Structure 4 roof fall and floor fill		Fine-point awl	Fragment	Small mammal	Long bone	500	1
			Essentially complete	Deer	Metatarsal	365	1
		Matt-weaving tool	Essentially complete	Large mammal	Long bone	428	1
		Tube	Essentially complete	Medium to large bird	Long bone	411	1
Structure 47 upper fill		Coarse-point awl	Incomplete	Large mammal	Long bone	1842	1
		Matt-weaving tool	Essentially complete	Medium to large artiodactyl	Long bone	1930	1
Structure 47 roof fall and floor fill		Fine-point awl	Essentially complete	Large mammal	Long bone	1152	1
		Matt-weaving tool	Essentially complete	Medium to large artiodactyl	Long bone	1152	1
			Shaft fragment	Medium to large artiodactyl	Long bone	1658	1
Structure 47 floor fill and fill		Fragmentary	Fragment	Large mammal	Long bone	1836	1
Structure 47 storage bin	121	Awl - no tip	Essentially complete	Deer	Metacarpal	1926	1
Structure 76 upper fill		Fine-point awl	Incomplete	Large mammal	Long bone	1257	1
						1425	1
				Medium artiodactyl	Long bone	1290	1
			Essentially complete	Medium artiodactyl	Long bone	1290	1
		Coarse-point awl	Incomplete	Large mammal	Long bone	1349	1
			Essentially complete	Bighorn sheep	Ulna	1290	1
		Bead/short tube	Incomplete	Large bird	Long bone	1379	1
		Fragmentary	Fragment	Cottontail rabbit	Radius	1293	1
				Deer	Ulna	1293	1
Structure 76 human burials	81/82	Fragmentary	Incomplete	Medium artiodactyl	Long bone	1173	1

Table 21.1. Continued.

Site and Component	Feature	Artifact Type	Completeness	Taxon	Element	FS	Count
Structure 76 floor fill and floor		Coarse-point awl	Essentially complete	Deer	Metatarsal	1650	1
		Bead/short tube	Essentially complete	Large bird	Long bone	1648	1
		Four-sided object	Incomplete	Deer or elk	Antler	1579	1
Structure 76 adobe wall support	83	Fragmentary	Fragment	Medium to large	Long bone	1206	1
		Fine-point awl	Incomplete	Medium to large	Long bone	1975	1
Structure 15 floor fill and floor		Fine-point awl	Essentially complete	Jack rabbit	Radius	936	1
Structure 70 upper fill		Fine-point awl	Essentially complete	Golden eagle	Ulna	1319	1
Study Unit 1 extramural, trash-filled pit	29	Fine-point awl	Essentially complete	Jack rabbit	Fibula	1085	1
LA 6170							
Area 1		Awl - no tip	Proximal	Bighorn sheep	Metatarsal	1459	1
Structure 2 roof fall or redeposit		Use-defined object	Fragment	Medium artiodactyl	Long bone	1052	1
Structure 5 overburden		Fine-point awl	Essentially complete	Medium artiodactyl	Long bone	1363	1
Structure 5 wind and water deposits		Tube	Essentially complete	Medium carnivore	Long bone	1403	1
Structure 5 roof fall and closing material		Awl - no tip	Incomplete	Medium artiodactyl	Metatarsal	1651	1
		Matt-weaving tool	Proximal	Medium to large artiodactyl	Long bone	1602	1
		Awl preform	Midsection/shaft	Medium artiodactyl	Metatarsal	1510	1
		Manufacturing debris	Midsection/shaft	Medium artiodactyl	Metatarsal	1520	1
Structure 5 floor fill & contact		Fragmentary	Fragment	Medium artiodactyl	Long bone	1823	1
		Matt-weaving tool	Shaft fragment	Medium artiodactyl	Long bone	1823	1
Structure 5 vent tunnel	24	Awl - no tip	Incomplete	Deer	Metatarsal	1937	1
Area 2		Bead or tube fragment	Fragment	Small to medium mammal	Long bone	2385	1
Structure 50 wind and water deposits		Fine-point awl	Essentially complete	Deer	Metatarsal	2068	1
		Coarse-point awl	Distal	Large mammal	Long bone	1967	1

Table 21.1. Continued.

Site and Component	Feature	Artifact Type	Completeness	Taxon	Element	FS	Count
Structure 50 wind and water deposits		Four-sided object	Essentially complete	Pronghorn or bighorn	Horn	2068	1
		Fragmentary	Fragment	Medium to large mammal	Long bone	2068	1
				Large mammal	Long bone	1982	1
				Medium artiodactyl	Long bone	2068	2
					Metapodial	2068	1
			Proximal		Metapodial	2068	1
				Deer	Metacarpal	2068	1
Structure 50 roof fall & closing material		Awl - no tip	Incomplete	Large mammal	Long bone	2017	1
			Fragment	Large mammal	Long bone	2017	1
		Fine-point awl	Essentially complete	Deer	Metacarpal	2021	1
		Bead or tube fragment	Fragment	Jack rabbit	Tibia	1971	1
			Incomplete	Jack rabbit	Tibia	1971	1
		Manufacturing debris	Fragment	Medium artiodactyl	Metapodial	2076	1
		Fragmentary	Fragment	Medium artiodactyl	Long bone	1968	1
					Metapodial	2033	1
			Midsection/shaft	Medium artiodactyl	Long bone	1969	1
Structure 50 floor fill and contact		Fine-point awl	Essentially complete	Medium artiodactyl	Metapodial	2082	1
		Tube	Incomplete	Jack rabbit	Femur	2156	1
		Manufacturing debris	Proximal	Medium to large mammal	Long bone	2082	1
				Pronghorn	Metatarsal	2082	1
			Midsection/shaft	Medium artiodactyl	Metapodial	2101	1
		Fragmentary	Midsection/shaft	Medium artiodactyl	Metapodial	2101	1
					Long bone	2082	
			Fragment	Medium artiodactyl	Metapodial	2118	1
Structure 50 ash pit	153	Fragmentary	Distal	Small to medium	Long bone	2272	1
			Fragment	Large mammal	Long bone	2272	1

Table 21.1. Continued.

Site and Component	Feature	Artifact Type	Completeness	Taxon	Element	FS	Count
Structure 50 vent tunnel	169	Fragmentary	Fragment	Medium artiodactyl	Metapodial	2396	1
			Midsection/shaft	Jack rabbit	Tibia	2336	1
Structure 50 sealed storage pit	171	Small spatulate	Essentially complete	Medium to large mammal	Long bone	2319	1
			Distal	Jack rabbit	Tibia	2319	1
LA 6171							
Structure 26 fill		Fragmentary	Fragment	Large mammal	Long bone	877	1
Structure 60 fill		Awl - no tip	Proximal	Deer	Metatarsal	653	1
		Fine-point awl	Distal	Medium to large mammal	Long bone	601	1
Structure 60 floor		Awl - no tip	Distal	Large mammal	Long bone	695	1
		Coarse-point awl	Distal	Large mammal	Long bone	666	1
LA 115862							
Structure Fill		Fine-point awl	Essentially complete	Deer	Metacarpal	140	1
Structure Floor		Fine-point awl	Essentially complete	Deer	Metacarpal	145	1

degrees of polishing and grinding. Special modification such as drilled holes, grooving for snapping or for stringing, or surface polish are recorded as a separate variable. The shape or plan view and cross section were recorded for the proximal end, midsection, and distal end when that portion is complete enough for the shape to be determined.

Up to two types of use wear can be recorded on functional ends (e.g., the distal ends of awls, spatulas, flakers, and so forth, and both ends of tubes and beads). This usually consists of polish, longitudinal striations, transverse or rotary striations, pitting, flaking, spalling, or step fractures.

All measurements are recorded in millimeters and only when the object is complete. Functional length is the taper length for awls and needles. Shaft widths are measured at midpoint and distal width just above the taper width on awls.

Typology, Description, and Function

This section describes each artifact type, the attributes, and the frequencies for the Peña Blanca assemblage. Table 21.2 gives the distribution of worked bone by site and Table 21.3 the distribution by ceramic dating period. Complete measurements for worked bone artifacts can be found in Table 21.4.

Manufacturing Debris

The seven pieces of manufacturing debris are artiodactyl bones that came from two sites (LA 265, LA 6170). The majority of these pieces are in good condition and exhibit polishing and grinding (n = 4), with minimal shaping, and a few display signs of intentional splitting. Four fragments are burned, one lightly scorched, and three pieces are blackened.

Fragments

Fragments, which comprise the second largest type in the assemblage (n = 27), are pieces of modified bone that are too small to determine the artifact type. The faunal sources include long bone fragments from small- to medium-sized mammals (n = 1), medium to large mammals (n=4), large mammals (n = 5), and medium artiodactyls (n = 6). Identified elements include a cottontail radius, a jackrabbit tibia, medium artiodactyl metapodials (n = 7), and a mule deer ulna and metatarsal. A few pieces are in poor (n = 2) or fair (n = 2) condition, and the remaining pieces (n = 22) are well preserved. Most are shaft fragments (n = 16) and a few are end fragments (n = 5). Modification is generally polished or ground (n = 18). All but 10 fragments are burned, ranging from lightly scorched to calcined. The majority of the burned pieces came from the burned roof fall stratum within Structure 50 (LA 6170), which dates to the Early Developmental period.

Use-Defined Objects

These are objects of bone that were utilized, often as expedient tools, that cannot be placed into a specific classification. The example here is a long bone splinter from a medium artiodactyl that has step fractures along one edge. This expedient tool is not burned, is in good condition, and came from LA 6170.

Preforms

Preforms represent the early stages of tool, usually awl, production. The three examples from Peña Blanca include a split deer metatarsal with no further modification, and split metatarsals from a deer and a medium artiodactyl that have modification directed toward awl manufacture (Fig. 21.1a, b).

Piercing Tools

Approximately half of the assemblage (n = 50) is comprised of a variety of piercing tools. Awls are produced from bones that were either deliberately split to manufacture the awl, or from pieces of broken or splintered bones. Piercing tools from Peña Blanca include awls with missing tips (n = 13), fine-point awls (n = 31), and coarse-point awls (n = 6). Fine and coarse-point awls were distinguished largely

Table 21.2. Frequencies of Bone Artifact Type by Site at Peña Blanca

Tool Type	Site													
	LA 249		LA 265		LA 6169		LA 6170		LA 6171		LA 115862		Total	
	n=	%	n=	%	n=	%	n=	%	n=	%	n=	%	n=	%
Manufacturing debris	-	-	1	3.8	-	-	6	13.3	-	-	-	-	7	6
Fragmentary	-	-	2	7.7	7	20.6	17	37.8	1	20	-	-	27	23.3
Use-defined object	-	-	-	-	-	-	1	2.2	-	-	-	-	1	0.9
Split metapodial/preform	-	-	1	3.8	-	-	-	-	-	-	-	-	1	0.9
Awl preform	-	-	1	3.8	-	-	1	2.2	-	-	-	-	2	1.7
Awl-no tip	1	25	4	15.4	1	2.9	5	11.1	2	40	-	-	13	11.2
Fine-point awl	1	25	10	38.5	13	38.2	4	8.9	1	20	2	100	31	26.7
Coarse-point awl	-	-	-	-	4	11.8	1	2.2	1	20	-	-	6	5.2
Four-sided object	-	-	1	3.8	1	2.9	1	2.2	-	-	-	-	3	2.6
Small spatulate	-	-	-	-	-	-	2	4.4	-	-	-	-	2	1.7
Matt-weaving tool	-	-	3	11.5	5	14.7	2	4.4	-	-	-	-	10	8.6
Bead/short tube	-	-	-	-	2	5.9	-	-	-	-	-	-	2	1.7
Tube	-	-	-	-	1	2.9	2	4.4	-	-	-	-	3	2.6
Bead/tube fragment	2	50	1	3.8	-	-	3	6.7	-	-	-	-	6	5.2
Edge-wear (flaked)	-	-	1	3.8	-	-	-	-	-	-	-	-	1	0.9
Unknown function	-	-	1	3.8	-	-	-	-	-	-	-	-	1	0.9
Total	4	100	26	100	34	100	45	100	5	100	2	100	116	100

Table 21.3. Frequencies of Peña Blanca Bone Artifact Type by Ceramic Dating Period

	Early Developmental		Mainly Early Developmental		Late Developmental		Mainly Late Developmental		Coalition		Mainly Coalition		Mainly Classic		Unknown		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Manufacturing debris	6	8	1	10	-	-	-	-	-	-	-	-	-	-	-	-	7	6
Fragmentary	20	26.7	-	-	1	16.7	3	23.1	-	-	3	50	-	-	-	-	27	23.3
Use-defined object	1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.9
Split metapodial/preform	1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.9
Awl preform	1	1.3	1	10	-	-	-	-	-	-	-	-	-	-	-	-	2	1.7
Awl - no tip	8	10.7	4	40	-	-	1	7.7	-	-	-	-	-	-	-	-	13	11.2
Fine-point awl	18	24	1	10	2	33.3	5	38.5	2	100	2	33.3	-	-	1	33.3	31	26.7
Coarse-point awl	2	2.7	1	10	1	16.7	2	15.4	-	-	-	-	-	-	-	-	6	5.2
Four-sided object	2	2.7	-	-	1	16.7	-	-	-	-	-	-	-	-	-	-	3	2.6
Small spatulate	2	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1.7
Matt-weaving tool	6	8	1	10	-	-	-	-	-	-	1	16.7	-	-	2	66.7	10	8.6
Bead/short tube	-	-	-	-	1	16.7	1	7.7	-	-	-	-	-	-	-	-	2	1.7
Tube	2	2.7	1	10	-	-	-	-	-	-	-	-	-	-	-	-	3	2.6
Bead or tube fragment	4	5.3	-	-	-	-	1	7.7	-	-	-	-	1	100	-	-	6	5.2
Edge-wear (flaked)	1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.9
Unknown function	1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.9
Total	75	100	10	100	6	100	13	100	2	100	6	100	1	100	3	100	116	100

Table 21.4. Bone Artifact Dimensions (mm) for Peña Blanca (complete measurements only)

Artifact type	Statistic	Total Length	Functional Length	Proximal Width	Width at Midshaft	Distal Width	Tip Width	Proximal thickness	Shaft thickness	Distal thickness
Use defined	n=	-	-	-	1	-	-	-	1	-
	mean	-	-	-	7.8	-	-	-	4.2	-
Awl preform	n=	-	-	1	2	-	-	1	2	-
	mean	-	-	18	9.7	-	-	7.6	6.8	-
	st. deviation	-	-	-	0.78	-	-	-	0.42	-
	minimum	-	-	-	9.2	-	-	-	6.5	-
	maximum	-	-	-	10.3	-	-	-	7.1	-
Awl - no tip	n=	-	-	7	12	3	-	8	12	2
	mean	-	-	17.8	10.7	8.9	-	11.1	6.8	5.5
	st. deviation	-	-	4.2	3.1	2.9	-	4.1	2	0.42
	minimum	-	-	11.7	5.5	6.8	-	4.8	3	5.2
	maximum	-	-	21.9	16	12.2	-	15.7	10.3	5.8
Fine point awl	n=	14	26	17	29	27	26	18	29	26
	mean	86.2	17.9	14.5	9.1	5.7	1.3	9.7	5.1	2.7
	st. deviation	34.8	9.2	6.9	3.8	3.7	0.3	5.7	2.3	1.5
	minimum	16.2	5.4	4.2	3	1.5	0.8	2	1.5	0.7
	maximum	149	49	25.1	15.5	14.2	1.9	21.2	10.4	6.8
Coarse point awl	n=	2	6	2	4	6	5	2	3	6
	mean	107.8	15.1	24.4	11	6.7	2.4	12.8	6.1	4.5
	st. deviation	21.4	4.9	3.8	2.6	4	0.6	3.8	3.6	1.3
	minimum	92.7	8.7	21.7	8.3	1.6	1.7	10.1	3.1	3.1
	maximum	123	19.8	27	14.6	11.8	3.1	15.5	10.1	6.4
Four-sided object	n=	1	2	2	3	2	1	2	2	2
	mean	80.4	8.8	6.9	9.3	8.4	6.8	5	6.4	5.7
	st. deviation	-	0.8	2.3	3	0.4	-	0.8	1.2	1.4
	minimum	-	8.3	5.4	7.3	8.1	-	4.4	5.6	4.7
	maximum	-	9.4	8.5	12.8	8.7	-	5.6	7.3	6.7
Small spatulate tool	n=	1	1	1	2	1	1	-	2	1
	mean	46.8	7	4.1	5.3	3.9	2.3	-	1.9	2.1
	st. deviation	-	-	-	1	-	-	-	0	-
	minimum	-	-	-	4.6	-	-	-	1.9	-
	maximum	-	-	-	6	-	-	-	1.9	-
Matt waving tool	n=	4	-	5	9	5	3	5	9	5
	mean	150.9	-	9.8	9.2	7.6	4.5	2.4	2.2	1.4
	st. deviation	52.9	-	2.1	1.9	1.2	2.2	0.5	0.8	0.7
	minimum	83.5	-	7.4	7	5.6	1.9	1.6	1	0.5
	maximum	205	-	13	12.9	8.2	5.9	2.9	3	2.3
Bead or short tube	n=	1	2	2	2	2	-	1	2	2
	mean	27.3	25.9	10.9	10	10.9	-	8.9	8.9	8.2
	st. deviation	-	2	0	1.3	0	-	-	2	1
	minimum	-	24.2	10.9	9.1	10.9	-	-	7.5	7.5
	maximum	-	27.4	10.9	10.9	11	-	-	10.4	8.9
Tube	n=	2	-	2	3	3	-	2	2	2
	mean	35.8	-	9.8	8.5	8.9	-	7.8	7.4	7.2
	st. deviation	4	-	3.6	3.6	3.9	-	3.5	3.7	3.5
	minimum	33	-	7.3	6.4	6.6	-	5.3	4.8	4.7
	maximum	38.7	-	12.4	12.6	13.4	-	10.3	10	9.7
Bead or tube fragment	n=	-	-	2	4	1	-	2	3	1
	mean	-	-	5.9	6.2	5.2	-	5.5	3.6	5.2
	st. deviation	-	-	1	1	-	-	0.5	1.4	-
	minimum	-	-	5.2	5.2	-	-	5.2	2.5	-
	maximum	-	-	6.6	7.5	-	-	5.9	5.2	-
Edge wear - flaked	n=	1	-	1	1	1	-	1	1	1
	mean	221	-	20.9	18.4	12.8	-	11.3	8.2	8.3
Unknown function	n=	-	1	-	1	1	1	-	1	1
	mean	-	2.1	-	21.3	21.4	20.9	-	10	9.1

on the basis of tip size. Table 21.5 summarizes the attributes for the Peña Blanca awls.

Kidder (1932:203) defines awls as tools with sharp points used to perforate hides or for the manufacture of basketry. According to Beach and Causey (1984:193), hide-working tools from Arroyo Hondo exhibit one or more of the following characteristics: brown staining, high polish, and a short robust shape. The brown staining probably results from materials (animal brains and fat) used to dress the hide. Basketry awls from Arroyo Hondo are long and thin, with tapered shafts and display signs of bleaching. Bleaching and polish on awls may have been caused by friction against vegetal materials utilized in basketry. The distinction between basketry and hide-working awls is not always obvious and cannot be based solely on size and staining or bleaching. Several awls at Arroyo Hondo display both staining and bleaching and have similar tips, probably indicating that tools had dual functions and were used to make baskets as well as to work hide (Beach and Causey 1984:193–194). Some forms may be more advantageous for a particular task. Sharp, short, and sturdy tools are required to penetrate hides. Through experimental studies, Olsen (1979:355) discovered that larger sized awls with blunt tips could not penetrate leather. Instead, they were used to increase the size of perforations made by smaller, sharp-tipped awls.

Awl–no tip. The majority of tools in this type (n = 13) are ground, polished, and well-shaped shaft fragments (Table 21.5) with missing tips, preventing their identification as either coarse or fine-point awls. Thermal alteration affected six of these awls, ranging from lightly burned to heavy and calcined. Faunal sources include large mammals (n = 4), medium artiodactyls (n = 4), mule deer (n = 4), and a bighorn sheep (n = 1).

Fine-point awls. All six sites at Peña Blanca produced fine-point awls (n = 31), with the largest numbers coming from LA 6169 (n = 13) and LA 265 (n = 10). Only two fine-point awls are burned, one light to heavy (LA 6170) and the other heavily burned (LA 6169). The majority of the tools are in good to excellent condition (Table 21.5). Several shaft portions of awls are unmodified, others are ground and polished.

One fine-point awl has a transverse groove for a string located near the mid-section of the tool (Fig. 21.1c). Microscopic viewing revealed longitudinal striations, transverse striations, flaking or spalling, and a step fracture on the fine-point awls. The faunal sources are mostly artiodactyls (n = 10) and mule deer (n = 10), with several from medium to large (n = 2) and large mammals (n = 3), a few from small mammals (n = 3), a jackrabbit (n = 2), and an ulna from a golden eagle (Fig. 21.1d).

The average tip width is 1.3 mm, slightly larger than those awls used in Olsen's (1979:355) hide-piercing experiments, which found awl tips less than 1.0 mm the optimum diameter for piercing leather hides. The total length of fine-pointed awls from Peña Blanca range between 16.2 to 149.0 mm (Table 21.4), suggesting a variety of functions.

Coarse-point awls. Coarse-point awls are also produced from broken and splintered long bones, or from bones deliberately split to make awls. Tips are wider and the handle stouter than for fine-tipped awls. Coarse-tipped awls may have been used to increase the size of a perforation initially made with a fine-tipped awl (e.g., Olsen 1979:355).

Coarse-point awls from Peña Blanca were made from large mammal long bone fragments (n = 4), a mule deer metatarsal, and a bighorn sheep ulna. Only one awl is blackened from burning (LA 6170). The condition of the tools varies from poor to good (Table 21.5). Use-wear observed on the awls includes polish and longitudinal striations. The proximal end on the bighorn sheep ulna awl is a natural, unmodified end. The individual is a juvenile and the proximal epiphysis is unfused (Fig. 21.2a).

Four-sided objects. This category was used for a small group of objects that resemble Kidder's four-sided implements, which taper gradually to points, but are not as sharp as awl tips or as blunt as punches. Some ends on Kidder's tools

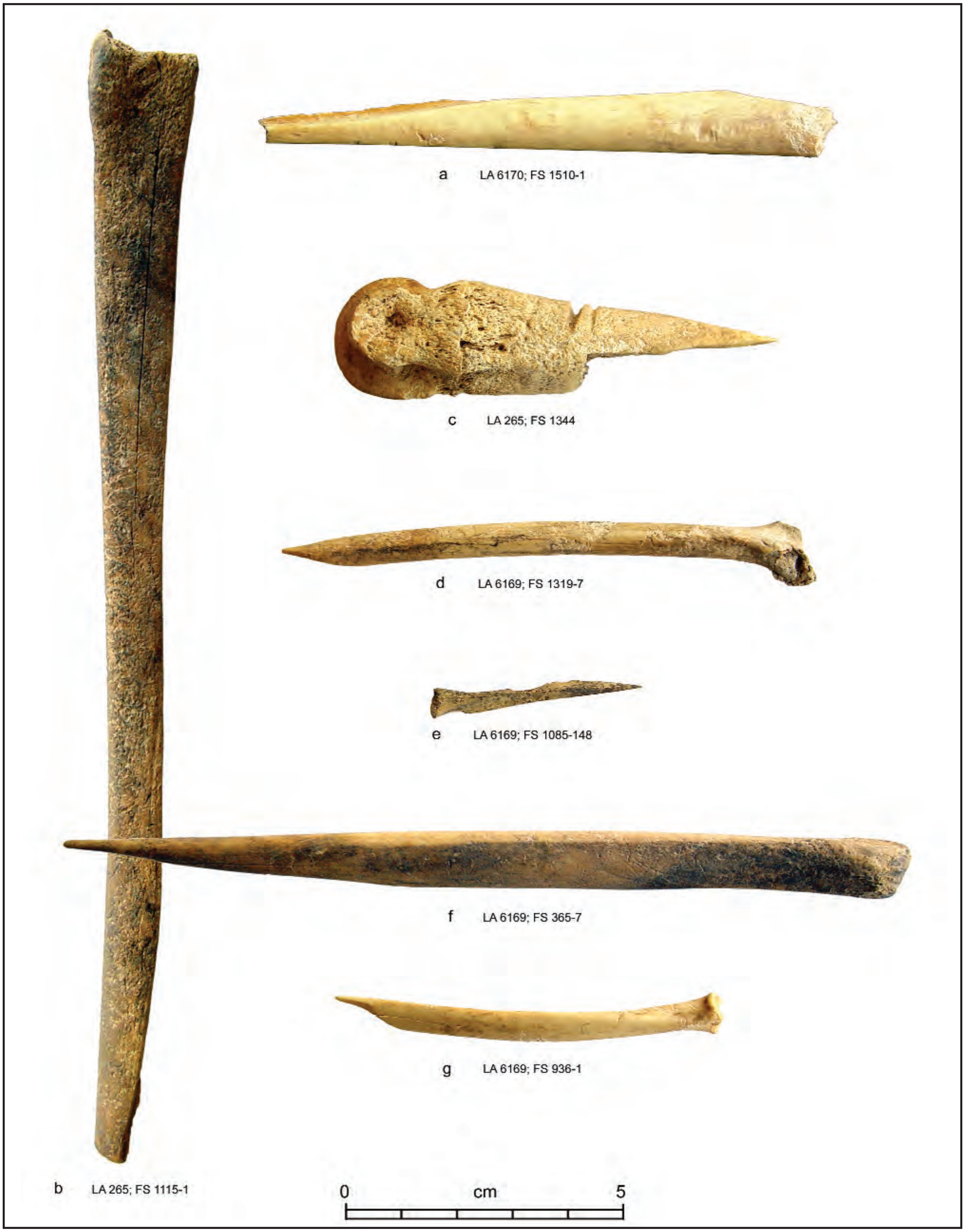


Figure 21.1 Bone tools; (a) Medium artiodactyl metatarsal awl preform from LA 6170; (b) deer metatarsal awl preform from LA 265; (c) deer metacarpal fine point awl with a transverse groove from LA 265; (d) golden eagle ulna fine point awl from LA 6169; (e) jack rabbit fibula fine point awl from LA 6169; (f) deer metatarsal fine point awl from LA 6169; (g) jack rabbit radius fine point awl from LA 6169.

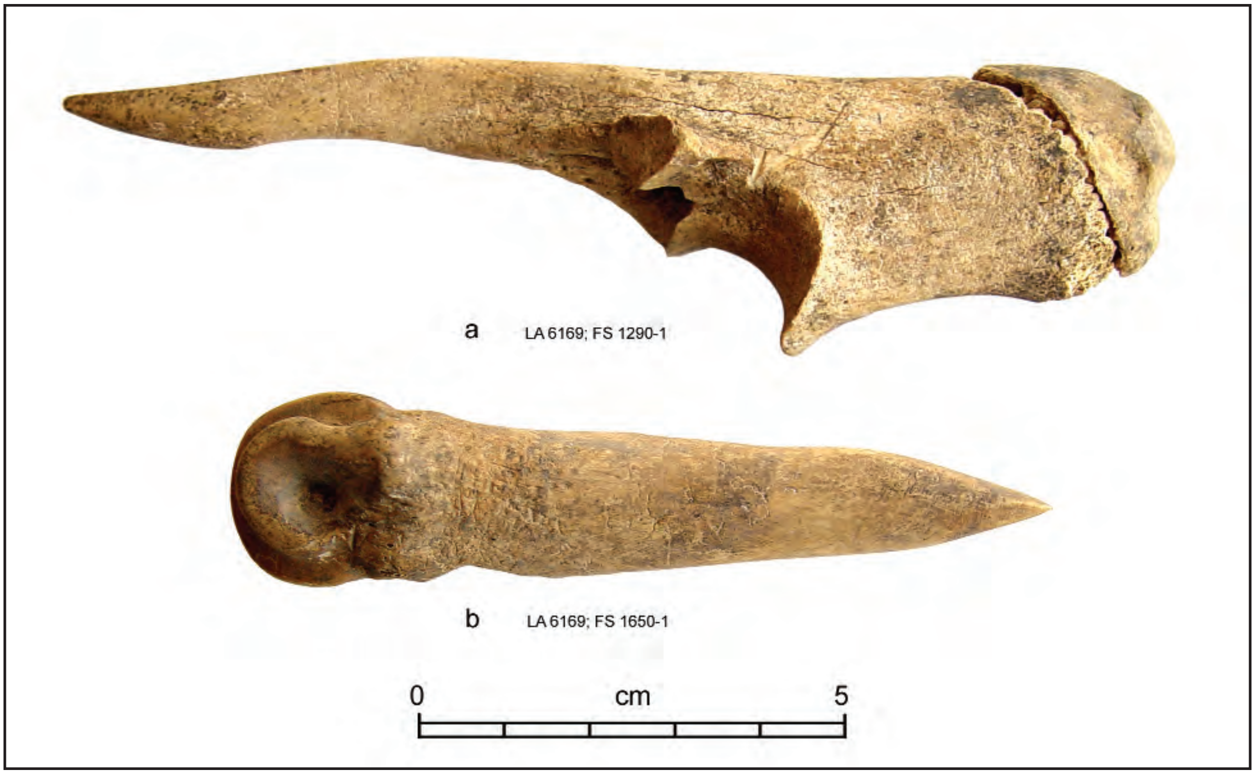


Figure 21.2. Coarse-point awls; (a) Bighorn sheep ulna awl from LA 6169; (b) deer metatarsal awl from LA6169.

are polished (1932:225). While we adapted Kidder's (1932:282–284) terminology for these objects, similar tools are referred to as "flakers" by other researchers (e.g., Stubbs and Stallings 1953:134–135). Kidder describes "flakers(?)" from Pecos as implements that have both round and wedge-shaped tips, but he was uncertain of their function. At Arroyo Hondo (Beach and Causey 1984:212), the "flakers" were interpreted as stone-knapping tools to pressure flake flint stone tools. These implements display varying degrees of polish on the shaft and tips and several had beveled tips.

Three of these objects (Figs. 21.3a, b) were recovered from Peña Blanca. Faunal sources include a medium artiodactyl metatarsal, a pronghorn or bighorn horn, and a deer or elk antler. Two are complete and one is an end fragment. The condition is good to excellent. Ends are moderately ground and polished or completely modified. Shafts are minimally to moderately ground and polished. On the complete artifacts, one end is rounded or convex and the other forms a broad point. Ends are round to oval in cross section, and midsections are either round or rectilinear. Polish is the only discernable wear (n = 1).

Small Spatulate Tools

Two small spatulate tool fragments (from the same provenience at LA 6170) were made from portions of a medium to large mammal long bone and the tibia of a jackrabbit. Both fragments are unburned and in good condition. The spatulates are rectilinear in shape with a crescent-shaped shaft cross section. All portions on one are well shaped through polishing and grinding. The proximal end on the other tool is unmodified and irregular, the distal end was minimally shaped with visible polish. Kidder (1932:242) suggests these tools were utilized for delicate skinning. The small rounded edges could have been used to remove flesh from small animals and birds (Fig. 21.3c).

Matt-Weaving Tools

The matting tools (n = 10) are some of the finest and most interesting tools recovered from Peña

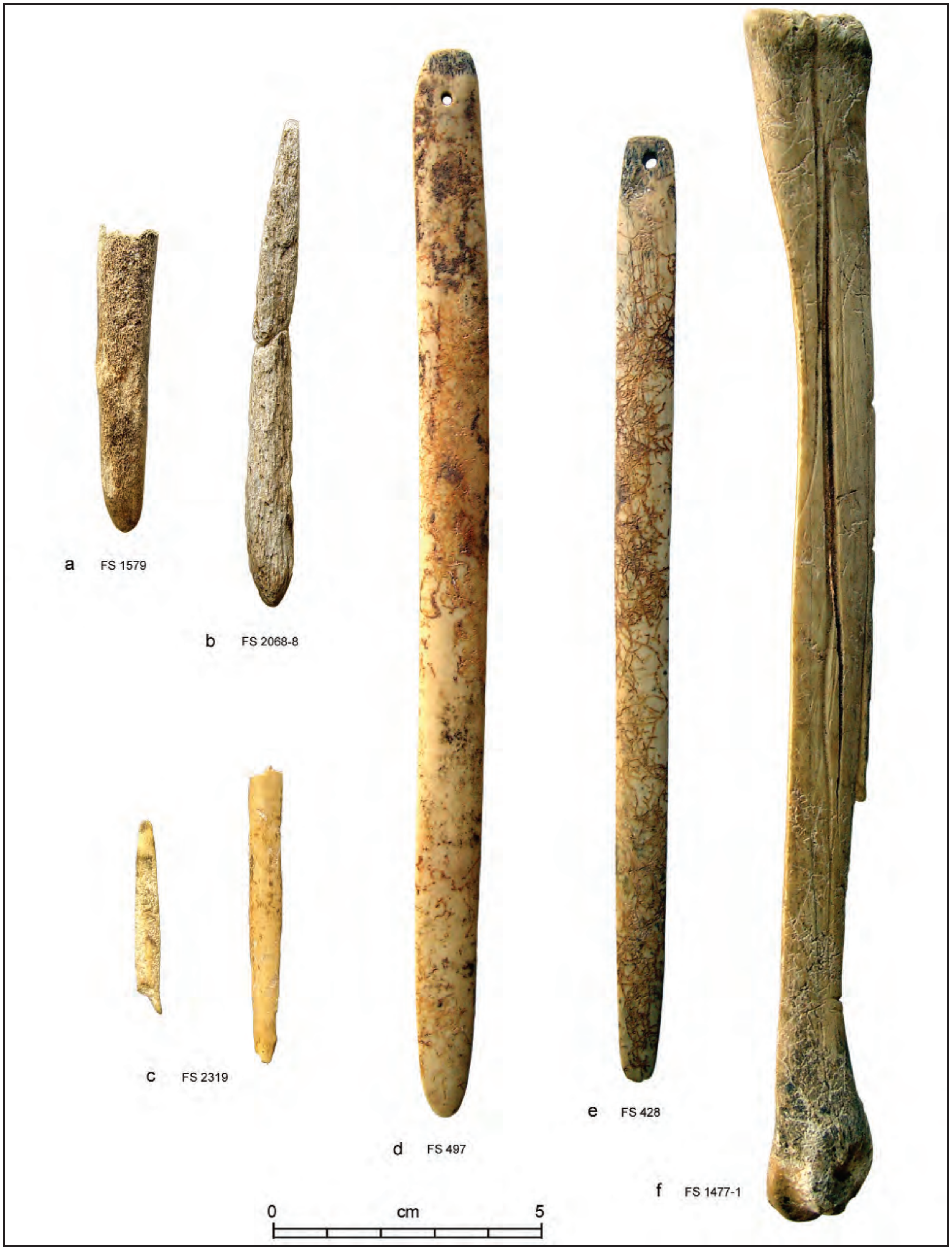


Figure 21.3. Bone tools; (a) Deer or elk antler four-sided object from LA 6170; (b) pronghorn or bighorn four-sided object from LA 6170; (c) small spatulate tools from LA 6170; (d) medium to large artiodactyl long bone matt-weaving tool from LA 6169; (e) Large mammal long bone matte-weaving tool from LA 6169; (f) deer metacarpal multi-functional tool from LA 265.

Blanca. At least seven of these tools are associated with Early Developmental components. Five tools are complete, one from LA 265 and four from LA 6169. Another tool is less than half present but included the proximal end. The others are shaft fragments. All tools have a very high polish and most are bleached suggesting they were used in the manufacture of some form of basketry. These are made from dense compact bone, usually the outer table of artiodactyl ribs. Several have areas where the cancellous rib tissue is not completely obliterated. Complete tools range in length from 83.5 to 205.0 mm with a width of 7.0 mm to 12.9 mm and a midshaft thickness of 1.0 to 3.0 mm. The tools are ground to a thin lenticular cross section. Proximal ends are either rounded or squared in shape, while distal ends are rounded or have broad points. All of the complete tools have drill holes at the proximal end as does the proximal fragment. These could be either threading holes utilized during the weaving process or suspension holes to hang and protect the lengthy tools, which are fairly delicate, when not in use (Fig. 21.3d, e).

All of the weaving tools exhibit a high degree of polishing and shaping. Although it is not possible to determine whether the high polish on these artifacts resulted from manufacture or use. Condition ranges from fair to excellent, with most being excellent. Two pieces are badly deteriorated from environmental conditions. Only one (LA 6169) is lightly scorched. One of the complete tools from LA 6169 has diagonal abrasions at the distal end.

Few similar tools have been recovered from the Rio Grande area. Snow recovered an object described as made from a rib and having a threading hole at one end from the floor of a Late Developmental structure at the Cochiti Dam site of LA 272 (Snow 1971a:20). A single example was found with an elderly female burial in the Early Coalition site of LA 3333 in the Galisteo Basin (Akins n.d.). Two fragments from Arroyo Hondo described as altered mammal ribs, one with a drill hole, are probably the same kind of tool (Beach and Causey 1984:215). None were found in excavations of Pindi Pueblo (Stubbs and Stallings 1953). However, McNutt (1969:49, Plate 9) recovered a complete example from the intermediate area at the Tesuque By-Pass site, which probably dates to the Late Developmental period.

Kidder recovered 27 specimens that he thought could have been employed in the manufacture of rush or twilled yucca-leaf basketry. He described the tools as splinters of bone with flat, tapered points, which were probably useful in manipulating flat strands of fiber. Neither of the examples illustrated resemble the Peña Blanca tools (Kidder 1932:226–227). Snow (1976:D 33) reports a single weaving tool described as made from an ulna, having an intact proximal end, a broken tip, a highly polished edge on the shaft, and transverse grooves. These appear to be quite different when compared with the Peña Blanca weaving tools.

While clearly present in Upper Middle Rio Grande sites, these forms are not reported in publications from Anasazi sites in Chaco and Mesa Verde areas. However, they do occur to the south. Martin recovered several fine examples from the SU Site, a Mogollon village site in western New Mexico (1968:71, 225). Similar objects have also been reported from Casa Grandes, Mexico. DiPeso considers these to be specialized bone plating tools used in the reed matt-weaving industry (1974:543–544). The broad points and bleaching on these tools suggest the Peña Blanca tools performed a similar matt-weaving function. Two of these tools, one from the Peña Blanca site of LA 265 and one from LA 3333, were buried with older females and other bone tools, suggesting females were the matt-weavers.

Tubular Bone Objects

Three categories of tubular bone objects were recovered from Peña Blanca, beads or short tubes (n = 2), tubes (n = 3), and beads or tube fragments (n = 6). Tubes are three times greater in length than their width, and beads are less than three times smaller. The hollow shaft portions of long bones were utilized for beads and

Table 21.5. Summary of the Attributes for Peña Blanca Awls

	Awl, No Tip	Fine Point	Coarse Point
Completeness			
Proximal	5	-	-
Distal	3	10	4
Mid-section/shaft	3	-	-
Complete	2	21	2
Proximal Modification			
Unmodified natural	1	5	-
Unmodified partial natural	3	4	1
Unmodified break	-	1	-
Split or cut	-	1	-
Polished/ground, minimal	1	3	-
Polished/ground, moderate	-	1	-
Completely modified	1	-	-
Natural end, minimally shaped	1	5	1
Shaft Modification			
Unmodified	-	4	1
Split only	-	5	2
Polished/ground, minimal	-	5	-
Polished/ground, moderate	4	6	-
Polished/ground, well-shaped	8	9	1
Distal Modification			
Unmodified	-	-	1
Polished/ground, minimal	-	3	3
Polished/ground, moderate	-	1	-
Polished/ground, well-shaped	2	19	2
Polished/ground, completely modified	-	3	-
Other Modification			
Surface polish	-	1	1
Transverse groove for string	-	1	-
Proximal Shape			
Unmodifield/irregular	-	7	1
Flattened or squared	1	1	-
Rounded or convex	5	8	1
Converging sides	-	1	-
Articular surface	1	3	-
Shape at Midshaft			
Unmodified/irregular	-	2	1
Flattened or squared	1	1	-
Rounded or convex	-	1	-
Concave	1	1	-
Sides parallel	1	7	1
Converging sides	9	18	1

Table 21.5. Continued.

	Awl, No Tip	Fine Point	Coarse Point
Distal Shape			
Unmodified/irregular	-	-	1
Flattened or squared	-	1	-
Rounded or convex	-	1	-
Converging sides	1	2	2
Broad point	-	-	3
Fine point	-	21	-
Proximal Cross Section			
Rounded or convex	1	-	-
Ovoid	-	1	-
Square or rectilinear	4	9	1
Flattened/rectilinear	-	2	-
U or crescent shaped	1	1	1
Domed or D-Shaped	-	2	1
Irregular	1	4	-
Cross Section at Mid-Shaft			
Ovoid	5	2	1
Square or rectilinear	2	1	1
Flattened/rectilinear	-	7	-
U or crescent shaped	5	10	-
Triangular or pyramid	-	7	-
Domed or D-Shaped	-	2	1
Distal Cross Section			
Round	-	7	-
Ovoid	2	19	5
U or crescent shaped	1	2	0
Triangular or pyramid	-	-	1
Use Wear			
Unknown (broken)	10	2	-
Polish	1	22	4
Longitudinal striations	-	1	1
Transverse striations	1	1	-
Flaking or spalling	-	1	-
Step fractures	-	1	-
Present, but indeterminate use	1	2	1

tubes. The proximal and distal joints were removed by incising grooves at each end with a stone tool. When the grooves were made deep enough, the ends were snapped off and a tube was created. Continuous incisions and snaps along a shaft would create a series of beads. Grooved edges of the tubular objects were often ground to create a finished edge (Beach and Causey 1984:206; Kidder 1932:256; Olsen 1979:359–360). The number of tubular objects recovered from Peña Blanca is small and most are incomplete and could not be called a bead or a tube. Tubular implements are thought to have been utilized as ornaments, drinking tubes, medicinal sucking instruments, gaming pieces, or strung together to make breast plates or wrist guards for archery (Beach and Causey 1984:206; Kidder 1932:256; Olsen 1979:359–360).

Bead or Tube Fragments. Pieces (n = 6) that are too fragmentary to distinguish whether they are tubes or beads are considered bead or tube fragments. These items were recovered from four sites. Faunal sources include small mammal (n = 2), small to medium mammal (n = 1), cottontail (n = 1), and jackrabbit (n = 2).

Half of the bead or tube fragments are in fair condition, one is too fragmentary to determine, and two are in good condition. Polish and grinding ranges from minimal (n = 1) to well shaped (n = 1), and three exhibit evidence of the bone being grooved and snapped. Thermal alteration is present on three pieces ranging from heavy (n = 2) to calcined (n = 1).

Bead or Short Tube. Two beads or short tubes are made from large bird bones. One is burned light to heavy and both are in good condition. The ends are well shaped by polishing and grinding and the shafts are minimally polished. Both display evidence of grooving and snapping. Portions of one tube interior appear to be smooth and/or polished. This sheen could occur when beads are strung on leather thongs or sinew and the movement of the beads against the leather will eventually polish the edges and interior of the bead.

Tube. Three tubes (two complete) were made from a large bird long bone shaft fragments, a medium-sized carnivore long bone fragment shaft, and a jackrabbit tibia. They range in size from 33.0 mm to 38.7 mm in length and 6.4 to 12.6 mm in diameter at midshaft. The edges of the carnivore bone tube fragment are beveled, and one edge of the bird bone tube displays an additional groove that was probably intended for snapping rather than decoration. All tubes are in good condition and one tube is partially burned. Ends are either moderately or well polished from either manufacture or use-wear.

Multifunctional Tools

At LA 265, a unique tool with an unknown function was manufactured from a mule deer metacarpal. It is in fair condition and unburned. Split longitudinally, the tool has the initial appearance of a metapodial split for the eventual manufacture of some form of tool. With closer inspection, the edges of the split shaft are polished. This tool may have been pulled lengthwise across leather or yucca fiber with both hands, thereby, acquiring polish from use-wear. One edge exhibits signs of battering. The exterior shaft has three longitudinal grooves that do not connect. Perhaps this is a beginning toolmaker's attempt to groove and split the bone a second time, became discouraged, and tossed it away. Another individual could have picked up the piece and used it.

Both natural ends of the metacarpal are unmodified, with the exception of polish and battering on the distal or condyle end. There is also a short, transverse groove on the distal shaft, possibly created by a string. This "rough-draft-of-a-tool" may have been involved in processing materials for matt or basketry weaving. Whatever the function of this tool might have been, it was categorized as multifunctional, because of the shaft polish, battering, and the groove possibly made by string (Fig. 21.3f).

Objects of Unknown Function

A proximal shaft fragment of an elk rib from LA 265 is minimally shaped and has abrasions on the end. The opposite end is missing, but the utilized end shows polish from use. The object is in good condition and unburned (Fig. 21.4).

Distribution

The majority of tools recovered from the six sites at Peña Blanca are from Early Developmental deposits (Table 21.5), with another ten from mainly Early Developmental deposits. Lesser numbers of tools were found during the Late and mainly Late Developmental periods, and these consist of a variety of awl types. Awls continue to be present through Coalition and mainly Coalition periods, but none was recovered from the mainly Classic period where only a bead or tube fragment was present. There were no tool kits associated with structures. However, an adult female burial at LA 265 (Feature 24, a large bell-shaped pit) had a tool kit comprised of a split metatarsal preform, a four-sided object, four fine-point awls, and an awl with no tip (Fig. 21.3a). Another adult female burial from LA 265 (SU 13, Feature

Figure 21.4. Elk rib object of unknown function from LA 265.

131) was interred with a fine-point awl and a matt-weaving tool.

The most unique of the Peña Blanca bone artifacts, the matt-weaving tools, were recovered mainly from Early Developmental deposits (Fig. 21.3d, e). These, as well as the variety of tools found, suggest that a range of activities took place. All sites had fine-point awls and most had beads or tubes.

Regional Comparisons

Comparing bone artifacts frequencies from regional sites is difficult because of the diverse excavation and collection strategies and the typological systems utilized by researchers. In addition, frequencies in some are presented as spatial or temporal components and others by the site as a whole. With this uneven treatment in mind, only the most consistently identified bone artifact types are used for comparison (Table 21.6). The comparative sites and occupational periods include: Pecos (late Coalition to Historic), Arroyo Hondo (late Coalition to Classic), Pindi (Late Developmental to Coalition), LA 3333 (Early Coalition), and the Cochiti Dam site of LA 70 (Classic).

Awls

Awls are the largest category of tools recovered from sites in the regional sample, ranging from 43.4 to 62.0 percent of the bone artifacts. While the proportions of awls are not that different, the faunal sources differ considerably. Later sites, with a good deal of turkey in the faunal assemblage, have more bird bone awls. At LA 70, the most commonly utilized bones were bird tibiotarsi followed by tarsometatarsi. Turkey bones comprised 45.5 percent (n = 131) of the awls collected at LA 70 (Snow 1976:D33). At Pindi, awls made from bird bones comprise 51 percent of the assemblage, while 32 percent of those from Arroyo Hondo are made from bird bones. The high percent of bird bones from Pindi reflects the importance of turkey husbandry at the pueblo and demonstrates how turkey by-products were utilized. The largest class of bird bone awls retained the head or condyle of the bone (80 percent) and were made from tibiotarsi and radii (Stubbs and Stallings 1953:131, 135). Conversely, turkey was not as abundant in the earlier dating deposits at Peña Blanca and at LA 3333 and few awls were made from bird bones. At Pecos, 2,479 awls were collected and only 253 were made from bird bones. Splinter awls (n = 184) made from "leg and wing bones of turkey and other large birds" were more common than awls with joint ends (n = 69). Kidder found awls "on all levels," but they were not temporally categorized and this impressive number of awls represents a 500-year occupation (Kidder 1932: 202, 217–219).

Table 21.6. Comparison of Selected Bone Artifacts for Regional Sites (does not include preforms, manufacturing debris, and small fragments that cannot be assigned an artifact type)

	Pena Blanca Early Developmental		LA 3333 Early Coalition		Pindi Coaltion		Arroyo Hondo Coalition-Classic		Arroyo Hondo Classic		Cochiti(LA 70) Classic		Pecos all periods	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Awls (all types)	28	59.6	37	46.2	184	64.8	317	60.5	97	54.5	264	62	2748	43.4
Matt-weaving tool	6	12.8	1	1.2	-	-	1?	0.2	1?	0.6	-	-	9?	0.1
Four-sided tools	2	4.2	-	-	1?	0.3	-	-	-	-	-	-	37	0.6
Spatulates/small spatulates	2	4.2	5	6.2	3	1.1	4	0.8	2	1.1	13	3	246	3.9
Flakers and antler-time tools	-	-	-	-	-	-	17	3.2	7	3.9	17	4	913	14.4
Bead or tubes	6	12.8	14	17.5	52	18.3	100	19.1	28	15.7	102	23.9	2044	32.3
Bitsitsi whistles	-	-	1?	1.2	8	2.8	48	9.2	26	14.6	1	0.2	-	-
Whistles or flutes	-	-	2	2.5	23	8.1	23	4.4	6	3.4	19	4.5	86	1.3
Other bone artifact types	3	6.4	20	25	13	4.6	14	2.7	11	6.2	10	2.3	247	3.9
Totals	47	100	80	100	284	100	524	100	178	100	426	100	6330	100

Sources: LA 3333 Akins in prep: Table a; Arroyo Hondo Beach and Causey 1984:Table 24; Pindi Stubbs and Stallings 1953:127; LA 70 Snow 1976:D36; Pecos Kidder 1932:202-203

Beads or Tubes

Bone bead or tubes are the second most common bone artifact recovered in the regional sites, except for Peña Blanca where beads, tubes, and matt-weaving tools were recovered in equal numbers. Excavations at Pindi Pueblo produced 52 bead or tubes, with only four of them considered tubes, and an infant burial contained a strand of six bone beads near the neck area (Stubbs and Stallings 1953:137). Kidder recovered an astonishing number of bone beads or tubes (n = 2,044) from Pecos. He divided his beads and tubes into subgroups based on tube diameter measurements. Most researchers employ his length typology to distinguish beads from tubes (Kidder 1932:203, 256–257, 263).

Bone tube flutes and whistles and Bitsitsi whistles are commonly found in the Rio Grande sites. Flutes have more than one hole while bone tube whistles have a single hole at either the center or near the end of the tube. Bitsitsi whistles consist of two small bone tablets bound together by vegetal matter (Stubbs and Stallings 1953:137). Kidder recovered a number of bird bone flutes or "flageolets" and whistles from Pecos. The later were identified by Zuni workmen as probable "whistles or bird-calls." Nothing resembling a Bitsitsi whistle was recovered from Pecos (Kidder 1932:249–252) .

At Pindi Pueblo, several bone tube whistles with a pierced hole near the center were found along with eight small Bitsitsi bone tablets. Stubbs and Stallings were informed by the Zuni that Bitsitsi is a personage associated with the Shalako ceremony and the Bitsitsi whistles are still utilized during Zuni rituals today (Stubbs and Stallings 1953:135–137).

A possible Bitsitsi whistle tablet was recovered from LA 3333 (Akins n.d.) and half a Bitsitsi whistle made from a bird bone was found at LA 70 (Snow 1976:D34). Large numbers of Bitsitsi whistles were recovered from Arroyo Hondo, most made from bird bones. Beach and Causey (1984:209–219, 225) interpret the presence and absence of Bitsitsi whistles at sites as temporal differences and cultural divergence. Neither Bitsitsi nor bone tube whistles were found at Peña Blanca. It also has the lowest number of bone beads or tubes in the regional sample (Table 21.6). This suggests these forms either developed later in time or simply were not or were rarely used by these earlier groups.

Matt-Weaving Tools

Matt-weaving tools are a rare find among the six Rio Grande sites. Other objects called matt-weaving tools are generally described as "haphazard . . . splinters of bone" with a "general inferiority of finish" (Kidder 1932:227). In comparison, the ten matt-weaving tools from Peña Blanca are magnificently manufactured. The entire shaft and rounded tips are so ground and polished that they have an ivory-like appearance. The extreme polish reveals untold hours of either tool manufacture or matt-weaving.

Miscellaneous Tools

Other tools, such as spatulates, flakers, and antler artifacts were also present at the Rio Grande sites. Gaming pieces are conspicuously absent at Peña Blanca. These do appear at later dated sites in the area. At LA70, Snow classified two shaped turtle carapace pieces as game "counters" along with three pieces of split bird bones that are completely polished. Two of the bird bones had black paint on the ends (Snow 1976:D30–31). Gaming pieces and bone tinklers, both of which are commonly found in northern Anasazi sites, are absent from the worked bone assemblages from Pindi Pueblo, Arroyo Hondo, LA 3333, and Pecos, suggesting a different tradition in bone object manufacture and use.

Conclusions

Residents of Peña Blanca and the surrounding sites fashioned mammal and bird bones into the implements necessary to fulfill daily tasks. Awls, which were essential tools for basketry, sewing, and hide preparation, are found in virtually all the Middle and Northern Rio Grande worked bone assemblages reviewed. Tubular objects, some manufactured into musical instruments, are widely distributed Similarities in the bone artifacts found at Peña Blanca and the regional sites indicate a shared tool tradition for the Rio Grande region.

Chapter 22
Human Skeletal Remains

Nancy J. Akins

Excavations undertaken as part of the Peña Blanca Project discovered a small number of human burials and scattered remains. When the first human burial was found, the Cochiti Tribal Council was consulted and they concurred with removing the human remains and conducting descriptive analyses at the Office of Archaeological Studies before reburial. Human burials and burial goods recovered during excavations related to the construction of Cochiti Dam were already scheduled for reburial, and the Council requested that the Peña Blanca burials be interred at the same time. On October 29, 1998, human remains and associated burial goods from a number of institutions were reburied on Cochiti Tribal land. The few scattered pieces of bone found in the general artifact assemblage were buried in the same location.

The Population

Burials were recovered from five sites (Table 22.1, Appendix 5.1). Another site contained a single tooth while no human burials were found at the final site. The two largest sites, LA 265 and LA 6169, have the largest number of burials and unassociated bones (Table 22.2). Not all are formal burials. In two instances, individuals were not recognized in the field because they were badly eroded. Fragmentary burials are treated as burials. In others, single or few bones indicate the presence of a distinct individual and these are treated as a burial. Thus, in this report, the term burial refers to a distinct individual rather than a formally buried and intact person, even if that individual is represented by only one or a few bones. Contexts of isolated bones were examined and when there was any possibility that these could be from an already identified individual, the isolated bone was not considered a distinct individual. When no other individual of that age and missing that particular part was found in the area, other factors were considered. These include whether the parts are small enough to have been transported a moderate distance by burrowing rodents or have evidence of carnivore damage, and whether that particular part conveys any information about an individual – such as burial context and age or sex. Individuals not included in Table 22.1 but in the demographic counts are those represented by an isolated male femur (FS 1479) and the radius from a 14- to16-year-old (FS 1010) from LA 265 and a foot phalanx (FS 1249) from a child around or over 6 years of age from LA 6169. The other individuals near that age, Burial 1 (found at 118N 134E) and Burials 10 and 11 (recovered at 85N 91E), were found at a sufficient distance to suggest that at least one additional child is represented by the phalanx (103N 136E). A burned radius from LA 6169 (FS 1667) is not counted as it could be from either of the males represented by single bones.

Although the number of individuals represented by burials and unassociated bones is relatively small (n = 30), the majority (n = 20) date to the Early Developmental period and can address a range of research questions. Since much of the previous work in the area was at later dating sites, these individuals provide base line data on a previously unreported segment of the prehistoric population in the Cochiti area. Because the sample is small, most conclusions must remain tentative with an emphasis on comparisons with better represented groups.

General Methods

Field methods differed slightly depending on the site director, the context, and the method of discovery. Individual methods and feature descriptions are found in the site section of this report.

Table 22.1. Individuals Represented at Peña Blanca Sites

LA	Burial	Sex	Age	Study Unit	Feature	Grid or Center Point	End Elevation	FS No.	Comments
249	1	female	45 ± 5	1	4	106N 113E	99.53	293	Late Developmental/Early Coalition; carnivore damaged
265	1	unknown	3 years	2	23	465.20N 492.80E	99.64	1483	Early Developmental; rodent disturbed
	2	unknown	9 ± 3 months	1	238	454.60N 498.79E	99.29	1679	Early Developmental
	3	female	30 ± 5	2	244	459.55N 500.10E	99.8	1700	Early Developmental
	4	female	45 ± 5	2	24	467N 490E	99.37	1485	Early Developmental
	5	female	50+	13	131	463N 537.25E	98.18	1537	Early Developmental
	6	female	50+	4	22	441.70N 493.28E	99.27	1482	Early Developmental; carnivore disturbed
	7	female	35-45	1	18	453.35N 496.35E	99.53	1015	Early Developmental; carnivore disturbed
6169	1	unknown	6 ± 2 years	8	82 (76)	118N 134E	98.66	1172	Late Developmental
	2	female	45+	11	2	94.88N 102.05E	@99.65	399	Early Developmental; disturbed by backhoe
	3	unknown	0 ± 2 months	1	1(4)	85N 87E		177	Early Developmental
	4	unknown	0 ± 2 months	8	120(47)	121.64N 136.21E	98.98	1714	Early Developmental
	5	male	20-40	1	8 (4)	86.85N 86.75E	98.21	212	Early Developmental; partial cranium only
	6	female	20-25	11	3	90.07N 96.62E	99.23	222	Coalition; carnivore disturbed
	7	unknown	2.5 y ± 10 m	8	49(47)	121.95N, 133.20E	98.92	1033	Late Developmental
	8	male	45+	10	95 (70)	94.08N 90.45E	98.29	1713	Coalition; carnivore disturbed
	9	male	18-19	8	81(76)	118.50N, 132.00E	98.4	1212	Late Developmental; rodent disturbed
	10	unknown	7 ± 2 years	1	68(66,4)	85.10N 91.14E	@98.90	1207	Early Developmental?
	11	unknown	5 ± 1.5 years	1	75(66,4)	85.12N 91.28E	98.88	1209	Early Developmental?
	12	unknown	4 ± 1 year	1	46	88.78N 94.35E	99.72	876	Coalition?
	13	unknown	0 ± 2 m	1	4	86N 89E	98.5	363	Early Developmental; not recovered as a burial
6171	1	male	45 ± 5	6	85	185.50N 178.30E	98.98	843	Coalition with Developmental
	2	unknown	30-40	3		230.25N 174.50E	97.81	540	Coalition with Developmental
115862	1	female	35 ± 5	2	6	99.10N 107.50E	98.85	172	Early Developmental
	2	unknown	fetus	2	6	99.10N 107.50E	98.85	172	Early Developmental
	3	female	18-19	2	7	100.40N 111.10E	98.98	157	Early Developmental
	4	unknown	6-9 months	2	8	101.28N 108.39E	99.06	185	Early Developmental, not recovered as a burial

Table 22.2. Scattered Human Elements by Site and SU and Individual

LA	FS	SU	Feature	Grid	End Elevation	Elements	Age/Sex	Comments	Date
249	280	1	6	106N 115E	99.32	L hand phalanx 1	mature♀	part of Burial 1	LD/EC
	286	1	6	105N 115E	99.39	L metacarpal 5	mature♀	part of Burial 1	LD/EC
	308	1	6	106N 115E	99.38	L? hand phalanx 3	mature♀	part of Burial 1	LD/EC
	374	1	2	106N 112E		hand phalanx 2, tarsal frag	mature♀	part of Burial 1?	LD/EC
265	1010	1	1	455N 495E		R radius, proximal and midshaft	14-18y		ED
	1076	2	23	north half	99.63	hand phalanx 1, carpal	3 years	part of Burial 1?	ED
	1286	9	51	vent	99.27	L mandibular central incisor, root partially disolved	mature	older adult; possible natural loss	ED
	1361	3	15	484N 495E	98.89	cranial case fragment	mature		ED
	1363	4	72	444N 493.05E	99.03	2 cranial case fragments	mature		ED
	1479	13		461N 539E	98.75	R femur shaft	mature♂	ends chewed off	ED
	1139	2	27	462.95N 494.25E	100.13	L vert arch frag	@ 2y		ED
6169	160	1	4	85N 87E	98.79	L radius, L prx ulna	0 ± 2m	part of Burial 3	ED?
	500	1	4	87N 86E	98.36	hand phalanx 2	7	part of Burial 10	ED
	764	1	4	86.78N 89.90E	98.51	R scapula, coracoid process	7	part of Burial 10	ED
	819	1	15	84N 90E	98.62	L? rib frag	7	part of Burial 10?	C/ED
	1238	1	87	85N 91E	98.88	3 hand phalanx 1, hand phalanx 2, L prox humerus frag; rib frags	7	part of Burial 10	ED
	1352	1	66	85N 91E		hand phalanx 1	7	part of Burial 10	C/ED
	1393	1	66	85N 91E	98.57	L radius, distal and shaft frag	7	part of Burial 10?	C
	1405	1	15	85N 90E	98.77	hand phalanx 1, phalanx 2, L prox humerus frag, R proximal fibula shaft	7	part of Burial 10?	C
	1406	1	66	85N 91E	98.63	tooth	7	part of Burial 10	C/ED
	1407	1	68	85.49N 90.90E	98.94	L rib 1	7	part of Burial 10	C/ED
	419	1	4	85.94N 86.51E	98.91	hand phalanx 1, 2 hand phalanx 3	5	part of Burial 11	C/ED
	709	1	4	85N 89E	98.4	hand phalanx 2	5	part of Burial 11	ED
	906	1	15	85N 90E	98.54	L distal rib, L prox rib; R scapula - coracoid epiphysis, hand phalanx 3	5?	probably Burial 11?	C
	997	1	15	84.81N 90.46E	98.47	tooth	7	part of Burial 11?	C
	1401	1	66	84N 91E	98.74	R rib distal, sternal element, unknown frag	2+	could be Burial 10 or 11; remodeled periostitis	C/ED
	1249	6	79	103.50N 136.30E	98.58	Foot phalanx 2, digit 1, distal & shaft	>6		MCD
	781	8	76	120N 131E	99.45	R occipital fragment	< 3	Burial 7?; active periostitis	ED
	1129	8	47	119N 133E		2 partial cerv vert arches; Rm1	3-6	probably Burial 7; backhoe trench	LD
	1142	8	76	NW quad	98.64	L distal rib; 2 cranial case frags	2-6	probably Burial 7	LD
	1172	8	82	118N 134E	98.66	L prx rib	<6	with Burial 1, probably Burial 7	LD
	1203	8	76	NE quad		vert body frag; epiphysis or tarsal frag; sphenoid frags, case frag	2-6	probably Burial 7; active periostitis on sphenoid and case frag	LD
	1316	8	76	SW quad	98.26	nasals	2-6	probably Burial 7	LD
	1667	9	76	floor fill	98.14	L radius, midshaft	mature	burned black; not Burial 9	LD
	1754	8		120N 132E	98.3	R scapula, acromion	> 2	probably Burial 7	LD/C

Table 22.2. Continued.

LA	FS	SU	Feature	Grid	End Elevation	Elements	Age/Sex	Comments	Date
6169	1788	8	47	120N 134E	98.2	R rib shaft frag, hand phalanx 1, cranial frags	2-6	Burial 7	ED
	915	8	76	122N 133E	99.1	R ulna shaft	mature	part of Burial 9	LD
	933	8	76	120N 132E	98.8	vert arch frag	mature	part of Burial 9	LD
	1013	8	76	118N 133E	99.1	L radius shaft	mature	part of Burial 9	LD
	1152	8	47	118N 134E	98.5	cranial case fragment	mature	part of Burial 9	LD
	1202	8	76	117N 133E		L hamate	mature	part of Burial 9	LD
	1315	8	81	118.95N 131.85E	98.3	rib shaft frag and prox epiphysis; distal humerus frag; 2 teeth	mature	part of Burial 9; in a rodent burrow	LD
	1425	8	76	120N 132E	98.3	cerv vert arch and body frag, cranial case frag	mature	part of Burial 9	LD
	1426	8	81	119N 132E	98.3	rib shaft fragments; long bone end fragment; 3 teeth	mature	part of Burial 9; in rodent disturbance	LD
	1427	8	76	119N 131.85E	98.3	R humerus, distal end & shaft	mature	part of Burial 9; carnivore gnaws prx end	LD
	1445	8	81	118.80N 131.80E	98.2	rib shaft fragment; 1 tooth	mature	part of Burial 9; carnivore puncture	LD
	346	10		95N 90E	99.4	Long bone shaft frags	mature	possibly Burial 8	C
	1183	10	70	93N 89E	98.9	hand phalanx 1	@ 6 y		C
	1279	10	70	92N 90E	98.3	thoracic vert frags	@ 6 y		C
	1616	10	95	93N 90-91E	98.3	foot phalanx 1, L5 vert transverse process; L vert superior articular facet	mature	probably Burial 8	C
	216	11		90N 96E	99.3	Vert frag, probable tarsal frag, 3 frags	mature	probably Burial 6	MCD
	222	11	3	90N 96E	99.2	Rm2 crown	@ 9 m	with Burial 6	MCD
	280	11		91N 95E	99.7	R fibula shaft frag	mature	probably Burial 6, matches FS 588	MCD
	588	11		91N 97E	99.5	R fibula, prx shaft frag	mature	probably Burial 6, matches FS 280	MCD
6170	2396	10	50	vent shaft	99.2	L maxillary first molar	mature	roots mostly dissolved; wear score 7.7	ED
6171	657	6	60	186N 183E	97.2	R talus, inferior frag	mature	not Burial 1	ED/C
	681	8		237N 172E		R mandibular canine	mature	probably same individual as Burial 2	C

ED= Early Developmental
LD= Late Developmental
C = Coalition
MDC = mixed Coalition and Developmental

Laboratory analysis followed the procedures set out in *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). This comprehensive system focuses on collecting the maximum amount of comparable information by recording the same attributes using the same standards. A series of 29 attachments and documentation records the following information.

1. Each part that makes up a human skeleton is inventoried along with an assessment of completeness and the portions found. Observations are documented using a series of drawings of skeletons and anatomical parts. A separate form records commingled or isolated bones.
2. Adult sex is determined by examining aspects of the pelvis and cranium. Size and comparative measurements were used when no other methods were possible on the Peña Blanca burials and isolated parts. Age changes are documented on the pubic sym-

physis using two sets of standards, on the auricular surface of the ilium, and through cranial suture closure.

3. For immature remains, the age-at-death is determined by scoring dental development, epiphyseal union, union of primary ossification centers, and through measurements of elements. Comparison with aged individuals allowed for approximate aging of the isolated parts from Peña Blanca.
4. Dental recording includes a number of diagrams as well as inventory, pathology, and cultural modification forms. Each tooth is coded and visually indicated for presence and whether it is in place, unobservable, or damaged, congenitally absent, or lost premortem or postmortem. Tooth development is assessed, occlusal surface wear is scored, caries are located and described, abscesses are located, and dental hypoplasias and opacities are described and located with respect to the cemento-enamel junction. Any premortem modifications are described and located.
5. Permanent teeth are measured and dental morphology scored for a number of traits.
6. Measurements are recorded for the cranium (n = 35), and a number of postcranial elements: the clavicle, scapula, humerus, radius, ulna, sacrum, innominate, femur, tibia, fibula, and calcaneus (n = 46). (Appendix 5.2)
7. Nonmetric traits are scored for the cranium (n = 21), atlas vertebra (n = 2), seventh cervical vertebra (n = 1), and humerus (n = 1).
8. Postmortem changes or taphonomy are recorded when appropriate. These include color, surface changes, rodent and carnivore damage, and cultural modification.
9. The paleopathology section groups observations into nine categories: abnormalities of shape, abnormalities of size, bone loss, abnormal bone formation, fractures and dislocations, porotic hyperostosis/cribra orbitalia, vertebral pathology, arthritis, and other conditions. The element, location, and other pertinent information are recorded under each category. Exact locations can be mapped on the diagrams, drawn, or photographed.
10. Cultural modifications such as trepanation and artificial cranial deformation are recorded on another set of forms.

Most of the analyses were completed soon after and during the later phases of excavation (August and September of 1998). Debra L. Martin (Hampshire College, Amherst, Massachusetts) reviewed and confirmed some trauma and pathological conditions, and Joseph Powell (University of New Mexico, Albuquerque, New Mexico) was consulted on some of the taphonomic observations. Maria Ostendorf Smith of Northern Illinois University shared her measurement data for the Cochiti Dam burials.

Almost two years after the burial analysis, funding for other artifact analyses resulted in the identification of additional human bones, either isolated remains or fragmentary burials that were not recognized as human in the field. The information on the burials and the isolated human bones provide the basis for this report. Forms and photo documentation are on file at the Office of Archaeological Studies and with the New Mexico State Historic Preservation Division, Archeological Records Management Section.

Research Issues

The research design for this project proposes no specific issues to be addressed by the human remains. However, the general objectives of documenting the culture history and change in the poorly understood Developmental period in this area and assessment of chronology, interaction, and settlement and subsistence systems (Ware 1997:44–50), provide a framework for discussion.

Most researchers view the Early Developmental period as part of the continuum between mobile hunters and gatherers and more sedentary groups with varying emphasis on agriculture (e.g., Cordell 1989:307). Residential sites were often positioned near land suitable for growing crops with floodwater irrigation or high water tables as well as access to hunting and gathering resources (Anschuetz et al. 1997:95). Yet, sparse site densities and a lack of investment in storage facilities suggest group mobility remained high with a mixed subsistence strategy (Cordell 1989:307).

The population, or at least site densities, increased in the Late Developmental period. Some interpret this as colonization of the area from the San Juan Basin while others still see a continuation of low settlement density with local instances of residential mobility (Cordell 1989:311; Ware 1997:11–12). Site settings are more diverse and include higher elevation farming locations (Anschuetz et al. 1997:95).

Site densities and site size increased further in the Coalition period. Some attribute this to a massive migration from the Colorado Plateau (Anschuetz et al. 1997:99) while others view it as crossing a demographic threshold with some migration contributing to the population increase. Agriculture may not have played a major part in subsistence but there is some evidence of an increase in sedentary occupation (Cordell 1989:317–319).

Large aggregated communities characterize the Classic period. Excavated sites in the Cochiti area have complex occupational histories with accretional growth, abandonment, reoccupation, and remodeling, suggesting to some that population mobility and settlement instability continued into this period (Ware 1997:15–16).

This brief assessment suggests a variety of research issues that can be addressed through the information provided by the human burials. Foremost is whether the populations were indeed mobile, if so, how mobile, how dependent on agriculture, and did this change over time? The demographic structure as well as the physical indications of mobile and agricultural pursuits can be examined along with assessing the overall health status of these individuals. Mortuary practices and hereditary traits may also inform on these issues. A second issue concerns cultural affinity and social behavior and asks whether there is evidence that the area was occupied by different populations and whether there is evidence of the interpersonal violence that can accompany the movement of one group into an already inhabited region. These questions are addressed by looking for changes in mortuary treatment and physical attributes and for evidence of trauma and interpersonal violence.

This report is structured to individually address these broader questions. It first examines those attributes that inform on mobility and agricultural dependence. Next, it looks at cultural affinity and social behavior, and may examine some of the same attributes. A final section takes a closer look at taphonomy and cultural modification that are not adequately addressed through either of the basic questions. Appendix 5.1 provides a summary of the information collected for each individual, Appendix 5.2 the measurements for adults, and Appendix 5.3 the measurements for children.

Mobility and Agricultural Dependence

Mobility and agricultural dependence are independent, yet, there is some correspondence. Foragers are generally mobile while agriculturalists tend to be more sedentary. However, foragers can be seasonally sedentary and agriculturalists seasonally mobile. Furthermore, early farmers may well have "fallen out" of their agricultural ways when faced with crop failures, environmental disasters (Finneman et al. 2000:457), or when conditions were optimal for foraging (e.g., Barlow 2002:70). Foragers could have gradually adopted and increased their farming when their territories could no longer support a strictly hunting and gathering existence (Finneman et al. 2000:457). We should expect a range of mobility among agriculturalists given the differences in the immediate environment, available technology, and population densities found in the Southwest.

From the perspective of health, several negative responses followed when corn became a key component of the diet. Caloric requirements could be met, however, corn is deficient in several essential amino acids and is a poor source of protein and vitamin C. Iron absorption is very low in corn-based diets, only some of which can be countered by food preparation techniques. In many areas, the adoption of a predominantly corn diet resulted in a reduction in stature and a deterioration in health caused by declining nutrition and increased infectious disease (Larsen 1997:16–17). Vitamin C deficiencies can result in scurvy (Ortner et al. 2001:350). The situation is further acerbated by the sedentism characteristic of intensive agricultural systems. Increases in population size and density, aggregation into communities, overuse of local resources, and the presence of domesticated animals all contribute to increasing the disease load (Martin 1994:95).

Demography

The human burial population from Peña Blanca is small (Table 22.3). As many as 20 individuals represent the Early Developmental period, and only 10 date from the Late Developmental and Coalition. LA 6169 and LA 6171 are multicomponent sites and dating some of the burials is problematic. Their placement reflects our best estimates given the stratigraphic contexts in which these individuals were found.

Small samples, such as this, can be imprecise reflections of a population due to stochastic effects. They are also highly influenced by burial practices that prescribe burial based on factors such as kinship, circumstance of death, and social status (Buikstra and Mielke 1985:364–365) and are more of a cultural sample than a biological one (Waldron 1994:12).

Several aspects of the Peña Blanca demographic profiles are unusual, and could be the result of the small sample size or of cultural factors (Fig. 22.1). In general, the Early Developmental age distribution curve follows the typical pattern for preindustrial human populations where infant mortality is high, with between 30 and 70 percent dying before the age of 15, followed by a healthy young adolescence, then increasing numbers of older individuals (Buikstra and Mielke 1985:399). In the Early Developmental sample, nine are children (under 10 years of age), one is an adolescent of unknown sex (14–18 years), eight are females, and two are males. An unusually high number of the children (six of nine) are fetuses or newborns. There is also an unusually high proportion of females who were over 40 years old when they died (62.5 percent). Two of the three exceptions are females who may not have been able to travel. One (30–40 years old) may have died in childbirth and the other (18 to 19 years old) was slender with an atrophied left hand. Neither of the Early Developmental males is a burial. Both are represented by single isolated bones, a femur that is quite large,

Table 22.3. Age and Sex Distribution for the Peña Blanca Humans*

	Early Developmental				Late Developmental & Coalition			
Age (Years)	Unknown	♀	♂	Total	Unknown	♀	♂	Total
0 - 1	6	-	-	6	-	-	-	-
1.5 - 5	2	-	-	2	2	-	-	2
5.5 - 10	1	-	-	1	2	-	-	2
15 - 19	1	1	-	2	-	-	1	1
20 - 24	-	-	-	-	-	1	-	1
30 - 34	-	1	1	2	-	-	-	-
35 - 39	-	1	-	1	1	-	-	1
40 - 44	-	1	-	1	-	-	-	-
45+	-	4	-	4	-	1	2	3
Mature	-	-	1	1	-	-	-	-
TOTAL	10	8	2	20	5	2	3	10

*Includes individuals listed as burials, the isolated male femur from LA 265, the radius of a 14 to 18 year old from LA 265, and a child over 6 years of age from LA 6169

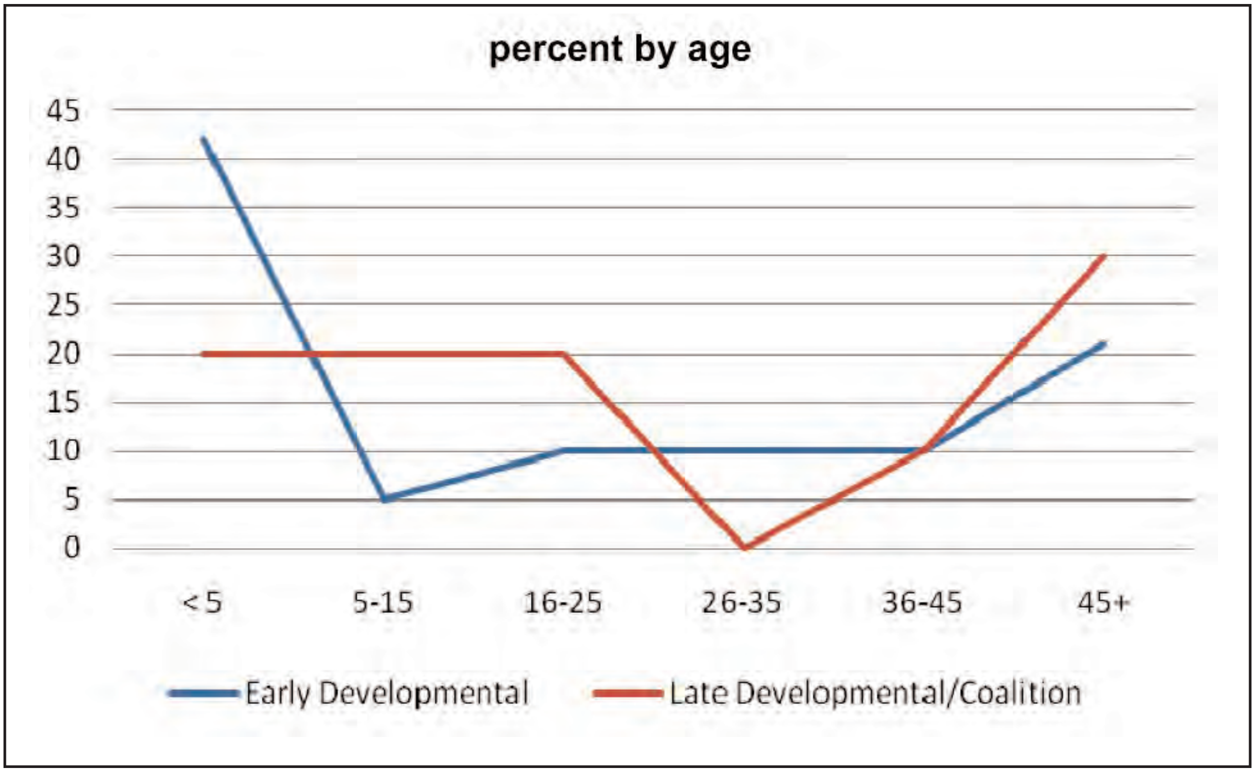


Figure 22.1. Age distribution for Peña Blanca.

and a partial cranium.

The smaller sample from the later dating deposits does not fit the expectations of a normal demographic curve. This sample has no newborns, four are children under 10, two are females, and three are males. All but one of the adults were over 45 years of age at death.

The proportion of infants and children (45.0 percent of the Early Developmental and 40.0 percent of the Late Developmental/Coalition samples are under 10 years of age) are within the range reported for other sites in the Southwest (Table 22.4). Compared with Cochiti Dam and Arroyo Hondo Coalition (early) and Classic (late) samples (Fig. 22.2), both the Peña Blanca Early Developmental (early) and the Late Developmental/Coalition (late) samples have relatively low proportions of children overall while the Early Developmental sample has the largest proportion of infants. In general, the cumulative percentages for Peña Blanca and nearby sites (Fig. 22.3) show similar patterns with steep increases up to 5 years of age, less of an increase up to 10 years of age, then all level off. The most divergent curves are for the two smallest samples, the Late Developmental/Coalition Peña Blanca and the Cochiti Dam Coalition samples, and are probably due to the small sample sizes.

Among the regional samples, the Arroyo Hondo populations also have high proportions of infants less than one year old. This site also has evidence of pathologies that occur with malnutrition and infectious disease, that, when combined, could have contributed to the high proportion of infant deaths (Palkovich 1980:47). A similar argument cannot be made for the Peña Blanca population, especially given the small sample size. Of the six Early Developmental burials in this age group, four are complete enough and preserved well enough for observation. One has periostitis, which in this case could be either a systemic infection or scurvy (25 percent) and none have porotic hyperostosis. Porotic hyperostosis was present for 7 of 24 (29 percent) and widespread periostitis for 3 of 18 (17 percent) infants in the Arroyo Hondo Coalition sample (Palkovich 1980:39). Pecos Pueblo also has large proportions of infants and this appears to have increased over time

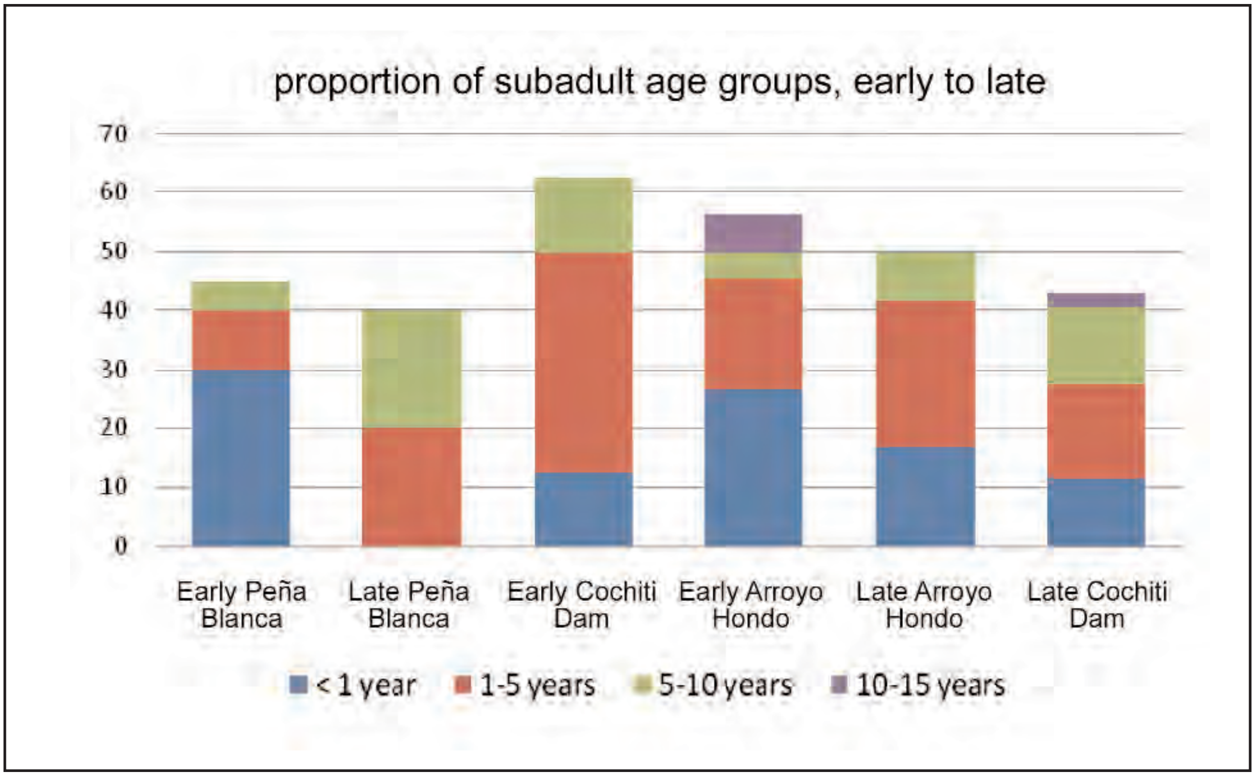


Figure 22.2. Proportions of subadult age groups for regional sites.

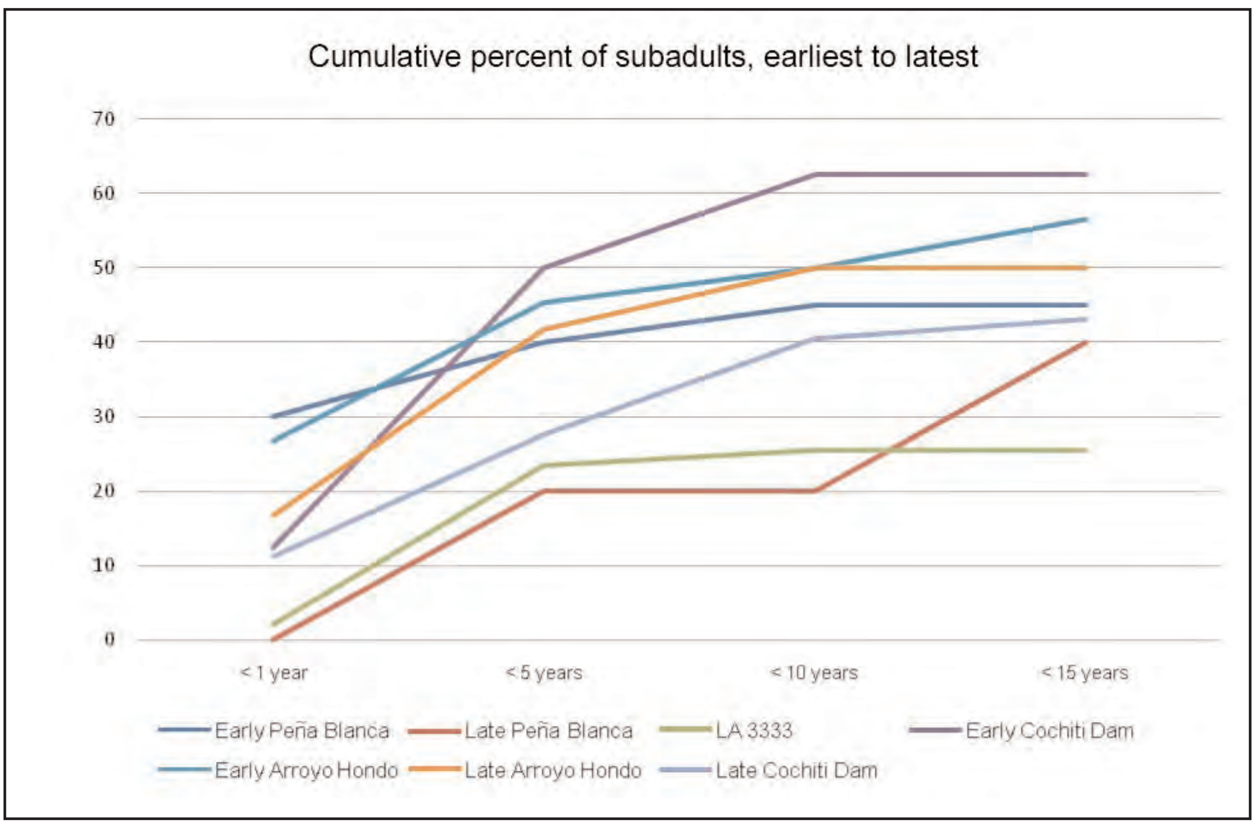


Figure 22.3. Cumulative percent of subadults for regional sites.

Table 22.4. Age Distribution Compared with Other Southwest Sites

Sample	Dates	N =	<1	<3	<5	<10	<15	>35
Peña Blanca	Early Dev.	20	30.0	-	40.0	45.0	45.0	31.6
Peña Blanca	Late Dev/Coal	10	-	-	20.0	40.0	40.0	40.0
Cochiti Dam	Coalition	8	12.5	-	50.0	62.5	62.5	25.0
Cochiti Dam	Classic	116	11.2	-	27.6	40.5	43.1	37.9
Galisteo LA 3333	Coalition	47	2.1	-	23.4	25.5	25.5	38.3
Arroyo Hondo	Coalition	108	26.8	-	45.4	50.0	56.5	16.7
Arroyo Hondo	Classic	12	16.7	-	41.7	50.0	50.0	25.0
Forked Lightening	Coalition	145	-	-	(<4) 29.6	40.7	-	37.9
Pecos	E Classic	61	26.2	39.3	-	47.5	-	(>30) 36.1
Pecos	M Classic	157	28.0	35.0	-	40.0	-	(>30) 47.8
Pecos	L Classic	84	30.9	38.1	-	42.9	-	(>30) 48.8
Black Mesa	PI-EPII	34	14.7	-	38.2	44.1	58.8	11.8
Black Mesa	PII-PIII	100	12.0	-	32.0	40.0	49.0	37.0
Mesa Verde	BMIII-EPII	150	-	10.7	(<8) 24.7	(<12) 28.7	35.3	(>36) 18.7
Mesa Verde	LPII-PIII	178	-	16.8	(<8) 29.2	(<12) 35.4	42.7	(>36) 15.7
Chaco Canyon	PII-PIII	135	8.9	-	25.4	-	37.0	(>40) 11.1
Pueblo Bonito	PII-PIII	95	1.0	-	9.5	21.0	28.4	28.4
La Plata	PII-PIII	67	6.0	-	25.4	29.8	40.3	22.4
Gran Quivira		80	-	18.7	(<7) 27.5	(<13) 32.5	(<17) 34.1	35.0

* apportioned

Sources: Cochiti: Smith 1998: Table II-1; LA 3333: Akins n.d.b: Table 1; Arroyo Hondo: Palkovich 1980:23; Forked Lightening and Pecos: Mobley 1980:523-524; Black Mesa: Martin et al. 1991:51; Mesa Verde: Stodder 1984:28,29; Chaco: Akins 1986a:20; Pueblo Bonito: Palkovich 1984:106; La Plata: Martin et al. 2001; Gran Quivira: Turner 1981:212

Some Cochiti infants were left in at the site (Smith 1998) so that this proportion is undoubtedly too low

(Mobley 1980:523–524). The more northern groups seem to have lower frequencies (Table 22.4). In general, while the proportion of infants in the Early Developmental period sample from Peña Blanca intuitively seems high, it is not outside the range reported for other regional populations.

When the same sites (except for Forked Lightning and Pecos where the data are not provided in Mobley 1980) are compared for sex ratios and the proportion of females over 40 (Table 22.5), the results are the same, suggestive but may be heavily influenced by sample size. Most sites considered here show considerable bias towards females in the burial samples; Mesa Verde is the exception. Given this range, the very low and high ratios for Peña Blanca samples are suspect. As for the proportion of older females, sites with relatively large sample sizes (more than 15 and not including Pueblo Bonito, which is arguably a culturally biased sample) range between 33.3 and 52.2 percent, again making the Peña Blanca Early Developmental period figure of 62.5 percent suspect. Whether this is a function of the small sample size or a lack of data from this transitional period remains unanswered.

While the Peña Blanca age and sex distribution could be strictly a function of the small sample size, it could also be influenced by mobility, residence patterns, or other cultural practices. This pattern is not unique. For example, a Middle Archaic period population in the lower Illinois River Valley has a similar pattern. The young, the old, and those who died prematurely with deforming pathology were buried in the village while the young and middle-aged individuals were buried in cemeteries

Table 22.5. Comparison of Sex Ratios and Percent of Females Over 40 Years of Age

Sample	Dates	# Males	# Females	Ratio M/F x 100	# Aged Females/ Females > 40	% Females > 40
Peña Blanca	Early Dev.	2	8	25	8/5	62.5
Peña Blanca	Late Dev/Coal	3	2	150	2/1	50
Cochiti Dam	Coalition	2	4	50	4/3	75
Cochiti Dam	Classic	39	53	73.6	40/20	50
LA 3333	Coalition	10	21	47.6	21/8	38.1
Arroyo Hondo	Coalition	16	24	66.7	18/6	33.3
Arroyo Hondo	Classic	2	3	66.7	3/3	100
Black Mesa*	PI-PIII	34	44	77.3	44/23	52.2
Mesa Verde	BMIII-EPII	46	45	102.2	45/4	8.9
Mesa Verde	LPII-PIII	49	48	102.1	47/17	34.7
Chaco	PII-PIII	23	29	79.3	29/5	17.2
Pueblo Bonito	PII-PIII	23	42	54.8	42/15	35.7
La Plata	PII-PIII	16	18	88.9	18/2	11.1
Gran Quivira	Early-Middle	18	23	78.3	23/12	52.2

* apportioned

Sources: Cochiti Dam: Smith 1998: Table 1-1, 1-2, 1-3; LA 3333: Akins n.d.b: Table 1; Arroyo Hondo: Palkovich 1980:23; Black Mesa: Martin et al. 1991:55; Mesa Verde: Stodder 1984:28,29; Chaco: Akins 1986a:20; Pueblo Bonito: Palkovich 1984:106; La Plata: Martin et al. 2001; Gran Quivira: Turner 1981:212

on the bluff crest (Buisktra and Mielke 1985:365). Without a larger sample of burials and more complete excavations of Early Developmental sites, we cannot be sure of the ultimate causes.

Mortuary Practices

Southwest archaeologists rarely consider the effect of mobility on burial populations beyond noting that camp sites contain few or no burials whereas permanent residential sites often contain human burials. Hunter-gatherers who depend on widely dispersed, seasonal, or mobile resources rarely spend enough time in one place to form rigid territories or discrete accumulations of burials. Groups with more restricted mobility who spend sufficient time at or return to the same location often enough, establish a sense of territoriality and may develop areas and conventions for burial. Sedentary agriculturalists, especially those competing for land, often symbolize their rights to that land by reference to ancestors buried there. (Hewett [1909:450] attributes just such a motive to the Cochitis concerning their claims to sites on the Pajarito Plateau.) At the very least, these groups bury their dead within the boundaries of their habitual domain (e.g., Charles 1995:79). This suggests there should be somewhat of a continuum in burial practices and their manifestations. Highly mobile groups should rarely bury more than a few individuals in any one place. Less mobile foragers or semisedentary farmers could experience enough deaths in a location to reflect at least some of the characteristics of those who inhabited the sites. Virtually all of the dead from long-term sedentary agriculturalists should be found in the vicinity of their residences.

For the Peña Blanca and Cochiti Dam burials, the mortuary practices should reflect a change from somewhat mobile to sedentary agriculturalists. Table 22.6 gives detailed information on the location, burial positions, and grave goods for Peña Blanca burials. These are then summarized by site and time (Table 22.7) and by time and age and sex (Tables 22.8) and compared with similar information for three

Table 22.6. Burial Location, Position, and Grave Goods for Peña Blanca Burials

LA-Burial	Sex/Age	Feature Type	Feature	Head & Spine Position	Arm Position	Leg Position	Burial Goods	Comments
249-1	Female/45±5	Shallow pit in midden	In pit	Head SE, face up; on back	Straight along sides	To left; flexed 115° at hips; tightly flexed knees 15°	None	LD/EC
265-1	Unknown/3 ± 1 year	Extramural bell-shaped pit	Lower fill	Head SE, left side; left side and slightly face down	Unknown	Extended; left side and slightly down	None	ED; rodent burrow through chest area
265-2	Unknown/ 9 ± 3 months	Pit above vent shaft		Unknown	Unknown	Unknown	*Haliotis* shell pendant	ED; scattered and incomplete
265-3	Female/30 ± 5	Extramural pit	Bottom	Head W, left side; on back	R along side with hand on pelvis; L down and out 140°, elbow tightly flexed and hand on left shoulder	Flexed 70° at hips to left; knees flexed 30°	MRG Plain beaker; MRG Plain pitcher	ED
265-4	Female/45 ± 5	Extramural bell-shaped pit	Bottom	Head & neck twisted and against pit edge top of head up, face south, spine oriented NE; chest down and slightly on right side	R down and under chest, elbow flexed and hand on left elbow; L down and slightly out, tightly bent at elbow lower arm under upper	Pelvis down and slightly to right; R leg flexed 45° at hip 35° at knee; L extended at hip, 85° at knee	Tahallogan Red seed jar; MRG Plain jar, 5 awls, 1 metapodial; 3 pieces of hematite	ED
265-5	Female/50+	Pit structure, subfloor pit	Middle fill	Top of head slightly up and S, slightly to right; vertebrae aligned to SW; on back	R along side but out 40°, elbow bent 90° with hand on pelvis; L over chest with elbow at vert. column, elbow bent 80°	Knees up flexed about 40° at knees	2 pieces of turquoise, 2 awls. 2 flicker and 1 meadowlark wing	ED
265-6	Female/50+	Pit structure	Lower fill along S wall	Head W; on back	R humerus across upper chest, lower missing; L tightly flexed against side with hand on left shoulder	Knees up; lower R leg missing	MRG Plain pitcher with strap handle	ED; carnivore disturbed
265-7	Female/35-45	Pit structure	Upper? fill	Head E; probably on left side and down somewhat	Unknown	Unknown	None	ED; backhoe disturbed
6169-1	unknown/6 ± 2 years	pit structure	middle fill	head N facing W; on back and slightly on right side	R under torso; L down to side bent about 70° at elbow, hand on pelvis	R & L tightly flexed to chest	partial Kwahe'e B/w bowl	LD
6169-2	female/45+	extramural shallow pit	pit bottom	head probably SW; right side	L humerus across chest, elbow at knee	legs tightly flexed to chest at hip and knee	2 San Marcial B/w bowls, 1 MRG Plain jar, sherds from 2 MRG Plain gray and 1 MRG Plain with fugitive red jars; jet pendant	ED; disturbed
6169-3	unknown/0±2 months	pit structure	middle fill?	head probably W; probably on the left side	unknown	on left side L knee flexed @70°, R @30°	none	ED; backhoe and rodent disturbance
6169-4	unknown/0±2 months	pit structure	upper fill against N wall	head SE on right side; chest down?	R down under body flexed about 90° at elbow - to east; L unknown	knees tightly flexed on right side; hips flexed @90°	none; possible matting	ED; disturbed during discovery

Table 22.6. Continued.

LA-Burial	Sex/Age	Feature Type	Location in Feature	Head & Spine Position	Arm Position	Leg Position	Burial Goods	Comments
6169-5	Male/20-40	Pit structure	Floor				none	ED; partial cranium only; carnivore gnawed
6169-6	Female?/20-25	Extramural pit	Fill	Head SE on left side; chest down	R arm along side and tightly flexed at elbow, under humerus; L under and across chest, head a R shoulder	R flexed to right about 90o at hip and 30o at knee	none?	C; carnivore damaged
6169-7	Unknown/2.5y ± 10 mo	Pit structure	Pit in upper fill against north wall	Head disarticulated from vertebral column; SW face down	Unknown	Unknown	Kwahe'e B/w canteen; MRG polished white jar sherds	LD; disarticulated and carnivore disturbed
6169-8	male/45+	Pit room	On floor	Head E on right side; right side	R straight down tightly flexed at elbow hand near chest; L unknown	On R side loosely flexed at hips about 130o, knees tightly bent against upper legs-about 20o	none	C
6169-9	male/18-19	Pit structure	Pit in lower fill	Head NNE on left side but disturbed; L hand on chest	Arms disturbed; L hand on chest	Flexed up and knees bent about 60o	Partial Kwahe'e B/w jar	LD; rodent disturbed; obsidian point in ribs
6169-10	Unknown/7 ± 2 years	Vent shaft	Upper fill	Head W? vertebrae e-w on back or left side	Unknown	To left loosely flexed at hips, R about 90o, L about 60o; R knee straight, L bent about 90o	*Anodonta* pendant	ED? B10 and 11 distrubed and intermixed
6169-11	Unknown/5 ± 1.5 y	Vent shaft	Upper fill	Head N? on back or left side	Upper arms straight down; R elbow bend about 70o with hand on chest, L probably straight	To left loosely flexed at hips, R about 30o, L about 40o; R knee bent about 70o, L unknown	*Anodonta* pendant	
6169-12	Unknown/4 ± 1 year	Unknown extramural		Unknown			None	C? few elements
6169-13	Unknown/0 ± 2 mo	Pit structure	SE quad lower fill	Unknown	Unknown	Unknown	Unknown	ED? Few elements; recovered from general fill
6171-1	Male/ 45 ± 5?	Extramural pit	Floor	Head SE, face down and to left; on chest to the left side	R straight out at shoulder, flexed about 90o up; L disarticulated and above cranium, lower arm down at side	R flexed about 60o at hip and 40o at knee; L below R and slightly more flexed	None?	CD
6171-2	Unknown/30-40	‘		Unknown	Unknown	Unknown	Unknown	CD; two elements
115862-1	Female/35 ± 5	Extramural pit	Floor	Head N on back toward left; left side	R extended along trunk; L extended out about 90o bent down at elbow about 90o	Both extended with slight flex (about 40o at knees)	San Marcial B/w bowl, jar body, 2 bowl rims, seed jar; MRG Plain small jar, jar body, and body sherd	ED
115862-2	unknown/fetus	extramural pit	with B1 in utero					ED
115862-3	female/18-19	extramural pit	floor	head SW; on back	straight along sides	extended straight	2 MRG Plain jars; San Marcial B/w bowl and seed jar *Olivella* beads on chest and top of head (n=47)	ED
115862	unknown/6-8 m	extramural pit	unknown	unknown	unknown	unknown	unknown	ED

ED = Early Developmental LD = Late Developmental C= Coalition CD= Coalition with Developmental

Table 22.7. Summary of Burial Location, Position, Orientation, and Burial Goods for Peña Blanca Burials by Site and Time Period

	Early Developmental				Late Developmental/Coalition			
	LA 265	LA 6169	LA 115862	Total	LA 249	LA 6169	LA 6171	Total
Structure								
Upper fill	1	2	-	3	-	2	-	2
Lower fill/floor	1	1	-	2	-	2	-	2
Subfloor	1	-	-	1	-	-	-	-
Vent area	1	2	-	3	-	-	-	-
Structure totals	4	5	-	9	-	4	-	4
Extramural	3	1	3	7	1	2	1	4
Totals	7	6	3	16	1	6	1	8
Flexed: back	-	-	-	-	-	1	-	1
Flexed: right	-	1	-	1	-	-	-	-
S-flexed: back	3	2	-	5	1	1	-	2
S-flexed: chest	1	1	-	2	-	1	1	2
S-flexed: left	-	1	-	1	-	-	-	-
S-flexed: right	-	-	-	-	-	1	-	1
Extended: back	-	-	1	1	-	-	-	-
Extended: left	1	-	1	2	-	-	-	-
Totals	5	5	2	12	1	4	1	6
Orientation								
N	-	1	1	2	-	1	-	1
NE	1	-	-	1	-	1	-	1
E	1	-	-	1	-	1	-	1
SE	1	1	-	2	1	1	1	3
SW	1	1	1	3	-	-	-	-
W	2	2	-	4	-	-	-	-
Total	6	5	2	13	1	4	1	6
No goods	2	2	1	5	1	3	1	5
Vessels	2	1	2	5	-	1	-	1
Vessel	1	-	-	1	-	2	-	2
Shell ornament(s)	1	2	1	4	-	-	-	-
Jet ornament	-	1	-	1	-	-	-	-
Turquoise	1	-	-	1	-	-	-	-
Hematite	1	-	-	1	-	-	-	-
Bone tools	2	-	-	2	-	-	-	-
Individuals	7	5	3	15	1	6	1	8

Cochiti Dam sites, LA 3333 in the Galisteo Basin, Pindi, and Arroyo Hondo (Table 22.9).

There are differences among the Peña Blanca sites. At LA 265, the number of burials located in structures and in extramural areas are almost equal while all those from LA 115862 are extramural, and LA 6169 has mostly structure-related burials. When totaled by time, the numbers are much closer and obscure differences between the individual sites. Burial position is variable with a distinct preference for semiflexed positions: on the back or chest in both periods. West and southwest orientations are the most common in the early period while southeast is favored in the later, regardless of site. Fewer of the later burials (37.5 percent) have grave goods and when they do, it is always ceramic vessels. Early Developmental burials have grave goods more often (66.7 percent), have more offerings, and have a greater diversity of offerings. Vessels, ornaments, and minerals are often found.

Table 22.8. Summary of Burial Location, Position, Orientation, and Burial Goods for Peña Blanca Burials by Age and Time Period

	Early Developmental					Late Developmental/Coalition					
	< 1	1.5-10	Female <40	Female >40	Total	1.5-10	Female <40	Female >40	Male <40	Male >40	Total
Structure											
Upper fill	2	-	-	1	3	2	-	-	-	-	2
Lower fill/floor	1	-	-	1	2	-	-	-	1	1	2
Subfloor	-	-	-	1	1	-	-	-	-	-	-
Vent area	1	2	-	-	3	-	-	-	-	-	-
Structure totals	4	2	-	3	9	2	-	-	1	1	4
Extramural	1	1	3	2	7	1	1	1	-	1	4
Totals	5	3	3	5	16	3	1	1	1	2	8
Flexed: back	-	-	-	-		1	-	-	-	-	1
Flexed: right	-	-	-	1	1	-	-	-	-	-	-
S-flexed: back	-	2	1	2	5	-	-	1	1	-	2
S-flexed: chest	1	-	-	1	2	-	1	-	-	1	2
S-flexed: left	1	-	-	-	1	-	-	-	-	-	-
S-flexed: right	-	-	-	-		-	-	-	-	1	1
Extended: back	-	-	1	-	1	-	-	-	-	-	-
Extended: left	-	1	1	-	2	-	-	-	-	-	-
Totals	2	3	3	4	12	1	1	1	1	2	6
Orientation											
N	-	1	1	-	2	1	-	-	-	-	1
NE	-	-	-	1	1	-	-	-	1	-	1
E	-	-	-	1	1	-	-	-	-	1	1
SE	1	1	-	-	2	-	1	1	-	1	3
SW	-	-	1	2	3	-	-	-	-	-	-
W	1	1	1	1	4	-	-	-	-	-	-
Total	2	3	3	5	13	1	1	1	1	2	6
No goods	3	1	-	1	5	1	1	1	-	2	5
Vessels	-	-	3	2	5	1	-	-	-	-	1
Vessel	-	-	-	1	1	1	-	-	1	-	2
Shell ornaments	1	2	1	-	4	-	-	-	-	-	-
Jet ornament	-	-	-	1	1	-	-	-	-	-	-
Turquoise	-	-	-	1	1	-	-	-	-	-	-
Hematite	-	-	-	1	1	-	-	-	-	-	-
Bone tools	-	-	-	2	2	-	-	-	-	-	-
Individuals	4	3	3	5	15	3	1	1	1	2	8

When examined by age and period (Table 22.8) subadults are almost twice as likely to be buried in structures as adults in the early period. Chances are also greater in the later period. In the early period, infants are less likely than adults to have burial goods. When children do have goods these are in the form of shell ornaments (an association also noted by Stubbs and Stallings 1953:138 for Pindi and Pecos Pueblo, and found at LA 3333). Females under 40 years of age always had vessels and one had numerous Olivella shells. All but one of those 40 or older had goods that include vessels, ornaments, minerals, and bone awls. The sample size for the later period allows for fewer suggestions of patterning. Children appear more likely to have goods than adults (66.7 and 20.0 percent).

Comparing sites on a regional basis from the Early Developmental to the Classic periods (Table 22.9) provides little consistency. Grave location varies by site with a distinct impression that this could be heavily biased by excavation strategy, that is, how much of the extramural area was excavated. The Cochiti Dam Classic period sites of Alfred Herrera and LA

Table 22.9. Comparison of Burial Practices with Cochiti Dam Sites, LA 3333, Pindi, and Arroyo Hondo

	Early Develop-mental	Late Developmental/ Coalition		Coalition		Classic		Coalition	Classic
	Early Peña Blanca	Late Peña Blanca	LA 3333	North Bank	Pindi	Alfred Herrera	LA 70	Arroyo Hondo	Arroyo Hondo
Location (n=)	16	8	36	19	90	77	103	99	12
Structure (%)	56.2	50	66.7	47.4	54	85.7	44.7	28.3	8.3
Nonstructure (%)	43.7	50	33.3	52.6	38	14.3	55.3	71.7	91.7
Position (n=)	12	6	31	8	41	62	39	73	12
Back/dorsal (%)	50	50	32.2	37.5	34.1	30.6	10.2	12.3	33.3
Chest/ventral (%)	16.7	33.3	16.2	12.5	21.9	27.4	28.2	20.5	16.7
Right (%)	8.3	16.7	35.5	12.5	26.8	19.3	38.5	34.2	16.7
Left (%)	25	-	16.2	37.5	17.1	22.6	23.1	28.8	33.3
Orientation (n=)	13	6	32	12	66	38	37	79	12
North (%)	15.4	16.7	15.6	25	20	7.9	18.9	20.2	8.3
Northeast (%)	7.7	16.7	12.5	8.3	-	5.3	2.7	-	-
East (%)	7.7	16.7	40.6	33.3	30	15.8	24.3	43	58.3
Southeast (%)	15.4	50	6.2	16.7	3	7.9	-	-	-
South (%)	-	-	12.5	8.3	23	26.3	24.3	20.2	25
Southwest (%)	23.1	-	3.1	8.3	-	7.9	-	-	-
West (%)	30.8	-	6.2	-	21	18.4	29.7	16.4	8.3
Northwest (%)	-	-	3.1	10.5	3	-	-	-	-
Grave Goods (n=)	14	8	29	19	90	77	103	99	12
Vessel(s) (%)	42.9	50	6.9	-	2.2	10.4	yes	12.1	33.3
Ornament(s) (%)	35.7	-	10.3	-	4.4	-	no	3	8.3
Mineral(s) (%)	14.3	-	10.3	-	-	1.3	yes	3	8.3
Bone tool(s) (%)	14.3	-	6.9	-	-	-	yes	2	-
No burial goods (%)	33.3	62.5	65.5*	100.0*	83.3**	83.1*	48.5*	36.4***	71.4***

* Does not include sherds and lithics thought to be pit fill rather than grave goods

** Does not include those with matting only; source: Stubbs and Stallings 1953:143, 145

*** Includes those without sherds and lithics that could be pit fill as well as a number of perishable items not preserved at the other sites (hide, matting, wood, feathers, and body paint)

Sources: Smith 1998, Heglar 1976, and Lange 1968a for Cochiti Dam, and Palkovich 1980 for Arroyo Hondo

70 are often different while Arroyo Hondo is more internally consistent between time periods. Preference for burial within structures may decrease with time: Alfred Herrera is the exception. Orientation preference is different for each site with no consistency by time period. The proportion of burials with no grave goods seems to increase with time. The Peña Blanca Early Developmental burials stand out in the high proportion of burials with grave goods.

Throughout the time sequence, these sites exhibit more internal than chronologic consistency. This lack of clear patterning in the burial practices that could signal a change in mobility patterns may be typical of loosely organized communities. While mortuary practices do change primarily in response to social and demographic conditions (e.g., Brown 1995:7), it is difficult to assess at what scale this occurs. Some of the changes in the Peña Blanca sample may be significant, but counts are too low for statistical manipulation. In the larger sample from Cochiti Dam, no statistically significant associations were found between age or sex in burial location, position, orientation, or the presence of grave goods at Alfred Herrera. The only significant result for LA 70 was between sex and the type of grave good when domestic goods (ceramics, bone tools, grinding stones) were compared with exotic materials (projectile points and minerals) (Smith 1998). Comparing Arroyo Hondo with other Northern Rio Grande sites (Forked Lightning, Pindi, Paa-ko, and Pecos), Palkovich found similar variation in burial location at all, a predominance of some sort of flexion as apposed to extended burial, no typical orientation, and a similar array of burial goods (Palkovich 1980:67–72).

Indicators of Activity/Occupation

Shape and robusticity of long bones, the presence of stress-induced injuries, and patterns of arthritis or degenerative joint disease can be used as measures of the type and level of activity in prehistoric populations. Here, these are used to address mobility in the Peña Blanca populations and their level of agricultural investment.

Long Bones. Bone tissue responds in the direction of functional demand (known as Wolff's Law). In order to counteract the effect of mechanical loading, the size and shape change as new bone is added to the region of bone where the strain is greatest. More remodeling occurs with low or moderate intensity and repeated use than sporadic high intensity use (Bridges 1989:387). Exterior expansion of bone continues in older adults. Decline in bone mass effects the interior rather than exterior dimensions (Bridges 1989:388; Larsen 1997:208).

This building process allows researchers to study the activities of prehistoric people. When applied to prehistoric populations ranging from foragers in the Great Basin to Pecos Pueblo and Georgia agriculturalists, cross-section areas of the femur midshaft demonstrate that strength closely reflects subsistence strategy in males. Hunter-gatherers were found to be high in midshaft strength and agriculturalists low. For females, there was no apparent relationship to subsistence strategy but there was a correspondence with the ruggedness of the terrain (Larsen 1997:204–205). Not all researchers have found decreased strength in agricultural populations. For some groups the workload associated with agriculture actually increased over that of hunters and gatherers from the same area (Bridges 1989:391). The physical demands of agriculture, differences in commitment, the level of technology employed, and methods of growing and processing crops contribute to the direction of change (Bridges 1995:119) and emphasizes the utility of examining changes through time.

While not as precise as methods, using cross-sectional geometry, external measurements, and the robusticity and shape indices derived from them, correlate with long bone strength and can be used to examine activity patterns (e.g., Bridges 1995:112). Few studies have concentrated on the Southwest, however, two burial populations recovered by OAS were used to examine the differences between Pueblo II–III sedentary agriculturalists from the La Plata River Valley in northwestern New Mexico and a fairly mobile Late Developmental/Early Coalition period group from LA 3333 (Galisteo Basin) who may have practiced some horticulture. Contrasting these two populations indicates that both the males and females from the more mobile LA 3333 population were generally larger, more robust, and have more ovoid femoral cross sections than their counterparts from the La Plata sedentary population. Within each group, males were larger than females in all respects except one, the robusticity of the humerus, where the La Plata females were more robust than the La Plata males and LA 3333 females. Differences in these two populations suggest that a more mobile role with less emphasis on agriculture resulted in larger, more robust individuals with more ovoid femurs and that intensive corn grinding is reflected in upper arm dimensions (Akins 1995, n.d.b).

Femur measurements for the Peña Blanca burials, summarized in Table 22.10, are consistent with a change from a more mobile, less corn-dependent group in the Early Developmental to a more sedentary, corn-dependent population in later periods. Results based on humerus measurements are less clear. The six Early Developmental females who could be measured, are physically smaller than the single later female and males in arm measurements and in femur length and head diameter. In midshaft femur measurements, the Early Developmental females are larger than the later females but smaller than the males. However, when robusticity is considered, the Early Developmental females are more robust than the later males. Only one of the females has an index smaller than the smallest male index, all others are larger than the largest male index. In shape, the one later female has a high index, as do

Table 22.10. Summary of Peña Blanca Human Measurements (mm)

	Early Developmental Females			Late Dev/Coalition Females		Late Dev/Coalition Males		
	n=	mean	st. dev.	n=	mean	n=	mean	st. dev.
Humerus								
length	5	28.5	7.96	1	29.2	2	310	-
head diameter	5	37.9	1.16	2	39.3	2	42.2	-
maximum diameter	6	21.1	1.07	2	22.6	3	21.3	0.01
minimum diameter	6	14.6	0.98	2	14.9	3	15.8	1.22
Femur								
physiological length	4	391	9.59	-	-	3	433	13.75
head diameter	4	38.9	0.64	2	41.25	2	44.3	-
AP diameter midshaft	6	27.6	2.39	1	26.8	3	29.7	0.29
ML diameter midshaft	6	23.9	1.61	1	20.9	3	26.1	1.07
robusticity index	5	13.1	0.97	-	-	3	12.9	0.41
shape index	6	1.16	0.11	1	1.28	3	1.14	0.04

Table 22.11. Peña Blanca Maximum Humerus Diameter (mm), Femur Robusticity, and Femur Shape Compared with a Late Developmental (Pojoaque/Nambe), a Fairly Mobile (LA 3333), and a Sedentary (La Plata) Population

	Peña Blanca			Pojoaque/Nambe		LA 3333		La Plata	
	Early Devel.	Late Devel./Coalition		Late Devel.		Late Develop./Early Coalition		PII-PIII	
	Female	Female	Male	Female	Male	Female	Male	Female	Male
Max humerus dia n=	6	2	3	7	3	8	6	4	8
Minimum	20.3	22.6	20.7	18.7	19.3	18	19	20	18.6
Maximum	22.9	22.6	22.2	23.4	23.7	22	23	24.4	22.7
Mean	21.1	22.6	21.3	20.5	20.8	20	21.5	22.5	21.2
Standard deviation	1.07	-	0.81	1.8	2.51	1.6	1.38	1.82	1.6
Femur robusticity index n=	4	-	3	5	1	11	5	8	10
Minimum	11.4	-	12.4	11.3	12.1	10.6	12	11.02	11.3
Maximum	14	-	13.2	13.3	12.1	13.2	14.3	13	13.1
Mean	13.1	-	12.9	12.1	-	12	13	11.7	12.1
Standard deviation	-	-	0.42	0.78	-	0.67	0.91	0.71	0.55
Femur shape index n=	6	1	3	7	3	11	7	8	12
Minimum	1.03	-	1.11	0.99	1.09	1.02	0.95	0.86	0.8
Maximum	1.29	-	1.2	1.12	1.49	1.35	1.43	1.18	1.14
Mean	1.16	1.28	1.14	1.04	1.28	1.14	1.16	1.03	1
Standard deviation	0.11	-	0.04	0.04	0.2	0.09	0.17	0.1	0.09

Notes: robusticity index = anterioposterior + mediolateral diameter at midshaft X 100 ÷ bicondylar length (Bass 1987:214)
shape index = anteroposterior ÷ mediolateral diameter at midshaft (Bridges 1995:118)

two of the Early Developmental females, who, as a group, range from 1.03 to 1.29. The later males vary at 1.11, 1.12, and 1.20 with a mean of 1.14. Overall, the Early Developmental females have a greater mean index than the later males, two have larger indexes than the largest male index and one other is larger than all but the largest male index. Only one of has a near round shape of 1.03 (round is 1.00).

When Peña Blanca is compared to the Cochiti Dam sites (Tables 22.11–22.12 and Figs. 22.4–22.6), the La Plata sedentary agriculturalists, the fairly mobile LA 3333 population, and a small Late Developmental population from the Pojoaque/Nambé area, the maximum humerus diameter (mm), a good indicator of upper arm strength and associated with corn grinding in females, the Pojoaque/Nambé males (20.8) and females (20.5), LA 3333 females (20.0), and LA 70 males (20.0) and females (20.1) have the smallest means followed by the Early Developmental Peña

Table 22.12. Femur Robusticity and Shape Indices and Maximum Humerus Diameter for Cochiti Dam Sites

Site and Sex	Date	n=	Minimum	Maximum	Mean
Maximum humerus diameter					
LA 6464 females	Coalition	1	-	-	22
LA 9154 males	Late Coalition/Classic	1	-	-	18
Alfred Herrera females	Coalition and Classic	15	19	28	21.3
Alfred Herrera males	Coalition and Classic	7	17	24	21.4
LA 70 females	Coalition and Classic	10	19	23	20.1
LA 70 males	Coalition and Classic	7	17	21	20
Femur robusticity index					
LA 6462 females	Coalition	2	11.8	13.2	12.5
LA 6462 males	Coalition	1	-	-	11.8
LA 9154 female	Late Coalition/Classic	1	-	-	12
Alfred Herrera females	Glaze A/A.D. 1425	10	10.6	12.6	11.4
Alfred Herrera males	Glaze A/A.D. 1425	16	10.8	15.1	12.2
Alfred Herrera females	Glaze C-D	3	11.2	13	12.1
Alfred Herrera female	Glaze D-E	1	-	-	10.9
Alfred Herrera male	Glaze D-E	1	-	-	13.6
LA 70 females	Classic period	4	11.2	12.8	11.9
LA 70 males	Classic period	9	9.1	13.5	12
Femur shape index					
LA 6462 females	Coalition	1	-	-	1
LA 6462 males	Coalition	1	-	-	1
LA 5194 female	Late Coalition/Classic	1	-	-	1.27
Alfred Herrera females	Coalition and Classic	17	0.79	1.36	1.05
Alfred Herrera males	Coalition and Classic	6	0.89	1.2	1.05
LA 70 females	Classic	14	0.91	1.2	1.06
LA 70 males	Classic	9	0.89	1.38	1.13

Note: Length-Diameter index data from Heglar 1968:282, 1971:96, and 1976:17; maximum humerus diameter based on data provided by Maria Smith

Blanca females (21.1). The largest diameters are found in the single later Peña Blanca female (22.6), females from La Plata (22.5), and males (21.4) and females (21.3) from Alfred Herrera. Compared to the males, the later Peña Blanca females, the LA 70 females, and the La Plata females all have means that are greater than the males from those sites while the means for Pojoaque/Nambé and Alfred Herrera are very close.

The femur robusticity indices for females show a decrease in the mean size after the Early Developmental period (Fig. 22.5). As with humerus size, males are more variable, with the exception of the LA 3333 males, and also show a decrease in the mean after the Early Developmental period. The female shape indices follow the same pattern, with the exception of the very large index for the single late Peña Blanca female and one from LA 9154, the indices decrease over time (Fig. 22.6). The males are more variable. Late Developmental populations then decrease followed by a slight increase in the LA 70 sample. Males from the Cochiti area sites have greater means and much higher maximum indices than for the La Plata males, while the female La Plata mean is comparable to several of the later Cochiti area sites.

These results are consistent with an interpretation of mobile Early Developmental females who did less corn grinding than later females in the area. Both the femur robusticity and shape index indicate these females were more mobile than the males in the later periods. The isolated femur from LA 265, with fair-

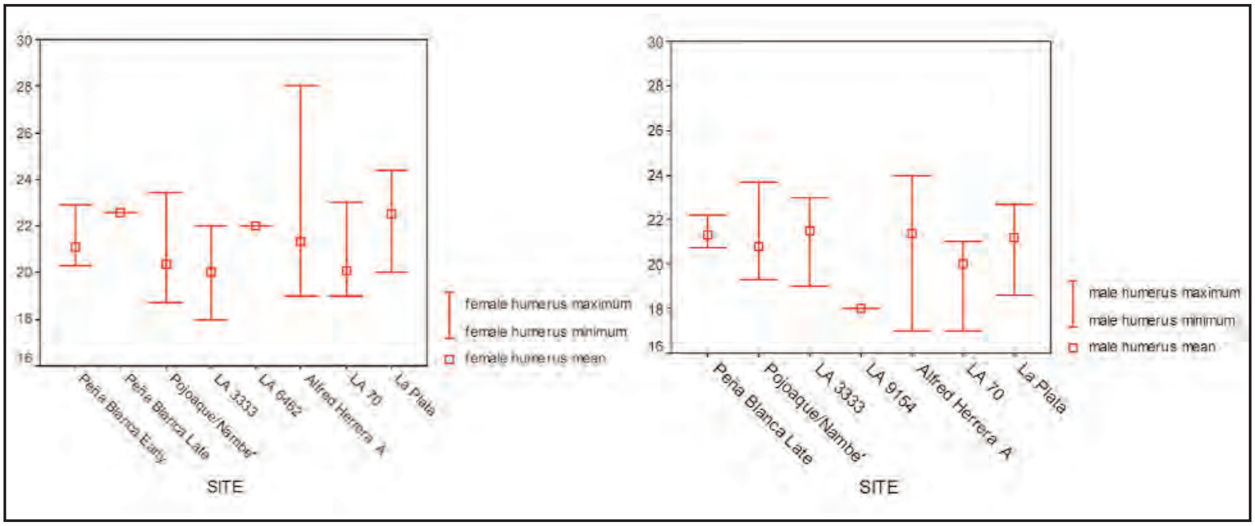


Figure 22.4. Range of humerus diameter.

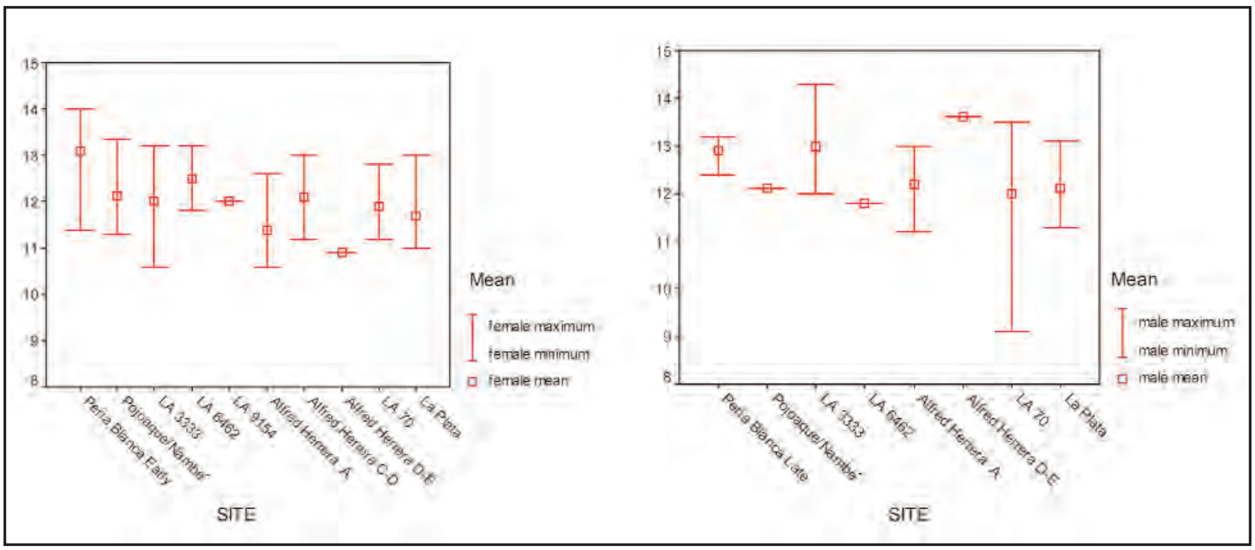


Figure 22.5. Ranges of femur robusticity.

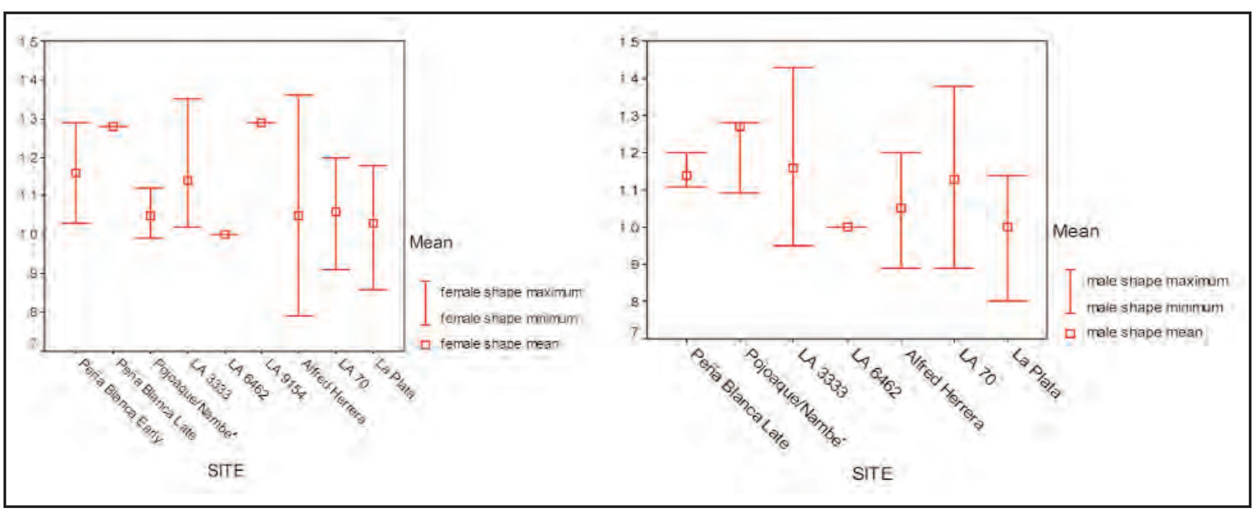


Figure 22.6. Range in femur shape index.

ly large dimensions, suggesting it is from a male, is too incomplete to calculate a robusticity index, but estimating the center produced a shape index of only 1.03. This small index is at the low end for mobile groups but within in the range of both the Early Developmental females and the Galisteo Basin males and females.

Stress Induced Changes. Enthesopathic lesions or irregularities, projections, or osteophytes that occur at the insertions of tendons and ligaments, often due to repeated trauma from muscular exertion (Rodgers and Waldron 1995:24–25), are another means by which habitual activities can be observed. The location and size give an indication of activities that utilize specific muscles. Spurs or projections on the plantar aspect of the calcaneus are linked with excessive walking and running (Larsen 1997:188–189). Raised attachments for the costoclavicular ligament on the clavicle may be related to strenuous activities involving the pectoral girdle (Mann and Murphy 1990:82).

Three Peña Blanca individuals have spurs on the plantar aspect of one or both calcanei, two Early Developmental period females from LA 265 and a Coalition period male from LA 6169. All are older individuals, consistent with the observation that there is no sex predilection but frequencies increase with age (Mann and Murphy 1990:130). Several other individuals are missing or have fragmentary calcanei so that the incidence of this condition could be greater. Both individuals with clavicular enthesophies are younger females. Other individuals with enthosophies are children or have these in locations that suggest reactions to injuries rather than development through habitual activities (summarized along with other conditions in Table 22.13). A very large enthesopathy on the palm side of the first phalanx of the second digit of Burial 1 from LA 6171 is idiosyncratic.

Other than the Schmorl's nodes (reported below), few of the trauma instances (Table 22.13) are likely indicators of particular activities. Fractures of the hand, wrist, foot, and rib and dislocation of the mandible are more likely to result from accidents than habitual activities. The wedged thoracic vertebra in an elderly female is probably age related while the healed depression fracture in the cranium of an older male could be accidental or violence related.

Degenerative Joint Disease. While osteoarthritis or degenerative joint disease is influenced by factors such as metabolism, nutrition, bone density, vascular deficiency, infection, trauma, and heredity, the primary contributing factor is mechanical stress and physical activity. Osteoarthritis increases with age and shows patterns related to particular physical activities (Larsen 1997:162–163).

These patterns are particularly difficult to quantify, a task made even more difficult when the condition of many of the bones is poor. Following Buikstra and Ubelaker (1994:122–123), lipping (bone spurs or osteophytic development) and periarticular resorptive foci on the margins of joint surfaces, porosity or pitting, eburnation or polish, and osteophytes on joint surfaces, and Schmorl's nodes on the bodies of vertebrae were recorded and summarized (Table 22.14). After the age of about 40, all of the Peña Blanca individuals had some form of osteoarthritis in the major joints. Those under 30 had little and scattered incidences, mainly in the feet in the Early Developmental period burials, and more widespread in the later burials. Most interesting is the presence of Schmorl's nodes in a young female and young male in the later group. These indentations in the superior and inferior surfaces of the vertebral bodies are caused by herniation of the intervertebral disc. Common in the elderly and resulting from degenerative disc disease, Schmorl's nodes are uncommon in adolescents and when found are caused by trauma from a fall, heavy lifting, or during exercise or physical activities (Mann and Murphy 1990:52). In the Peña Blanca population, which is dominated by older individuals, there are none in the older group and the two who have herniated discs are quite young and probably acquired these as a result of trauma or physical exertion.

Table 22.13. Summary of Conditions Observed

Burial	Sex/Age	Porotic Hyperostosis	Periostitis	Degenerative Joint Disease	Trauma	Other
249-1	♀ 45±5	Parietals - slight, remodeled	None observed	Moderate most joints, more extensive at elbows, C4-5, sacroiliac		Large sternal foramen; parturition pit
265-1	3±1 y	Orbits - slight, remodeled	None observed			Spina bifida S1 & S4
265-2	9±3 m	None observed	None observed			
265-3	♀ 30±5	Occipital - very slight remodeled	None observed	Eburnation L talus calcaneus articulation; most joints too eroded to observe but none on intact surfaces		L 6 sacralized; L femur & R tibia have calluses posterior with no evidence of infection or remodeling
265-4	♀ 45±5	Moderate orbits; slight parietals and occipital; remodeled	None	Slight to moderate all joints	Healed right rib fracture near proximal end	Large parturition pits; lesion R prox phalanx 1, digit 1; enthesopathy R calcaneus plantar & ilia posterior auricular surface
265-5	♀50+	None	None	Moderate most joints	T11 wedged	S1 lumbarized
265-6	♀50+	Orbits - slight remodeled; parietals too fragmentary to observe	None	Moderate most joints	Bilateral dislocation of mandibular condyles	S1 lumbarized; C2-3 fused; R parturition pit; lesions R foot phalanx 1 & 2; enthesopathy on L calcaneus plantar
265-7	♀ 35-45	Orbits - slight remodeled; parietals fragmentary	None observed	Moderate most joints that could be observed		L5 sacralized or S1 lumbarized
6169-1	6±2 y	Orbits - slight remodeled; parietals - slight remodeled	None observed			Lesions or developmental defects lumbar verts; spina bifida S1-S4; L 5 misaligned; fused deciduous i2 and C - bilateral
6169-2	♀ 45+	Unknown		Very poor condition and fragmentary; moderate vertebrae and proximal femur		Stafne's defect - developmental cyst L mandible, labial
6169-3	0±2 m	None	None			
6169-4	0 ± 2 m	None	extensive on cranium, thorax, and limbs; active - possibly scurvy			
6169-5	♂ 20-40	None	Unknown	Unknown	Unknown	
6169-6	♀? 20-25	None	None	C verts - some could be traumatic or a defect; slight feet and hands	Schmorl's nodes L4-L5	Lesion: foot digit 1 proximal phalanx 1; enthesopathy: bilateral - proximal inferior clavicles; pits in distal ulnae; bregmatic bone

Table 22.13.Continued.

Burial	Sex/Age	Porotic Hyperostosis	Periostitis	Degenerative Joint Disease	Trauma	Other
6169-7	2.5 y ± 10 m	Orbits unknown; parietal and occipital - coalesced with some thickening; remodeled	Active occipital and endocranial on scattered pieces that are probably B7; probably scurvy			Craniosynotosis or anagenisis of coronal suture
6169-8	♂ 45+	Orbits unknown; none on parietals or occipital	None	Most joints slight to moderate	R distal ulna possible healed fracture; R MC 5 healed fracture	Enthesopathy: distal shaft R tibia and R calcaneus plantar
6169-9	♂ 18-19	Unknown	Femur and tibia shafts; remodeled	Slight at knees and feet	Projectile point tip in rib 12; Schmorl's nodes T 11 & 12	Fused foot phalanges 2 & 3, probably digit 5
6169-10	7±2 y	Unknown	Unknown		Lesion/pit distal R femur at plantaris insertion probably traumatic	
6169-11	5±1.5 y	Orbits - moderate and healing; parietals and occipital healing	None on parts found			Enthesopathy: R radius medial shaft; fusion defects anterior vertebrae
6169-12	4 ± 1 y	Unknown	Unknown			
6169-13	0 ± 2 m	None	Unknown			
6171-1	♂ 45±5	None	None	Slight to moderate most joints; more in elbows; eburnation L rib 1 vertebral articulation	Healed depression fracture along coronal suture; healed fracture phalanx 2, digit 2 left foot	Large enthesopathy: L phalanx 1, digit 2 palmar; small bumps near distal ends of 3 L ribs
6171-2	30-40	Unknown	Unknown	Unknown	Unknown	Unknown
115862-1	♀ 35 ±5	None	None/unknown	Most ends eroded; slight to moderate where observed		Enthesopathy L proximal clavicle
115862-2	fetus	Unknown	Unknown			
115862-3	♀ 18-19	None?	None?	Very slight L foot elements		Lesion L hand phalanx 1, digit 1; L hand elements atrophied - bones are slim but normal length
115862-4	6-9m	Unknown	Unknown	Unknown		Very fragmentary

Table 22.14. Summary of Degenerative Joint Disease by Time and Age

Burial	Age and Sex	Neck	Thorax	Lower Back	Shoulder	Elbow	Wrist/ Hand	Hip	Knee	Ankle/ Feet
Early Developmental										
265-5	50+ ♀	P	P	P+O	LPR	LOR	L++R	L	LOR	LR
265-6	50+ ♀	L+PO+R	P+O+R	L+P+O+	L+P+R	L+P+R	L+P+R	L+P+R	L+P	L+P+R
249-1	45±5 ♀	L++P+O+	L+P+O+	L+O+	L++R	L++	L+	L+	-	-
265-4	45±5 ♀	O+	L+P+O+R	L+P+O+	L+	L	L+R	LP	L+PO	L+R
265-7	35-45 ♀	-	L+	L+P+	L+PR	L+P	L	L+	-	L+P
115862-1	35±5♀	L	LO+	O	P+R	LP+	L	-	-	L
265-3	30±5♀	-	-	-	-	-	-	-	-	E
115862-2	18-19 ♀	-	-	-	-	-	-	-	-	L
Late Developmental/Classic										
6169-8	45+♂	L+P+O+	L+P+O+	L+P+O+	L+PR	L+P+R	L+P+	LR	L+R	L+PR
6171-1	45±5 ♂	O+	L+P+E	L+	L+PR	L+R	L+P+R	LR	L+R	L+
6169-6	20-25 ♀	L	-	S	-	-	L	P	-	L
6169-9	18-19 ♂	-	S	-	-	-	-	-	L	L

(maximum severity; lipping L minimum, L+ moderate, L++ extensive; P porosity, P+ severe porosity; E eburnation; O osteophyte; O+ extensive osteophyte, R periarticular resorptive foci clearly present; S Schmorl's node)

General Indicators of Health

General health, often considered a measure of nutritional adequacy, is estimated by examining a number of factors including stress and deprivation during the growing years and exposure to infectious pathogens. More mobile groups with a diet supplemented by hunting and gathering should exhibit health patterns distinct from those heavily dependent on corn agriculture. Studies of populations in the Midwest and upper Midwest suggest that health was most severely compromised during the transition to a corn diet, rather than when dependence was greatest and that much of that associated with corn dependence was more a function of population density than of diet (Buikstra 1992:97–98). Similarly, Stodder reports increased stress and mortality in subadults and reproductive age females from the Mesa Verde Late Pueblo II–III period as compared to Basketmaker II–Pueblo II period females and attributes it to changes in subsistence, settlement, and regional climatic patterns (Stodder 1987). Again, with the small Peña Blanca sample, strong patterns are unlikely and those found could be due to sampling error.

Growth Related. Growth is a highly sensitive indicator of the health of a community. It is affected by genetics, hormone deficiencies, and psychological stress, infectious diseases, and the environment, especially nutrition. Well fed children are taller and grow faster than poorly nourished ones. Young children are the most sensitive to environmental conditions while adolescent growth is genetically influenced. Numerous studies comparing children in maize dependant and foraging populations document declines in growth (long bone length and cortical thickness) and increases in other stress indicators (porotic hyperostosis and enamel defects) associated with a switch to a maize diet (Larsen 1997:8–12).

When the few Peña Blanca children are arranged by age (Appendix 5.3), steady rates of growth can be observed in all instances but one. The LA 6169 -11 child with a mean age of five years is considerably smaller than one from LA 265-1 age three. Since this child lacks evidence of the conditions that could influence growth (e.g., chronic infection), this probably means no more than the LA 265-1 child falls toward the end of the suggested age range (4 years) and that from LA 6169 at the beginning of the range (3.5 years). With only one child from the later time period, it is not possible to evaluate growth trajectories between the two samples.

Tooth size is also influenced by nutrition and has been shown to decrease when populations shift from foraging to farming (Larsen 1997:24–25). Again, the Peña Blanca burial population is small and includes too many very young and old individuals with missing and worn teeth to adequately address whether tooth size decreased with agricultural intensification.

Dentition. Teeth provide information on age at death, population affinity, and on health, diet, and nutrition, and are often the best and only parts preserved in many situations. Dental hypoplasias and pitting are useful in assessing health and nutrition while dental wear and dental disease (caries, abscesses, and tooth loss) can reflect the relative amount of sugar or carbohydrates in the diet and the amount of cooking (Buikstra and Ubelaker 1994:47).

Tooth enamel is especially sensitive to nutritional deficiencies and disease and provides a permanent record of juvenile developmental disturbances (Buikstra and Ubelaker 1994:56; Larsen 1997:44). Dental enamel begins forming in the fourth month in utero and continues to form until the twelfth year (Larsen 1997:48). Permanent incisors are the most sensitive to stressors producing hypoplasias between birth and three years and canines between three and six years (Rose et al. 1985:289). Even minor metabolic disturbances can result in visible changes in tooth enamel. Potential causes of dental hypoplasias include hereditary anomalies, localized trauma, and systemic metabolic stress. The first two are rare; the primary metabolic stress is due to dietary deficiency. Since metabolic insults affect only that portion of the tooth that is forming, the location provides a chronological indicator of stress history. There is also evidence that the size of a hypoplasia line reflects the duration or severity of the stress episode, or combination of the two (Larsen 1997:45–50). Adults often have fewer defects than juveniles and young children more than older children suggesting those undergoing stress during childhood tend to die younger (Larsen 1997:53).

Numerous studies have found that the frequency and/or severity of dental hypoplasias in both deciduous and permanent dentition are greater in farmers than in hunter-gatherers (Cohen and Armelagos 1984:589). Circumstances conducive to increased stress, and often associated with the transition to a farming economy, include poor nutrition, population aggregation, and increases in infectious disease (Larsen 1997:61).

None of the Peña Blanca Early Developmental period burials with deciduous teeth have hypoplasia lines, although some have small pits, indicating some maternal and infant stress. Peak line formation on permanent teeth occurred between 2 and 3 years and between 3.5 and 6 years of age (Table 22.15). The samples, especially the later one, which includes one child 4 years old and one individual with only two scorable teeth, are insufficient for chronological comparisons. For the group as a whole, the maxillary first incisors and mandibular canines (Figs. 22.7, 22.8) show an almost continuous high rate of teeth with hypoplasia lines from 2 until 5.5 years of age. Little tooth crown development takes place between about 7 and 10 years and third molars generally develop between about 10 and 14 years (Buikstra and Ubelaker 1994, fig. 24). High rates between 2 and 4 years of age could be due, at least in part, to weaning stress, while later lines are

Table 22.15. Number of Individuals with Hypoplasia Lines (M2-I1) by Half Years of Age

Age in Years	Early Dev. (n=9)	Late Dev/Col (n=3)	Total (n=14)
1.0-1.4	1	-	1
1.5-1.9	1	-	1
2.0-2.4	6	-	6
2.5-2.9	5	1	7
3.0-3.4	3	1	4
3.5-3.9	7	2	10
4.0-4.4	4	1	7
4.5-4.9	4	2	6
5.0-5.4	4	1	6
5.5-5.9	4	1	7
6.0-6.5	2	1	3
6.5-6.9	1	-	1

Note: incidences on third molars include 4 developed between 13 and 14 years and one between 11 and 12 years of age

(calculated following Martin et al. 2001)

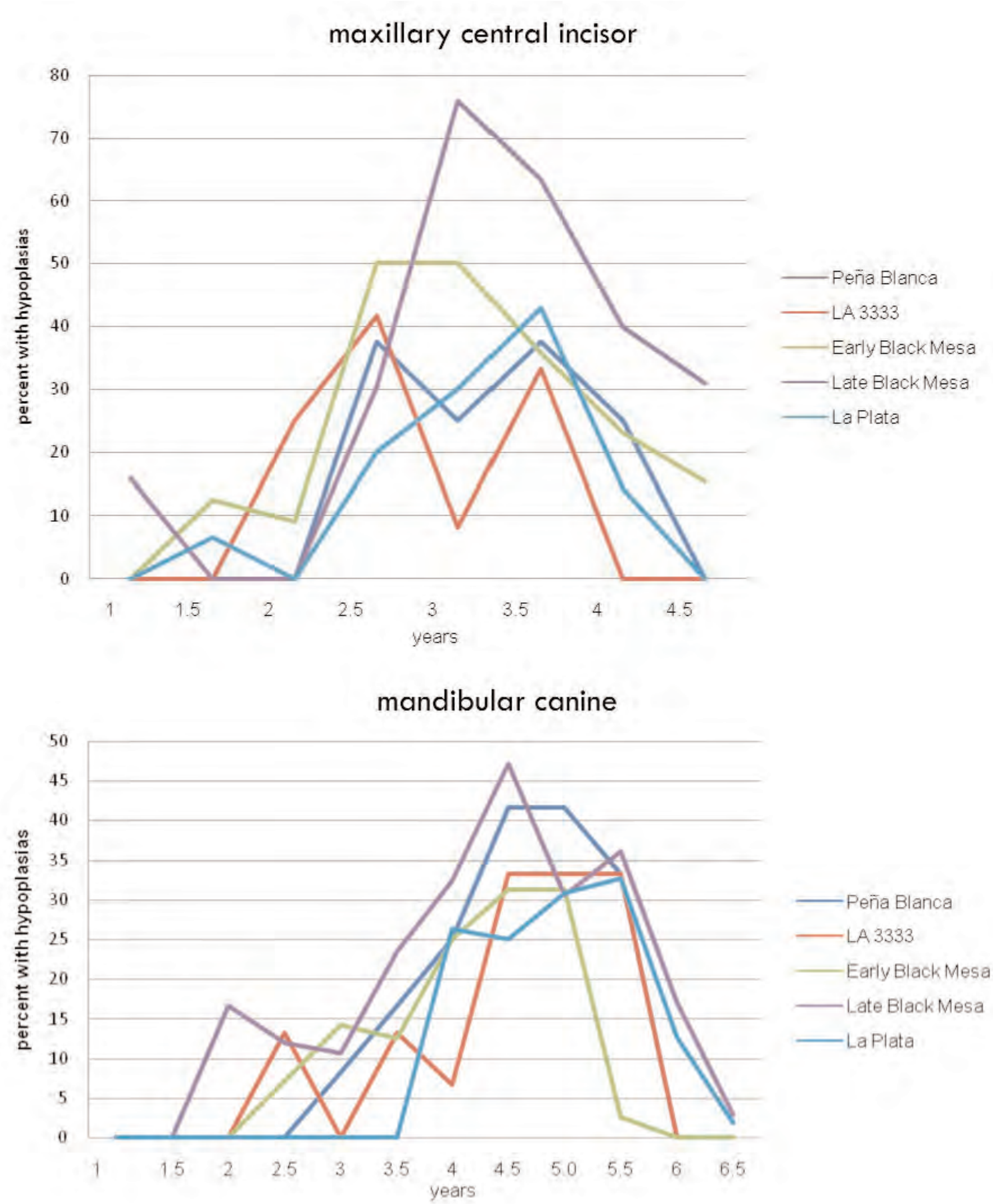


Figure 22.7. Comparison of proportions of hypoplasia lines .

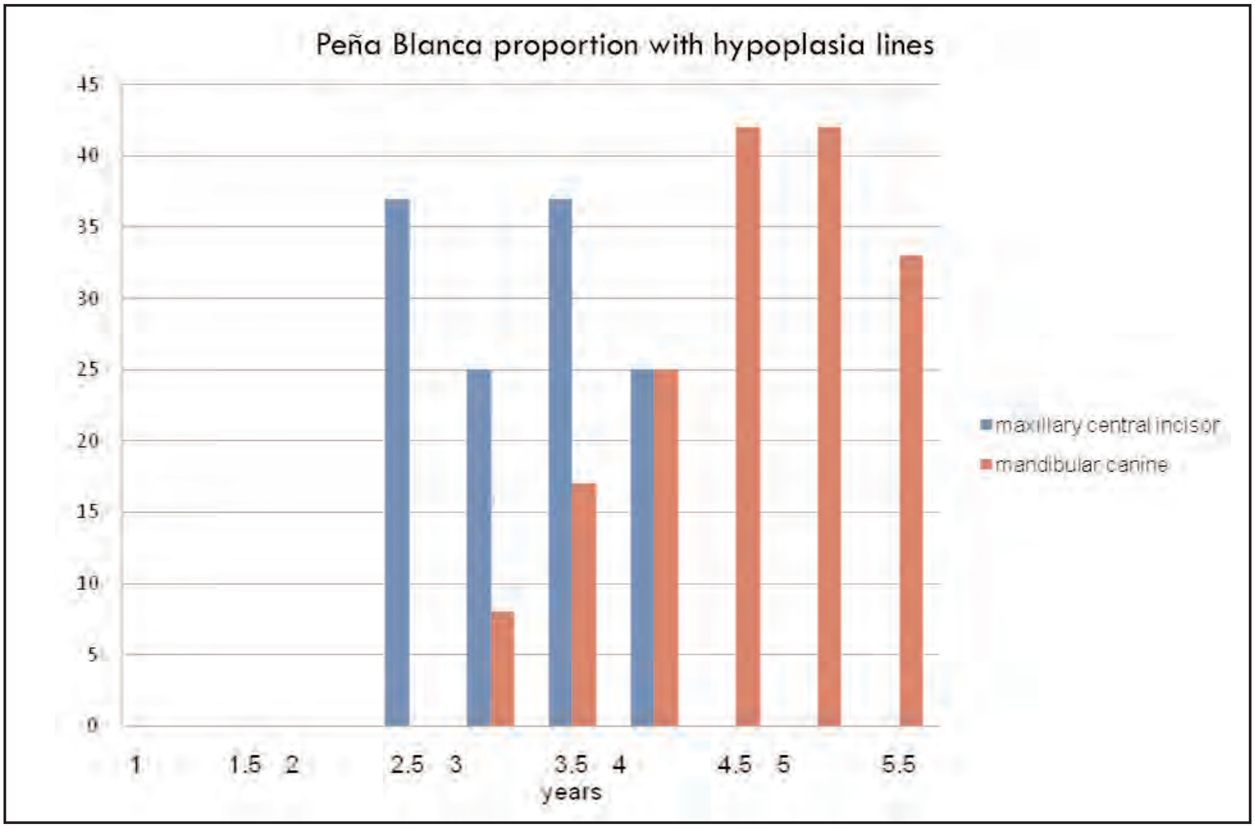


Figure 22.8. Proportion of Peña Blanca teeth with hypoplasia lines by age of formation.

more likely from periodic food shortage (Larsen 1997:49, 51). The small Early Developmental population has no indication that those dying young were more stressed. The mean proportion of scorable teeth (teeth having sufficient enamel and not coated with calculus) with lines for adult females (n = 6, mean 25.9, range 0–41.7) is slightly higher than that for the two children (mean 25.2, range 23.1-27.3). Rates for the later burials include two females at 20.0 and 57.1 percent (mean 38.5) and 3 males ranging from 9.1 to 38.5 percent (mean 22.5). Neither of the children from later time periods have enough scorable teeth to evaluate. With individual rates so variable, it is difficult to conclude there are changes associated with the time periods. This could indicate that the amount of stress recorded in dental hypoplasias was similar in the two populations or it could be entirely because of the small sample size.

Compared to other populations scored in a similar manner (Table 22.16, Fig. 22.7), the Peña Blanca sample generally falls in the middle of the range for maxillary central incisors but is on the high end for the later ages (4–6 years) recorded for the mandibular canines. In general, one population that was clearly more heavily dependent on agricultural foods (La Plata) did not have greater incidences of the stressors that result in hypoplasia lines. It may well be that the differences in degree of dependence on agricultural products in many of these populations was not sufficient to result in clear differences.

In prehistoric Southwestern populations, foragers and early agricultural groups generally have few caries but rapid dental wear often led to abscesses and antemortem tooth loss. More agriculturally dependent groups have high rates of both caries and abscesses. Caries rates for a number of populations range from 8 to 85 percent with caries, 4 to 62 percent with abscesses, and 13 to 63 percent who had antemortem tooth loss (Stodder 1989:180–181). Percentages are undoubtedly influenced by the age distribution within the population and how instances were summarized, making

Table 22.16. Proportion of Individuals with Hypoplasia Lines on the Maxillary Central Incisor and the Mandibular Canine by Age Compared to Other Populations

Age Interval	Peña Blanca		Galisteo Basin, LA 3333		Black Mesa Early		Black Mesa Late		La Plata	
	Incisor	Canine	Incisor	Canine	Incisor	Canine	Incisor	Canine	Incisor	Canine
.5 - 1.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0
1.0 - 1.5	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	6.7	14.3
1.5 - 2.0	0.0	0.0	25.0	0.0	9.1	0.0	0.0	16.7	0.0	0.0
2.0 - 2.5	37.5	0.0	41.7	13.3	50.0	7.1	30.4	12.0	20.0	0.0
2.5 - 3.0	25.0	8.3	8.3	0.0	50.0	14.2	75.9	10.7	30.0	0.0
3.0 - 3.5	37.5	16.7	33.3	13.3	35.7	12.5	63.3	23.5	42.9	0.0
3.5 - 4.0	25.0	25.0	0.0	6.7	23.1	25.0	40.0	32.4	14.3	26.3
4.0 - 4.5	0.0	41.7	0.0	33.3	15.4	31.3	31.0	47.2	0.0	25.0
4.5 - 5.0	-	41.7	-	33.3	-	31.3	-	30.6	-	30.9
5.0 - 5.5	-	33.3	-	33.3	-	25.0	-	36.1	-	32.7
5.5 - 6.0	-	0.0	-	-	-	0.0	-	17.1	-	12.7
6.0 - 6.5	-	0.0	-	-	-	0.0	-	2.8	-	1.8

Sources: LA 3333, Akins n.d.b: Table 13; Black Mesa: Martin et al. 1991:Table 5-7; La Plata: Martin et al. 2001:Table 4.8

Table 22.17. Number of Caries by Age and Tooth

	< 30 years (n=7)			35-40 y (n=2)			45+ (n=6)			All Mature (n=13)		
	# teeth	# caries	# teeth w/ caries	# teeth	# caries	# teeth w/ caries	# teeth	# caries	# teeth w/ caries	# teeth	# caries	# teeth w/ caries
Upper Dentition												
M3	5	-	-	3	1	1	6	2	2	14	3	3
M2	6	-	-	3	1	1	5	2	2	14	3	3
M1	7	-	-	2	-	-	7	4	4	16	4	4
P2	8	-	-	4	2	2	10	3	2	22	5	4
P1	8	7	3	2	-	-	9	1	1	19	8	4
C	8	-	-	3	-	-	11	1	1	22	1	1
I2	6	-	-	4	1	1	12	1	1	22	2	2
I1	6	-	-	1	-	-	11	1	1	18	1	1
Lower Dentition												
I1	6	-	-	4	3	2	10	-	-	20	3	2
I2	6	-	-	3	1	1	12	2	2	22	3	3
C	6	-	-	3	-	-	12	-	-	22	-	-
P1	6	-	-	3	-	-	11	-	-	21	-	-
P2	6	-	-	3	-	-	9	1	1	19	1	1
M1	7	3	2	2	-	-	9	4	5	19	8	7
M2	6	-	-	3	1	1	6	2	2	15	3	3
M3	6	-	-	2	2	1	7	7	4	15	9	5

interpopulational inferences difficult.

For Peña Blanca (Table 22.17) only one child (the 7 year old) has caries (one in a maxillary molar) and relatively few were found in individuals under the age of 30 (9.7 percent of the teeth). Incidences increase in the 35 to 40 year (28.6 percent of teeth) and the 45 and older groups (23.1 percent of the teeth). On an individual basis, only one adult burial with teeth was without caries and that individual is a young female (18 to 19 years) resulting in a relatively high proportion (92.3 percent) of the adults with teeth having one or more caries. The general pattern is similar at the Classic period site of LA 70 where few young adults (21–35 years) had caries, more middle age adults (36–55 years) had caries, and few older adults (56+ years) had caries (Helgar 1976:J23). Alfred Herrera, another Classic period site, was different in that caries were almost as frequent in younger adults (Helgar 1968:291).

Antemortem loss and abscesses (Table

Table 22.18. Antemortem Loss (AM) and Abscesses (AB) for Individuals 45 Years or Older

Tooth	249-1 ♀ 45±5		36772 ♀ 45±5		36773 ♀ 50+		36774 ♀ 50+		6169-2 ♀ 45+		6169-8 ♂ 45+		6171-1 ♂ 45±5	
	AM	AB	AM	AB	AM	AB	AM	AB	AM	AB	AM	AB	AM	AB
Upper Dentition														
M3	-	-	-	-	2	-	2	-	?	-	2	-	-	-
M2	-	-	-	-	2	-	2	-	?	-	2	-	-	1
M1	-	-	-	-	1	1	2	1	1	-	2	-	-	-
P2	-	-	-	-	-	-	1	1	2	-	1	1	-	-
P1	-	-	-	-	-	1	1	1	2	-	1	-	-	-
C	-	-	-	-	-	-	1	-	2	-	-	-	-	-
I2	-	-	-	-	-	-	-	-	2	-	-	-	-	-
I1	-	-	-	-	-	-	-	-	2	-	1	-	-	-
Lower Dentition														
I1	-	-	-	-	-	2	-	-	1	-	2	1	-	-
I2	-	-	-	-	-	1	-	-	1	-	-	1	-	-
C	-	-	-	-	-	-	-	-	?	-	-	-	-	-
P1	-	-	-	-	-	1	-	-	1	-	1	-	-	-
P2	-	-	-	-	-	1	2	-	1	-	1	-	-	-
M1	-	1	-	-	-	1	1	-	1	-	2	-	-	-
M2	1	2	-	-	1	-	1	-	1	-	2	-	-	-
M3	-		-	-	1	-	1	1	-	-	0	-	-	-
Totals	1	3	0	0	7	8	14	4	17+	0?	18	3	0	1

22.18) were all in individuals over 40 years of age, and several had considerable loss and abscessing. Burials from the Classic period sites of LA 70 (Helgar 1976:J22–J23) and Alfred Herrera (Helgar 1968:290) indicate that abscessing began younger, two young (21–35 years) males and a female from LA 70 and one each from Alfred Herrera had abscesses as did six older males and four females from LA 70 and twelve males and a female from Alfred Herrera. In addition, three older (over 35 years) males had lost half or more teeth in a dental quadrant as did a young female from LA 70 and four older males and three females from Alfred Herrera.

Attrition scores increase with age for both the maxillary and mandibular anterior teeth and molars (Table 22.19). There is a very slight tendency for the later group of individuals to have greater scores for the anterior teeth and maxillary molars when compared by age sets. While this could indicate a greater reliance on maize ground on a metate, the sample is small and age ranges sufficiently broad, that no conclusions are possible.

Porotic Hyperostosis. Active, unhealed porotic hyperostosis lesions, found on the cranial vault and upper portions of the orbits, mostly occur in children less than 5 years old. When found in older juveniles and adults, the lesions are generally remodeled and healed. This age patterning suggests that the lesions were formed during episodes of childhood anemia. Diet was certainly a major contributor, but others include low birth weight, which can predispose a child to anemia and blood loss, chronic diarrhea, and parasitic infections (Larsen 1997:29–32).

Dietary iron deficiency anemia occurs when foods contain insufficient iron or when the iron is poorly absorbed. Meat is high in iron and is efficiently absorbed while the iron in plant foods is generally poorly absorbed. In addition, substances found in many nuts and cereals (including corn) inhibit iron absorption. Combining plant foods with meat or fish enhances the iron absorption (Larsen 1997:29). Regardless of the cause, where the cause of the anemia is dietary, a more varied diet containing sufficient animal protein should result in lower incidences of porotic hyperostosis. Some regions that have enough time depth to compare foragers with intensive agriculturalists show clear increases in the rates of porotic hyperostosis through time. The association in

Table 22.19. Attrition Scores Oldest to Youngest Mature Individuals (Anterior Teeth are Scored 1-8 and Molars 1-10)

Individual	Sex/Age	Anterior Maxilla	Anterior Mandible	Molars Maxilla	Molars Mandible
265-5	♀ 50+	7.5	7.0	10.0	6.3
265-6	♀ 50+	5.9	5.7	-	4.1
6171-1*	♂ 45±5	7.3	6.3	7.2	8.0
6169-8*	♂ 45+	7.1	6.7	-	10.0
265-4	♀ 45±5	5.1	5.0	5.3	7.5
249-1*	♀ 45±5	5.4	5.3	3.8	3.6
115862-1	♀ 35±5	4.4	4.6	3.5	3.5
265-7	♀ 35-45	3.7	4.7	-	4.2
265-3	♂ 30±5	2.7	3.0	3.9	3.6
6169-9*	♂ 18-19	2.4	-	2.4	2.5
115862-3	♀ 18-19	2.0	2.7	3.1	2.6

* Late Developmental/Coalition sample

the Southwest is probably complex. Sedentism, especially crowded and dark living conditions and poor sanitation, also contributes to the parasite load and produces similar results (Larsen 1997:36–37). Indeed, the cause probably varies by population and setting. When the patterning by age is examined, porotic hyperostosis in some populations peaks under 1 year of age and is probably due to maternal malnutrition and low birth weight. In other populations the peak is between 1and 3 years of age and probably due to weaning diets, diarrheal syndromes, and increased exposure to infection brought on by the loss of natural immunities acquired at birth. When porotic hyperostosis co-occurs with generalized infection (periostitis), the anemia was probably a product of infection, perhaps combined with dietary deficiency (Stodder and Martin 1992:58–59).

For Peña Blanca (Table 22.20), no child under a year old has signs of porotic hyperostosis, suggesting maternal stress was slight or absent, at least for these individuals. This changes dramatically in the next two age groups where all children had some degree that could result from the nutritional stresses caused by a weaning diet. Just over half of the females had this condition while none of the males did. There are no distinct patterns associated with time period in this small sample, however, there are differences between the sites and between males and females. Most of the females at LA 265 had signs of porotic hyperostosis while neither of those from LA 115682 did. All but three of the instances were slight or very slight in expression – and those were moderate. One individual with a moderate expression also had active periostitis that probably is the result of scurvy. The only observation of active, still healing porotic hyperostosis was in a 5- year-old child with no other signs of infection. This, too, may have had a different causation.

Rates and patterns of porotic hyperostosis are difficult to compare because of different standards used in recording and reporting. A compilation of 12 Southwestern populations gives a range of 15 to 88 percent for children up to 10 years of age (Stodder and Martin 1992:58). The Navajo Reservoir, Grasshopper, Arroyo Hondo, and Gran Quivira all have relatively low rates (less than 25 percent) while Black Mesa, Mesa Verde, late Canyon de Chelly, and San Cristobal have very high rates (more than 75 percent). The small Peña Blanca sample (50 percent) falls in the middle range.

Periosteal Reactions. Nonspecific infection, manifest as periosteal reactions or osteomyelitis, are responses to bacterial infections or traumatic injury. Periostitis is the basic inflammatory response resulting in irregularities in the bone

Table 22.20. Peña Blanca Summary of Porotic Hyperostosis

Time/Site	< 1 year		1-4		5-9		Females		Males		Total	
	With	Without	With	Without	With	Without	With	Without	With	Without	With	Without
Early Developmental												
LA 265	-	1	-	-	-	-	4	1	-	-	5	2
LA 6169	-	3	-	-	2	-	-	-	-	1	2	4
LA 115862	-	-	-	-	-	-	-	2	-	-	-	2
Total E.D.	0	4	1	0	2	0	4	3	0	1	7	8
Late Developmental/Coalition												
LA 249	-	-	-	-	-	-	1	-	-	-	1	-
LA 6169	-	-	1	-	-	-	-	1	-	1	1	2
LA 6171	-	-	-	-	-	-	-	-	-	1	-	1
Total LD/C	0	0	1	0	0	0	1	1	0	2	2	3
Total Peña Blanca	0	4	2	0	2	0	5	4	0	3	9	11

surface while osteomyelitis involves the surface and subsurface bone. Foraging populations generally have fewer and less severe instances of periostitis than groups making the transition from foraging to horticulture or to intensive agriculture. Increased population size and density are the main contributors along with interactions between groups and an emphasis on nutritionally poor foods, such as corn. Malnourished individuals are more susceptible to infectious pathogens and infection worsens nutritional status (Larsen 1997:82–91).

Similar porotic lesions from chronic inflamation are characteristic of scurvy, which is caused by vitamin C deficiency. Chronic bleeding results in minor trauma to vessels and lesions, particularly on the skull, scapula, and metaphyseal ends of subadult long bones. The most distinctive lesions are found on the greater wing of the sphenoid but lesions also occur on the roof and lateral margins of the orbits, the posterior maxilla, the interior surface of the zygomat, the infraorbital foramen, the palate, and the alveolar process of the maxilla. One study of North American subadults found instances were greatest in the birth to 2.9 year group (7.0 percent) and decline with age (1.0 percent in the 13 to 18.9 year age groups) with the overwhelming majority (87.0 percent) occurring in children under 7 years of age (Ortner et al. 2001:344–346). The transition to agriculture, along with losses due to cooking and prolonged storage, reduced the contribution of fresh fruits and uncooked vegetables to the diet and the vitamin C. This vitamin is necessary to fight infection and for normal formation of body tissues. Reliance on corn would predispose people to scurvy, especially when fresh produce was not available (Roberts and Manchester 1995:171).

For the prehistoric Southwest, rates of periostitis are generally low and increase over time, ranging from 2 percent in the Navajo Reservoir population to 23 percent at Black Mesa (Stodder and Martin 1992:62–63). Scurvy, which comprises an unknown proportion of the periostitis, is rarely reported. However, a recent study of collections in the Smithsonian Institution found lesion patterns characteristic of scurvy in subadults from Hawikuh, Pueblo Bonito, and Jemez with an overall rate of 2.0 percent. Rates are higher for sites in the Midatlantic (6.0 percent) and Southeast (38.0 percent) regions and scurvy is absent in those from the Plains.

One Early Developmental Peña Blanca burial, a newborn with extensive periostitis on the cranium, thorax, and limbs and one of the later burials, a 2.5-year-old child with active lesions on the greater wings of the sphenoid, the inferior occipital, and temporal bones, have lesion patterns suggesting scurvy. The only other periositis is on a young male with remodeled lesions on the tibia and femur shafts.

Summary and Conclusions on Mobility and Agricultural Dependence

While the number of Early Developmental Peña Blanca burials is small, the overall demographic profile is similar to that expected from a preindustrial population. This suggests that it is, at least vaguely, representative of the prehistoric populations living at these sites. If the burials are a reflection of that population, the intriguing combination of very young and very old individuals could suggest that the more mobile section of the population, older children, young and middle-aged females, and virtually all of the males, spent much of their time away from the site. Older females, very young children, and undoubtedly a portion of the individuals in those age groups that experience low mortality could have lived at the site year-round with influxes in population when labor was needed to plant and harvest the crops.

Finding relatively few burials is also consistent with a population that spent time away from the site and experienced most early to mid-aged deaths away from the residences. A general lack of patterning in mortuary practices above the site level suggests a kind of loose organization may have persisted throughout the time span.

The best evidence, although the sample size is small, for mobility in the Early Developmental population is in the long bone measurements and indices. Leg strength among females decreased through time while arm strength increased somewhat suggesting that a more mobile collecting strategy gave way to a sedentary one where corn grinding occupied a greater portion of their time. In males, mobility may have decreased somewhat but the wide range within the indices suggests a variety of roles for males. Since even the older females interred at these sites have robust and ovoid femurs, they had to have been mobile at one point. This pattern is not simply a matter of females tending the fields while males were away hunting.

Patterns of degenerative joint disease are also consistent with greater mobility in the early group. Feet are most commonly affected in the early group while evidence of arthritis is more widespread in the later group suggesting different kinds and probably more labor intensive activities.

Overall, the early group was remarkably healthy, which is consistent with a more diverse diet. Indications of seasonal food shortage were found in both the early and later Peña Blanca groups, dental hypoplasia lines indicate relatively mild periodic stress beyond the age of weaning. Possible scurvy was found in both the Early and Late Developmental groups, suggesting some young children and their mothers may have lacked the fresh fruits and vegetables needed to provide Vitamin C. For this group, there is little evidence of infectious disease, also suggestive of a fairly adequate diet and a dispersed population.

Few in the Peña Blanca population experienced caries under the age of 30 and few had lost teeth before the age of 50. The Cochiti Dam populations seem to have greater frequencies and earlier onsets, which is consistent with a greater reliance on a carbohydrate diet. Within the Peña Blanca populations, the amount of attrition is greater in the later group, again, consistent with a diet that included more ground corn.

In sum, the data tend to support an inference of greater mobility and a more diverse diet for the Early Developmental population. It also suggests that succeeding groups were more sedentary and relied more on corn agriculture.

Cultural Affinity and Social Behavior

Increases in site density during the Late Developmental and Coalition periods have been interpreted as the result of colonization from the San Juan Basin and Colorado Plateau as well as natural increases augmented by immigration (Ware 1997:1–12). The possibility of a hiatus in occupation between the Early and Late Developmental periods and a change in the direction of ceramic influence from south to north during the Early Developmental could also suggest shifts in the populations occupying the Peña Blanca sites. In addition, the Cochitis do not claim direct association with the majority of the sites in the area, the exception being those adjacent to Frijoles Canyon

(Lange 1990:8).

Thus, it is entirely possible that three distinct groups are represented in the prehistoric occupation of the Cochiti area. The original occupants of the Rio Grande Valley, including the Peña Blanca Early Developmental population, could have been ancestral Tiwa who were replaced by Tewas expanding down the Rio Grande or from the Upper San Juan area. Keresan ancestors of the Cochitis may have entered the area after AD 1300 (Ford et al. 1972:30–35) and could have inhabited at least some of the Classic period sites.

Cultural affinity can be approached by examining biological and cultural attributes. Cultural attributes, such as mortuary practices, should be more similar between related groups than successive but different groups. Given that there are only so many variations on the theme of human burial, these differences may be too subtle to provide clear indications of affiliation. Metric and nonmetric variation along with distributions of developmental disturbances might also provide information when adequate comparative populations exist. Finally, evidence for interpersonal violence could signal entry of a new group into an area. If found, trauma and violent deaths could provide insight into whether these kinds of conflicts occurred in the Cochiti area.

Mortuary Practices

According to Ellis (1968:60–69), historic Pueblo death rites identify the deceased's membership in social units in order for the individual to take their proper place in the afterworld. The social group can be ceremonial and not strictly related to kinship, like the corn groups of the Tiwa or like the religious groups of the Keresans, or it can be kinship based like the Tewa moieties. Isleta Tiwa preburial rites include laying a line of cornmeal to provide a road directing the deceased in the proper direction for his corn group. Face painting, using the color and emblems of the corn group, identify the spirit in the afterworld. Individuals are interred with their heads to the south, the direction from which some Isletans came. Burial goods consisting of an individual's personally owned ceremonial equipment are buried apart from the body (Ellis 1968:62–64). Tewa burials are oriented east so the spirit can continue its journey. Religious objects are not considered personal possessions and are taken by members of his religious society. Four days after the interment, a ceramic vessel containing pieces of food brought by related families is deposited on the village trash mound (Ellis 1968:65–66). Keresans also paint faces to identify membership in a religious society. An individual's personal belongings and a vessel containing bits of food are laid on a special mound outside of the village by a religious society leader in some villages and thrown off a cliff in special areas at other villages (Ellis 1968:67–69). Although subtle, these differences may have antecedents that are recorded in prehistoric burials. Just as the practice of interring burials throughout a site and flexed and semiflexed burial have been replaced by extended burial in formal cemeteries, deposition of burial goods in areas other than the grave may be an accommodation to Catholicism (e.g., Ellis 1968:72). More important may be whether personal and religious or ceremonial items belong to the individual. If ceremonial and religious objects belonged to the individual, they would be buried, but if ownership rested with some group, they would not.

While there appears to be no patterns in the Rio Grande area mortuary practices, at least at the level examined, it may be because these are quite subtle. For example, lack of consistency in orientation may reflect membership in a group represented by a direction (either two or four directions). In cases where the groups represent four or even six directions, the overall proportion should reflect how many members belonged to a particular group, with all directions represented. In other groups, orientation may reflect the direction from which they came or a dual division. Similarly, we might expect some groups to bury all kinds of personal possessions with the individual, while others would not include religious or ceremonial objects, and still others might place goods apart from the body.

Looking to the northwest, the San Juan and Colorado Plateau, where some of the possible immigrants are thought to originate, finds a similar lack of consistency or evidence of continuity. Few reports describe more than a small number of burials and the information is often in a form that makes quantification and comparisons difficult. Many of the variables that are fairly routinely recorded are subject to observer bias and error. Excavation strategies, such as how much extramural area is examined, influence proportions of structure versus extramural burials, and interpretations of the burial location and grave preparation can be vague or subject to multiple interpretations. Likewise, definitions of extended, flexed, and semiflexed burial positions, and forcing a choice between those three, introduces a number of biases. Orientation is particularly vague as some report the direction faced, some the top of the head, some give no definition as to what orientation means or apply any combination of definitions (e.g., LA 70). Furthermore, the level of precision varies from exact degrees to one of the four cardinal directions. Objects considered burial goods also vary. Some consider everything in a grave as a burial good, even if it originated in the trashy soil used to fill the pit. Preservation of perishable materials (e.g., textiles, mats, leather) also differs. When these materials are preserved, few burials are without goods (e.g., Arroyo Hondo), but in areas where preservation is poor, more burials are interpreted as having no grave goods. Given these complexities, and the generally small sample sizes involved, anything other than major differences or changes in burial patterns are unlikely to be detected.

Table 22.21 examines these variables for the Cochiti area, Rio Grande, and three northern Anasazi populations. If immigrants from the northern areas arrived during the Late Developmental or Coalition period, burial practices at the later Peña Blanca components, at North Bank, the Galisteo Basin site of LA 3333, Pindi, and early Arroyo Hondo should resemble those from Dolores, La Plata, and/or Chaco Canyon or those of the Pajarito Plateau (e.g., Anschuetz et al. 1997:107; Crown et al. 1996:198). Those at the Classic sites could be more like those of the large pueblos on the Pajarito Plateau, those to the north (e.g., Sapawe), or sites to the west.

Within this small database, a few things stand out. Burial location is almost always mixed with only Arroyo Hondo having a vast majority of extramural (trash and plaza locations) and Alfred Herrera, Dolores, La Plata, and the later Chaco sample predominantly structure burials. The rest are more evenly distributed. While the northern sites tend toward burial in structures, this is a rare pattern in the Rio Grande samples. Another difference may be in the number of flexed burials. Large proportions of tightly flexed burials are typical of the Classic period sites and Arroyo Hondo Coalition but not of the earlier Rio Grande or the northern sites. When orientation (defined here as alignment of the spine and head with the head determining the orientation) is ranked by cardinal direction (for example, using the proportion for northwest, north, and northeast for the north total), easterly is the most common direction to rank first, usually followed by south. The exceptions are the Early Developmental Peña Blanca, the Alfred Herrera Classic period, and La Plata groups where southerly is ranked first, and the LA 70 Classic sample where westerly is ranked first. The later may be an error based on the way these burials are described. When translating many of these into a direction, I assumed that a burial placed on the left side facing south would have their head to the east and when the description said head west, they meant the orientation was west.

Northwest orientations are rare or absent in Coalition and Classic sites, suggesting that either orientation had nothing to do with the place from which the group came or that the origin was not in the upper San Juan. Orientation to the north and northeast are found but neither are as common as eastern orientations. If orientation does indicate place of origin, the high proportion of westerly ori-

Table 22.21. Peña Blanca, Rio Grande, Galisteo Basin, San Juan Basin and Northern San Juan Comparative Burial Practices

	Peña Blanca		Galisteo Basin LA 3333	North Bank	Pindi	Alfred Herrera	LA 70	Arroyo Hondo		Dolores	La Plata	Chaco Small Sites	
	Early Dev.	Late Dev./ Coalition	L Dev/ Coalition	Coalition	Coalition	Classic	Classic	Coalition	Classic	850-1250	PII-PIII	1030-1150	1100-1175
% structure	56	50	67	47	54	86	45	28	8	75	70	51	86
% extramural	44	50	33	53	38	14	55	72	92	25	30	49	14
% extended	8	17	-	14	2	2	3	-	-	23	3	4	22
% semiflexed	67	83	61	57	52	7	10	-	-	43	50	48	52
% flexed	25	-	39	29	47	91	87	"almost invariably flexed"		34	47	48	26
% NW	-	-	3	10	3	-	-	-	-	6	2	6	4
% N	15	17	16	25	20	8	19	20	8	18	20	13	8
% NE	8	17	12	8		5	3	-	-	18	2	2	-
% E	8	17	41	33	30	16	24	43	58	27	22	25	42
% SE	15	50	6	17	3	8	-	-	-	12	2	8	-
% S	-	-	12	8	23	26	24	20	25	6	22	21	19
% SW	23	-	3	8	-	8	-	-	-	3	10	2	-
% W	31	-	6	-	-	18	30	16	8	9	10	23	27
Rank NW-NE	4	3	2	2	3	4	4	2	3	2	4	4	4
Rank NE-SE	2	1	1	1	1	2	2	1	1	1	3	1	1
Rank SE-SW	1	2	3	3	3	1	3	2	2	3	1	2	3
Rank SW-NW	2	-	4	4	2	3	1	4	3	4	2	3	2
% with no goods	33	62	65	100	83	83	48	36	71	@66	43	<32	<29

entations at LA 70 could suggest part of the population came from the west and others from the south and east. Similar proportions could indicate a four-direction system that determined the orientation of graves. Alternatively, with the exception of La Plata, easterly is always ranked first or second, this may reflect the historic Tewa pattern reported by Ellis (1968) of orientation to the east so the spirit can continue its journey.

In general, the variability in the Cochiti, Rio Grande, and the more northern samples suggests that either conceptual rules concerning orientation were not that rigid or that it was complex with membership in a group associated with a certain direction producing the variable results. Internal consistency within sites, as opposed to groups of sites (e.g., Peña Blanca, Chaco Canyon, and La Plata), is much greater than indicated by summary totals, suggesting that orientation may be more of a local or family decision.

Looking to the north, burial practices at Forked Lightning and Pecos Pueblo lack quantification on many aspects of mortuary practice. At Forked Lightning (Coalition period), where 152 burials were found, burial practices were similar to those at the Cochiti Dam sites and at Arroyo Hondo. Burial tended to be in midden areas or rooms used for middens; none was subfloor. All were flexed or semiflexed, usually wrapped in twill matting with no regularity in orientation and little in position (30 were flexed on the left side, 21 on the right, 13 face down, and 47 on the back). Individuals with burial goods (30 of the 152 or 19.7 percent) had vessels or parts of vessels (n=18), Olivella shells or disc or tubular beads (n = 8), and a variety of other material. Five individuals, three older males and two young to middle-aged females had medicine kits (Kidder 1958:26–28). At Pecos, Kidder excavated 1,938 burials dating from the Late Coalition/Early Classic to the Historic period. Burials were found everywhere; however, there were no subfloor infant burials, only a few premature infants found in pots. Throughout the prehistoric time spectrum all were flexed except for a few small infants and four adults. The most common position was face down and tightly flexed (n = 272) with a few described as loosely flexed (n = 26). Burial on the back was common in the Late Coalition-Early Classic burials (36.7 percent of 49 burials) then declined steadily in favor of burial face down. Orientation was not uniform with the midden burials placed parallel to the slope rather than any particular direction. There was little evidence of perishable burial goods and ceramic vessels were rare and usually found with infants or small children. Other types of goods were infrequent. Shell (with 13) and turquoise (with 12) were usually found with infants and children under 2 years of age. Kidder describes a number of "medicine outfits" buried with adults of both sexes. Some of the more unusual finds include three pierced wolf molars with one, five wolf molars plus a crinoid stem with another, and one with a beaver tooth pendant (Kidder 1932:106-108, 1958:279–295). The prevalence of tightly flexed burial and variable orientation is consistent with practices recorded for LA 70 and Alfred Herrera.

Information on the burial practices for the Pajarito Plateau and the more Northern Rio Grande area is sparse to nonexistent, which is unfortunate, given the amount of excavation done at several of the large sites. What is reported implies a great deal of diversity between sites in the location, position, and in presence and types of burial goods. Hewett comments that the search for burials at Tyúonyi located none until they placed a series of trenches through the talus in front of the cliff wall, and none of those had pottery or other vessels (Hewett 1938:97). At Otowi, about 150 burials were excavated from the area around the structures. Burials were so dense that early burials had been disturbed when placing later ones. Burial position was not uniform, but more were placed on the back than on the face or side and the knees were always drawn up toward the chest. Some had matting or basketry and almost all had ceramic vessels, usually food bowls. Bone awls and polishing stones were also abundant (Hewett 1938:130–132).

Summarizing his finds at Tsankewi'i and Tsirege, Hewett (1938:134–135) describes burial in houses, subfloor in houses, in urns, in crypts, and in cemeteries (mounds just outside the buildings). Flexed burials were most common. Infants were found under room floors at Puye, Tshirege, and Tsankawi (Kidder 1958:280). Clearly, burial practices on the Pajarito Plateau varied considerably and could suggest that divergent groups occupied the area.

Groups of artifacts considered medicine kits have a widespread distribution and one that could relate back to who owned an individual's religious or ceremonial objects. Kidder (1926:2) describes a pouch with a medicine stone, concretions, and two whistles buried with a middle-aged male, another middle-aged male with a medicine outfit of small oddly shaped stones and fossils (Kidder 1958:26–27) from Forked Lightning. In another publication, Kidder describes medicine outfits from three other individuals at Forked Lightning. A young female had a hematite concretion, three hematite pebbles, two waterworn obsidian pebbles, a quartz crystal, a limestone cylinder, a limestone pebble, six tiny pieces of turquoise, an oblong bone dice, and a crinoid stem. An adult male was buried with five small pebbles, an obsidian or dark quartz pebble, a piece of turquoise, a piece of limestone, a segment of crinoid stem perforated in the middle, two oblong dice, and a stubby awl. The third, an adult female, had a large flat fossil, a fossil bivalve, two crinoid stems, a tapering cylinder of soft white limestone, and a drill with a missing tip (Kidder 1932:110). Eight similar kits were found at Pecos Pueblo. Three from Glaze I contexts include an adult with two gypsum crystals, two pieces of limestone, three pieces of crystalline quartz, a bone tube, and a bone flageolet; a middle-aged adult male with two bubbly concretions, eight pebbles, seven quartz pieces, four obsidian knives or spear points, four smaller points, a projectile point, and a piece of shell. A Glaze II adult male had three ground olivella shells, four lumps of shiny mineral, a lump of prepared red ochre, a quartz chip, and a quartz projectile point. Glaze III individuals with kits include a middle-age female with a dumbbell-shaped sandstone concretion, three waterworn pebbles, a section of crinoid stem, a worn quartz crystal, a crude and worn obsidian point, a cylinder made fro m fossil bone, a hematite cylinder, an olive green stone cylinder, and two wildcat claws; an older male had a bubbly sandstone concretion, a dumbbell-shaped concretion, a tiny quartz pebble, a worn piece of white stone with a black streak, two quartz crystals, and a piece of soft limestone, and an older male with a hollow hematite concretion, a bone tube, eight worn pebbles, a lump of soft ore, a tiny piece of copper, a fossil bivalve, a section of crinoid stem, a cylinder of limestone, and a biface. Finally, an elderly female from a Glaze IV or V context had a bone tube, seventeen unworked hematite pebbles, two other pebbles of a heavy material, a large waterworn quartz pebble, and an obsidian projectile point (Kidder 1932:106-108).

Only one is reported for Arroyo Hondo. A male was buried with projectile points, possibly a wooden bow, stone balls, sheets of mica, a bone awl tip, an eagle claw, a raven skin, and the wings of a raven (Palkovich 1980:17). Items suggestive of medicine kits from the Galisteo Basin Late Developmental/Early Coalition site of LA 3333 include a middle-aged female with a cache of awls, bone tubes, and concretions, and an older female with bone tools, stone balls, hematite, a canine tooth, claws, and other material found in a cache under the body. One female from Peña Blanca was buried with a number of bone awls and pieces of worked hematite. No similar finds are reported for Pindi, the Cochiti Dam sites, or Dolores. However, there are a few from Mesa Verde. Rohn (1971:93) describes a 33-year-old male with a number of vessels and inside one small bowl were 16 stone objects that he felt could have been a medicine man's kit. It was comprised of two cylindrical paint stones, two ground chunks of hematite, four side-notched projectile points, two ground pieces of petrified wood, and six pebbles. Also in the grave were a shale pendant blank, a lump of heavy mineral, and four pebbles. At Long House a young adult was buried with a side-notched axe, a large pendant, a cone of green hornfels, a turquoise pendant, three hematite paint stones, a pair of eagle talons, a perforated eagle talon, a bone pendant, and two crystals of quartz and flourite. Cattanach felt this individual was probably a male and a medicine man, and that most of the items were in a container beside the body (Cattanach 1980:148).

A few individuals from small sites at Chaco Canyon had single items typically found in medicine kits (e.g., paint stones, crystals). A young adult, probably female, from BC 59, was buried with a pitcher, a bowl, a necklace with a jet bird effigy pendant, two quartz crystals, four steatite cylinders, a ground clear stone, and a smoothed stone awl. Each of the disturbed burial rooms at Pueblo Bonito contained numerous objects typical of medicine kits (Rooms 33, 320, 326, 329, and 330) but none could be associated with a particular individual (Akins 1986a:154–165). Aztec Ruin had similar disturbed contexts where medicine kit items were found with a number of disturbed infants and children in one room, with adults and children in another, and with two disturbed adults in a third room (Morris 1924:151–153, 155–161, 163–167). At La Plata, Morris 41 had a Basketmaker burial, a male, with a small pot containing chips of stone, projectile points, and other stones as well as other ceramic vessels and a stone bowl containing red pigment (Morris 1939:96). Rather than indicating a particular ethnic or linguistic group, these kits are widespread.

Developmental Disturbances

Similarities in the developmental defects or anomalies found in the axial skeleton may represent genetic markers that suggest relatedness in and among populations. In the living, most of these defects are undetected unless growth or development in childhood or functional stress or trauma in adulthood cause their identification. In prehistoric populations, patterning can provide information on the general occurrence of major defects, on biological affinities and homogeneity, and on cultural (e.g., marriage and residence patterns) and environmental influences (Barnes 1994:1–2, 5).

The most common and most informative of the defects found in the Peña Blanca population is that of cranial-caudal border shifting, lumbarization of the first sacral vertebra, and sacralization of the fifth lumbar vertebra. These defects, where the affected vertebra takes on the characteristic of adjacent vertebrae, are not rare and occur more often in females than in males. The lumbosacral border is the most frequent site of shifting with incidences reported for populations from Gran Quivira (n = 4, 4 percent), Chaco Canyon (n = 3, 2 percent), Mesa Verde (n = 1), Quarai (n = 3), Elden Pueblo (n = 1), Giuseua (n = 1), Amoxiumqua (n = 6), Hawikku (n = 7), Heshotauthla (n = 1), Puye (n = 36, 38.7 percent), Otowi (n = 3, 33.3 percent), and Tsankawi (n = 1, 14.2 percent) (Barnes 1994:79–80, 108–111, 252). One of the three female burials from LA 103919 near Pojoaque/Nambé has a lumbar sacral shift (Akins 2005) as do a male and a female from LA 391 in the same general area (Akins, in prep.a). What is unusual about Peña Blanca is the high incidence at one site, four of the five adult females from LA 265, suggesting a high degree of interrelationship. Incidences could be much higher as these are more difficult to detect in children, especially when preservation is poor, as in this sample. The other burials from other sites of this or later periods lack this defect. High frequencies are common at several of the Pajarito Plateau sites. Reported incidences seem lower for the northern groups, but at least one of the La Plata sites had very high frequencies. At this site (LA 35601), three of five males and none of the three females had cranial-caudal border shifting, as did one 9-year-old child (Martin et al. 2001, appendix 2).

One of the more commonly reported defects or anomalies reported for prehistoric populations is spina bifida occulta, usually of the sacrum. This cleft, or failure of the arches to unite, occurs in low frequencies for Puye (9.8

percent) but is common for Otowi (66.6 percent) and Tsankawi (28.5 percent) (Barnes 1994:49, 262). This was observed in two Peña Blanca children, one Early Developmental period burial from LA 265 (S1 and S4) and one Late Developmental period burial from LA 6169 (S1–S4 with L5 misaligned).

Another example from the Peña Blanca population is a Type II block vertebra in the most common site of occurrence, that of the second and third cervical vertebra. Rarely producing symptoms, this particular defect is found in Anasazi populations throughout the Southwest including Gran Quivira, Chaco Canyon, Mesa Verde, Arroyo Hondo, the Kayenta area, Amoxiumqua, Hawikku, Heshotauthla, Yellow Jacket, Elden Pueblo near Flagstaff, Arizona, Puye, Otowi, Tsankawi (Barnes 1994:67–70, 237–240), at Alfred Herrera (Heglar 1968:265), and at LA 3333 (Akins, n.d.b).

More unique is the anagenesis of the coronal suture observed in a young child from LA 6169. Absence of sutures produces cranial deformity due to the displacement of the growing brain. The absence of this suture is more common in females and gives the cranium a rounded appearance. No case of bilateral anagenesis is reported by Barnes (1994:152–154).

Another is the presence of Stafne's defect in a woman from LA 6169. This occurs when the salivary gland develops prematurely and creates a deep cavity in the mandibular body that enlarges as the gland grows. Frequencies of this defect are high in Plains Archaic and Middle Mississippian populations but Barnes reported only one for the Southwest, from Amoxiumqua (Barnes 1994:170–171). Recent excavations at a Coalition/Classic site in Santa Fe found two in a population of over 150 (Akins, in prep.b).

Sternal apertures, when the fusion of sternal bands is incomplete, are commonly reported in prehistoric populations including those from Gran Quivira, Hawikku, Pueblo Bonito, Puye (14.7 percent), and Otowi (28.5 percent) (Barnes 1994:222–227, 288). A large aperture was present in the burial from LA 249, in a male and a female from Alfred Herrera (Heglar 1968:265), and a young male from Pojoaque/Nambé, LA 391 (Akins, in prep.a).

A Late Developmental period child (LA 6169-1) has fused crowns (and possibly roots) of the deciduous mandibular lateral incisors and canines. Detailed information on dental anomalies are rarely reported. Somewhat similar is the fusion of the roots and about half the crowns of the right deciduous mandibular first and second incisors on a 3-year-old child from La Plata (LA 37601, Burial 9).

Most of the developmental defects observed in the Peña Blanca population are found in a wide range of Southwestern populations so that their presence does not provide concrete evidence of biological affinity. Within the Peña Blanca sites and time periods, there are differences. The most significant is the large number of lumbosacral defects from LA 265, which suggests a high degree of relatedness between at least the females from this site and perhaps homogeneity of this particular group but not of the Early Developmental population in general. All of the other developmental defects are single occurrences. Defects were found in all but one of the LA 265 burials but only three of those from LA 6169 and none of the LA 115862 burials. While some of this may be due to better preservation and more complete representation at LA 265, it could also indicate more diverse groups at the other sites and in the later time periods.

Metric and Nonmetric Variation

Studies of biological distance date back to at least the 1950s and peaked between 1970 and 1980. The recent decline is attributed, at least in part, to a recognition that the traits measured are only moderately heritable. However, when used in conjunction with paleodemographic and paleopathological information, these studies can provide a framework for viewing questions concerning topics such as biological variation or heterogeneity, migration, or endogamy (Buikstra et al. 1990:2–6). Indeed, *Standards* (Buikstra and Ubelaker 1994:61, 69) records metric and nonmetric dental and cranial measurements noting that genes greatly influence cranial shape and it is assumed that similarities in craniofacial morphology indicate the degree of relatedness between groups.

Two early studies of cranial variation include burials from the Cochiti Dam sites of LA 70, North Bank (LA 6462), and Alfred Herrera (LA 6455). Rodger Heglar's (1974) dissertation research focused on the question of whether the prehistoric population (n = 103) was similar to contemporary populations and published data on other prehistoric populations from north-central New Mexico (e.g., Paa'ko [n = 28], Pecos [n = 250], Pindi [n = 12], and Te'ewi [n = 16]). For comparison, Navajo Reservoir (n = 20), Hawikuh (n = 37), and Whitewater (n = 19) populations were also included (Heglar 1974:20–21). The methodology compared the means for 30 craniofacial measurements, 20 cranial indices, 75 postcranial measurements, stature, and 32 indices using t-tests and their probability levels. A smaller number of morphological traits (n = 16) were also considered (Heglar 1974:23, 27–29). Assuming that the Cochiti Dam archaeological population was Eastern Keres, Heglar ultimately concludes that the population was not morphologically homogeneous, was smaller craniofacially than that from Pecos Pueblo and the more northern populations and most similar to Paa'ko, were taller than any of the other groups, and that in size and shape the males are unlike any of the other groups. In general, he felt the population was biologically conservative and rather isolated and best considered a local example among similar circum-Rio Grande Valley prehistoric populations (Heglar 1974:105–106).

A few years later, James Mackey (1977:477–482) included the LA 70 and Alfred Herrera cranial measurements in a multivariate study questioning the link between Pecos Pueblo and the Towa villages. Comparing populations based on possible linguistic or cultural affiliation, he considered the following populations and affiliations: Hawikuh (n = 39, Zuni), Cochiti Dam (n = 21, Keresan), Hopi (n = 14 from six sites), Piro-Tompiro (n = 8 from four sites), Pottery Mound (n = 15, Southern Tiwa), Kuaua-Puaray (n = 9, Southern Tiwa), Jemez (n = 6 sites, Towa), Pecos (n = 99), Paa'ko (n = 21, Tano or Southern Tiwa), Puye (n = 28, including Puye, Tsirege, Otowi, and Tsankawi, Tewa), Sapawe (n = 11, Tewa), Salt River (n = 28, Hohokam), Rosa (n = 12 from five sites, no affiliation assigned), and Largo-Gallina (n = 19 from eight sites, no affiliation assigned). Since the paper focused on the Pecos-Jemez connection, no conclusions were reached regarding the Cochiti Dam population. However, F statistic distances for Cochiti Dam are smallest when paired with the Piro-Tomiros or Gran Quivira, Pardo, Quarai, and Chilili (5.53), Puye (8.10), Hopi (8.47), Rosa (8.51), and Paa'ko (8.62) populations and most divergent when compared to those from Pottery Mound (24.23), Pecos (17.41), and Salt River (13.49) (Mackey 1977:481). Another study (Mackey 1980:171–181), examining population affinities for Arroyo Hondo, but using discrete traits and not including Cochiti Dam, found that Arroyo Hondo appears genetically similar to other probable ancestral Tewa and Tano groups, that is Puye, Pindi, and Sapawe (Mackey 1980:180).

More recent works by Schillaci and colleagues (1998) and Schillaci (2001) use a subset of cranial measurements to examine migration. The earlier study concludes that, at least in the populations studied, there is no evidence to support an influx of people from the San Juan/Mesa Verde to the Rio Grande area during the Classic period. Sapawe, Pecos, Arroyo Hondo, and Otowi form a cluster of probable Tewa/Tanoans (Schillaci et al. 1998:9). The later study, focusing on Pueblo IV/Classic populations, found close relationships between San Cristobal, Puye, and Hawikku and between San Cristobal and Hawikku (Schillaci 2001:8–9).

Absent DNA studies, which could provide greater precision in determining relationships or stable strontium isotope ratio studies useful in tracing migration patterns (Buikstra and Ubelaker 1994:170, 172), that were not done on the Peña Blanca or Cochiti Dam burials, any estimates of cultural affinity must rely on metric and nonmetric variation. These data remain largely unreported and unavailable; however, this report and information on file provides some of the baseline data needed for these studies. Building on past work and other nonbiological findings, future studies should consider the possibility of different linguistic groups inhabiting these sites. The Early Developmental period Peña Blanca burials could be most closely related to groups to the south such as those who inhabited the Albuquerque West Mesa, Pottery Mound, and perhaps Kuaua and Tijeras Pueblo. Late Developmental, Coalition, and even Classic populations are most likely to show affiliations with Tewa/Tano groups such as those from LA 3333, the Pojoaque/Nambé area, Arroyo Hondo, Pindi, Puye, Otowi, San Cristobal, and Pecos Pueblo. Other Classic populations or even individuals could show affiliations with populations to the west or from Chaco Canyon or Mesa Verde.

Trauma

Given the speculation about migrants supplementing or replacing the local population from the Late Developmental period on, we might expect that, if true, some interpersonal violence or conflict occurred. Such evidence could take the form of defensive site location, increasing site size, clustering of sites, line-of-site communications, burned sites or parts of sites, violent deaths, and unburied bodies (LeBlanc 1999:55–85). While the determined researcher could find evidence of all of the above in the general area, the paucity of supporting evidence and lack of clear evidence argues this was not the case. This is especially true if the evidence is broken down by time rather than considered as a single case.

None of the Peña Blanca burials from any time period could be construed as candidates for unburied or hastily buried bodies that might result from raiding or attacks on villages (e.g., LeBlanc 1999:85). While the bodies may not always be neatly arranged, most were deliberately placed and are often accompanied by burial goods. None of the trauma found in the Early Developmental burials need be the result of violence. A rib fracture, wedged vertebrae, and mandible dislocation are all in separate individuals, all older women, and most likely the result of age and accidents. Nor is it likely that the partial male cranium from LA 6169 should be classed as a trophy head. The only marks on the skull are carnivore gnaws found at the upper margins of both orbits and the nose and canine-like punctures in one orbit and the left sphenoid. The face, the mastoids, and the base are missing. This was, more likely, a cranium retrieved after it was disturbed by dogs. Its placement on the floor of a pit structure along with a partial bear mandible undoubtedly had some significance but to suggest it was the remains of a slain enemy or a trophy head (e.g., LeBlanc 1999:87–88) is unwarranted when there is abundant evidence for carnivore-disturbed burials at Peña Blanca. One child (LA 265-1) is missing the coronoid process and looks as if it were ripped off with tears in the superior surface of the horizontal ramus. Yet the mandible was in or very close to anatomical position when found and this could result from the rodent activity noted for this burial.

Very few burials from the Rio Grande region date to the Early Developmental period. To the south, at Rivers Edge west of Albuquerque, a small Early Developmental period population (n = 4) included a male (40 to 50 years of age) with cranial trauma, a depressed fracture on the parietal (Hilton and Ogilvie 1991:1, 14).

Of the four Peña Blanca burials that date to the Late Developmental period, the two children have no evidence of trauma. The older female may have perimortem or postmortem trauma. She was neatly arranged, on her back with arms to her sides and legs flexed to the left side at the hips, the left side of her face has fractures that could have occurred at the time of death, during, or shortly after burial. The malar is fractured in an unusual manner and the coronoid process is broken off of the mandible and was not recovered, although the jaw was in place. A young male from LA 6169 had a projectile point tip embedded in a lower rib and the point itself was found among the ribs. Since no healing had occurred, the injury could have contributed to his death. While it is possible that the injury resulted from an ambush, the point came from above and hit him from behind in the lower back, it could also have been from a hunting accident. Methods such as driving deer or pronghorn into a canyon or gully or surrounding and shooting animals must have resulted in occasional accidents. Since there is no evidence this was more than an isolated incident and the individual was returned to the site for burial, accidental death remains an option. Data on other populations dating to this period is sparse but intriguing. From LA 103919, near Pojoaque and Nambé, three female burials have rather large but healed cranial fractures. All are near the top of the head and one also has two fractured ribs. The single male from this site has no trauma (Akins 2005). Dating only slightly later, at the Late Developmental/Coalition transition, the Galisteo Basin site LA 3333 has several examples of healed cranial trauma, including a 4-year-old child. Three males (37.5 percent) have small healed injuries, two on the frontal and one on the parietal and occipital. One also had a dislocated rib. Females had proportionately fewer incidences (28.6 percent) but several of these were severe. One woman has a piece of stone embedded in a parietal, small depression fractures in her frontal, and a large gash in the margin of one orbit; another has a broken nose plus large and small depression fractures in the parietal. Postcranial injuries in this group are largely hand, foot, and wrist injuries (Akins, n.d.b). Reed (1966) reports a projectile point embedded in a thoracic vertebra in a burial from earlier excavations at this site. All this suggests some level of interpersonal conflict at the end of the Developmental period. The pattern of injuries is consistent with sporadic raiding aimed at wife-stealing and stealing or destroying resources of other groups (e.g., Haas and Creamer 1996:205) and possibly tension between settled and migrant groups.

Trauma in Coalition period burials from Peña Blanca includes a male with a wrist fracture and a male with a healed cranial depression fracture and a toe fracture. The cranial fracture, along the coronal suture, could have resulted from conflict. For Arroyo Hondo, Palkovich (1980:168) reports a single incident where a male had a point embedded in his pelvis. Trauma was not common in the Classic period Cochiti Dam burials. Heglar (1976:J5) noted a wrist fracture, a broken mandibular condyle, and a depressed fracture or trepanation on the back of the head, all in males from LA 70. Alfred Herrera had a few more, largely wrist fractures (n = 3), a femoral neck fracture, a fractured clavicle, and three males with small healed cranial fractures, one possibly altered by trephination (Heglar 1968:55). It is hard to put these into proportions of the population, but the incidences are fairly low and perhaps consistent with the view that aggregation serves as a means to manage conflict (e.g., Crown et al. 1996:200).

This pattern of low level aggression contrasts with findings at Coalition period Forked Lightning near Pecos Pueblo where Kidder found many parts of the pueblo had burned and three rooms held unburied bodies, one with a battered face (1926:6). Similarly, at Pecos Pueblo, while not at all common, projectile points were second only to ceramics in abundance for items found in graves and several were found in the chest and the pelvic area (Kidder 1958:294). If migrants did settle in the Cochiti area, either the area was fairly empty so there was little or no competition for land and resources or they were peacefully integrated into the sites investigated.

Summary and Conclusions on Cultural Affiliation

Mortuary practices have yet to provide clear indications of cultural affinity within the Cochiti Dam sites or with groups from the Upper San Juan or Pajarito Plateau. Similarities are widespread. The distribution of developmental defects is equally widespread in prehistoric pueblo populations. High levels of a particular defect in burials from one of the Early Developmental sites do suggest it was occupied by a closely related group of females who were not that closely related to individuals found at the other early sites. Metric and nonmetric studies tend to suggest diverse populations occupied large areas rather than distinct territories being settled by the different linguistic groups.

Evidence for the level of the violence that might be expected if large numbers of unrelated people tried to move into an already settled area is absent from the Cochiti area. Region-wide, low level violence seems to be more common in the Late Developmental period and continued into the Coalition and Classic periods. Low level violence is more consistent with sporadic raiding that resulted in wife-stealing and stealing or destroying the resources of other groups, as is the infliction primarily on women. If migration occurred as might be indicated by the diverse burial practices and metric and nonmetric studies, the assimilation of these groups was relatively peaceful.

Taphonomy and Cultural Modification

Carnivore and rodent disturbance and damage occurred fairly frequently in otherwise complete burials. These intrusions undoubtedly led to some dispersal of human bone. In addition to damage that is diagnostically carnivore or rodent, a number of burials have chop or cut-like marks that are extremely difficult to explain, especially since most occur on articulated or slightly disturbed burials and in a variety of locales. Table 22.22 gives this information by burial or isolated element, along with the general context and efforts to cover or protect the burial. The carnivore and rodent damage is reviewed before turning to the more problematic marks.

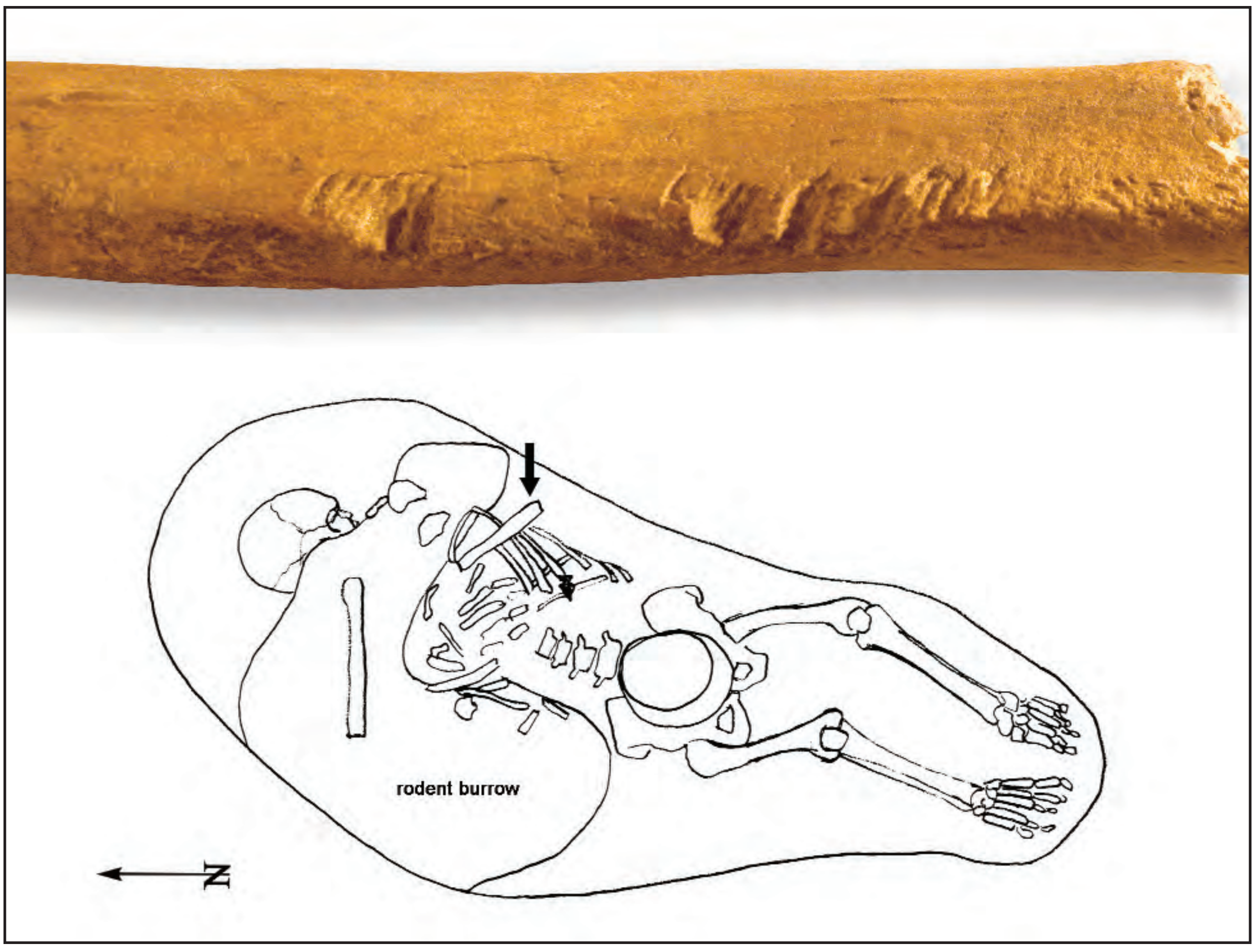


Figure 22.9. Rodent disturbance and gnawing, LA 6169, Burial 9.

Table 22.22. Summary of Carnivore, Rodent, and Possible Cultural Modification

Site/Burial or FS	Carnivore	Rodent	Cultural	Context/comments
LA 249-1	Possible: R pubis, 3 L ribs -- bone is eroded with fresh breaks	Possible - erosion rather than gnawing: L femur, proximal posterior; *scattered L foot and hand bones	Chops/cuts: L tibia anterior shaft, R tibia posterior shaft, R fibula lateral shaft; possible perimortem damage to left side of face, missing coronoid process but jaw was articulated	ARTICULATED ADULT FEMALE; shallow pit in midden, large cobbles above and around edge of pit; articulated burial; minor disturbance but much breakage on cranium
LA 265-1		*Burrow through torso, arms and hands -- removed some elements	Rodent or cultural?coronoid process looks torn off but jaw was close to normal position	ARTICULATED/RODENT DISTURBED CHILD; bell-shaped extramural pit sealed with adobe chunks and cobbles
LA 265-2			Chop: L femur midshaft medial	DISTURBED INFANT; shallow pit above vent shaft, no covering noted; poor preservation with few bones remaining; no comments on cause of disturbance
LA 265-3				ARTICULATED ADULT FEMALE; extramural pit, no covering noted; slight disturbance and shifting, not detailed by excavator
LA 265-4				ARTICULATED ADULT FEMALE; bell-shaped extramural pit, not sealed but lower fill contained slumps of construction adobe; rodent burrow in vicinity but no disturbance other than minor shifting
LA 265-5		*Minimal rodent disturbance		ARTICULATED ADULT FEMALE; pit structure, subfloor pit, metate 26 cm above cranium, pit may have been at least partially plastered over
LA 265-6	Vault - grooves and stellar-like pits; femurs: distal ends have punctures, irregular edges, and slight polish; jagged gnawed ends on L proximal tibia, L proximal fibula, R distal humerus			ARTICULATED ADULT FEMALE; lower fill of pit structure, extensive pile of adobe chunks over burial; excavator notes the left knee joint and lower right leg and lower right arm were removed by carnivores
LA 265-7	Rib shafts and R radius distal shaft - carnivore-like breakage		Possible cuts/chops: R(?) & L radii distal shafts - lateral; L distal ulna; 2 rib shafts - superior edge; longbone fragment, pitting in cranial case fragment; slight burn on 2 thoracic vertebrae	BACKHOE DISTURBED ADULT FEMALE; pit structure upper fill; unknown covering; few bones in place; 3 rib shafts have small very round holes, almost like insect borings; 2 left metatarsals are sunbleached
LA 265 FS 1479	Femur shaft - ends chewed off			ISOLATED ELEMENT/ADULT MALE
LA 6169-1		*Slight disturbance		ARTICULATED CHILD; fill of pit structure, no covering noted
LA 6169-2				ARTICULATED ADULT FEMALE; shallow extramural pit, no covering evident but it could have been removed by road maintenance; backhoe impacted and very poor preservation
LA 6169-3		Probable rodent - lower left arm found above burial		DISTURBED FETUS/NEW BORN; pit structure fill, covering unkown
LA 6169-4		*Burrow - at edge of burial pit - disturbance uncertain		ARTICULATED FETUS/NEW BORN; upper fill of pit structure, pit filled with hard clay; disturbance mainly of midsection - probably rodent but not noted by excavator

Table 22.22. Continued.

Site/Burial or FS	Carnivore	Rodent	Cultural	Context/comments
LA 6169-5	Gnaws on upper edges of orbits; punctures in orbit and sphenoid; much missing - possibly removed by canines			ISOLATED ELEMENT/ADULT MALE; partial cranium placed on pit structure floor along with bear mandible
LA 6169-6	Extensive damage mainly scalloped edges with rare gnaws and possible punctures: pubic symphyses, L lateral clavicle, L& R distal humerus, R prox radius and ulna, L proximal ulna, pits in L femur near both ends and L fibula distal shaft	*Rodent disturbance throughout midsection - disturbing vertebrae and hand bones	Carnivore or human? L femur shaft anterior and posterior - gnaws or anterior and posterior - gnaws or dull cuts. R femur and tibia - multiple deep chops	ARTICULATED ADULT FEMALE; extramural pit, no covering noted; cranium, upper thorax, R arm, parts of pelvis and right leg relatively undisturbed; poor preservation
LA 6169-7	Scalloped end, L distal femur	*Rodent disturbance	Cuts or abrasions? Posterior parietals – very fine but cut-like; possible chops (n=2), R posterior ulna	CHILD; pit structure upper fill, no seal noted; *some disarticulation and poor preservation
LA 6169-8	Punctures: L pubis; punctures and scallops: ribs of both sides; other elements have breaks and scalloped edges that could be from carnivores but no diagnostic marks	*Rodent disturbance throughout		LARGELY ARTICULATED ADULT MALE; pit room floor, no covering noted but cobbles in upper fill of room; midsection especially disturbed -probably by carnivores; otherwise fairly intact
LA 6169-9	Possible puncture L proximal humerus, R proximal humerus shaft, and rib shaft fragment	*Extensive burrow disturbed and removed bone from lower cranium to lower thoracic vertebrae; gnaws L humerus shaft	Projectile point tip in rib; point in rib cage	LARGELY ARTICULATED YOUNG ADULT MALE; pit structure lower fill, some large chunks of adobe in upper fill; intact except for rodent burrow area
LA 6169-10			Possible chops: R fibula proximal shaft lateral and L ulna medial midshaft	PARTIALLY ARTICULATED CHILD; upper fill of vent shaft, possibly by chunked and solidified adobe; Burials 10 & 11 were shallowly buried, superimposed and disturbed
LA 6169-11		*burrows through chest cavity and arm areas; bones moved by rodents	Possible chops: R humerus distal shaft medial , R ulna, L ulna and radius at midshaft; 3 L ribs look like the ends were cut off, other ribs have odd breaks- possibly carnivore	PARTIALLY ARTICULATED CHILD; same as B. 10; *some damage and movement during excavation
LA 6169-12		*Rodent burrow		FRAGMENTARY CHILD; extramural, covering unknown
LA 6169-13				FRAGMENTARY/FETUS NEW BORN; few elements recovered from wall of backhoe trench
LA 6171-1	Scallops - possible carnivore damage R medial scapula body	*Rodent disturbance shoulder area and foot; some disarticulation of thorax; L humerus above rest of burial		LARGELY ARTICULATED ADULT MALE; extramural pit, covered by 6-7 layers of rock
LA 115862-1		Minor disturbance/movement; foot phalange found in vessel		ARTICULATED ADULT FEMALE; extramural pit, no covering noted but pit discovered by mechanical scraping in gravel terrace; poor condition; *root disturbance only
LA 115862-3		L radius shaft - gnaws or possibly chops - located just above or at the edge of a large seed jar	L radius shaft - rodent gnaws or chops	ARTICULATED YOUNG ADULT FEMALE; extramural pit, no covering but in gravel terrace with gravel fill; poor to good condition; no disturbance other than missing some hand and foot phalanges

* noted by excavator

Figure 22.10. Cut marks on bone.

Carnivore and Rodent Damage

Few intact burials lack some degree of rodent disturbance. This ranged from displacing a few small bones to rather massive churning of portions of the burial pit (Fig. 22.9). Rodent gnawing was rare but the condition of the bone may have obscured minor assaults on the poorly preserved individuals. Notations of rodent disturbance are almost ubiquitous.

Carnivores damaged a number of burials. Diagnostic marks (tooth punctures, gnaws or shallow grooves, pits, and scalloped edges) were found along with breakage patterns that frequently result from carnivores (e.g., Binford 1981:65–78). These occurred in relatively intact burials and on isolated elements that were undoubtedly removed from burials. The prehistoric population was well aware of the disturbance. In one instance (Burial 265-6), the excavator noted that the left knee, lower right leg, and lower right arm were removed by carnivores before someone augmented the adobe rubble covering the burial to protect the grave from further damage. Ultimately, the burial was covered with a mound of about a meter of rubble extending 1.5 m out from the structure wall against which the burial was placed. Another burial (6171-1) had several courses of rock sealing the pit and other burials had what appears to be deliberate attempts to thwart carnivore invasions (Table 22.22). Unfortunately, some excavators did not recognize the carnivore disturbance for what it was and did not try to explain the absences or dispersals or note any attempts to prevent further damage.

Cultural Modification

Several of the marks observed on the bones are most consistent with an interpretation of cultural modification. These "chop-like" or "cut-like" marks (Fig. 22.10) are found on articulated, undisturbed burials or parts of burials (249-

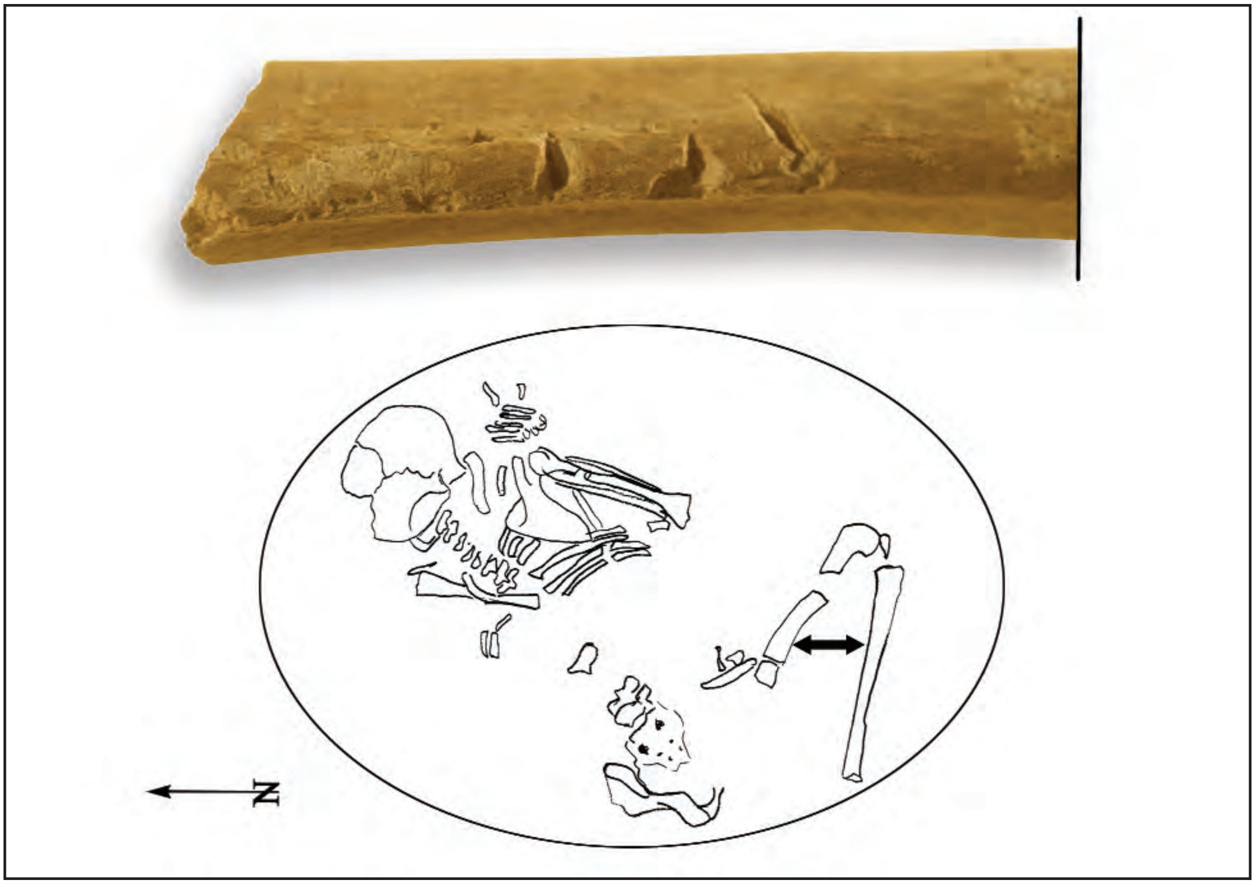


Figure 22.11. Chop-like marks on Burial 6.

1, 6169-6, and possibly 115862-3), as well as on a burial disturbed by the backhoe (265-7), burials with carnivore damage (6169-7), and shallow burial with disturbance (265-2, 6169-10 and 6169-11). Found at four sites, five date to the Early Developmental period, two to the Late Developmental, and one to the Coalition. Elements involved are largely arm and leg bones with more ambiguous marks on crania and ribs.

Some of the chop-like marks fit the definition accepted by White (1992:146), that is, broad marks that are V-shaped in cross section and generally perpendicular to the bone surface. Many are wider than those illustrated by White (1992:149) but are cleaner than his examples of percussion pits (White 1992:141, 255). Other marks have one clean side as if cut with a sharp instrument but the other side is rough as if removed by pressure rather than the cutting or chopping motion. In the adults, none the marks are associated with breaks, however in the two children, these resulted in breaking the arm bones. Other marks, some of the cut-like marks, the abrasions, and the percussion pit-like marks are ambiguous and open to multiple interpretations as to whether they are human in origin. What is clear is that none of these examples resemble dismembering of the individuals for consumption or even funerary purposes. Chops on anterior tibias and many of the other locations could serve no purpose such as releasing tension on muscles or tendons. It is uncertain when these actions occurred: before death, at death, at burial, well after burial, or any combination. Although noteworthy, the lack of clear patterning of any kind precludes any firm conclusions at this time.

Similar chop-like marks also occur on a Late Developmental period burial from the Pojoaque/Nambé area. A young male, deliberately buried with one or two ceramic vessels, has similar marks on his fibulas. Finding simi-

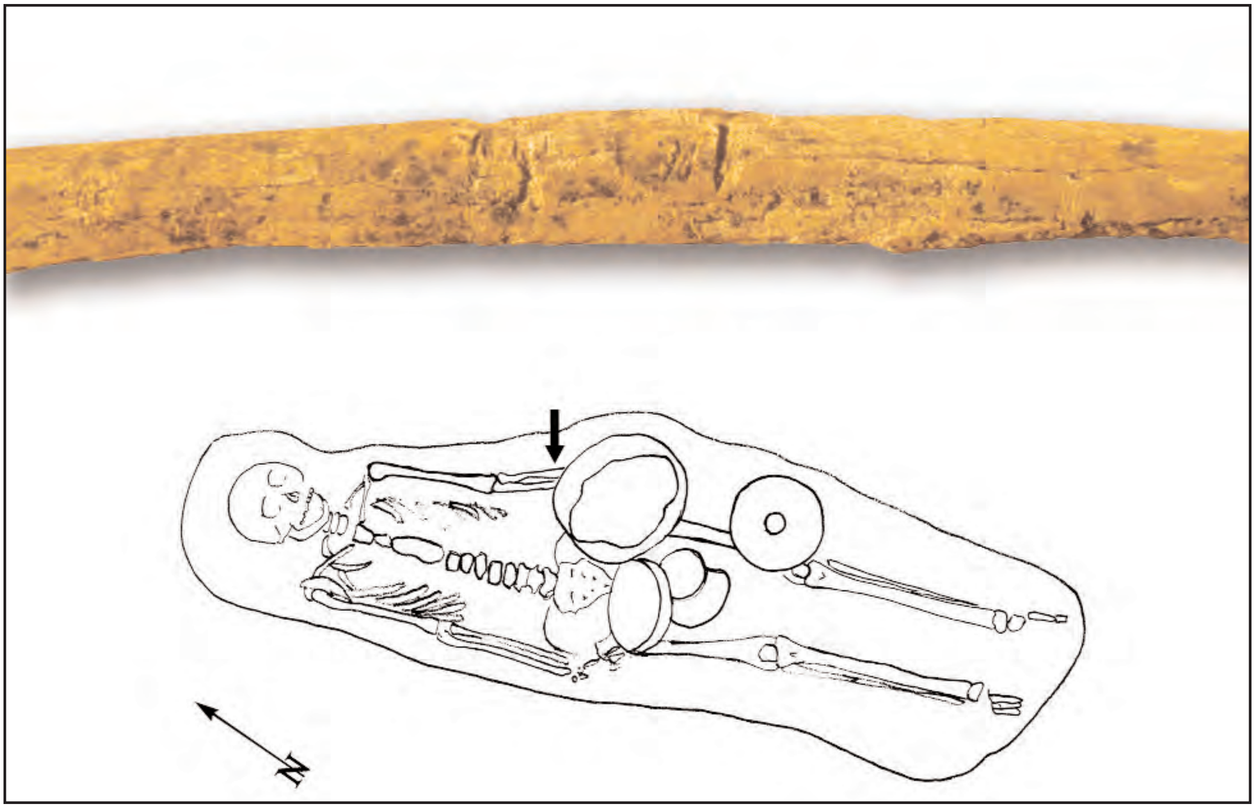


Figure 22.12. Chop-like marks on Burial 3.

lar marks outside of Peña Blanca may suggest it represents a more widespread practice that may have been overlooked in other area populations.

A single burned human bone was found among the 20,000 or so faunal specimens. The midsection piece of a left radius is burned black with a carmelized interior. This kind of uniform heavy burning generally occurs when there is no longer flesh on the bone and caramelizing when marrow in the medullary cavity is incompletely incinerated (Buikstra and Swegle 1989:255). It was found in the floor fill of Structure 76 at LA 6169, a layer of trashy material that contains burned soil and material suggesting a burned and dismantled roof. Given this context, the burning could very well be accidental.

Conclusions

Although the sample size is small, the Peña Blanca burials provide a great deal of insight into life during the prehistoric period. Most significant is the indication that groups practicing early agriculture were quite mobile. At least early on, the task of maintaining a permanent residence and the garden plots may have fallen mainly on older and less mobile women. This mobility pattern evolved into the more settled and agriculturally committed model we typically attribute to early Pueblo populations. As long as the younger members maintained a degree of mobility, and consequentially a more diverse diet, their general health was better than for many sedentary agricultural groups. While present, the conditions used to monitor health status, e.g., porotic hyperostosis, periostitis, and dental hypoplasia, are less severe than found in groups to the northwest, but appear to have increased significantly in later groups occupying the sites.

Cultural affinity remains elusive. Neither mortuary practices, distributions of developmental defects, nor metric and nonmetric studies show clear patterns that could identify populations such as the linguistic groups who occupied fairly distinct spatial territories in the Historic period. Burial practices and most developmental defects have wide distributions and much more detailed information is needed before we can use these to begin to trace the movements of prehistoric populations.

Finally, the presence of unusual marks on articulated burials suggests that we need to evaluate and expand our ideas about what constitutes mortuary practice and the range of taphonomic processes that could produce marks similar to those described here. Formally buried individuals rarely undergo the level of scrutiny afforded disturbed burials and disarticulated bones, however, finding marks on formally buried individuals suggests these should undergo a similar level of observation. Similarly, excavators need be more aware of disturbance when uncovering burials so that the effects of carnivores and rodents are not confused with human modification.

Chapter 23
Flotation Sample Analysis, Macrobotanical Sample Analysis, and Wood Identification at Peña Blanca (LA 249, LA 265, LA 6170, LA 6171, and LA 115862)

Pamela J. McBride, Mollie S. Toll, and Jessica Badner

Flotation, macrobotanical, and wood samples were examined from seven sites just north of Peña Blanca, New Mexico along State Route 22, south of Cochiti Dam. Sites ranged in age from the earliest Developmental to the Classic periods. A total of 236 flotation samples were analyzed and of these, 201 produced carbonized plant material, including weedy annuals, grasses, cacti and other perennials, as well as corn, beans, and squash (Table 23.1). Species composition was determined for a sample of charcoal from each flotation sample. Wood samples identified prior to submission for ^{14}C dating (n = 67) and macrobotanical samples (n = 133) provided additional information.

An extensive survey of plant resources in the Cochiti Reservoir area conducted by Tierney (1979) provides valuable information about the diversity and seasonal availability of edible plant species in the study area. Peña Blanca sites are on a 5 km (2 mile) stretch of dissected Pleistocene gravel terrace above the Rio Grande floodplain on both sides of the Santa Fe River, similar to Tierney's Study Area G. Tierney found 96 native edible plants in the nine combined study areas, including 20 edible species in Area G. Spring resources that were abundant in the area included the roots and tender leaves of *Cymopterus fendlerii* (chimaya), the young leaves of *Chenopodium* sp. (goosefoot), *Artemisia dracunculoides* (false tarragon), and *Cleome serrulata* (beeweed), and the seeds of ricegrass *(Oryzopsis hymenoides).* Stipes and buds of *Yucca angustissima* (narrowleaf yucca), young joints and buds of cholla *(Opuntia imbricata),* and the emerging purslane plants *(Portulaca)* would have been available in late spring. A transition from greens and buds to flowers, fruits, and some seeds begins in the early summer and continues to the peak productivity of the late summer and fall when wolfberry *(Lycium pallidum)* and cactus fruits, juniper cones, seeds of goosefoot, purslane, and dropseed grass, and piñon nuts mature.

The majority of contexts on the Peña Blanca project date to the Early Developmental. LA 6169, however, was occupied during the Early and Late Developmental as well as the Coalition periods; LA 6170 had both Early and Late Developmental components; and LA 249 had a Late Developmental pit structure, and middens associated with a Classic period pueblo outside the right-of-way. The Early Developmental site LA 265 was the largest of the project area sites and therefore had the greatest number of flotation samples that were analyzed. At least 15 wild plant taxa were identified from LA 265 contexts, with a predominance of disturbance-loving weedy annuals. Of these, *Corispermum, Cycloloma,* and *Iva* were not recorded at all by Tierney, but are found in the Northern Rio Grande area (Martin and Hutchins 1980) and probably do occur in the region. Grasses and grass-like plants, trees and shrubs of the grassland and upper piedmont, and cacti were also recovered, but were generally less abundant. Construction and fuelwood material were represented by seven wood taxa, as well as common reedgrass and grass stems that probably functioned as roof closing elements. Like the plant assemblage from LA 265, the 33 taxa that were recovered from throughout the Peña Blanca project reflect exploitation of the surrounding biotic

Office of Archeological Studies, Ethnobotany Lab Technical Series # 86 communities: grassland, riparian corridors along the Rio Grande and Santa Fe River and their tributaries, and the foothills and upper elevations of the Jemez Mountains.

Methods

Flotation Processing

The 257 soil samples collected during excavation were processed at the Museum of New Mexico's Office of Archaeological Studies by the simplified "bucket" version of flotation (see Bohrer and Adams 1977). Flotation soil samples ranged in volume from 0.35 to 6.23 liters. Each sample was immersed in a bucket of water, and a 30–40 second interval was allowed for the settling out of heavy particles. The solution was then poured through a fine screen (about 0.35 mm mesh) lined with a square of "chiffon" fabric, catching organic materials floating or in suspension. The squares of fabric were lifted out and laid flat on coarse mesh screen trays until the recovered material had dried.

Full-Sort Analysis

The 257 Peña Blanca flotation samples represent 236 discrete proveniences. The remaining 21 samples represent additional bags of soil from various locations. One sample from each discrete provenience was subjected to full-sort analysis.

Each sample was sorted using a series of nested geological screens (4.0, 2.0, 1.0, 0.5 mm mesh), and then reviewed under a binocular microscope at 7–45x. Charred and uncharred reproductive plant parts (seeds and fruits) were identified and counted. Table 23.1 lists all carbonized plant taxa encountered in Peña Blanca samples by Latin and common names and the anatomical parts. Flotation data are reported as a standardized count of seeds per liter of soil, rather than an actual number of seeds recovered. Relative abundance of nonreproductive plant parts such as pine needles and grass stems was estimated per liter of soil processed.

To aid the reader in sorting out botanical occurrences of cultural significance from the considerable noise of post-occupational intrusion, data in tables are sorted into categories of "Cultural" (all carbonized remains), "Possibly Cultural" (indeterminate cases, usually of unburned, economically useful taxa either found together with burned specimens of the same taxon, or found in relatively good preservation conditions), and "Non-Cultural" (unburned materials, especially when of taxa not economically useful, and when found in disturbed contexts together with modern roots, insect parts, scat, or other signs of recent biological activity).

Charcoal Identification

From each flotation sample with at least 20 pieces of wood charcoal present, a sample of 20 pieces was identified (a maximum of 10 pieces from each screen size). In smaller samples, all charcoal from the 4 mm and 2 mm screens was identified. Each piece was snapped to expose a fresh transverse section, and then identified at 45x. Identified charcoal from each taxon was weighed on a top-loading digital balance to the nearest tenth of a gram and placed in labeled plastic bags. Low-power, incident light identification of wood specimens does not often allow species- or even genus-level precision, but can provide reliable information useful in distinguishing broad patterns of utilization of a major resource class.

Macrobotanical Samples

Wood specimens (generally bigger pieces than those recovered in flotation samples) were examined in the same manner as for flotation charcoal. Charcoal, destined for ^{14}C dating, was separated by taxon, weighed, and placed in labeled foil packets. Corn specimens (all carbonized) were measured to the nearest 0.1 mm using dial calipers, following parameters detailed in Bird (1994) and Toll and Huckell (1996). To be considered measurable, cob fragments needed to possess a full circumference, and kernels needed to be complete in two of the three possible dimensions (length, width, and thickness). Dial calipers were used to measure carbonized kernels and beans in these three dimensions to the nearest 0.1 mm. Other specimens were identified as to taxon and part by comparison with modern reference specimens. When necessary, fragile specimens were wrapped in acid-free tissue and/or polyester fiber and placed in durable archival containers, to protect them from further breakage.

Results of Flotation, Marcrobotanical, and Wood Analysis

LA 249

Sampled proveniences at LA 249 include a Late Developmental pit structure (Feature 6) and two middens (AU 406 and 412) associated with a large Classic period adobe pueblo (Tashkatze Pueblo) outside the right-of-way. A burial and an extramural hearth (Feature 7) underneath the AU 412 midden, another extramural hearth (Feature 3), and a surface strip, contexts that could not be directly associated with a particular time period, were also sampled. The site is on a high, heavily dissected gravel terrace above the floodplain at 1,616 m in elevation.

Cultural plant remains from the Late Developmental pit structure fill consisted of corn parts (kernels, cupules, glumes, cobs, and stalk fragments) along with wood (Tables 23.2–23.4). Juniper was the most commonly identified wood taxon both in flotation and macrobotanical samples. Cottonwood/willow was the next most common taxon recovered and traces of Mormon tea, piñon, rose family, and saltbush/greasewood were also present. Flotation samples from the floor of the structure were only slightly more productive, yielding goosefoot seeds, yucca fiber, and corn (Table 23.5). As in the fill, juniper was the dominant wood identified, but only small amounts of cottonwood/willow were present along with unknown non-conifer and conifer wood (Table 23.6).

Cultural non-wood plant material was absent from flotation samples from the surface hearths (Features 3 and 7); uncharred goosefoot, dropseed grass, and purslane seeds were identified and represent non-cultural intrusives (Table 23.7). Ponderosa pine, a wood that would have been harvested at higher elevations in the Jemez Mountains, was identified in flotation samples from Feature 7 and from the AU 406 midden. Juniper, unknown conifer, and unknown non-conifer wood were also identified in Feature 7 samples. Carbonized corn cupules, cottonwood/willow, piñon, juniper, Mormon tea, rose family, and saltbush/greasewood wood were identified from the midden as well (Tables 23.8, 23.9). Fragments of corn stalk were the sole carbonized archaeobotanical remains recovered from AU 412 midden (Table 23.10). Corn cupules, glumes, and a cob were recovered from the burial and probably are part of the overlying midden deposits.

Corn was the only domesticate recovered in flotation samples from LA 249, and seems to have been an important part of the diet of site occupants throughout the occupation of the site. Absence of fall-harvested wild plants in the archaeobotanical record suggests that site occupation may have been limited to the growing season. Goosefoot and yucca fiber were restricted to samples from the earlier occupation and Feature 7. The wood assemblage was dominated by juniper, but cottonwood/willow occurred frequently and was the sole evidence for riparian plant use. Ponderosa wood was identified in midden samples and may be an indication that site occupants during the Classic period made forays to higher elevation locales to collect ponderosa for construction material. The balance of wood taxa consisted of local shrubs and piñon.

LA 265

The largest of the Peña Blanca project sites, LA 265, is an Early Developmental site located on a terrace just south of the confluence of the Rio Grande and Santa Fe River. Two-hundred and seventy cultural features were excavated, including three pit structures and their interior features as well as five extramural activity areas with hearths, storage pits, possible shallow pit structures, and a variety of other pits.

Study Unit 1 is a large circular pit structure. Samples analyzed from the upper fill yielded charred goosefoot, cheno-am, cholla, and prickly pear cactus seeds along with common reed stems, piñon nutshell, and corn kernels and cob parts (Table 23.11). Juniper was the dominant wood taxon identified in flotation samples, followed by cottonwood/willow (Table 23.12). Traces of piñon, saltbush/greasewood, and conifer were also present. A carbonized corn cupule was found with an infant burial in the upper fill of the structure and probably represents part of the fill and not a deliberate inclusion. The majority of taxa from the floor fill and floor features of the pit structure were weedy annual seeds and corn kernels and cupules (Table 23.13). Floral remains from Study Unit 1 floor features probably represent general fill rather than residue from use of the features. This is substantiated by the recovery of piñon nutshell, corn cupules, and fragments of juniper and cottonwood/willow wood from the three linear floor features. Defined as possible foot drums, they would not be expected to yield any remains of food processing activities. The wood assemblage from floor features was also very similar to that from the structure fill with the exception of traces of rose family and unknown non-conifer wood (Table 23.14). Macrobotanical samples examined from the central hearth, postholes, an ash pit, and warming pits consisted primarily of juniper, cottonwood/willow, and saltbush/greasewood wood with a smattering of rose family wood and a few corn cupules (Table 23.15).

Macrobotanical remains from the extramural activity area (Study Unit 2) surrounding Study Unit 1 were scarce, including a few corn cupules and juniper, cottonwood/willow, and saltbush/greasewood wood (Table 23.16). In contrast, floral remains from two large, irregular-shaped pits (Features 14 and 34) and another large pit (Feature 15) in Study Unit 3 (another extramural area) were diverse and consisted of charred weedy annual seeds, piñon nutshell, skunkbush and banana yucca seeds, corn, and squash rind, as well as wood remains of juniper, cottonwood/willow, saltbush/greasewood, oak, and cholla (Tables 23.17–23.23).

Weedy annual seeds dominate the array of taxa recovered from upper fill in Study Unit 4 (a small pit structure; Table 23.24). Piñon nutshell and prickly pear cactus seeds represent perennial plant use. The only evidence of utilization of grasses for food came from the fill of Study Unit 4 in the form of dropseed grass grains; grass stems were also recovered and may represent the remains of tinder or roofing material. Corn kernels and cob parts were the only cultivar remains identified. The wood assemblage is similar to Study Units 1, 2, and 3, with juniper the dominant wood taxon and varying amounts of cottonwood/willow, conifer, piñon, oak, and saltbush/greasewood (Table 23.25). The floral assemblage from floor fill and features is less diverse than that found in general fill. Fewer annual taxa were present, but skunkbush seeds and a trace of cholla wood were additions that were not present in general fill (Tables 23.26–23.28). Carbonized juniper twigs and grass stems were recovered from the Feature 74 secondary hearth and may represent burned roofing material or residue from tinder.

Study Unit 13 is a small pit structure on the east side of NM 22 that is probably contemporary with the other two pit structures on the west side of the highway. Archaeobotanical remains from the upper fill, roof fall, and floor fill and floor features are very similar, with weedy annual, cholla, and skunkbush seeds occurring along with corn, grass stems, and juniper twigs (Tables 23.29 and 23.31). Wood taxa are the same as described for other proveniences at the site; juniper is the most commonly recovered taxon with varying amounts of cottonwood/willow, cholla, saltbush/greasewood, and pine present (Tables 23.30 and 23.32).

The pattern of plant use at LA 265 seems to be focused on annuals like goosefoot, pigweed, and purslane with some use of perennial plant resources including yucca, cacti, skunkbush, and piñon. Corn and possibly squash were cultivated, although *Cucurbita* rind was extremely limited in distribution (restricted to Feature 14 from Study Unit 3). Wood use reflects a sitewide preference for juniper and cottonwood/willow; some piñon was used along with shrubs like saltbush, cholla, and members of the rose family. All of these resources would have been found growing in disturbed ground around fields or habitations (weedy annuals) along the Rio Grande or Santa Fe River (cottonwood/willow), or in the immediate site environs (cacti) and foothills of the Jemez Mountains (skunkbush). The presence of plant resources that could be gathered both during the growing season and in the fall points to the likelihood of longer-term occupation at LA 265.

LA 6169

LA 6169 is a multicomponent site with evidence of occupation that spanned the Early Developmental through Coalition periods. The most diverse floral assemblages came from an Early Developmental pit structure (Feature 47), a Late Developmental pit structure (Feature 76) that was built inside Feature 47 (both on the east side of the right-of-way), and a Coalition pit room (Feature 70) on the west side of the right-of-way. Some curious floral assemblages were found in Early Developmental storage bins (Features 119 and 121). At least seven plant taxa including common reedgrass, goosefoot, purslane, piñon, dropseed grass, possible squash rind, and corn were recovered (Tables 23.33, 23.34). With no evidence of post-use burning, the abundant and diverse charred economic plant parts are logically interpreted as secondary trash deposition. Common reedgrass stems, yucca leaf fragments, and willow family wood were recovered from a roof matting sample from Feature 47 (Table 23.35). The *Cucurbita* rind that was found in Feature 121 is the only evidence of other domesticates at LA 6169.

Plant remains from Feature 76 are more evenly distributed throughout this Late Developmental structure, but hedgehog cactus and winged pigweed seeds found in two separate floor samples are the sole examples of these species from LA 6169 (Table 23.36). Amaranth, goosefoot, and purslane were also identified in floor samples and the hearth. Grass stems and juniper twigs found on the floor could be roof closing materials or debris from tinder or firewood (see Tables 23.37 or 23.38).

The central hearth (Feature 98) of the Feature 70 Coalition pit room yielded a diverse array of annuals, perennials, and grasses (Table 23.39). Plant remains reflect the use of a variety of habitats from riparian *(Carex)* to Plains and Great Basin grassland *(Oryzopsis, Plantago).* A range of seasonality is also represented by *Oryzopsis* that generally matures in the spring, *Portulaca* and *Amaranthus* in late summer, and *Pinus edulis* in the fall. Possible uses of plants are also variable, including a source of dye *(Cleome),* pot herbs *(Cleome, Plantago, Portulaca),* medicinal purposes *(Plantago),* and seeds commonly ground into flour *(Chenopodium, Sporobolus). Lycium* wood, rarely recovered from the project, was found in Feature 98 (Table 23.40).

Weedy annual seeds and corn were the dominant taxa recovered from the other Early Developmental pit structure (Feature 4), two other Coalition period pit rooms (Features 10 and 16), and extramural features in Study Units 6, 7, and 8 (Tables 23.41, 23.42, 23.43, 23.46). Over 30 cob fragments were recovered from the floor of Feature 16, representing the majority of cobs from the site; 9 of these were measurable. Piñon nutshell was identified in Feature 4 and an extramural roasting pit that was in use during the late Developmental (Feature 79). An unburned *Prunus* pit was recovered from Level 1 of the feature, suggesting some post-occupational contamination. The domesticated plum and apricot are introduced species and the pit displays rodent gnawing, revealing the probable source of introduction. The floor samples from Feature 15, another Coalition period pit room that was built into the wall of Feature 4, contained exclusively grass stems, corn, and charcoal (Tables 23.43 and 23.45). The limited taxonomic diversity is probably because only two samples were analyzed. A thermal feature found in the upper fill of Feature 15 that probably represents a Classic period reuse of this part of the site, contained carbonized goosefoot seeds and grass stems (Table 23.43). A single cholla seed was identified in an extramural cobble-lined roasting pit from the late Developmental period (Feature 149; Table 23.46). It's tempting to suggest that cholla fruits were roasted in the feature, though one specimen constitutes very slim evidence for feature usage. Charcoal from shrubs (largely saltbush/greasewood and willow family) dominated the wood assemblage from the Coalition pit rooms (Table 23.44).

Plant remains from Feature 64, a large unburned pit buried underneath a sheet trash deposit in Study Unit 11 northeast of Feature 70, consisted of a few unburned goosefoot seeds and carbonized corn parts. Another large unburned extramural pit (Feature 159) in Study Unit 13 (possible midden) contained charred goosefoot and cheno-am seeds, corn cupules and juniper and cottonwood/willow wood. The contents of both pits probably reflect trashy deposits, rather than feature use.

Three extramural features on the east side of the right-of -way in Study Unit 6 (Feature 84), Study Unit 8 (Feature 145), and Study Unit 9 (Feature 127) could not be directly linked to a specific time period. Corn cupules were the only plant remains from Feature 84 (Table 23.46). Saltbush/greasewood was the sole wood charcoal from Feature 127, while Feature 145 produced the mix of wood charcoal types found throughout the site (Table 23.47). Weedy annual seeds and corn cupules were identified in Feature 127 (Table 23.48). An uncarbonized peach pit, another obvious intrusive, was recovered from Area 2 of Study Unit 8.

Wood from Developmental and Coalition period contexts alike is predominately juniper, cottonwood/willow, and saltbush/greasewood. Several contexts yielded sequestered wood taxa; oak was present solely in an interior warming pit (Feature 165) of Feature 47, a trace of cholla wood was identified in the central hearth (Feature 17) of Feature 10, a minute amount of rabbitbrush was recovered from the floor of Feature 16, and wolfberry was identified in the central hearth (Feature 98) of Feature 70 and in a floor contact sample from Feature 76 (Tables 23.35, 23.37, 23.38, 23.40, 23.42, 23.44, 23.45, and 23.47). Wood from the probably Classic period thermal Feature 14 in the upper fill of Feature 15 was exclusively saltbush/greasewood. There does not seem to be any significant change in wood procurement practices through time. The floral assemblage from the site indicates an economy based on corn agriculture and, as at LA 265, a focus on weedy annual species and perennials that would have been harvested in the late summer and fall. Feature 70 was the only context with evidence for possible occupation in the spring.

LA 6170

At LA 6170, 151 cultural features were excavated, including three Early Developmental pit structures with associated extramural features, and a midden, a Late Developmental pit room, and the foundation of an early historic surface room. Flotation samples were not examined from the historic surface room and no diagnostic artifacts were present, so relative age of the structure is unknown.

General fill and floor fill/contact of Structure 2, a small, ovoid pit structure, associated with the earlier prehistoric occupation of the site, produced corn cupules and glumes, partially charred goosefoot seeds, and carbonized grass stems (Table 23.49). These were the only Structure 2 contexts that yielded floral material. Consistent with wood data from throughout the project, juniper was the most common taxon identified (72 percent by weight) and a smaller percentage of cottonwood/willow and saltbush/greasewood was also present (Table 23.50). A number of corn cobs, a few cupules, and a kernel were identified in macrobotanical samples from various structural fill contexts (Table 23.51).

Immediately north of the historic surface room is a Late Developmental complex of superimposed features that includes a possible activity area with a subsurface cache of ground stone artifacts and a rectangular pit room (Structure 5A). The pit room and the activity area are mostly contained within the fill of an Early Developmental pit structure (Structure 5). Charred plant remains from the two mealing bins in Structure 5A probably reflect redeposited trash rather than remains from grinding activity. A corn kernel fragment, cupules, and glumes, piñon needles, and four-wing saltbush fruits were recovered along with uncharred goosefoot and dropseed grass seeds (Table 23.52). Prickly pear cactus seeds, corn cupules, and piñon nutshell were identified in samples from the fill and floor of the structure. Grass and common reed stems were also recovered in fill and floor samples. Wood taxa consisted of juniper, cottonwood/willow, and saltbush/greasewood.

In Structure 5 (the ovoid pit structure below Structure 5A), a partially burned roof collapsed after intentional or accidental burning shortly after the four main roof supports and large structural beams were removed. Results of flotation analysis from fill were divided into the components of general fill, roof and closing material, and floor fill and contact (Table 23.53). We note slightly greater diversity of taxa from general fill and roof fall samples: pigweed, goosefoot, purslane, yucca leaf fiber, monocot stems, and corn in general fill and roof material, compared to corn, grass and monocot stems, and piñon from the floor samples. Of the five Structure 5 features with floral remains, the central hearth, the heating pit, the Feature 20 cobble-lined thermal pit, and the Feature 19 ash pit contained non-wood cultural material. Weedy annual seeds, piñon nutshell, and corn were recovered from the four features (Table 23.54).

Macrobotanical samples from fill and features contributed some interesting additions to the list of taxa recovered in flotation samples (Tables 23.55 and 23.56). Bean cotyledons were identified from the ash pit and from the roof and closing material. Although corn cob fragments were recovered in the ash pit and floor fill flotation samples, 119 cob pieces (17 of which were measurable) were identified in macrobotanical samples. Common reed stems, willow family wood, and a small amount of yucca leaf fiber were part of the macrobotanical sample from the roof component of fill, strongly suggesting roof beams were cottonwood and reed stems functioned as closing material of the structure. Yucca leaf strips may have been used to tie corn cobs to the ceiling or as part of the closing material as well. With the exception of a trace of mountain mahogany from floor fill/contact, the wood assemblage can be characterized as a repetition of taxa recovered from throughout the Peña Blanca project (Tables 23.55, 23.56, and 23.57).

Structure 50 is the third Early Developmental pit structure and is located on the east side of NM 22. Several sealed floor features indicate at least one remodeling episode. Floor fill and floor samples from Structure 50 yielded the richest array of floral remains from the structure, including obvious roofing materials (grass, monocot, and common reedgrass stems), along with three weedy annual taxa, yucca leaf, juniper twigs, cholla seeds, and corn (Table 23.58). Roof and closing material deposits also had monocot and common reedgrass stems, yucca leaves, corn, and cheno-am seeds, indicating a mix of roof materials and fill or that corn and other plant materials were stored on the roof or hung from the ceiling. Three of the sealed floor pits produced plant remains: carbonized piñon nutshell (Feature 162 small thermal pit), corn cupules and uncharred goosefoot (Feature 157, storage pit), and charred piñon nutshell and uncharred goosefoot (Feature 177, large thermal pit; Table 23.59). The contents of the pits suggest a similar source for these deposits (such as secondary trash), despite the sealed openings of the features. A mix of charred and uncharred remains in the thermal pit 177 does not make sense for primary deposition. However, the piñon nutshell found in thermal pit 162 may represent the remains of one of the last meals consumed by inhabitants of Structure 50 before the pit was sealed. Plant remains from unsealed features consisted of weedy annual seeds, corn, piñon nutshell, and juniper wood. Bean cotyledons were identified in the ash pit and collared hearth macrobotanical samples (Table 23.60). Corn cobs, yucca fiber, and common reedgrass stems were other distinctive floral remains identified in macrobotanical samples from fill and features (Tables 23.60 and 23.61). Wood from all contexts was predominately cottonwood/willow and juniper (Table 23.62). Small amounts of piñon, mountain mahogany, and unknown non-conifer were also present. Ritual abandonment of Structure 50 is suggested by the presence of a partial deer cranium against the east wall with a corn cob including kernels, inside the inverted skull. Many kernels were scattered around the skull with some fused as a result of oozing endosperm when the pit structure burned.

South of Structure 50 is an extramural activity area (Study Unit 12) that consists of a cobble-lined thermal pit, a bell-shaped storage pit, a stain, and several smaller pits. There are differences in elevation of the features, indicating possible non-contemporaneity. Charred goosefoot seeds, corn, and yucca leaf fragments were recovered from the large cobble-lined thermal pit (Feature 53) and the bell-shaped storage pit (Feature 69; Table 23.63). Wood remains were minimal and consisted of less than a gram each of juniper, cottonwood/willow, and saltbush/greasewood. Uncharred fragments of juniper wood weighing 10.10 g in the macrobotanical sample from a posthole (Feature 81), provide an identity for the post. In an extramural area to the north, a shallow depression (Study Unit 14) filled with midden material shows no sign of plant-related activities: only uncharred cheno-am and stickleaf seeds were recovered.

Construction materials from LA 6170 were examined from two pools of wood specimens. Those examined to assess suitability for tree-ring dating were largely burned beam fragments from the roof fall layer of Structure 5. Of the 54 specimens, 78 percent were cottonwood/ willow and 22 percent juniper (Table 23.64). Other roof fall and fill samples were examined prior to submission for radiocarbon dating. All wood in fill from Structures 5 and 50 was cottonwood/willow; common reed stems were also part of the roofing material (Table 23.55 and 23.61). In Structure 2 fill and Feature 20 of Structure 5, however, juniper was the predominant wood type (78 percent by weight), while cottonwood/willow made up 21 percent, and trace amounts of saltbush/greasewood and piñon were also encountered. This assemblage, with a strong conifer component and greater diversity, more closely resembles Early Developmental fuel contexts elsewhere at Peña Blanca sites (Tables 23.50 and 23.56).

Corn cobs and kernels from the four structures and Feature 69 (bell-shaped pit in Study Unit 12) were measured; The majority of the cobs (58 percent) were 12-rowed and are discussed, along with kernel morphological characteristics, in a regional comparative framework later in this chapter. Several beans from Structures 5 and 50 were also measured. One displayed clear characteristics of the common bean *(Phaseolus vulgaris),* and the other four are probably the same species.

Weedy annuals, perennials like prickly pear cactus and piñon, corn, and beans were the staples in the diet of LA 6170 inhabitants. Grass seeds were not recovered with any frequency, perhaps indicating a more minor role of grasses as a food resource. Grass stems (especially common reedgrass), were important elements of roof thatch material. Probably because of close proximity and rapid growth, cottonwood was the most commonly occurring roof beam material identified, followed by juniper. Mountain mahogany and saltbush/greasewood were also present, but not in high frequencies. Evidence of ritual abandonment of Structure 50 provides insight into the importance of corn and deer not only as food, but in the spiritual life of the people who lived at LA 6170. Site complexity and the presence of fall-ripening resources suggest occupation of LA 6170 was similar to that at LA 6169 during the Early Developmental. LA 6170 appears to have been occupied, not only during the growing season, but extending into the fall when piñon and prickly pear cactus fruit were collected.

LA 6171

LA 6171 was an Early Developmental habitation with four pit structures, three activity areas, and a series of large, oxidized, bell-shaped pits that are some of the earliest Developmental features identified in the Northern Rio Grande to date. The site was covered by a layer of Coalition sheet trash associated with unexcavated components to the east.

Study Unit 5 contained a series of extramural features, many of which were associated with Feature 38, an activity area later used as a dumping area for hearth or roasting pit refuse. Goosefoot and two corn cupules were the only charred taxa recovered from Feature 38 fill. The sample from Feature 39, an ash and fire-cracked rock concentration, or possible thermal feature within Feature 38 was more varied, yielding goosefoot, cheno-am and, prickly pear cactus (Table 23.65). Most of the wood from both features was juniper with trace amounts of saltbush/greasewood. Variations in taxa recovered from the two features could support the speculation that Feature 39 is a specific dumping episode within Feature 38 and that Feature 38 fill could be made up of more of these discrete dumping episodes. Structure 1, located to the southwest of Feature 38 contained a considerable number of burned goosefoot (15) and some corn remains (Table 23.65).

Structure 60 (Study Unit 6) was a shallow, oval, Early Developmental pit structure with very little evidence of roof fall. Samples examined from the central hearth, an ash pit, and two small pits yielded few plant remains, including goosefoot and cheno-am seeds; evidence of corn was sparse but ubiquitous, consisting of a few cupules in each feature and a kernel fragment from the ash pit (Table 23.66). The only flotation sample with wood charcoal was from the ash pit; juniper was the dominant wood taxon with a smattering of saltbush/greasewood.

Earliest Developmental features were located in Study Units 5, 6, and 7. Archaeobotanical remains from large, oxidized, bell-shaped cists (Features 43, 54, 56, and 92) that may have also been used as small structures are among the most diverse at LA 6171. Goosefoot was prevalent in all samples that had charred seeds, but was most dominant in Features 43 and 56, accounting for 80 to 90 percent of the total burned seed assemblage (Table 23.67). Other weedy annuals recovered were seepweed, pigweed, winged pigweed, and bugseed. Charred grass seeds, monocot stems, and juniper seed fragments made up the remaining wild plant remains. Unburned spurge, goosefoot, and nightshade family seeds were likely intrusive. Cultivars included squash rind as well as corn cupules, glumes, and one corn kernel. As with the rest of the site, wood from these features was dominated by juniper with a small amount of cottonwood/willow and trace bits of saltbush/greasewood in Feature 55 (Table 23.68). It is possible that some of the sampled deposits were associated with later site occupations. However, cupules from Feature 54 produced a 2-sigma date range from AD 440–640 indicating early use of corn and an intact deposit.

Study Unit 4 was made up of two small, overlapping shallow pit structures (Structure 18 and 26) and two intrusive extramural features. As with Structure 60 in Study Unit 5, there was very little evidence of roof fall. Floral sampling in the earlier Structure 26 was limited to two quadrants and one thermal feature. The highest concentration of plant remains was found in the northwest quadrant. Charred weedy annuals consisted of goosefoot, sumpweed, and an unidentified species of the composite family. Evidence of cultivars in the form of a small amount of squash rind and corn was also recovered. One corn kernel and intrusive uncharred dove-weed seeds were recovered from the southwest quadrant (Table 23.69). Wood from Structure 26 floor was mostly juniper and saltbush/greasewood with trace amounts of cottonwood/willow (Table 23.70).

Despite extensive sampling, charred wild plant remains from Feature 27 (a small roasting pit in Structure 26) were extremely sparse and were limited to goosefoot seeds and juniper seeds and twigs (Table 23.69). The feature was lined with several discrete layers of burned twigs that were smothered with soil, as indicated by the small diameter and intact nature of the recovered wood. Juniper and saltbush/

greasewood comprised the majority of wood from the feature and can confidently be identified as fuel wood (Table 23.70). A dumping episode (Feature 105) in the fill of Structure 26 contained small quantities of burned and unburned goosefoot seeds, corn cupules, and juniper and cottonwood/willow wood. The episode could not be linked to any specific occupation.

In general, sparse amounts of weedy annuals were recovered from Structure 18 in the form of goosefoot, purslane, and pigweed seeds (Table 23.71). Because the eastern margin of the structure was excavated into Feature 26 fill, it is possible that the relatively large amount of goosefoot recovered from this half of the structure is intrusive. Unburned bugseed and goosefoot seeds and piñon needles were probably also intrusive. Flotation wood charcoal was dominated by juniper, with trace amounts of saltbush/greasewood, unknown conifer, and cottonwood/willow (Table 23.72). A corn cob was identified in macrobotanical samples from the southeast quadrant of the structure, in addition to an unburned hackberry seed.

Study Unit 2, an activity area immediately to the north of Study Unit 4, had sparse evidence of charred plant remains. Because other features were deflated or suffered extensive rodent disturbance, sampling was restricted to Feature 7 (ash pit), which contained charred goosefoot seeds and juniper and saltbush/ greasewood charcoal.

Structure 9 was an Early Developmental pit structure at the northern end of LA 6171. Unlike structures at the south end of the site, this pit structure was excavated into terrace cobbles, was deeper (60 cm), had well-defined roof fall, and was burned. Floor features yielded goosefoot, pigweed, and winged pigweed, as well as grass stems and a few corn cupules (Table 23.73). Wood from thermal features in Structure 9 contained a mixture of cottonwood/willow, saltbush/greasewood, and juniper (Table 23.74). Feature 16 (the ash pit), contained mostly juniper followed closely by cottonwood/willow with a small quantity of saltbush/greasewood. Wood analyzed from this feature was collected as a ^{14}C sample and may be biased towards the larger pieces of wood found in the feature fill. This may not be the case for Feature 13, the primary central hearth, from which only very small quantities of cottonwood/willow and juniper along with the only rose family wood from LA 6171 was recovered. Feature 12, the remodeled hearth, had a particularly high proportion (90 percent) of cottonwood/willow charcoal. This high frequency of riparian wood may be weighted by burned construction wood deposits, suggesting that the hearth was open when the structure collapsed. Greasewood/saltbush was the dominant wood type recovered from Feature 14, a thermal pit. Macrobotanical wood from structure fill was sparse but showed nearly equal parts of cottonwood/willow and juniper. The sample was dominated by the presence of grass stems, which may have been used as roofing material. Roof beam samples recovered from structure closing fill and identified prior to submission for dendrochronological dating, were all juniper.

Study Unit 8 was an activity area to the immediate north of Structure 9 and likely postdates the structure. Archaeobotanical remains from Features 96 (a deflated hearth) and 97 (a shallow pit) consisted of fewer than ten corn cupules from Feature 96.

Throughout time, inhabitants of LA 6171 exploited both desert scrubland and riparian environments. Floral remains show a familiar reliance on weedy annuals, as well as consistent evidence of reliance on agriculture. Indicators of agriculture in the Upper Rio Grande Valley as early as AD 500 are corn recovered from Feature 54 and possible squash rind found near the base of Feature 43. Taxa recovered from Early Developmental contexts are similar to, if not as varied as, those recovered from earlier contexts. Weedy annuals were predominant, and corn occurred in 15 of 20 samples (75 percent). Squash rind, recovered from Structure 26 floor was the only incidence of other cultivars besides corn.

Much of the wood recovered from LA 6171 was juniper (60 percent by weight). Juniper was dominant in thermal features with three exceptions:

Features 12 and 14 in Structure 9, and Level 2 of Feature 27 in Structure 26. Cottonwood/willow predominated in Feature 12, and saltbush/greasewood was dominant in Features 14 and 27.

Higher diversity and percent presence of weedy annuals from the earliest Developmental contexts may indicate greater dependence on wild plant resources compared to the ensuing Early Developmental. However, corn was actually encountered in slightly more of the flotation samples from the earlier time period (83 percent, compared to 75 percent of the Early Developmental samples). With the exception of juniper, wild plant remains in the earliest Developmental were restricted to late summer annuals. While prickly pear cactus was recovered from an Early Developmental context, a single occurrence of a fall-maturing plant does not make a strong argument for distinct differences in season of occupation between the two time periods.

LA 115862

Location of this pit structure on a narrow terrace above the floodplain ostensibly parallels that of similar nearby habitations of the same period (AD 800s). But digging into these gravel and cobble deposits, with practically no interstitial fines, was surely very difficult, especially given the tools at hand. Why did these Early Developmental people persist with this daunting and formidable task, when more amenable substrates abounded nearby? If the particular significance of this location lies in subsistence, floral remains do not reveal any distinctive or unusual qualities of this site. Rather, they are highly consistent with other project sites of this period.

Carbonized cultural plant debris is scanty within the pit structure (low-frequency goosefoot in the central hearth, and corn kernels, cupules, and glumes in floor fill, a basin-shaped pit, and an ash pit; Table 23.75). Wood is predominantly juniper in both the ash pits and several postholes, but includes some cottonwood/willow from the river corridor, and bits of saltbush/greasewood from the floodplain and terraces (Table 23.76).

The extramural activity area thermal features produced a considerably more diverse assemblage of economic floral remains. Carbonized wild seeds included the usual weedy annual suspects (goosefoot, pigweed, purslane) as well as bulrush (Table 23.77). Corn remains were found in every feature, including a hearth (Feature 5), roasting pits (Features 9, 11), and charcoal or ash stains (Features 10, 12). The only wood data available from the extramural proveniences came from Feature 9; juniper is the predominant element in both flotation and macrobotanical wood samples (87 percent and 99 percent by weight, respectively). Feature 8, a small trash-filled pit southwest of the pit structure, contained carbonized goosefoot, cheno-am, and goosefoot family seeds and corn cupules. Again, site occupants seem to have focused on a restricted number of weedy annuals that mature in late summer. The site probably was occupied at least through the growing season.

LA 115863

LA 115863 is a multiple component sherd and lithic artifact scatter. A cobble-filled roasting pit was the only cultural feature encountered during data recovery. A flotation sample examined from the feature yielded less than a gram of charcoal, and there were no herbaceous floral remains.

Discussion

Taxa Recovered at Peña Blanca Sites

At Peña Blanca's earliest occupation, goosefoot, pigweed, and corn turn up in most samples, but the weedy annual assemblage is otherwise sparse, and there are no edible perennials represented (LA 6171; Table 23.78). This is based on a very small sample, however, so we cannot interpolate economic and social implications. The Early Developmental period has a larger and more broadly based sample (133 flotation samples from five sites of various types and sizes). Here we see a wider spread of economic taxa (Table 23.78), with again a short list of weedy annuals (goosefoot, pigweed, and purslane) making up the bulk of occurrences of annuals in samples, and, in fact, 40 percent of *all* economic occurrences in these 133 samples (Table 23.79). There is a healthy array of perennials showing up in this time period, including piñon, squawberry, cacti, sedge, and yucca, and again, corn in nearly every sample. The Late Developmental stands out as having the highest emphasis on corn agriculture, with corn in every flotation sample (Table 23.80) and corn comprising 43 percent of all Late Developmental economic occurrences (Table 23.79). The list of weedy annuals is short (goosefoot, pigweed, purslane, and one occurrence of winged pigweed) and perennials (piñon, cacti) make up just 12 percent of economic occurrences. Similar to Salmon Ruin (Doebley 1981) and Chaco sites (Toll 1985, 1987), wild plant usage is showing an inverse relationship with corn.

Of all the plant taxa present in Peña Blanca sites, ubiquity (number or percentage of samples in which a taxon occurs) is consistently high for only cheno-ams and corn. The distinctly widespread prehistoric distribution of cheno-ams has been noted repeatedly for the Greater Southwest area (Gasser 1982; Minnis 1982; Adams 2001; Huckell and Toll, in press). The consistency of the prehistoric pattern combined with less ubiquitous contemporary distribution suggests that the prehistoric presence of cheno-ams on the landscape was significantly different, due to some combination of natural and anthropogenic factors. An enticing possibility is the encouragement of these taxa when they volunteered in agricultural fields, as documented in the twentieth century for the Cochiti (Lange 1968a:99). Bye (1981) has also provided evidence of the encouragement and harvest of goosefoot, pigweed, mustard, and purslane in modern cultivated fields of the Tarahumara of Northern Mexico.

Ricegrass has high potential subsistence value, due to its relatively large and nutritious seeds, ripening early in the growing season when food stores are at their lowest level (Bohrer 1975:199). Tierney (1979:38) encountered modern ricegrass populations in her pebble terrace sample plot, as well as mesa top and Santa Fe River floodplain contexts. Ricegrass, however, was identified only at LA 6169 in a Coalition context. The much smaller seeds of dropseed grass turned up in low frequencies in Early Developmental contexts at LA 265, and Early Developmental and Coalition contexts at LA 6169. Grass frequency is low throughout all time periods, aside from the presence of grass and common reedgrass stems (probably as roof closing material). Among perennials with potential food value, juniper is most widespread followed by piñon (though many occurrences of both taxa are likely ambient debris, or fuel rather than food remnants). Far less frequent are occurrences of seeds of leaf-succulents, possibly pointing to fruit consumption: cholla, prickly pear, hedgehog cactus, and yucca. Riparian areas of the nearby river corridor are represented by infrequent occurrences of common reedgrass, sedge, and bulrush.

The flotation contents of 9 roasting pits and 16 other thermal features with primary deposits were compared to see if differences in associated plant taxa could be detected (Table 23.81). The greatest taxonomic diversity was linked to Coalition period thermal features at LA 6169, followed by Early Developmental thermal features at LA 6169, 6171, and 115862. Within the Early Developmental period, roasting pits display far less floral diversity than other thermal features. There is also a case at LA 6169 where a Late Developmental extramural roasting pit produced twice the taxonomic diversity found in two contemporaneous interior thermal features.

Wood charcoal taxa richness was greatest from LA 265, though probably biased by the particularly large number of charcoal samples (n = 47) compared to other sites (Table 23.82). However, Classic period contexts at LA 249, with only nine samples, showed wood utilization that was nearly as diverse (Table 23.83). Some of the later Peña Blanca wood assemblages seem to have somewhat higher taxonomic diversity (see, for example, the Late

Developmental and Classic period assemblages at LA 249 and the Coalition at LA 6169). Such patterns of increasing diversity, whether applied to wood use or plant foods, are often taken to indicate the effects of population pressure (Kohler and Matthews 1988). Woods avoided or rejected in the past may have been added to the use repertoire to meet growing needs. Cottonwood, willow, and box elder, for instance, are relatively soft, weak, and easily damaged by rot, but have a rapid replacement rate (Lamb 1975:86, 153; Vines 1960:87, 676–677). Juniper is widely the dominant wood taxon, without respect to time or site type. Exceptions include LA 6170, where a distinctly high percentage of Early Developmental samples contained willow family wood, and LA 6169, where the ubiquity of saltbush/greasewood from Coalition contexts was 10 percent higher than juniper.

A comparison between primary deposits in intramural and extramural thermal features shows that wood diversity is 50 percent greater in intramural features (seven to eight taxa, versus 4; Table 23.84). Juniper is the dominant taxon, followed by saltbush/greasewood and then the willow family. Though sample size could be skewing the results, it does look like shrubby woods are showing up in intramural thermal features and not in their extramural counterparts.

Regional Plant Use Patterns

Corn morphometrics provide a way of looking at the complex interdigitation of two realms of variability. Genetic or racial affinities in time and space certainly relate to ethnic or community ties and communication patterns, while morphological traits that reflect growing stress inform us about agricultural success from one area to another of the Rio Grande Valley and San Juan Basin, and within any given area over time. The number of kernel rows on a cob is an attribute that perhaps illustrates perfectly the informative and obfuscating potentials of corn data. Probably because this trait can be tallied consistently by any analyst with a minimum of training and practice, this one measure is available for virtually every archaeological corn assemblage examined in this century. The trait is under genetic command, with variation (largely diminuition) due to stressful growing conditions. Theoretically, similar distributions of percent composition of various row numbers should illustrate genetic or racial affinities, in time and space. Divergences from general trends should indicate prominence of (or interaction with) alternate genetic strains, or the effects of difficult growing conditions. Sorting these patterns out for the prehistoric Southwest will clearly require much larger sample sizes than we've had to work with to date, and discriminatory statistics. We know that moisture, temperature, and mineral stress affect reduction in size of the corn plant as a whole, as well as the cob, and often results in irregular row configuration and undeveloped kernel rows (Denmead and Shaw 1960; Robins and Domingo 1953). We are limited, however, in what variables we can measure archaeologically on any significant number of specimens. Cob length is a far more sensitive measure of stress than cob diameter (Sanchez G. and Goodman 1992), but very few archeological cobs from open sites are complete in length (16 percent of River's Edge I cobs; 3 percent of cobs at the KP site; and less than 1 percent in the approximate 900 cob sample from Pueblo Alto; Brandt 1991b:25; Wiseman 1989:84; Toll 1987).Using the cruder measure of cob diameter, some relationships are still evident.

The Earliest/Early Developmental periods and late Basketmaker/Pueblo I are dominated by 12-rowed cobs in the Central Rio Grande Valley (Tables 23.85 and 23.86), as well as Chaco (Toll 1993a, table 26) and at LA 26749 near Crownpoint (Donaldson 1981). Ford (1976, F2) indicates presence of an "'old corn'. . . widely distributed in prehistoric times . . . with a mean of 12 rows" at LA 70 in the Cochiti Dam flood pool. In the Middle/Late Developmental and Pueblo II, Peña Blanca and Cochiti sites share very similar row-number configurations (only slightly more 10-rowed cobs than 12) with Chaco, Bis sa'ani, ENRON, and Navajo Mines

(Donaldson and Toll 1982; Struever 1977; Toll 1983, 1985, 1986, 1987, 1993b; Winter 1993). Several of these same areas share diminutive cob diameters, ranging from an average of 7.8 mm on the Navajo Mines area to 10.2 mm in Chaco. Note that at this same time period, Salmon Ruin (Bohrer 1980) and sites in the La Plata Valley (Toll 1993c, 1993d) are predominantly 12-rowed, and have average cob diameters ranging from 11.5 to 14.0 mm in the upper and lower La Plata Valleys, respectively. By Pueblo III a very interesting dichotomy in assemblages seems to be emerging: smaller sites in many areas have smaller, predominantly 10-rowed, cobs, while downtown Chaco sites reflect traits seen earlier in the major river valleys: very large cobs, with a significant majority 12-rowed. Interestingly, Salmon corn falls off slightly in size and goes to a majority of 10-rowed cobs at this time.

Corn kernel morphometrics form a smaller and more difficult to interpret database. Peña Blanca kernel specimens derive entirely from the Early Developmental period (Table 23.87) and are somewhat wider and thicker than later kernels from the nearby Cochiti Dam project (Table 23.88). Contemporaneous kernels from farther south in the Rio Grande Valley are taller and broader, but thinner.

This patterning tells us something about where and when farming may have been more successful. Decrease in average cob size from Pueblo II to Pueblo III takes place not only at Salmon, but also at Bis sa'ani, Pueblo Alto, and throughout the La Plata Valley. ENRON corn gets smaller between Basketmaker/Pueblo I and Pueblo II, and then levels off. Likewise, undeveloped and irregular rows increase with time in the La Plata Valley, from 22 percent of cobs in Pueblo II, to 39 percent in Pueblo III. These observations suggest the likelihood that many, varied areas of northern New Mexico may have been experiencing difficulties producing corn in the AD 1000s and 1100s.

In an overview of farming at Cochiti Pueblo, Lange (1968a:94–95) indicates that beans were raised by almost every farmer. Beans were second in importance to corn and were sometimes planted with other crops. The place of beans as second in importance to corn is not often supported by archaeobotanical evidence. Beans are not normally found in significant quantities. This probably has more to do with how corn and beans were harvested, stored, and cooked, and how they preserve archaeologically, than how important beans were in the diet. Heavily indurated corn cobs survive better than beans. Beans have a thin, fragile seed coat that can break easily, leaving the endosperm exposed to environmental factors that cause deterioration (Gasser and Adams 1981). Other seeds with tougher seed coats have a distinct preservation advantage. At Walpi, Gasser and Adams (1981) recovered 509 beans as opposed to a whopping 24,746 watermelon seeds. There is also some suggestion, deserving of experimentation, that beans rarely survive carbonization except under low oxygen conditions. The additional widespread use of cobs for fuel adds to the lopsided visible presence of corn remains. Cobs shrink, but frequently survive in a fully recognizable form, in hearth fires (Brugge 1965).

Bean specimens recovered from Peña Blanca (all from site LA 6170) belong to the widespread and highly diversified species of common bean *(Phaseolus vulgaris).* Charred common beans are difficult to distinguish as to variety, as seed coat color and patterning are critical traits (Kaplan 1956). The average length of beans found at LA 6170 was 12.1 mm, average width 6.6 mm, and average thickness 5.0 mm (Table 23.89). We have at present only two bean specimens from Basketmaker/Pueblo I contexts at Chaco Canyon, the closest comparative bean assemblage available (Table 23.90). These beans are a similar shape, and slightly larger. In the succeeding Pueblo II period, Chaco beans from one site are morphologically close to the Peña Blanca specimens, while those from a second site are more diminutive, possibly indicating the presence of a different variety, or more difficult growing conditions. At Bc288 (Pueblo III), unburned beans allowed separation into multiple varieties, which proved to have corresponding morphological configurations that were respectively larger or stubbier than the Peña Blanca specimens.

Although there are no Archaic components at Peña Blanca, some discussion of Archaic patterns found farther south in the Middle Rio Grande has been included to provide some perspective on long-term changes in settlement patterns and subsistence strategies. Previous research in the Jemez Valley has resulted in the recognition of land use and subsistence patterns common to the Jemez Valley as well as the Middle Rio Grande and the Rio Puerco regions. Archaic settlement includes both a general Archaic signature and that of the San Pedro occupation in the Late Archaic, interpreted by Huckell (1987, 1990, cited in Elyea 1999) as intrusive settlement by agriculturists from Northern Mexico. Sites in the general Archaic category include campsites of foraging groups that occupied dunal sites for intervals in the summer months and moved to the upper elevations of conifer woodlands in the fall to gather piñon and cactus fruits (Toll and Cully 1985:391). Direct evidence is scarce for foraging camps in the conifer woodlands; the paucity of Archaic sites in conifer woodlands is primarily an artifact of where systematic surveys have taken place. Our knowledge of sites of any time period in the three areas is largely a product of strip surveys related to highway construction or housing development. These are likely to produce data about sites in the grassland biotic community, while little is known about sites in the valley margins or areas of more variable topography, such as the foothills of the Jemez Mountains. Flotation samples from Early to Middle Archaic sites in this category produced a limited number of weedy annuals, grasses, and cacti (Table 23.91). Middle to Late Archaic contexts yielded a greater diversity of weedy annuals, juniper, the same grass taxa found in Early and Middle Archaic samples, and yucca. Corn was recovered from very Late Archaic components of the multicomponent sites, LA 9193 and LA 110942. Late Archaic wood from two of the MAPCO project sites in the Jemez Valley was predominately juniper with small percentages of piñon, saltbush/greasewood, rabbitbrush, and cottonwood/willow wood (Table 23.92).

Also included in the general Archaic category are sites with round or oval shallow structures with intramural features that include hearths and storage pits. These have been interpreted as winter-occupied habitations because of the presence of the intramural features and both spring and fall-ripening seed crops (Elyea 1999:149). While there are only a handful of sites associated with the San Pedro occupation in the area, a very different signature is apparent. Sites are more complex and include one or more pit structures, large storage features, and diverse assemblages of wild plants along with maize. The greater time invested in the construction of these sites suggests year-round occupation. The discovery of more sites from the San Pedro occupation with datable material might clarify the degree to which these Archaic settlement and subsistence styles overlap.

In the ensuing Basketmaker II/III (earliest Developmental) and Pueblo I (Early Developmental) periods, a shift occurs from a mobile hunting-gathering economy to a more sedentary economy in which maize agriculture played an important role. More substantial pit structures replace the shallow, brush or skin-covered structures of the Archaic. Sites are in various locations ranging from gravel terraces to low rises above the Rio Puerco floodplain but all are fairly close to major tributaries of permanent streams (Cordell 1979; Wiseman 1976). Flotation samples from these periods document the use of maize, possibly squash, and even beans (LA 25862, McBride 1999), along with a variety of spring- to fall-ripening annuals, perennials, and grasses (Table 23.91). The wild plant assemblages were especially rich in the Early Developmental period when up to 25 taxa were present. As in the Archaic, juniper remains the dominant wood taxon and the number of shrubby, non-conifer woods exploited increases (Table 23.92).

Human remains from Early Developmental sites at Peña Blanca display characteristics of a fairly mobile group of individuals. A disproportionate number of older women and children indicate only a segment of the population may have been living at sites on a semipermanent basis (see Akins, Chapter 22). Corn was ubiquitous throughout the occupation of the Peña Blanca area, but osteological data tell us that people living there did not develop traits more typical of sedentary agriculturalists until the Late Developmental and Coalition periods (Akins, Chapter 22), suggesting a slow transition from a hunter-gatherer to a more sedentary lifestyle.

Few Pueblo II (Late Developmental) sites have been detected in the Jemez River Valley and changes from the preceding period seem to be limited to an increase in jacal or adobe surface structures (Gerow 1999:170) and an apparent standardization of pit structure features. Four-post roof supports, ladder rests, ash pits, sipapus, and slab-lined ventilators show up more consistently than in earlier time periods (Wetherington 1968:88, cited in Gerow 1999:170). The Late Developmental signature at Peña Blanca does not seem to be significantly different from the preceding Early Developmental, with pit structures continuing to be built at sites with earlier components. A slight increase in the frequency of corn and a decrease in the diversity of wild plant taxa in flotation samples may reflect a shift in diet from the Early Developmental, but the vast difference in sample size between the two periods may be skewing the overall picture. The wood assemblage is also similar to preceding periods, but Mormon tea and wolfberry wood were absent in assemblages from previous periods.

Flotation samples from the Late Developmental KP site (LA 46300) on the north side of the Santa Fe River Valley gives us an alternative picture of plant use in an upland setting. The major differences between the two plant assemblages is the occurrence of yucca, bulrush/sedge, *Echinocactus* (Turk's head), and squash seeds that were not recovered at Peña Blanca. The Turk's head seeds may be a misidentification because this genus occurs today only in the southern portion of New Mexico (Martin and Hutchins 1980:1335). The recovery of squash seeds is unusual. Based on remains from rock shelters, squash was probably used more intensively than the rare finds from open-air sites would indicate, where evidence of squash is normally restricted to small bits of rind. Preservation of other parts seems to be random and not dependent exclusively on optimal preservation conditions or provenience. At the KP site, seeds were recovered from all trash-fill levels as well as the floor. The balance of the floral assemblage from the site is not at all unusual, indicating preservation was not necessarily ideal. Differential recovery of squash remains could indicate varying success rates with this cultivar. Squash is less cold tolerant than beans or corn and may have been more difficult to grow than the other cultivars. Finally, it is thought that because wild squash have little or no flesh in the fruits, they may have been domesticated for their seeds; it was only when fleshier mutant varieties were selected for that the squash similar to what we know was developed (Heiser 1990:180; Sauer 1969:68). If the seeds were considered the important edible part of the fruit, then it follows that seeds would not usually be part of the archaeobotanical record.

The Pueblo III (Coalition) period is characterized by substantial above-ground residential structures, although pit structures are still being built (Gerow 1999:171) during the transition from the Late Developmental to the Coalition. Settlement in lowland agricultural settings expands into upland settings particularly, with the onset of a colder climate and winter-dominant precipitation (Stuart and Farwell 1983). Theoretically, this results in greater dependence on wild plants found at higher elevations (Doleman 1989), though Peña Blanca floral data show no such trend. The archaeobotanical assemblage from four Coalition pit rooms at LA 6169 that date to the early Coalition does not reflect any such dependence on upland species, but rather an increase in the number of weedy annuals and the presence of grasses like ricegrass that were not found in earlier time periods suggests an expansion of lowland plant resource use instead of a decrease. The wood assemblage is very different from all others in that saltbush/greasewood is the most common taxon by weight and not juniper. In comparison, LA 3333, a pithouse village on the eastern edge of the Galisteo Basin yielded a similar array of plant remains, with the exception of hedgehog and *Opuntia* cactus and wild grape seeds. Both sites had a high percentage of corn in samples, indicating a considerable reliance on corn agriculture. The wood assemblage at LA 3333 reflects the location of the site; piñon and juniper are present in nearly equal percentages and only one shrubby taxon was recovered.

Population levels during the Pueblo IV or Classic period were at a maximum, possibly due in part to an influx of immigrants from the San Juan region (Cordell 1979). The period is marked by aggregations of populations into large, sometimes multistoried pueblos surrounding a plaza. A large number of small sites that also occur at this time have been interpreted as logistical foray sites that were occupied briefly throughout the year, with the pueblos serving as primary residences. Tashkatze Pueblo (LA 249) at Peña Blanca represents this occupation. Its location outside the highway right-of-way means we know little about plant utilization from the site aside from a few corn parts and wood charcoal recovered from middens associated with the occupation of Tashkatze. The Coalition to early Classic plant assemblage from LA 110953 consisted of isolated occurrences of goosefoot family, purslane, cheno-am, and grass seeds along with four-wing saltbush fruit. Although the assemblage was certainly more diverse than at LA 249, corn is the only plant remain that occurs with any significant frequency. Wood from LA 249 is consistent with project-wide results with the exception of ponderosa pine; LA 249 is the only site with evidence of this high-elevation conifer. What emerges from this overview of the Middle Rio Grande is that agricultural dependence gradually increased through time, but wild plant resources always played an important role in the diet of prehistoric populations; climactic fluctuations required a flexible regime that was generally dependent on agriculture, contingent upon weather conditions and population pressure.

Summary and Conclusions

Peña Blanca sites reflect common regional patterns of wild plant usage for the Upper Rio Grande Valley and the Colorado Plateau. Wild plant foods focus on a short list of weedy annuals, with dual crops of early summer greens, and late summer seeds. Goosefoot, pigweed, and purslane make up a major share of the floral array, with supplementation from winged pigweed and bugseed, and rare appearances by beeweed, marsh elder, groundcherry, plantain, and seepweed. As corn takes a more dominant share of plant foods over time, weedy annuals fall off slightly, while grasses (ricegrass, dropseed) and perennials (cacti, yucca, sedges, piñon nuts, and squawberry) become a more significant part of the dietary array.

When trying to determine seasonality of site occupation, it is tempting to look to floral debris as evidence of when site occupants were actively harvesting economic resources, and inhabiting the site. However, it's important to recognize the multiple factors that can complicate the relationship between time of harvest and time of use. Storage of foodstuffs and raiding caches found in animal nests are just two behaviors that result in the utilization of plant crops in seasons that post-date collection time. People also take advantage of the "on-the-plant" storage system (Adams and Bohrer 1998:130) with resources such as juniper berries and four-wing saltbush fruits. When evaluating duration of occupation, the archaeobotanical assemblage cannot be used in isolation. Additional lines of evidence that should be brought into play include number of storage features, the nature of trash middens, and osteology, ceramic, and lithic studies

Adams and Bohrer propose examining seasonality using the following relationship: "the higher the proportion of weedy contributors, the more likely long-term, multi-season occupation is being expressed" (Adams and Bohrer 1998:132).

Their premise assumes that as a site is occupied for longer periods, there is more disturbed land where weedy annuals thrive and the proportion of weedy annuals to climax species will be higher. The percentage of weedy annuals is compared to other plant categories at Peña Blanca through time in Table 23.93. The assemblages are dominated by weedy annuals and domesticates except in the Late Developmental when the occurrence of domesticates far exceeds any other category. By Adams and Bohrer's criteria, this indicates that sites were occupied for multiple seasons rather than year-round. Year-round occupation would require a considerable presence of "plant parts available during cold or dry dormant seasons" (Adams and Bohrer 1998:129), which are minimal at Peña Blanca. The concept of multiple season occupation implies a period or periods of absence during the annual cycle.

Evidence for springtime occupation of Peña Blanca sites is decidedly sparse, with a single occurrence of carbonized ricegrass recovered from the central hearth of the Coalition pit room 70 at LA 6169. The dearth of plants that mature in the spring suggests seasonal occupation of sites where farming took place on the floodplain of the Santa Fe River and stored corn from previous harvests formed the major part of the diet, supplemented by annual weed seeds from volunteer plants in garden plots and other disturbed areas. Several perennial taxa recovered from Early and Late Developmental sites have fruits and seeds that mature in the fall, suggesting that the season of occupation during these time periods extended from the growing season at least into early fall.

Corn morphometrics clearly show Peña Blanca's participation in the regional predominance of a *chapalote*-like variety (small, slender, cigar-shaped, and largely 12-rowed) in the Earliest/Early Developmental period. In the Late Developmental we see larger, more cylindrical cobs, and a boost in 8- and 10-rowed ears, attributed to *maiz de ocho,* a second-wave introduction from Mexico.

Wood charcoal suggests that the period of greatest pressure on local wood supplies may have been during the Early Developmental period, when the highest use of cottonwood and willow was noted. Juniper was the predominant wood used in all time periods. Piñon was a minor component, becoming slightly more evident in the Late Developmental period. Ponderosa pine was brought into the area in small quantities in the Classic period, probably for construction elements at Tashkatze Pueblo. Other construction materials are noted in the frequent appearance of reedgrass stems in roof fall levels. Saltbush/greasewood is the only shrubby wood type used consistently and in significant quantities.

Table 23.1. Peña Blanca Charred Plant Taxa Recovered from Flotation, Macrobotanical, and Wood Samples

Latin Name	Common Name	Plant Part
Annuals:		
Amaranthus	Pigweed	Seed
Chenopodiaceae	Goosefoot family	Seed
Chenopodium /Amaranthus	Cheno-am	Embryo, seed
Chenopodium	Goosefoot	Embryo, seed
Cleome	Beeweed	Seed
Corispermum	Bugseed	Seed
Cycloloma	Winged pigweed	Seed
Physalis	Groundcherry	Seed
Plantago	Plantain	Seed
Portulaca	Purslane	Seed
Cultivars:		
Cucurbita	Squash	Rind
Phaseolus vulgaris	Common bean	Cotyledon
Zea mays	Corn	Cob, cupule, glume, kernel
Grasses:		
Gramineae	Grass family	Caryopsis, culm, glume
Oryzopsis	Ricegrass	Caryopsis
Phragmites	Common reedgrass	Culm
Sporobolus	dropseed grass	Caryopsis
Other:		
Compositae	Composite family	Seed
Dicotyledonae	Dicot	Leaf
Euphorbia	Spurge	Seed
Iva	Sumpweed	Seed
Monocotyledonae	Monocot	Leaf, stem
Salvia	Sage	Seed
Scirpus	Bulrush	Seed
-	Unidentifiable	Seed
-	Unknown	Bark, embryo, stem, unknown, wood
Perennials:		
Artemisia	Sagebrush	Wood
Atriplex canescens	Four-wing saltbush	Fruit
Atriplex/Sarcobatus	Saltbush/greasewood	Wood
Carex	Sedge	Seed
Cercocarpus	Mountain mahogany	Wood
Chrysothamnus	Rabbitbrush	Wood
Cylindropuntia	Cholla	Seed, wood
Echinocereus	Hedgehog cactus	Seed
Ephedra	Mormon tea	Wood
Forestiera	New Mexico olive	Wood
Gymnospermae	Conifer	Wood
Juniperus	Juniper	Leaflet, seed, twig, wood
Lycium	Wolfberry	Wood
-	Non-conifer	Wood
Pinus	Pine	Wood
Pinus edulis	Piñon	Nutshell, needle, wood
Pinus ponderosa	Ponderosa pine	Wood
Platyopuntia	Pricklypear cactus	Seed
Quercus	Oak	Wood
Rhus	Skunkbush	Seed
Rosaceae	Rose family	Wood
Salicaceae	Willow family	Wood
Yucca	Yucca	Fiber, leaf
Yucca baccata	Banana yucca	Seed

Note: Indian ricegrass no longer goes by the Latin name *Oryzopsis,* but is now correctly referred to as *Achnatherum hymenoides* (Roemer and J. A. Schultes) Barkworth. In this report, it is still referred to in text and tables as *Oryzopsis.* Common names follow USDA 1974 *Field Guide to Native Vegetation of the Southwestern Region,* Forest Service, Southwestern Regional Office.

Table 23.2. LA 249, Structure 6 Fill, Late Developmental/Coalition Flotation Plant Remains, Frequency and Abundance per Liter

Stratum	29a, Upper Fill	29c, Mixed Pumice and Alluvium	50, Level 8 Roof Fall	50, Level 9 Roof Fall
FS #	315	309	283, 308	324
Cultural				
Cultivars:				
Zea mays	+ cob frags., +c, +g	+ cob frags., +c, +g	+c, +g, .5k	+c
Other:				
Monocotyledonae	-	+ stem	-	-
Non-Cultural				
Annuals:				
Chenopodium	-	-	-	0.5
Euphorbia	0.5	-	-	-

Plant remains are seeds unless otherwise indicated; All cultural material is carbonized.

+ less than 10, c cupule, g glume, k kernel

Table 23.3. LA 249 Structure 6 Fill, Late Developmental/CoalitIon Wood Charcoal from Flotation Samples, Weight in Grams

Stratum	29c, Mixed Pumice and Alluvium	50, Level 8 Roof Fall	50, Level 9	Totals	
FS#	309	283, 308, 313	324	Weight	%
Conifers:					
Ephedra	-	0.30g	-	0.30g	8%
Juniperus	0.89g	1.31g	0.19g	2.39g	67%
Pinus edulis	-	0.20g	-	0.20g	6%
Unknown conifer	0.01g	0.06g	0.30g	0.37g	10%
Non-Conifers:					
Rosaceae	0.15g	-	-	0.15g	4%
Salicaceae	0.02g	0.07	-	0.09g	3%
Sarcobatus/Atriplex	0.05g	-	0.02g	0.07g	2%
Unknown non-conifer	-	-	0.02g	0.02g	<1%
Totals	1.12g	1.94g	0.53g	3.59g	100%

Table 23.4. LA 249, Structure 6 Fill, Late Developmental/Coalition Carbonized Wood and Macrobotanical Samples, Count and Weight in Grams

Stratum	29a, Upper Fill	29b, Pumice Deposits with Ash and Charcoal	50, Level 8 Roof Fall
FS#	282	285	283, 286
Wood:			
Juniperus	31/9.12g	-	-
Rosaceae	3/0.64g	-	-
Salicaceae	6/1.12g	-	-
Cultivars:			
Zea mays	1cob/1.80g, 1s/0.12g	7/1.02g	11/2.92g

s = stalk

Table 23.5. LA 249, Feature 6 Late Developmental/ Coalition Floor and Features, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Floor	Feature 10, Pit	Feature 13, Pit
FS#	338	356	357
	Cultural		
Annuals:			
Chenopodium	0.50	-	-
Perennials:			
Yucca	-	-	+ fiber
Cultivars:			
Zea mays	+ cob, +c	+c	+c

Plant remains are seeds unless otherwise indicated; all cultural material is carbonized.

c = cupule, + = less than 10

Table 23.6. LA 249, Feature 6 Late Developmental/Coalition Floor and Features, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Floor	Feature 10, Pit	Feature 13, Pit	Totals	
FS#	338	356	358	Weight	%
Conifers:					
Juniperus	.80g	.24g	.42g	1.46g	74%
Unknown conifer	.07g	.03g	.14g	0.24g	12%
Non-Conifers:					
Salicaceae	-	-	.13g	0.13g	6%
Unknown non-conifer	.03g	.10g	-	0.13g	6%
Totals	.90g	.37g	.69g	1.96g	100%

Table 23.7. LA 249, Features 3 and 7 (Extramural Hearths), Flotation Plant Remains, Frequency and Abundance per Liter

Feature/FS	3/267	7/278
Non-Cultural		
Annuals:		
Chenopodium	12.6	2.0
Portulaca	0.6	-
Grasses:		
Sporobolus	-	2.0

Plant remains are seeds unless otherwise indicated.

All cultural materials are carbonized.

Table 23.8. LA 249, AU 406 Midden (107N 115E), Flotation Plant Remains, Frequency and Abundance per Liter

Context	Stratum 30, Level 2	Stratum 30, Level 3	Stratum 30, Level 4
FS	256	257	258
Cultural			
Cultivars:			
Zea mays	-	+c	+c
Non-Cultural			
Annuals:			
Chenopodium	115.5	14.5	0.5
Euphorbia	1.0	-	-
Portulaca	4.0	-	-

Plant remains are seeds unless indicated otherwise; all cultural material is carbonized.

+ = less than 10, c = cupule

Table 23.9. LA 249, AU 406, Wood Charcoal from Flotation Samples, Weight in Grams

Context	108N 113E Stratum 29, Level 2	104N 115E Stratum 50, Level 8	106N 115E Stratum 50 Level 8	106N 115E Stratum 29c, Level 9	105N 114E Stratum 50, Level 8	106N 114E Stratum 50, Level 9	105N 115E Stratum 60, Level 10	105N 115E Stratum 29	Totals	
FS	278	283	308	309	313	324	338		Weight	%
Conifers:										
Ephedra	-	.30g	-	-	-	-	-	-	.30g	5%
Juniperus	.64g	.57g	.47g	.89g	.25g	.19g	.80g	.64g	4.47g	71%
Pinus edulis	-	-	-	-	.20g	-	-	-	.20g	3%
Pinus ponderosa	.07g	-	-	-	-	-	-	-	.07g	1%
Unknown conifer	.03g	-	-	.01g	.06g	.30g	.07g	.17g	.64g	10%
Non-Conifers:										
Rosaceae	-	-	-	.15g	-	-	-	-	.15g	2%
Salicaceae	-	.01g	.01g	.02g	.05g	-	-	.13g	.22g	4%
Sarcobatus/Atriplex	-	-	-	.05g	-	.02g	-	-	.07g	1%
Unknown nonconifer	.01g	-	-	-	-	.02g	.03g	.10g	.16g	3%
Totals	.75g	.88g	.48g	1.12g	.58g	.53g	.90g	1.04g	6.28g	100%

Table 23.10. LA 249, AU 412 (Midden) and AU 413 (Burial), Grid 106N 113E, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	Midden			Burial
Context	Stratum 30, Level 2	Stratum 30, Level 3	Stratum 30, Level 4	Stratum 29
FS	260	261	262	293
Cultural				
Cultivars:				
Zea mays	-	-	+ s	+cob frags., ++c, +g
Non-Cultural				
Annuals:				
Chenopodium	59.5	4.5	-	-
Euphorbia	5.0	2.0	-	++
Portulaca	-	0.5	-	-
Grasses:				
Sporobolus	0.5	-	-	-
Perennials:				
Juniperus	+t	1.0	-	-

Plant remains are seeds unless indicated otherwise; All cultural material is carbonized.
+ = less than 10, ++ = 11-25, c = cupule, g = glume, s = stem, t = twig

Table 23.11. LA 265, Study Unit 1 Upper Fill, Flotation Plant Remains, Frequency and Abundance per Liter

Stratum	1	1.1	1.2	2.1	2.2	2.3	2.4	2.5	3	3.1
FS #	827	828	829	830	831	832	833	834	835	836
Cultural										
Annuals:										
Chenopodium	-	-	0.5	2.5	4.2	-	1.0	3.2	-	2.2
Cheno-am	-	-	-	-	-	-	-	2.2	-	-
Cultivars:										
Zea mays	+c	+c	+c	+c	+c, 0.3k	+c	+++c, +g	+c	+c	+c, 0.3k
Grasses:										
Phragmites	-	-	-	-	+s	-	-	-	-	-
Other:										
Monocotyledonae	-	-	-	-	-	-	+s	-	-	-
Unidentifiable	-	-	-	-	0.3	-	-	-	-	-
Perennials:										
Cylindropuntia	-	-	-	-	-	-	-	0.3	-	-
Pinus edulis	-	-	-	0.5	-	-	-	-	-	-
Platyopuntia	-	-	-	0.5	-	-	0.5	1.1	-	-
Non-Cultural										
Annuals:										
Amaranthus	-	-	-	-	-	-	-	1.1	-	-
Ambrosia	0.5	-	-	-	-	-	-	-	-	-
Chenopodium	18.0	-	-	-	-	-	-	-	-	-
Cryptantha	0.5	-	-	-	-	-	-	-	-	-
Euphorbia	1.0	-	-	0.5	-	-	-	-	-	-
Portulaca	2.5	-	-	-	-	-	-	-	-	-
Other:										
Unknown	0.5 pod	-	-	-	-	-	-	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
c = cupule, g = glume, k = kernel, s = stem, + = less than 10, ++ = 11-25, +++ = 26-100

Table 23.12. LA 265, Study Unit 1 (Pit Structure) Upper Fill, Wood Charcoal from Flotation Samples, Weight in Grams

Stratum	2.1	2.2	2.5	3	3.1	Totals	
FS #	830	831	834	835	836	Weight	%
Conifers:							
Juniperus	.20g	.60g	.40g	.08g	.30g	1.58g	60%
Pinus edulis	.04g	-	-	-	-	.04g	2%
Unknown conifer	-	-	-	.01g	-	.01g	<1%
Non-Conifers:							
Salicaceae	.04g	.04g	.04g	.01g	.40g	.53g	20%
Sarcobatus/Atriplex	-	.04g	.04g	-	.40g	.48g	18%
Other:							
Unknown	-	-	-	.01g	-	.01g	<1%
Totals	.28g	.68g	.48g	.11g	1.10g	2.65g	100%

Table 23.12b. LA 265, Study Unit 1 Upper Fill, Macrobotanical Samples, Count and Weight

Stratum	Roof Fall, SE 1/4	1 Infant Burial
FS #	1245	1679
Cultivars:		
Zea mays	2 cupules/ .10g	1 cupule/ .04g

All plant material is carbonized, unless indicated otherwise.

Table 23.13. LA 265, Study Unit 1 Floor Fill and Features, Frequency and Abundance per Liter

Component	Floor Fill				Features		
Feature					107	108	109
Quadrant/Feature Type	NW	NE	SW	SE	Linear floor pit, possible foot drum		
FS	1039	1040	1238	1265	1532	1497	1498
		Cultural					
Annuals:							
Amaranthus	-	0.5	-	0.5	-	-	-
Chenopodium	-	0.5	0.5	-	-	-	-
Corispermum	-	0.5	-	-	-	-	-
Portulaca	-	2.0	-	-	-	-	-
Cultivars:							
Zea mays		+c, 0.5k	+c	+c	+c	-	+c
Perennials:							
Pinus edulis	-	-	-	-	-	-	0.5
		Non-Cultural					
Annuals:							
Chenopodium	0.5	0.5	-	-	3.1	3.0	0.5
Euphorbia	-	-	-	-	-	0.5	-
Grasses:							
Sporobolus	-	-	-	-	-	3.3	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized. c = cupule, k = kernel, + = less than 10

Table 23.14. LA 265, Study Unit 1 Floor Fill and Features, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Floor Fill		Feature 108	Totals	
Quadrant/Feature Type	NW	NE	Linear floor pit, possible foot drum	Weight	%
FS	1039	1040	1497		
Conifers:					
Juniperus	.23g	.17g	.04g	.44g	32%
Unknown conifer	.02g	.03g	-	.05g	4%
Non-Conifers:					
Salicaceae	.03g	.01g	.80g	.84g	61%
Sarcobatus/Atriplex	.03g	-	-	.03g	2%
Unknown non-conifer	-	.01g	-	.01g	1%
Totals	.31g	.22g	.84g	1.37g	100%

Table 23.15. LA 265 Study Unit 1 (Pit Structure) Features, Macrobotanical Samples, Count and Weight in Grams

Feature	102	106	110	117	118	189
Feature Type	Central Hearth	Posthole, NE 1/4	Ash Pit	Warming Pit	Warming Pit	
FS	1551	1379	1500	1390	1456	1649
Conifer Wood:						
Juniperus	12/.53g	9/.63g	27/1.10g	45/1.55g	-	19/.70g
Non-Conifer Wood:						
Rosaceae	-	-	-	1/.01g	-	-
Salicaceae	7/.32g	2/.14g	21/.66g		11/.62g	1/.01g
Sarcobatus/Atriplex	-	-	12/.95g	106/5.35g	37/1.25g	-
Unknown non-conifer	-	-	1/.02g	1/.01g	-	-
Cultivars:						
Zea mays	-	3 cupules/ .06g	-	-	-	-

All plant material is carbonized.

Table 23.16. LA 265, Study Unit 2, Macrobotanical Samples, Weight in Grams and Count

	Keyhole-Shaped Pit					Small Bell-Shaped Pit in F. 27	Bell-Shaped Storage Pit in F. 27		Storage Pit in F. 33	Hearth in F. 33	Bell-Shaped Storage Pit w/ Dog Burial
Feature	27	27	27	33	33	41	47	52	57	59	60
FS	1138	1246	1248	1228	1239	1223	1227	1260	1262	1263	1400
Conifer wood:											
Juniperus	19/5.12g	6/.66g	12/1.35g	23/2.64g	24/2.39g	37/1.47g	7/.31g	18/.72g	5/.26g	8/.19g	1/.40g
Unknown conifer	-	-	-	-	-	-	-	-	-	-	2/.21g
Non-Conifer wood:											
Salicaceae	18/.67g	-	7/.39g	5/.39g	5/.68g	29/1.25g	4/.08g	2/.03g	2/.01g	-	1/.18g
Sarcobatus/Atriplex	16/2.12g	-	1/.14g	1/.28g	-	8/.09g	-	-	-	2/.03g	-
Unknown non-conifer	2/.23g	-	-	1/.08g	1/.24g	-	-	-	-	3/.08g	-
Cultivars:											
Zea mays cupules	-	-	1/.06g	-	-	-	-	-	-	-	1/.07g
Other:											
Unknown bark	-	-	-	-	-	-	-	-	-	-	6/.76g
Unknown plant part	-	-	-	-	-	-	-	-	-	-	4/.07g

All plant material is carbonized unless indicated otherwise.

Table 23.17. LA 265, Study Unit 3, Feature 14 (Large Irregular-Shaped Pit), Flotation Plant Remains, Frequency and Abundance per Liter

Stratum	2	3	4	5	6	7	8	9
FS	1158	1159	1160	1161	1162	1163	1157, 1164	1156
Cultural								
Annuals:								
Amaranthus	-	-	-	-	-	-	-	0.3
Chenopodium	-	-	1.0	2.5	2.0	0.5	1.0	1.6
Cheno-am	-	-	-	-	2.0	-	0.2	1.3
Portulaca	1.0	-	-	-	-	-	0.2	-
Cultivars:								
Cucurbita	-	-	-	-	+ rind	-	-	-
Zea mays	+++c	+c	+c, +g	+c	+c, 1.0k	+c	++c, +g	+c, 0.6k
Other:								
Unidentifiable	-	-	-	-	1.0	-	-	-
Unknown	-	0.5pp	-	-	-	-	-	0.9pp
Perennials:								
Pinus edulis	-	-	-	0.5	-	0.5	-	0.3
Non-Cultural								
Annuals:								
Amaranthus	-	-	-	1.0	1.0	-	-	-
Chenopodium	-	-	-	0.5	1.5	1.0	0.2	1.3
Cheno-am	0.5	-	-	-	-	-	-	-
Portulaca	-	-	-	-	-	0.5	-	-
Grasses:								
Sporobolus	-	-	-	1.0	5.0	2.0	-	-
Perennials:								
Quercus	-	+ leaf	-	-	-	-	-	-

Plant remains are seeds unless otherwise indicated;
All cultural plant material is carbonized.
c cupule, g glume, pp plant part, k kernel, + less than 10,
++ 11-25, +++ 26-100

Table 23.18. LA 265, Study Unit 3, Feature 14 (Large Irregular-Shaped Pit), Wood Charcoal from Flotation Samples, Weight in Grams

Stratum	2	3	4	5	6	7	8	9	Totals	
FS	1158	1159	1160	1161	1162	1163	1157, 1164	1156	Weight	%
Conifers:										
Juniperus	.65g	.20g	.40g	.30g	.40g	.50g	1.10g	1.00g	4.55g	78%
Unknown conifer	.06g	-	-	-	-	-	-	-	.06g	1%
Non-Conifers:										
Cylindropuntia	-	-	-	-	-	.04g	-	-	.04g	1%
Quercus	-	-	-	-	-	-	.04g	-	.04g	1%
Salicaceae	.02g	.04g	.20g	.10g	.20g	.04g	.24g	.04g	.88g	15%
Sarcobatus/Atriplex	-	-	.04g	.04g	.04g	.04g	-	.04g	.20g	3%
Unknown non-conifer	.01g	-	.04g	-	-	-	-	-	.05g	1%
Totals	.74g	.24g	.68g	.44g	.64g	.62g	1.38g	1.08g	5.82g	100%

Table 23.18b. LA 265, Study Unit 13, Feature 14, Macrobotanical Sample, Count and Weight in Grams

Stratum	7
FS	1163
Cultivars:	
Zea mays	3cobs/.40g

All plant material is carbonized.

Table 23.19. LA 265, Study Unit 3, Feature 15 (Very Large Pit), Flotation Plant Remains, Frequency and Abundance per Liter

Stratum	2	3	4	5	6	7	10
FS	960	961	1020	1021	1022, 1240	1023	1267
			Cultural				
Annuals:							
Amaranthus	0.3	0.5	0.5	-	0.5	-	1.1
Chenopodium	1.9	2	1	1.5	3.0, .3e	5	-
Cheno-am	0.3	1.5	-	-	-	-	-
Portulaca	0.6	-	-	-	0.5	-	-
Salvia	-	0.5	-	-	-	-	-
Cultivars:							
Zea mays	+c, .3k	+c, ++g, 1.0k	+c	++c, +g	++c, +g	++c, +g, .5k	+c, +g
Other:							
Unidentifiable	-	0.5	-	-	-	-	-
Unknown	.3pp	-	-	-	.3ur	-	-
Perennials:							
Juniperus	-	-	-	+t	-	-	-
Pinus edulis	0.3	-	-	0.5	-	-	-
Rhus	-	0.4	-	-	-	-	-
Yucca baccata	-	0.4	-	-	-	-	-
			Non-Cultural				
Annuals:							
Chenopodium	7.8	53.6	0.5	-	1.3	-	2.1
Descurainia	0.3	-	-	-	0.3	-	-
Euphorbia	-	3.5	0.5	-	0.3	-	-
Portulaca	-	-	-	-	0.3	-	-
Other:							
Unidentifiable	-	0.5	-	-	-	-	-
Grasses:							
Sporobolus	11.3	-	25.0	-	0.5	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
c = cupule, g = glume, pp = plant part, t = twig, ur = unknown reproductive, + = less than 10, ++ = 11-25, +++ = 26-100

Table 23.20. LA 265, Study Unit 3, Feature 15 (Very Large Pit), Wood Charcoal from Flotation Samples, Weight in Grams

Stratum	2	3	4	5	6	7	10	Totals	
FS	960	961	1020	1021	1022, 1240	1023	1267	Weight	%
Conifers:									
Juniperus	0.40g	2.40g	0.20g	0.29g	1.60g	0.29g	0.50g	5.68g	79%
Unknown conifer	-	-	-	0.04g	-	0.06g	-	0.10g	1%
Non-Conifers:									
Salicaceae	0.04g	0.14g	0.10g	0.07g	0.50g	-	0.20g	1.05g	15%
Sarcobatus/Atriplex	0.04g	0.08g	-	0.02g	0.24g	-	-	0.38g	5%
Unknown wood	-	-	-	0.01g	-	0.01g	-	0.02g	<1%
Totals	0.48g	2.62g	0.30g	0.43g	2.34g	0.36g	0.70g	7.23g	100%

Table 23.21. LA 265, Study Unit 3, Feature 15 (Very Large Pit), Macrobotanical Samples, Count and Weight in Grams

Stratum	3	5	7	10
FS	961	1021	1023	1267
Cultivars:				
Zea mays	1c/.02g	2c/.04g	4 cobs/.40g	2c/.04g

All plant material is carbonized unless indicated otherwise. c = cupule.

Table 23.22. LA 265, Study Unit 3, Feature 34 (Large Irregular-Shaped Pit) by Stratum, Flotation Plant Remains, Frequency and Abundance per Liter

Stratum	1	2	3	4	5	7
FS	1446	1403, 1447	1150	1154	1155	1522
Cultural						
Annuals:						
Amaranthus	-	0.2	-	-	-	-
Chenopodium	-	0.9	0.9	-	-	-
Portulaca	-	0.2	-	-	-	-
Cultivars:						
Zea mays	+++c	+c	+c, +g	+c	+c	+c
Other:						
Unknown	0.3e	-	-	-	-	-
Non-Cultural						
Annuals:						
Chenopodium	0.3	-	-	0.5	0.5	0.5
Euphorbia	-	-	0.9	-	2.5	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized. C = cupule, e = embryo, g = glume

Table 23.23. LA 265, Study Unit 3, Feature 34 (Large Irregular-Shaped Pit) by Stratum, Wood Charcoal from Flotation Samples, Weight in Grams

Stratum	1	3	4	Totals	
FS	1446	1150	1154	Weight	%
Conifers:					
Juniperus	.20g	1.50g	.30g	2.0g	85%
Non-Conifers:					
Salicaceae	.04g	.10g	.10g	.24g	10%
Sarcobatus/Atriplex	.04g	.04g	-	.08g	3%
Unknown non-conifer	.04g	-	-	.04g	2%
Totals	.32g	1.64g	.40g	2.36g	100%

Table 23.24. LA 265, Study Unit 4 Upper Fill and Roof Fall, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Upper Fill							Roof Fall
Stratum	1	2	3	4	5	6	7	8
FS	903	904	905	906	907	908	909	910
Cultural								
Annuals:								
Amaranthus	-	-	0.5	1.5	-	9.1	11.3	2.5
Chenopodium	-	2.0	1.5	3.0	-	3.9	-	0.5
Cheno-am	-	-	-	4.5	-	-	-	3.0
Corispermum	-	-	-	-	-	-	1.3	-
Physalis	-	-	-	-	-	-	-	0.5
Portulaca	-	-	-	0.3	-	-	-	4.5
Cultivars:								
Zea mays	+c	+++c, +g, +cob, 6.5k	++c, +g	+c, .6k	+c	+c	+++c, 5.0k	+c
Grasses:								
Gramineae	-	-	+s	-	-	-	-	-
Sporobolus	-	-	-	-	-	-	-	1.0
Other:								
Unidentifiable	-	-	-	-	-	-	-	1.0
Unknown	-	-	2.5pp	-	-	-	-	1.0
Unknown #9211	-	-	-	0.3	-	-	-	-
Perennials:								
Pinus	-	-	+cs	-	-	-	-	-
Pinus edulis	-	-	0.5	-	-	-	-	-
Platyopuntia	-	-	-	-	-	-	-	0.5
Non-Cultural								
Annuals:								
Amaranthus	-	-	-	-	-	-	2.5	1.0
Chenopodium	-	-	-	-	-	-	-	0.5
Grasses:								
Sporobolus	-	-	-	1.2	-	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
+ = less than 10, ++ 11-25, +++ 25-100, b = bark, c = cupule, cs = conescale, g = glume, k = kernel, pp = plant part

Table 23.25. LA 265, Study Unit 4 Upper Fill and Roof Fall, Wood Charcoal from Flotation Samples, by Weight in Grams

Component	Upper Fill							Roof Fall	Totals	
Stratum	1	2	3	4	5	6	7	8	Weight	%
FS	903	904	905	906	907	908	909	910		
Conifers:										
Juniperus	.11g	.44g	.27g	.50g	.40g	.59g	.41g	.30g	3.02g	70%
Pinus edulis	.01g	-	-	-	-	-	.18g	.04g	.23g	5%
Unknown conifer	.02g	.06g	-	-	-	.06g	.04g	-	.18g	4%
Non-Conifers:										
Artemisia	-	-	-	-	-	-	-	.04g	.04g	1%
Quercus	-	-	.05g	-	-	-	-	-	.05g	1%
Salicaceae	-	.19g	.09g	.04g	.04g	.03g	.05g	.10g	.54g	12%
Sarcobatus	.02g	-	-	-	-	-	-	-	.02g	1%
Sarcobatus/Atriplex	-	-	-	.04g	.04g	-	-	.04g	.12g	3%
Unknown non-conifer	-	-	.03g	.04g	-	-	-	-	.07g	2%
Other:										
Unknown	.04g	.01g	.01g	-	-	-	-	-	.06g	1%
Totals	.20g	.70g	.45g	.62g	.48g	.68g	.68g	.52g	4.33g	100%

Table 23.26. LA 265, Study Unit 4 Floor Fill and Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	Floor Fill				100	72	73	74	76
Component	NW 1/4	NE 1/4	SW 1/4	SE 1/4	Burial Fill	Central Hearth	Secondary Hearth	Secondary Hearth	Sealed Floor Pit
FS	1024	1031	1052	1055	1313	1364	1296	1317	1339
					Cultural				
Annuals:									
Chenopodium	0.4	0.9	0.3	1.5	0.5	-	-	5.2	-
Cultivars:									
Zea mays	+c	+c, 0.4k	+c	+c, +g	+c, 0.5k	+c	-	+c, 0.3k	+c
Grasses:									
Gramineae	-	-	-	-	-	-	-	+s	-
Other:									
Unidentifiable	-	0.4	-	-	-	-	-	-	-
Unknown	-	-	-	-	0.5e	-	-	-	-
Perennials:									
Juniperus	-	-	-	-	-	-	-	+++t	-
Platyopuntia	-	-	-	-	-	0.5	-	-	-
Rhus	-	-	-	-	-	0.5	-	-	-
					Non-Cultural				
Annuals:									
Chenopodium	-	-	-	-	4.5	2.8	2.5	-	-
Euphorbia	-	0.4	-	-	-	-	-	-	-
Salsola kali	+nr	-	-	-	-	-	-	-	-
Grasses:									
Sporobolus	0.7	-	-	-	-	-	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

c = cupule, g = glume, e = embryo, t = twig, k = kernel, nr = nonreproductive, + = less than 10, ++ = 11-25, +++ = 26-100

Table 23.27. LA 265, Study Unit 4 Floor Fill and Floor Features, Wood Charcoal from Flotation, Weight in Grams

Component	Floor Fill			Central Hearth	Secondary Hearth	Sealed Floor Pit	Burial Fill	Totals	
Feature	NW 1/4	NE 1/4	SE 1/4	72	73	76	100	Weight	%
FS	1024	1031	1055	1364	1296	1339	1313		
Conifers:									
Juniperus	.20g	.04g	.26g	.20g	3.60g	.90g	.20g	5.4g	74%
Pinus	-	-	-	.04g	-	-	-	.04g	<1%
Unknown conifer	-	-	-	-	-	-	.02g	.02g	<1%
Non-Conifers:									
Cylindropuntia	-	-	-	-	.04g	-	-	.04g	<1%
Salicaceae	.04g	.10g	.03g	.10g	-	.40g	.05g	.72g	10%
Sarcobatus/Atriplex	.04g	.01g	.03g	.10g	.20g	-	.07g	1.08g	15%
Totals	.28g	.15g	.32g	.44g	3.84g	1.30g	.34g	7.30g	100%

Table 23.28. LA 265, Study Unit 4 Floor Fill and Floor Features, Macrobotanical Samples, Count and Weight

Component	Floor Fill		Central Hearth	Secondary Hearth	N 1/2	S 1/2
Feature	NW 1/4	SW 1/4	72	73	74	74
FS	1024	1052	1365	1296	1316	1317
Wood:						
Juniperus	-	21/7.48g	5/.74g	20/5.77g	20/3.95g	19/3.23g
Pinus edulis	-	1/.23g	15/3.71g	-	-	
Salicaceae	-	4/.81g	-	-	-	1/.07g
Cultivars:						
Zea mays	1cob/.20g	-	-	-	-	-

All plant material is carbonized.

Table 23.29. LA 265, Study Unit 13 Upper Fill and Roof Fall by Stratum, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Upper Fill					Roof Fall		
Stratum	1	2	2.1	2.2	2.3	3	3.2	3.3
FS	1168	1169	1170	1171	1172	1176	1175	1174
			Cultural					
Annuals:								
Amaranthus	-	-	-	1.7	-	-	-	-
Chenopodium	-	-	5.7	3.4	3.6	-	1.0	-
Cheno-am	-	-	-	-	1.8	0.5	3.0	-
Cultivars:								
Zea mays	+c	-	+c	+c	+c, +g	+c, +g	+c, +g	+c
Other:								
Unidentifiable	-	-	-	-	-	-	0.5	-
Unknown	-	-	1.4e	-	-	-	-	-
Perennials:								
Cylindropuntia	0.3	-	-	-	-	-	-	-
			Non-Cultural					
Annuals:								
Chenopodium	-	-	0.7	-	-	-	-	-
Euphorbia	-	0.6	-	-	-	-	-	-
Perennials:								
Croton	-	-	-	-	7.5	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
+ = less than 10, c = cupule, e = embryo, g = glume

Table 23.30. LA 265, Study Unit 13 Upper Fill and Roof Fall by Stratum, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Upper Fill			Roof Fall	Totals	
Stratum	2.1	2.2	2.3	3.3	Weight	%
FS	1170	1171	1172	1174		
Conifers:						
Juniperus	0.20g	0.30g	0.40g	0.20g	1.10g	65%
Pinus	-	-	-	0.10g	0.10g	6%
Non-Conifers:						
Cylindropuntia	-	0.04g	0.04g	-	0.08g	5%
Salicaceae	0.10g	0.04g	0.10g	0.04g	0.28g	17%
Sarcobatus/Atriplex	-	0.04g	0.04g	-	0.08g	5%
Unknown non-conifer	-	-	-	0.04g	0.04g	2%
Totals	0.30g	0.42g	0.58g	0.38g	1.68g	100%

Table 23.30b. LA 265, Study Unit 13 Upper Fill by Stratum, Macrobotanical Sample, Count and Weight

Component	Upper Fill
Stratum	2.2
Wood:	
Juniperus	5/.70g
Pinus edulis	15/2.58g

All plant material is carbonized.

Table 23.31. LA 265, Study Unit 13, Floor Fill and Burial, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Structure Floor			F. 131 Adult Human Burial	
Quadrant	SE1/4	NW1/4	NE1/4	NW1/4 Level 1	NW 1/4 Level 2, Below Burial
FS	1303	1304	1305	1537	1548
			Cultural		
Annuals:					
Amaranthus	-	-	-	-	2.5
Chenopodium	-	-	-	1.1	4.0
Cheno-am	0.5	-	-	-	-
Portulaca	1.0	1.0	-	-	-
Cultivars:					
Zea mays	++c	+c	+c	+c	-
Grasses:					
Gramineae	-	+s	-	-	-
			Non-Cultural		
Annuals:					
Chenopodium	0.5	41.0	-	-	-
Euphorbia	-	-	-	-	0.5
Portulaca	0.5	1.0	-	-	-
Grasses:					
Sporobolus	-	-	34.0	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
c = cupule, s = stem, + = less than 10, ++ = 11 to 25,+++ = 26 to 100

Table 23.32. LA 265 Study Unit 13, Floor Fill, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Structure Floor		Total	
Quadrant	SE1/4	NW1/4		
FS	1055	1024	Wt	%
Conifers:				
Juniperus	0.60g	0.50g	1.10g	74%
Non-Conifers:				
Cylindropuntia	-	0.04g	0.04g	3%
Salicaceae	0.04g	0.30g	0.34g	23%
Total	0.64g	0.84g	1.48g	100%

Table 23.32b. LA 265, Study Unit 13, Burial, Macrobotanical Samples, Count and Weight in Grams

Component	F. 131 Adult Human Burial	
Quadrant	NW 1/4 Level 1	NW 1/4 Level 2, Below Burial
FS	1537	1548
Conifers:		
Juniperus	18/1.37g	-
Non-Conifers:		
Salicaceae	1/0.14g	-
Sarcobatus/Atriplex	1/0.09g	-
Cultivars:		
Zea mays	-	1c/0.04g, 1e/0.04g

All plant material is carbonized, unless indicated otherwise.

c = cupule, e = embryo

Table 23.33. LA 6169, Feature 47 (Early Developmental Pit Structure) Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	119 Storage Bin	121 Storage Bin	161 Small Burned Pit	163 Wall Niche	165 Large Burned Pit
FS	1952	1908	1969	1995	1984
		Cultural			
Annuals:					
Chenopodium	1.1	0.2	-	3.0	-
Cheno-am	0.9	-	-	-	-
Portulaca	1.4	-	-	-	-
Cultivars:					
Cucurbita	-	+r	-	-	-
Zea mays	++c, 9.1e, 3.4k	+c, +g, 0.2k	-	+c	-
Grasses:					
Gramineae	-	+++s	+++s	-	-
Phragmites	+s	-	-	-	-
Sporobolus	2.9	-	-	-	-
Other:					
Monocotyledonae	-	+s	-	-	-
Unidentifiable	-	-	-	0.5	-
Unknown	0.9pp	-	-	-	-
Perennials:					
Pinus edulis	0.9	-	-	-	-
		Non-Cultural			
Annuals:					
Chenopodium	1.4	0.2	-	0.5	-
Cheno-am	-	0.2	-	-	-
Euphorbia	0.3	0.2	-	-	-
Portulaca	-	14.5	-	2.0	0.5
Grasses:					
Sporobolus	-	-	-	0.5	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, ++ = 11-25, +++ = 25-100, c = cupule, e = embryo, g = glume, k = kernel, pp = plant part, r = rind, s = stem

Table 23.34. LA 6169, Feature 47 (Early Developmental Pit Structure) Floor Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	119 Storage Bin	121 Storage Bin	161 Small Burned Pit	163 Wall Niche	165 Large Burned Pit	Totals	
FS	1952	1908	1969	1995	1984	Weight	%
Conifers:							
Juniperus	0.40g	0.20g	1.50g	0.20g	0.80g	3.10g	50%
Pinus edulis	-	-	-	0.10g	-	0.10g	2%
Non-Conifers:							
Quercus	-	-	-	-	0.04g	0.04g	1%
Salicaceae	0.20g	0.70g	-	0.04g	0.04g	0.98g	16%
Sarcobatus/Atriplex	-	0.04g	0.70g	0.10g	1.20g	2.04g	33%
Totals	0.60g	0.94g	2.20g	0.44g	2.08g	6.26g	100%

Table 23.35. LA 6169, Feature 47 (Early Developmental Pit Structure) Floor Features, Macrobotanical and Wood Samples, Count and Weight in Grams

Feature	47 Roof Matting	119 Storage Bin	121 Storage Bin	152 Ash and Refuse Dump	163 Large Burned Pit
FS	1836	1964	1908	1895	1995
			Wood		
Non-Conifers:					
Salicaceae	-	-	20/15.52g	-	-
			Macrobotanical		
Cultivars:					
Zea mays	-	18k/1.50g	-	3c/0.20g	-
Grasses:					
Phragmites stems	>50	-	-	-	-
Perennials:					
Salicaceae wood	11/1.10g	-	-	-	-
Unknown bark	2/0.04g	-	-	-	-
Yucca leaves	>10	-	-	-	-
Non-Cultural Perennials:					
Celtis seed	-	-	-	-	1/0.04g

All plant material is carbonized unless indicated otherwise.
c = cupule, k = kernel

Table 23.36. LA 6169, Feature 76 (Late Developmental Pit Structure) Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	Floor Contact		113
Context	118N 132E SW Quad	120N 132E NW Quad	Posthole-Deflector Support
FS	1440	1476, 1651	1677
	Cultural		
Annuals:			
Amaranthus	-	0.2	-
Chenopodium	2.5	0.8	2.5
Cheno-am	-	-	2.5
Cycloloma	-	0.2	-
Portulaca	-	-	0.8
Cultivars:			
Zea mays	+c, +g	+c, 0.2k	+c
Grasses:			
Gramineae	+s	+s	-
Other:			
Unknown	-	-	+s
Perennials:			
Echinocereus	-	0.3	-
Juniperus	+t	-	+l
	Non-Cultural		
Annuals:			
Chenopodium	1.0	1.7	14.2
Euphorbia	-	1.8	-
Portulaca	-	-	0.8
Grasses:			
Gramineae	-	+floret	-
Sporobolus	-	0.5	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized. '+ = less than 10, c = cupule, g = glume, l = leaf, k = kernel, s = stem, t = twig

Table 23.37. LA 6169, Feature 76 (Late Developmental Pit Structure) Floor Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	Floor contact		113	Totals	
Context	118N 132E SW Quad	120N 132E NW Quad	Posthole-Deflector Support	Weight	%
FS	1440	1476, 1651	1677		
Conifers:					
Juniperus	0.9	0.71	0.40	2.01g	58%
Pinus edulis	-	0.30	-	0.30g	9%
Non-Conifers:					
Lycium	0.04	-	-	0.04g	1%
Salicaceae	0.30	0.50	-	0.80g	23%
Sarcobatus/Atriplex	0.04	0.24	-	0.28g	8%
Unknown non-conifer	-	0.04	-	0.04g	1%
Totals	1.28g	1.79g	0.40g	3.47g	100%

Table 23.38. LA 6169, Feature 76 (Late Developmental Pit Structure) Floor Contact, Macrobotanical and Wood Charcoal Samples, Count and Weight in Grams

Feature	Floor Contact		
Context	118N/132E SW Quad	118N/134E SE Quad	117N/133E SE Quad
FS	1473	1625	1626
Wood			
Conifers:			
Juniperus	31/4.85g	-	5wood/4.10g
Pinus edulis	6/0.63g	-	-
Non-Conifers:			
Salicaceae	12/2.18g	-	-
Sarcobatus/ Atriplex	1/0.49g	-	-
Macrobotanical			
Zea mays	-	1cob/.40g	-

All plant material is carbonized unless indicated otherwise.

Table 23.39. LA 6169, Feature 70 (Coalition Pit Room) Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	95 Human Burial	98 Central Hearth
FS	1597	1643
Cultural		
Annuals:		
Amaranthus	-	0.5
Chenopodium	0.4	2.4
Cheno-am	-	0.5
Cleome	-	0.5
Euphorbia	-	0.5
Plantago	-	1.4
Portulaca	-	0.5
Cultivars:		
Zea mays	+c	+c, 1.9k
Grasses:		
Oryzopsis	-	1.4
Sporobolus	-	0.5
Other:		
Dicotyledonae	-	+leaf
Unidentifiable	-	2.4
Perennials:		
Carex	-	0.5
Juniperus	-	+l
Pinus edulis	-	+n
Non-Cultural		
Annuals:		
Chenopodium	58.5	2.4
Descurainia	2.5	-
Euphorbia	0.4	7.1
Nicotiana	-	3.8
Other:		
Leguminosae	1.8	-
Perennials:		
Carex	-	0.5
Grasses:		
Sporobolus	0.7	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, c = cupule, l = leaflet, k = kernel, n = nutshell

Table 23.40. LA 6169, Feature 70 (Coalition Pit Room) Floor Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	95 Human Burial	98 Central Hearth	Totals	
FS	1597	1643	Weight	%
Conifers:				
Juniperus	.10g	.10g	.20g	11%
Pinus edulis	-	.10g	.10g	6%
Non-Conifers:				
Lycium	-	.10g	.10g	6%
Salicaceae	.90g	.20g	1.10g	61%
Sarcobatus/Atriplex	.10g	.20g	.30g	17%
Totals	1.10g	.70g	1.80g	100%

Table 23.40b. LA 6169, Feature 70 (Coalition Pit Room) Floor Features, Macrobotanical and Wood Samples, Count and Weight in Grams

Feature	95 Human Burial	98 Central Hearth
FS	1713	1644, 1645
Wood		
Juniperus	-	9/4.67g
Salicaceae	-	10/0.09g
Unknown nonconifer	-	1/0.09g
Macrobotanical		
Cultivars:		
Zea mays	25 cupules/0.20g	-

All plant material is carbonized.

Table 23.41. LA 6169, Feature 4 (Early Developmental Pit Structure) Roof Fall/Floor Fill and Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	13 Cobble Concentration in Roof Fall/Floor Fill with Dog Burials	68 & 75 Human Burials	75 Human Burial
FS	498	1176	1164
	Cultural		
Annuals:			
Amaranthus	0.6	-	-
Chenopodium	1.7	1.6	-
Cheno-am	-	0.5	-
Portulaca	-	0.3	-
Cultivars:			
Zea mays	+c	+c	+c, +g
Other:			
Unknown	-	2.2pp	-
Perennials:			
Pinus edulis	-	0.3	-
	Non-Cultural		
Annuals:			
Euphorbia	-	1.1	-
Kallstroemia	-	1.6	-
Perennials:			
Croton	-	7.5	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, c = cupule, g = glume, pp = plant part

Table 23.42. LA 6169, Feature 4 (Early Developmental Pit Structure) Roof Fall/Floor Fill and Floor Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	13 Cobble Concentration in Roof Fall/Floor Fill with Dog Burials	75 Human Burial	Total	
FS	498	1164	Wt	%
Conifers:				
Juniperus	.20g	.40g	.60g	68%
Non-Conifers:				
Salicaceae	.10g	.10g	.20g	22%
Sarcobatus/Atriplex	.04g	.04g	.08g	9%
Totals	.34g	.54g	.88g	100%

Table 23.42b. LA 6169, Feature 4 (Early Developmental Pit Structure) Upper Fill, Floor, and Floor features, Wood and Macrobotanical Samples, Count and Weight in Grams

Component	Upper Fill			Floor and Floor Features			
Feature		66 Ventilator Shaft		4 Floor	42 Small Burned Pit	35 Hearth	36 Ash Pit
Stratum	11-2	2-ab		Floor			
Level	11	4	3	1			
FS	433	1386	1393	204	922	1092	1120
				Wood			
Conifers:							
Juniperus	-	9/1.33g	10/0.32g	-	6/1.31g	14/1.61g	96/6.82g
Pinus edulis	-	7/0.32g	-	-	-	-	-
Non-Conifers:							
Artemisia	-	-	-	-	-	-	1/.03g
Salicaceae	-	3/0.67g	4/0.06g	6/2.20g	14/1.96g	5/0.47g	15/.87g
Sarcobatus/Atriplex	-	1/0.15g	-	-	-	1/0.11g	8/.49g
				Macrobotanical			
Zea mays	1cob/2 .20g	-	-	-	-	-	-

All plant material is carbonized.

Table 23.43. LA 6169, Features 10, 15, and 16 (Coalition Pit Rooms) Floor and Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Pitroom	10			15			16				
Feature	Floor Fill and Floor 72N87E	Floor Fill and Floor 72N 86E	17 Central Fire Pit	14 Thermal Feature in Upper Fill	Floor Fill and Floor		Floor Fill and Floor 80N 89E	Floor Fill and Floor 82N 89E	105 Hearth	128 Small Pit	130 Hearth
FS	604	633	721	580	935	936	1306	1320			
					Cultural						
Annuals:											
Chenopodium	0.3	-	-	3.0	-	-	0.6	-	9.1	-	-
Cheno-am	-	-	-	-	-	-	0.6	-	1.9	-	-
Corispermum	-	0.4	-	-	-	-	-	-	-	-	-
Portulaca	-	-	1.6	-	-	-	-	-	-	0.7	-
Cultivars:											
Zea mays	-	+c	0.4cob, ++c	-	+c, +g	+c, +g	+c	+c	+c, 1.1k	-	+c, 0.3e, 0.6k
Grasses:											
Gramineae	-	-	-	+s	+s	-	-	-	0.4	-	-
Other:											
Unidentifiable	-	-	-	-	-	-	-	-	1.1	-	-
Unknown #9210	-	0.4	-	-	-	-	-	-	-	-	-
					Non-Cultural						
Annuals:											
Chenopodium	-	-	17.1	-	0.5	-	5.9	0.6	1.5	1.3	-
Corispermum	-	-	0.8	-	-	-	-	-	-	-	-
Euphorbia	0.5	-	>100	-	-	-	0.6	-	-	-	-
Kallstroemia	-	-	5.7	-	-	-	-	-	-	-	-
Nicotiana	95.1	23	-	-	-	-	-	-	-	-	-
Portulaca	-	-	-	-	2.0	-	-	-	-	0.7	-
Perennials:											
Echinocereus	-	-	-	-	-	-	-	-	0.4	-	-
Juniperus	-	-	0.8	-	-	-	-	-	-	-	-
Grasses:											
Gramineae	-	-	0.4	-	-	-	-	-	-	-	-
Sporobolus	-	-	-	-	-	-	0.6	-	-	4.7	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, ++ = 11-25, c = cupule, e = embryo, g = glume, k = kernel

Table 23.44. LA 6169, Features 10, 15, and 16 (Coalition Pit Rooms) Floor Features, Wood Charcoal from Flotation Samples, Weight in Grams

Pit room	10	15	16					Totals	
Feature	17 Central Firepit	Floor Fill and Floor	Floor Fill and Floor 80N 89E	Floor Fill and Floor 82N 89E	105 Hearth	128 Small Pit	130 Hearth	Weight	%
FS	721	935	1306	1320	1697	1737	1832		
Conifers:									
Juniperus	.30g	.10g	.04g	.20g	.04g	.10g	.30g	1.08g	32%
Pinus edulis	.04g	.01g	.04g	-	-	-	-	.09g	3%
Non-Conifers:									
Chrysothamnus	-	-	-	.10g	-	-	-	.10g	3%
Cylindropuntia	.04g	-	-	-	-	-	-	.04g	1%
Forestieria	-	-	-	.04g	-	-	.10g	0.14	4%
Salicaceae	.04g	.10g	.04g	.10g	.10g	.04g	.04g	.46g	13%
Sarcobatus/Atriplex	.04g	-	.04g	.04g	1.00g	.04g	.30g	1.46g	43%
Unknown non-conifer	-	.04g	-	-	-	-	-	.04g	1%
Totals	.46g	.25g	.16g	.48g	1.14g	.18g	.64g	3.41g	100%

Table 23.45. LA 6169, Features 10, 15, and 16 (Coalition Pit Rooms) Floor Features, Macrobotanical and Wood Samples, Count and Weight in Grams

Pit room	10	15	16				
Feature	17 Central Firepit	Floor Fill and Floor	Floor Fill and Floor	103 Mealing Basin	105 Hearth	129 Venti-lator	130 Hearth
FS	719	936	1615	1960	1694	1833	1830
			Wood				
Conifers:							
Juniperus	12/.43g	17/2.70g	-	-	9/.71g	-	20/1.72g
Non-Conifers:							
Artemisia	6/.16g	-	-	-	-	-	-
Salicaceae	9/.66g	1/.19g	10/.51g (9u)	-	-	-	7/.47g
Sarcobatus/Atriplex	2/.04g	10/1.08g	-	-	41/2.40g	-	13/1.30g
Unknown	-	-	-	1/.04g	-	-	-
			Macrobotanical				
Cultivars:							
Zea mays	5c/.06g	1cob/.90g	16c/.30g, 30cobs/ 5.80g	-	-	1cob/.30g	-
Grasses:							
Phragmites stems	-	-	-	3/.20g	-	-	-
Perennials:							
Unknown bark	-	-	1/.30g	-	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
c = cupule, u = uncarbonized

Table 23.46. LA 6169, Study Units 6, 7 and 8 Extramural Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	55 Large Pit	79 Large Cobble-Filled Thermal Pit, Level 1	79 Large Cobble-Filled Thermal Pit, Level 2	84 Large Cobble-Filled Thermal Pit	88 Large Burned Pit	147 Large Cobble-Filled Thermal Pit	149 Large Cobble-Filled Thermal Pit	155 Burned Pit w/in Large Burned Pit	156 Burned Pit
FS	1098	1248	1303	1247	1366	1822	1937	1901	1911
					Cultural				
Annuals:									
Amaranth	-	-	0.2	-	-	-	-	-	-
Chenopodium	-	2.7	5.2	-	3.8	-	6.5	0.5	0.4
Cheno-am	-	-	0.2	-	-	-	-	1.0	-
Portulaca	-	-	-	-	-	-	5.0	0.5	-
Cultivars:									
Zea mays	+c	+c	+c, .2k	+c	+c, .5k	+c	+c	+c	+c
Other:									
Unidentifiable	-	-	0.2	-	-	-	-	-	-
Unknown	-	0.2	-	-	1.0e	-	-	-	-
Perennials:									
Cylindropuntia	-	-	-	-	-	-	0.5	-	-
Juniperus	-	-	-	-	-	-	+l	-	-
Pinus edulis	-	-	0.2	-	-	-	-	-	-
					Non-Cultural				
Annuals:									
Chenopodium	2.9	23.4	1.4	2.8	-	2.1	-	-	3.2
Euphorbia	-	0.2	0.4	-	-	-	-	-	0.4
Portulaca	-	0.2	0.4	-	-	-	0.5	-	1.6

Table 23.46b. LA 6169, Study Units 6, 7, and 8 Extramural Features and Sheet Trash, Macrobotanical Samples, Count and Weight in Grams

Feature or Component	79 Large Cobble-Filled Thermal Pit, Level 1	SU 8, 121N 133E, Stratum 1, Level 2
FS	1304	945
	Cultural	
Cultivars:		
Zea mays	-	3cupules/0.10g
	Non-Cultural	
Prunus	1stone/.50g	-

All cultural plant material is carbonized.

Table 23.47. LA 6169, Study Units 6, 7, 8 and 9 Extramural Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	79 Large Cobble-Filled Thermal Pit, Level 1	79 Large Cobble-Filled Thermal Pit, Level 2	84 Large Cobble-Filled Thermal Pit	88 Large Burned Pit	149 Large Cobble-Filled Thermal Pit	155 Burned Pit w/in Large Burned Pit	156 Burned Pit	127 Large Burned Pit	145 Large Cobble-Lined Thermal Feature	Totals	
FS	1248	1303	1247	1366	1937	1901	1911	1726	1792	Weight	%
Conifers:											
Juniperus	.20g	.50g	1.70g	.50g	.30g	.40g	.20g	-	1.00g	4.80g	51%
Pinus edulis	-	.04g	-	-	-	-	-	-	-	.04g	<1%
Non-Conifers:											
Salicaceae	-	.04g	.04g	.04g	.04g	.04g	0.10g	-	0.10g	.30g	3%
Sarcobatus/Atriplex	.04g	-	-	.10g	.04g	.04g	-	4.00g	0.04g	4.26g	45%
Unknown non-conifer	-	-	-	.04g	-	-	.04g	-	-	.08g	1%
Totals	.24g	.58g	1.74g	.68g	.38g	.48g	.24g	4.00g	1.14g	9.48g	100%

Table 23.48. LA 6169, Study Units 8 and 9 Extramural Area, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	127 Large Burned Pit		145 Large Cobble-Lined Thermal Feature
Context	134N 138.42E, Stratum 01, Level 1	134N 138.42E, Stratum 01, Level 2	
FS	1725	1726	1792
Cultural			
Annuals:			
Amaranthus	0.7	0.2	-
Chenopodium	-	1.0	-
Cheno-am	-	0.5	-
Portulaca	3.4pc	-	-
Perennials:			
Juniperus	-	0.2	-
Cultivars:			
Zea mays	+c	+c, 0.2k	-
Non-Cultural			
Annuals:			
Chenopodium	13.7	0.3	0.3
Euphorbia	0.7	0.3	-
Portulaca	0.7	-	-

Plant remains are seeds unless otherwise indicated;
All cultural material is carbonized (pc indicates partially charred).
+ = less than 10, c = cupule, k = kernel

Table 23.49. LA 6170, Structure 2 Early Developmental Components, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Structure Fill	Floor Fill & Contact 92N 102E, Stratum 255, Level 17	Floor Fill & Contact 93N 101E, Stratum 255, Level 17
FS	1008	1192	1203
Cultural			
Annuals:			
Chenopodium	-	0.9pc	-
Cultivars:			
Zea mays	+c	+c	+c, +g
Grasses:			
Gramineae	-	-	+s
Non-Cultural			
Annuals:			
Chenopodium	-	0.9	-
Corispermum	-	0.9	-
Cycloloma	-	0.9	-
Other:			
Unknown	-	-	+s

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized (pc indicates partially carbonized).
+ less than 10, c = cupule, g = glume, s = stem

Table 23.50. LA 6170, Structure 2 Early Developmental Components, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Structure Fill	Floor Fill & Contact 92N 102E, Stratum 255, Level 17	Floor Fill & Contact 93N 101E, Stratum 255, Level 17	Totals Weight	Totals %
FS	1008	1192	1203		
Conifers:					
Juniperus	.30g	2.00g	.20g	2.50g	72%
Non-Conifers:					
Salicaceae	-	.04g	.20g	.24g	7%
Sarcobatus/Atriplex	-	.60g	.04g	.64g	18%
Unknown non-conifer	-	.10g	-	.10g	3%
Totals	.30g	2.74g	.44g	3.48g	100%

Table 23.51. LA 6170, Structure 2 Early Developmental Components, Wood Charcoal and Macrobotanical Samples, Weight in Grams and Count

Component	Overburden	Wind/Water Deposits	Roof Fall/ Redeposit	Floor Fill & Contact
FS	971	1135	See below*	1191, 1192
		Wood		
Juniperus	4/.10g	14/1.26g	247/24.20g 7u/.20g	27/4.05g
Pinus edulis	-	-	2/.33g	-
Salicaceae	-	12/1.71g	190/17.64g	12/1.24g
Sarcobatus/Atriplex	-	-	4/.46g	-
Unknown non-conifer	-	-	2/.13g	-
		Macrobotanical		
Cultural				
Cultivars:				
Zea mays	-	9cobs/0.90g, 4cupules/.10g	13cobs/6,12g, 1cupule/.04g, 1kernel/.10g	3cobs/.20g

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized. u = uncarbonized. * FS 1067, 1073, 1095, 1097, 1108, 1117, 1130, 1132, 1136, 1141, 1142, 1143, 1147, 1150, 1153, 1281.

Table 23.52. LA 6170, Structure 5A Late Developmental Components, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Structure Fill	Floor Fill	Feature 6, Mealing Bin	Feature 7, Mealing Bin
FS	1464	1484	1505	1506
		Cultural		
Cultivars:				
Zea mays	+c	+c	+c, +g	+c, .5k
Grasses:				
Gramineae	+s	-	-	-
Phragmites	+s	+s	-	-
Other:				
Monocotyledonae	-	-	-	+s
Perennials:				
Atriplex canescens	-	-	1.1 fruit	-
Pinus edulis	-	0.5	-	+n
Platyopuntia	1.0	-	-	-
		Non-Cultural		
Annuals:				
Amaranthus	-	2.5	-	-
Chenopodium	7.0	2.5	5.6	0.5
Euphorbia	20.5	-	-	-
Grasses:				
Sporobolus	65.5	65.0		60.5

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
+ = less than 10, ++ = 11-25, c = cupule, g = glume, k = kernel, n = needle, s = stem

Table 23.53. LA 6170, Structure 5 Early Developmental Fill Components, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Feature 5 Fill	Roof & Closing		Floor Fill & Contact		
		101N 104E, Level 8	104N 102E, Level 18	102N 100E, Level 20	104N 100E, Level 18	104N 103E, Level 15
FS	1447	1540	1636	1677	1819	1824
			Cultural			
Annuals:						
Amaranthus	0.5	0.8	-	-	-	-
Chenopodium	-	-	12.2, 3.9pc	-	-	-
Portulaca	-	-	1.5	-	-	-
Cultivars:						
Zea mays	+c	+c	+c, +g	+c	0.9cob, +c	+c, 0.5k
Grasses:						
Gramineae	-	-	-	+s	+s	+s
Other:						
Monocotyledonae	-	+s	+++s	-	+s	-
Unidentifiable	0.5					
Perennials:						
Pinus edulis	-	-	-	-	-	0.5
Grasses:						
Gramineae	-	-	-	+g	-	-
			Non-Cultural			
Annuals:						
Amaranthus	-	2.3	-	-	0.9	-
Chenopodium	1.0	4.5	0.9	-	11.9	13.5
Cheno-am	-	-	-	-	0.9	-
Euphorbia	0.5	0.8	-	-	5.1	2.0
Nicotiana attenuata	-	-	-	-	-	0.5
Portulaca	-	-	-	-	-	0.5
Grasses:						
Sporobolus	1.5	3.8	-	-	-	1.5

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized (pc indicates partially carbonized).

+ = less than 10, +++ = 26-100, c = cupule, g = glume, l = leaf, k = kernel, pc = partially charred, s = stem

Table 23.54. LA 6170, Structure 5 Early Developmental Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	12 Heating Pit	18 Central Hearth	19 Ash Pit, 103.25N 102.20E	19 Ash Pit 103.20N 102.14E	19 Ash Pit 103.35N 101.95E	20 Cobble-Lined Thermal Pit
FS	1926	1909	1911	1913	1914	1906
			Cultural			
Annuals:						
Amaranthus	-	15.1	-	-	-	-
Chenopodium	-	0.5	-	-	1.0	-
Cheno-am	1.3pc	1.2pc, 10.5	-	-	1.0	-
Portulaca	-	2.5	-	-	-	-
Cultivars:						
Zea mays	-	+c, +g	1.0 cob, +c	-	+c, .5k	+c
Other:						
Monocotyledonae	-	-	-	-	-	+s
Unknown	-	-	-	2.3pp	-	0.7pp
Perennials:						
Pinus edulis	-	0.5	-	-	-	-
			Non-Cultural			
Annuals:						
Amaranthus	-	20.9	-	-	0.5	-
Chenopodium	2.6	-	3.0	-	-	1.9
Cheno-am	82.5	3.5	-	1.1	-	-
Euphorbia	157.3	-	-	-	-	0.2
Malvaceae	1.3	-	-	-	-	-
Nicotiana attenuata	-	-	-	-	18.5	-
Portulaca	8.5	-	-	-	-	-
Perennials:						
Carex	1.3	-	-	-	-	-
Grasses:						
Sporobolus	-	-	-	-	2.0	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized (pc indicates partially carbonized). + = less than 10, c = cupule, g = glume, k = kernel, pp = plant part, s = stem

Table 23.55. LA 6170, Structure 5 Early Developmental Fill Components, Macrobotanical Samples, Count and Weight in Grams

Component	Overburden	Wind/Water Deposits	Roof & Closing	Floor Fill & Contact	Ventilator Shaft
FS	1301, 1376	1334, 1353, 1370	*	**	1949
Wood					
Conifers:					
Juniperus	10/1.10g	-	-	-	-
Non-Conifers:					
Salicaceae	6/0.50g	-	24/11.95g 6uncharred/0.40g	-	-
Possibly Cultural					
Cultivars:					
Phaseolus cotyledon	-	-	1/0.10g	-	-
Zea mays	-	11cobs/0.90g	15cobs/3.31g, 3c/0.10g, 3 shanks/0.25g, 1 stem/0.20 g	11cobs/ 5.8g, 1c/0.04g	29cobs/3.1 0g
Grasses:					
Phragmites stem	3/0.12g	-	86/4.54g	-	-
Other:					
Monocotyledonae stem	-	-	1/0.19g	-	-
Perennials:					
Yucca leaf	-	-	0.04g	-	-

All plant material is carbonized unless indicated otherwise. c = cupule

* FS 1489, 1512, 1520, 1561, 1633, 1635, 1636, 1712, 1743, 1820, 1943

** FS 1817, 1819, 1823

Table 23.56. LA 6170 Structure 5 Features, Macrobotanical Samples, Count and Weight in Grams

Feature	11 Primary Structural Posthole	12 Heating Pit	14 Posthole	19 Ash Pit	20 Cobble-Lined Thermal Pit	24 Deflector Posthole
FS	1903	1926	1898	1913, 1911, 1914	1906	1937
Wood:						
Juniperus	-	-	-	-	92/51.90g	-
Sarcobatus/Atriplex	-	-	-	1/0.50g	-	-
Unknown	-	-	2/0.10g	-	-	-
Cultivars:						
Phaseolus cotyledon	-	-	-	1/0.04g	-	-
Zea mays	12cobs/5.30g	-	-	1cob/0.10g, 1kernel/0.04g	1cob/0.10g	39cobs/3.60, 1c/0.04g
Other:						
Unknown bark	-	8/0.30g	-	-	-	-

All plant material is carbonized unless indicated otherwise.

Table 23.57. LA 6170, Structure 5A (Late Developmental) and Structure 5 (Early Developmental) Fill Components, Wood Charcoal from Flotation Samples, Weight in Grams

Structure	Structure 5A		Structure 5							
Component	Structure Fill	Feature 6 Mealing Bin	Structure Fill	Roof & Closing		Floor Fill & Contact			Totals	
FS	1464	1505	1447	1540	1636	1677	1819	1824	Weight	%
Conifers:										
Juniperus	0.50g	0.50g	0.10g	0.10g	0.10g	0.04g	1.60g	0.04g	1.98g	17%
Non-Conifers:										
Cercocarpus	-	-	-	-	-	0.04g	-	-	0.04g	<1%
Salicaceae	0.04g	0.60g	0.10g	0.10g	2.40g	3.10g	2.20g	1.50g	9.40g	81%
Sarcobatus/Atriplex	0.04g	0.20g	0.20g	0.04g	-	-	-	-	0.24g	2%
Totals	0.58g	1.30g	0.40g	0.24g	2.50g	3.18g	3.80g	1.54g	11.66g	100%

Table 23.58. LA 6170, Structure 50 Early Developmental Fill by Component, Flotation Plant Remains, Frequency and Abundance per Liter

Component	Wind/Water Deposits	Roof & Closing		Floor Fill & Contact	
		120N 138E Stratum 750, Level 3	126N 142E Stratum 750, Level 8	124N 144E Stratum 755, Level 8	122N 141E Stratum 755, Level 8
FS	1967	2076	2120	2119	2156
Cultural					
Annuals:					
Amaranthus	-	-	-	-	1.5
Chenopodium	-	-	-	-	94.8
Cheno-am	-	-	1.0	-	-
Cycloloma	-	-	-	-	1.5
Cultivars:					
Zea mays	+c	+c, +g	+c	+c	+c, 4.4 cob frags., 7.4e, ++g, 100.7k, ++kf
Grasses:					
Gramineae	-	-	-	-	++++s
Phragmites	-	-	+s	+s	-
Other:					
Monocotyledonae	+s	+++s	-	-	+++s
Perennials:					
Cylindropuntia	-	-	-	-	3.0
Juniperus	-	-	-	-	+l
Yucca	-	+l	-	-	+l
Non-Cultural					
Annuals:					
Chenopodium	-	-	0.5	-	-
Euphorbia	-	-	3.5	-	62.2
Portulaca	-	-	1.0	-	-
Perennials:					
Lithospermum	-	-	1.0	-	-
Grasses:					
Sporobolus	-	-	1.0	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
+ = less than 10, ++ = 11-25, +++ = 25-100, ++++ = more than 100, c = cupule, e = embryo, g = glume, k = kernel, kf = kernel fragments, l = leaf, s = stem, t = twig

Table 23.59. LA 6170, Structure 50 Early Developmental Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	152 Collared Hearth	153 Ash Pit	154 Heating Pit with Cobble Fill	157 Sealed Storage Pit	162 Sealed Heating Pit	166 Sealed Storage Pit	169 Venti- lator Tunnel	177 Sealed Heating Pit	183 Sealed Storage Pit
FS	2269	2273	2157	2321	2281	2368	2396	2289	2375
					Cultural				
Annuals:									
Chenopodium	-	2.0	2.3	-	-	-	4.8	-	-
Cycloloma	1.0	-	-	-	-	-	-	-	-
Portulaca	12.3	2.0	-	-	-	-	-	-	-
Cultivars:									
Zea mays	-	+c	++c, +g	+c	-	-	+c	-	-
Grasses:									
Gramineae	-	-	+nr	-	-	-	-	-	-
Other:									
Unknown	2.1e	-	-	-	-	-	-	-	-
Perennials:									
Pinus edulis	-	-	-	-	0.6	-	1.0	0.7	-
					Non-Cultural				
Annuals:									
Chenopodium	-	0.7	1.7	6.4	-	0.5	-	0.7	1.1
Cheno-am	-	-	0.6	-	-	-	-	-	-
Euphorbia	-	-	-	-	-	34.1	1.0	-	49.7
Other:									
Unknown	-	-	-	0.9e	-	-	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, ++ = 11-25, c = cupule, e = embryo, g = glume, nr = non-reproductive

Table 23.60. LA 6170, Structure 50 Early Developmental Features, Macrobotanical Samples, Count and Weight in Grams

Feature	152 Collared Hearth	153 Ash Pit	161 Sealed Main Roof Support Posthole	164 Main Roof Support Posthole	169 Venti- lator Tunnel	172 Sealed Main Roof Support Posthole
FS	2269	2272	2334	2303	2336, 2396	2320
			Cultural			
Cultivars:						
Phaseolus cotyledon	1/0.10g	2/0.10g	-	-	-	-
Zea mays	6cobs/1.60g	1k/0.10g	-	-	1cob/0.10g, 3c/0.10g, 4s/0.90g	-
Grasses:						
Phragmites stem	-	-	-	-	1/0.10g	-
Perennials:						
Juniperus wood	-	1/0.04g	-	-	-	-
Salicaceae	1bark/0.10g, 15wood/ 10.40g	4wood/ 0.04g	-	-	-	-
Perennials:						
Yucca fiber	-	14/0.04g	-	-	-	-
			Non-Cultural			
Other:						
Unknown wood	-	-	1u/0.04g	-	-	-
Perennials:						
Celtis seed	-	-	-	1/0.04g	-	3/0.10g

All plant material is carbonized unless indicated otherwise. c = cupule, k = kernel, s = stalk, u = uncarbonized

Table 23.61. LA 6170, Structure 50 Early Developmental Fill by Component, Wood and Macrobotanical Samples, Count and Weight in Grams

Component	Overburden	Wind/Water Deposits	Roof & Closing	Floor Fill & Contact	Ventilator Shaft Fill
FS	2051	1967, 1981	2021, 2082, 2101	*	2445
Cultural					
Wood:					
Salicaceae	-	-	1/.06g	13/0.60g	-
Macrobotanical					
Cultivars:					
Zea mays	2cobs/.3g	3cobs/1.1g, 8c/0.2g, 28g/0.1g	4cobs/5.g	18cobs/14.5g, 13c/.2g, 91k/9.9g	2cobs/.3g
Grasses:					
Phragmites	-	-	30/2.79g	-	-
Other:					
Monocot	-	-	1s/2.5g	2leaf/0.04g	-
Unknown	-	-	-	2s/0.13g	6bark/0.5g
Non-Cultural					
Perennials:					
Celtis	-	-	-	1u/0.04g	-

All plant material is carbonized unless indicated otherwise. c = cupule, g = glume, k = kernel, s = stem, u = uncarbonized. * FS 2133, 2136, 2142, 2146, 2156

Table 23.62. LA 6170, Structure 50 Early Developmental Fill by Component, Wood Charcoal from Flotation Samples, Weight in Grams

Component	Wind/Water Deposits	Roof & Closing		Floor Fill & Contact		Totals	
		120N 138E Stratum 750, Level 3	126N 142E Stratum 750m, Level 8	124N 144E Stratum 755, Level 8	122N 141E Stratum 755, Level 8	Weight	%
FS	1967	2076	2120	2119	2156		
Conifers:							
Juniperus	0.10g	-	0.04g	0.04g	-	0.18g	2%
Pinus edulis	0.04g	-	-	-	-	0.04g	1%
Non-Conifers:							
Cercocarpus	-	0.10g	-	-	-	0.10g	1%
Salicaceae	0.20g	0.40g	1.10g	1.00g	4.70g	7.4g	95%
Unknown non-conifer	-	-	0.04g	-	-	0.04g	1%
Totals	0.34g	0.50g	1.18g	1.04g	4.70g	7.76g	100%

Table 23.63. LA 6170, Study Unit 12 (Extramural Activity Area), Flotation Plant Remains, Frequency and Abundance per Liter

Feature	53 Cobble-Lined Thermal Pit	69 Bell-Shaped Storage Pit
FS#	2248, 2250	2403, 2404
	Cultural	
Annuals:		
Chenopodium	0.6	-
Cultivars:		
Zea mays	+c	++c, 2.8cob, + glume, .9k
Perennials:		
Yucca	-	+l
	Non-Cultural	
Annuals:		
Chenopodium	5	-
Euphorbia	1.1	-
Portulaca	0.8	-
Grasses:		
Sporobolus	0.6	-

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.

+ = less than 10, ++ = 11-25, c = cupule, k = kernel, l = leaf

Table 23.64. LA 6170, Wood Charcoal Specimens Examined Prior to Possible Tree-Ring Dating, Diameters in mm

Feature	FS	*Juniperus*	Salicaceae
Structure 2 roof fall/red deposit	1131, 1143	x	-
Structure 5A, fill	1463	x	-
Structure 5 sealed features	1926	x	-
		4.7*	-
SU 12	2251, 2417	x	-
		x	-
Structure 5	1357		x
roof and closing material	1492	12.0+*pc	-
	1494	-	12.5-13.0+*
	1495	-	x
	1501	-	x
	1502	-	3.3+*
	1509	-	x
	1513	-	x
	1514	-	x
	1516	-	x
	1517	-	x
	1519	-	x
	1521	-	9.5+*
	1536	-	5.4*
	1541	-	7.8+*
	1542	-	x
	1543	-	x
	1544	-	6.5+*
	1545	-	5.5+*
	1546	-	4.2+*
	1548	-	7.0*
	1552	-	X
	1555	-	5.8+*
	1556	-	5.6+*
	1557	-	9.4+*
	1559	-	5.2+*
	1560	-	7.3+*
	1565	-	4.9+*
	1566	-	5.4+*
	1567	8.5+*	-
	1568	-	5.9*
	1569	-	5.5+*
	1570	-	5.1*
	1571	-	7.4+*
	1572	-	7.0*
	1573	-	7.8+*
	1593	4.0+*	-
	1594	4.8+*	-
	1597	-	4.1+*
	1599	5.6+*	-
	1604	x	-
	1610	-	x
	1611	-	x
	1617	-	x
	2497	-	x
Number of samples		6, 1x	23, 16x
Average diameter in mm		6.98	6.46

+ present but incomplete diameter. Only complete diameters included. * complete measurement with bark, +* complete but no bark

Table 23.65. LA 6171, Feature 38 Fill and Subfeatures and Structure 1 Fill, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	F. 38 Fill	F. 39 Small Burned Pit at Base of F. 38	Structure 1 Fill
FS	574	612	345
Cultural			
Annuals:			
Chenopodium	8.2	1.0	15.0
Cheno-am	-	0.5e	-
Cultivars:			
Zea mays	+c	-	+c, +g
Other:			
Unidentifiable	-	0.9e	-
Perennials:			
Platyopuntia	-	0.5	-
Non-Cultural			
Annuals:			
Chenopodium	-	-	2.0
Cheno-Am	-	-	1.0
Grasses:			
Sporobolus	-	-	1.0

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized.
+ = less than 10, c = cupule, g = glume, e = embryo

Table 23.66. LA 6171, Study Unit 6, Structure 60 Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	61 Warming Pit	65 Small Pit	66 Ash Pit	77 Hearth
FS	706	713	714	887, 888
Cultural				
Annuals:				
Chenopodium	-	2.3	-	0.9
Cheno-am	-	-	1.3	-
Other:				
Unknown	-	+nr	-	0.7embryo
Cultivars:				
Zea mays	+c	+c	+c, 0.6k	-
Non-Cultural				
Annuals:				
Chenopodium	-	-	-	0.7
Portulaca	-	6.8	-	0.7

Plant remains are seeds unless otherwise indicated; all cultural material is carbonized. +less than 10, c cupule, k kernel, nr non-reproductive

Table 23.67. LA 6171, Earliest Developmental Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	43 Large Burned Pit	54 Large Burned Pit	55 Small Pit	56 Large Burned Pit	58 Small Pit	92 Large Burned Pit	91 Small Burned Pit
FS	600	793	864	613	614	868	937
Cultural							
Annuals:							
Amaranthus	2.7	1.9	-	-	-	-	-
Chenopodium	51.7	6.1	6	26.8	6.5	-	5.1
Cheno-am	1.9	0.9	-	3.8	0.3	-	0.5
Corispermum	-	-	-	-	0.5	-	-
Cycloloma	0.9	-	-	1.3	-	-	-
Suaeda	-	-	-	2	-	-	-
Cultivars:							
Cucurbita	+r	-	-	-	-	-	-
Zea mays	+c, .4k	+c, +g	+c, +g	+c, +g	+c, +g	-	-
Grasses:							
Gramineae	-	3.7	-	-	-	-	-
Other:							
Monocotyledonae	-	+s	-	-	-	-	-
Unknown	4.7e	.9e	1.5e	-	.5e	-	.5pp
Perennials:							
Juniperus	-	+ fragments	-	-	-	-	-
Non-Cultural							
Annuals:							
Chenopodium	-	-	2	-	-	2	1.4
Euphorbia	-	-	2	-	-	-	-
Other:							
Solanaceae	-	-	-	1.3	-	-	-

Plant remains are seeds unless otherwise indicated; all cultural material is carbonized.
+ = less than 10, c = cupule, e = embryo, g = glume, k = kernel, pp = plant part, r = rind, s = stem

Table 23.68. LA 6171, Earliest Developmental Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	54 Large Burned Pit	55 Small Pit	Totals	
FS	793	864	Weight	%
Conifers:				
Juniperus	0.40g	0.13g	0.53g	67%
Unknown conifer	-	0.17g	0.17g	22%
Non-Conifers:				
Salicaceae	0.04g	0.03g	0.07g	9%
Sarcobatus/Atriplex	-	0.02g	0.02g	3%
Totals	0.44g	0.35g	0.79g	100%

Table 23.69. LA 6171, Structure 26 Floor Fill and Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	26 Structure Floor		27 Small Cobble-Filled Thermal Pit	
	Level 6 Stratum 37 NW1/4	Level 6 Stratum 45 SW1/4	Level 1 Stratum 77	Level 4
FS	850	854	908	929, 930
		Cultural		
Annuals:				
Chenopodium	3.9	-	-	0.7
Compositae	0.5	-	-	-
Iva	0.5	-	-	-
Other:				
Unknown	+nr	-	-	-
Perennials:				
Juniperus	-	-	-	1.1, +twig
Cultivars:				
Cucurbita	+rind	-	-	-
Zea mays	+cupule, +glume	+c	-	-
		Non-Cultural		
Annuals:				
Croton	-	7.7	-	-
Euphorbia	-	-	0.6	-

Plant remains are seeds unless otherwise indicated;
All cultural plant material is carbonized.

Table 23.70. LA 6171, Structure 26 Floor Fill and Features, Wood Charcoal from Flotation Samples, Weight in Grams

Feature	F. 26 Structure Floor		F. 27 Small Cobble-Filled Thermal Pit				Totals	
Context	Level 6 Strat 37 NW1/4	Level 6 Strat 45 SW 1/4	Level 1, Stratum 77	Ash/ Charcoal, Level 2	Level 4	Level 4	Weight	%
FS	850	854	908	909	929	930		
Conifers:								
Juniperus	.20g	.20g	.50g	7.86g	1.70g	2.00g	12.46g	54%
Non-Conifers:								
Atriplex	-	-	-	8.54g	-	-	8.54g	37%
Salicaceae	.04g						.04g	<1%
Sarcobatus/Atriplex	.10g	.04g	.40g	.90g	.10g	-	1.18g	5%
Other:								
Unknown	-	-	-	.88g	-	-	.88g	4%
Totals	.34g	.24g	.54g	18.18g	1.80g	2.00g	23.1g	100%

Table 23.71. LA 6171, Structure 18 Floor, Flotation Plant Remains, Frequency and Abundance per Liter

Quadrant	NW	SW	NE	SE
FS	521	528	532	542
		Cultural		
Annuals:				
Amaranthus	-	-	0.5	-
Chenopodium	0.5	0.3	2.0	9.1
Portulaca	-	0.3	-	0.6
Cultivars:				
Zea mays	+c	+c	+c, +g	+c, +g
Other:				
Unidentifiable	-	-	-	0.6
Unknown	+bark	-	-	+nr
Perennials:				
Pinus	-	-	+fascicle	-
		Non-Cultural		
Annuals:				
Chenopodium	-	0.6	0.5	0.6
Corispermum	0.8	-	-	-
Perennials:				
Pinus edulis	.3n	-	-	-

Plant remains are seeds unless otherwise indicated;

All cultural plant material is carbonized.

+ = less than 10, c = cupule, g = glume, n = nutshell, nr = non-reproductive

Table 23.72. LA 6171, Structure 18 Floor, Wood Charcoal from Flotation Samples, Weight in Grams

Quadrant	NW	NE	SE	Totals	
FS	521	532	542	Weight	%
Conifers:					
Juniperus	0.50g	0.50g	0.50g	1.50g	81%
Unknown conifer	-	-	0.04g	0.04g	2%
Non-Conifers:					
Salicaceae	0.10g	0.04g	0.10g	0.24g	13%
Sarcobatus/Atriplex	0.04g	0.04g	-	0.08g	4%
Totals	0.64g	0.58g	0.64g	1.86g	100%

Table 23.73. LA 6171, Structure 9 Floor Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	12 Remodeled Hearth	13 Primary Hearth	14 Small Burned Pit	16 Ash Pit
FS	643	660	650	680
		Cultural		
Annuals:				
Amaranthus	2.0	-	-	1.6
Chenopodium	0.5	-	-	-
Cycloloma	-	-	-	1.3
Cultivars:				
Zea mays	+c	-	-	+c
Grasses:				
Gramineae	+s	-	+s	+s
		Non-Cultural		
Annuals:				
Amaranthus	-	-	-	1.3
Chenopodium	-	0.6	0.8	1.6
Other:				
Unidentifiable	0.5	-	-	-

Plant remains are seeds unless otherwise indicated;
All cultural plant material is carbonized. c = cuple, s = stem, + = less than 10

Table 23.74. LA 6171, Structure 9 Floor Features, Wood Charcoal (Flotation and Macrobotanical), Weight in Grams

	Flotation		Macrobotanical		Total	
Feature	12 Remodeled Hearth	14 Small Burned Pit	13 Primary Hearth	16 Ash Pit		
FS	643	650	660	680	Wt	%
Conifers:						
Juniperus	0.20g	0.50g	6/.06g	10/2.74g	3.50g	42%
Non-Conifers:						
Rosaceae	-	-	4/.12g	-	0.12g	1%
Salicaceae	1.90g	0.30g	5/.09g	11/1.42g	3.71g	44%
Sarcobatus/Atriplex	-	0.90g	-	1/.15g	1.05g	12%
Unknown	-	-	4/0.05g	-	0.05g	1%
Total	2.10g	1.70g	19/0.32g	22/4.31g	8.43g	100%

Table 23.75. LA 115862, Study Unit 1 (Pit Structure) Floor and Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature FS	Floor Fill	18 Basin-Shaped Pit 224	19 Central Hearth 227	20 Ash Pit 233
		Cultural		
Annuals:				
Chenopodium	-	-	0.5	-
Cultivars:				
Zea mays	+g	-	+c	+c, .5k
		Non-Cultural		
Annuals:				
Amaranthus	-	-	0.5	1.1
Chenopodium	1.0	0.5	-	44
Euphorbia	-	1.5	-	-
Polanisia	-	-	-	0.5
Portulaca	1.0	0.5	-	1.1

Plant remains are seeds unless otherwise indicated; all cultural plant material is carbonized. + = less than 10, c = cupule, g = glume, k = kernel

Table 23.76. LA 115862, Study Unit 1 (Pit Structure) Floor and Features, Wood Charcoal from Flotation and Carbonized Wood Samples, Count and Weight in Grams

Sample Type	Flotation	Macrobotanical Wood				Totals	
Feature	20 Ash Pit	14 Posthole, NE quad	16 Posthole, SW Quad	17 Posthole, NW Quad	21 Deflector Posthole	Weight	%
FS	233	209	221	222	236		
Conifers:							
Juniperus	1.76g	39/.17g	21/.43g	-	26/.74g	3.10g	80%
Non-Conifers:							
Salicaceae	.02g	-	17/.18g	2/.15g	14/.35g	.70g	18%
Sarcobatus/Atriplex	-	-	1/.02g	-	1/.04g	.06g	1%
Unknown non-conifer	-	-	-	-	2/.02g	.02g	<1%
Other:							
Unknown wood	.01g	-	-	-	-	.01g	<1%
Totals	1.79g	.17g	.63g	.15g	1.15g	3.89g	100%

Table 23.77. LA 115862, Extramural Activity Area and Features, Flotation Plant Remains, Frequency and Abundance per Liter

Feature	5 Large Burned Pit	9 Large Cobble-Filled Thermal Pit	10 Charcoal/Ash Stain	11 Large Cobble-Filled Thermal Pit	12 Charcoal/Ash Stain
FS	154	192	193	197	195
			Cultural		
Annuals:					
Amaranthus	-	-	1.7	-	-
Chenopodiaceae	-	-	0.8	-	-
Chenopodium	-	-	19.8	-	1.0pc
Cheno-Am	-	0.5	-	-	-
Portulaca	-	-	-	1.5	-
Cultivars:					
Zea mays	+ur	+c, 0.5k	-	+c, +g, +ur	+ur
Other:					
Unidentifiable	-	0.5	-	-	-
Unknown	-	0.5pp	2.0e	0.5pp	0.5e
Perennials:					
Scirpus	-	-	0.8	-	-
			Non-Cultural		
Annuals:					
Amaranthus	-	-	-	-	2.5
Cheno-Am	0.5	-	-	-	-
Euphorbia	0.5	-	0.5	-	0.5
Portulaca	-	-	9.7	-	7.5
Suaeda	0.5	-	-	-	-
Grasses:					
Sporobolus	2.0	-	-	-	-

Plant remains are seeds unless otherwise indicated;
All cultural plant material is carbonized (pc indicates partially carbonized).
+ = less than 10, c = cupule, e = embryo, g = glume, k = kernel, ur = unknown reproductive

Table 23.78. Peña Blanca Earliest Developmental and Early Developmental Carbonized Plant Remains (Occurrence in Percent of Samples with Carbonized Remains)

	LA 6171 Earliest Developmental	LA 265 Early Developmental	LA 6169 Early Developmental	LA 6170 Early Developmental	LA 6171 Early Developmental	LA 115862 Early Developmental
# of samples with charred remains	6	69	8	27	20	9
Annuals:						
Amaranthus	33%	23%	13%	15%	15%	11%
Chenopodium	100%	58%	75%	30%	70%	44%
Cheno-Am	83%	17%	25%	15%	10%	22%
Compositae	-	-	-	-	5%	-
Corispermum	17%	1%	-	-	-	-
Cycloloma	33%	1%	-	7%	5%	-
Iva	-	-	-	-	5%	-
Physalis	-	1%	-	-	-	-
Portulaca	-	14%	25%	15%	10%	11%
Salvia	-	1%	-	-	-	-
Suaeda	17%	-	-	-	-	-
Cultivars:						
Cucurbita	17%	1%	-	-	5%	-
Zea mays	83%	97%	88%	81%	75%	89%
Grasses:						
Gramineae	17%	4% stem	25% stem	4%, 7% stem	10%	-
Phragmites	-	1% stem	13% stem	7% stem	-	-
Sporobolus	-	1%	13%	-	-	-
Other:						
Monocotyledonae	17% stem	1% stem	13% stem	26% stem	-	-
Unknown #9211	-	1%	-	-	-	-
Perennials:						
Cylindropuntia	-	3%	-	4%	-	-
Juniperus	17%	3%	-	4% twig	5%	-
Pinus edulis	-	12%	25%	19%		-
Platyopuntia	-	9%	-	-	5%	-
Rhus	-	3%	-	-	-	-
Scirpus	-	-	-	-	-	11%
Yucca	-	-	leaf	4% fiber, 4% leaf	-	-
Yucca baccata	-	1%	-	-	-	-
Total taxa	11	20	10	13	12	6

Occurrences are seeds or fruits, unless otherwise specified. *Zea mays* occurrences include cupules, cob fragments, and kernels.

Table 23.79. Peña Blanca Taxonomic Composition of Flotation Assemblage by Time Period

	Developmental Period						Coalition Period	
	EARLIEST #/% of Economic Occurrences		EARLY #/% of Economic Occurrences		LATE #/% of Economic Occurrences		#/% of Economic Occurrences	
Sites	LA 6171		LA 265, 6169, 5170, 6171, 115862		LA 249, 6169, 6170		LA 6169	
Flotation samples	6		133		21		11	
Annuals:								
Amaranthus	2	52%	25	37%	1	27%	-	27%
Chenopodium/Amaranthus	5	-	20	-	3	-	3	-
Chenopodium	6	-	72	-	9	-	5	-
Cleome	-	-	-	-	-	-	1	-
Corispermum	1	-	1	-	-	-	1	-
Cycloloma	2	-	4	-	1	-	-	-
Physalis	-	16%	1	8%	-	8%	-	20%
Plantago	-	-	-	-	-	-	1	-
Portulaca	-	-	19	-	3	-	-	-
Suaeda	1	-	-	-	-	-	-	-
Cultivars:								
Cucurbita	1	-	3	-	-	-	-	-
Zea mays	5	24%	118	38%	21	43%	9	30%
Grasses:								
Gramineae	1	-	8	-	3	-	2	-
Oryzopsis	-	-	-	-	-	-	1	
Phragmites	-	4%	4	5%	2	10%	-	13%
Sporobolus	-	-	3	-	-	-	1	-
Other: [1]								
Compositae	-	-	1	-	-	-	-	-
Euphorbia	-	-	-	-	-	-	1	-
Iva	-	0	1	1%	-	0	-	3%
Salvia	-	-	1	-		-	-	-
Scirpus	-	-	1	-	-	-	-	-
Perennials:								
Atriplex canescens	-	-	-	-	1	-	-	-
Carex	-	-	-	-	-	-	1	-
Cylindropuntia	-	-	3	-	1	-	-	-
Echinocereus	-	-	-	-	1	-	-	-
Juniperus	1	4%	4	11%	-	12%	1	7%
Pinus edulis	-	-	15	-	2	-	-	-
Platyopuntia	-	-	7	-	1	-	-	-
Rhus	-	-	3	-	-	-	-	-
Yucca	-	-	4	-	-	-	-	-
Total Number of Taxa	9		23		12		12	
Total Number of Occurrences	25		318		49		30	

[1] Taxonomic group that includes both annual and perennials

Table 23.80. Peña Blanca Late Developmental through Classic Period Carbonized Plant Remains

	LA 6169 Late Develop-mental	LA 6170 Late Develop-mental	LA 249 Late Develop-mental	LA 6169 Coalition	LA 249 Classic
# of samples with charred remains	10	4	7	11	4
Annuals:					
Amaranthus	10%	-	-	-	-
Chenopodium	80%	-	14%	45%	-
Cheno-Am	30%	-	-	27%	-
Cleome	-	-	-	9%	-
Corispermum	-	-	-	9%	-
Cycloloma	10%	-	-	-	-
Euphorbia	-	-	-	9%	-
Plantago	-	-	-	9%	-
Portulaca	30%	-	-	27%	-
Cultivars:					
Zea mays	100%	100%	100%	82%	100%
Grasses:					
Gramineae	20% stem	25% stem	-	9%, 9% stem	-
Oryzopsis	-	-	-	9%	-
Phragmites	-	50% stem	-	-	-
Sporobolus	-	-	-	9%	-
Other:					
Monocotyledonae	-	-	14% stem	-	-
Unknown #9210	-	-	-	9%	-
Perennials:					
Atriplex	-	25%	-	-	-
Carex	-	-	-	9%	-
Cylindropuntia	10%	-	-	-	-
Echinocereus	10%	-	-	-	-
Juniperus	10% leaflet, 10% twig	-	-	9% leaflet	-
Pinus edulis	10%	25%	-	-	-
Platyopuntia	-	25%	-	-	-
Yucca	-	-	14% fiber	-	-
Total taxa	11	7	4	14	1

Table 23.81. Peña Blanca Earliest Developmental through Coalition Thermal Features with Primary Deposits, Presence of Plant Taxa in Flotation Samples

Time Period and Feature Type	Early Developmental: Other Thermal Features	Early Developmental: Cobble-Filled Thermal Pits	Late Developmental: Other Thermal Features	Late Developmental: Cobble-Filled Thermal Pits	Coalition: Other Thermal Features
# of features with primary deposits	11	8	2	1	3
Annuals:					
Amaranthus	+	-	-	+	+
Chenopodium	+	+	+	+	+
Cheno-Am	+	+	+	+	+
Cleome	-	-	-	-	+
Cycloloma	+	-	-	-	-
Euphorbia	-	-	-	-	+
Plantago	-	-	-	-	+
Portulaca	+	+	+	+	+
Cultivars:					
Cucurbita	-	-	-	-	-
Zea mays	+	+	+	+	+
Grasses:					
Gramineae	-	+stem	-	-	+
Oryzopsis	-	-	-	-	+
Sporobolus	-	-	-	-	+
Other:					
Monocotyledonae	+stem	-	-	-	-
Perennials:					
Carex	-	-	-	+	-
Cylindropuntia	-	-	-	+	-
Juniperus	-	+	-	+leaflet	+leaflet
Pinus edulis	+	-	-	+	-
Platyopuntia	+	-	-	-	-
Rhus	+	-	-	-	-
Total taxa	10	6	4	8	13

Table 23.82. Peña Blanca Earliest and Early Developmental Flotation Wood Charcoal, Percent Weight

Site/Time Period	LA 6171 Earliest Developmental	LA 265 Early Developmental	LA 6169 Early Developmental	LA 6170 Early Developmental	LA 6171 Early Developmental	LA 115862 Early Developmental
# of samples with wood charcoal	2	47	8	15	14	2
Conifers:						
Juniperus	67%	74%	54%	36%	57%	97%
Pinus	-	<1%	-	-	-	-
Pinus edulis	-	1%	1%	<1%	-	-
Unknown conifer	22%	1%	-	-	<1%	2%
Non-Conifers:						
Artemisia	-	<1%	-	-	-	-
Atriplex/Sarcobatus	3%	6%	28%	3%	35%	-
Cercocarpus	-	-	-	1%	-	-
Cylindropuntia	-	1%	-	-	-	-
Quercus	-	<1%	1%	-	-	-
Salicaceae	9%	17%	16%	60%	8%	1%
Unknown non-conifer	-	1%	1%	1%	-	-
Total Weights	0.79g	32.26g	7.82g	28.54g	31.00g	2.09g

Table 23.83. Peña Blanca Late Developmental through Classic Flotation Wood Charcoal, Percent Weight

Site/Time Period	LA 6169 Late Developmental	LA 6170 Late Developmental	LA 249 Late Developmental	LA 6169 Coalition	LA 249 Classic
# of Flotation Samples with Wood Charcoal	8	2	6	9	9
Conifers:					
Ephedra	-	-	5%	-	9%
Juniperus	67%	53%	69%	25%	45%
Pinus edulis	6%	-	4%	4%	6%
Pinus ponderosa	-	-	-	-	2%
Unknown conifer	-	-	11%	-	20%
Non-Conifers:					
Atriplex/Sarcobatus	7%	13%	1%	35%	2%
Chrysothamnus	-	-	-	2%	-
Cylindropuntia	-	-	-	1%	-
Lycium	1%	-	-	2%	-
Rosaceae	-	-	3%	-	5%
Salicaceae	17%	34%	4%	31%	7%
Unknown non-conifer	1%	-	3%	1%	5%
Total Weight of Identified Charcoal	5.35g	1.88g	5.55g	5.07g	3.27g

Table 23.84. Peña Blanca Wood Charcoal from Intramural and Extramural Thermal Features with Primary Deposits

Thermal Feature Type	Intramural		Extramural	
# of samples	13		9	
	weight	%	weight	%
Conifers:				
Juniperus	26.40g	65%	6.08g	56%
Pinus	0.04g	<1%	-	-
Pinus edulis	0.14g	<1%	0.04g	1%
Total Conifer	26.58g	65%	6.12g	57%
Non-Conifers:				
Atriplex/Sarcobatus	12.62g	31%	4.28g	40%
Cylindropuntia	0.04g	<1%	-	-
Lycium	0.10g	<1%	-	-
Quercus	0.04g	<1%	-	-
Salicaceae	1.48g	4%	0.38g	3%
Total Non-conifer	14.28g	35%	4.66g	43%
Total Weight of Identified Charcoal	40.86g	100%	10.78g	100%

Table 23.85. Peña Blanca *Zea mays* Cob Morphometrics, in mm

Site	FS #	Row #	Cob Portion	Row Type	Length	Cob Diameter	Cupule Width	RSL*
LA 249	282	12	M	ST	38.5	17.6	8.2	3.3
LA 265	653	14	M	ST	44.1	20.0	7.7	3.6
	727	10	M	ST	9.1	8.9	5.3	3.7
	690	10	M	ST	12.0	9.0	4.3	2.3
	1713	12	M	-	15.1	10.3	3.5	2.7
LA 6170	1073	14	T	ST	24.9	9.3	3.1	2.8
	1130	12	T	ST	78.9	19.2	7.8	3.3
	1143	16	M	ST	29.8	11.6	4.1	3.1
	1192	10	M	ST	11.2	6.9	3.2	3.1
	1463	10	T	ST	16.4	8.2	4.5	2.6
	1636	8	T	ST	21.5	5.4	5.6	2.7
	1636	12	M	ST	41.1	17.0	7.3	3.2
	1817	12	M	ST	39.5	7.6	6.8	3.3
	1819	12	M	ST	15.6	12.4	5.4	4.2
	1819	12	T	ST	35.6	13.9	5.8	4.1
	1819	12	T	ST	33.9	10.3	4.1	3.0
	1819	12	M	ST	16.1	9.1	4.7	3.2
	1823	12	M	ST	53.9	12.8	6.3	3.8
	1903	12	M	ST	31.7	15.0	5.9	4.1
	1903	12	M	ST	27.7	14.0	5.3	3.4
	1903	12	M	ST	26.8	13.6	6.4	3.1
	1903	12	M	ST	42.4	15.9	6.6	3.0
	1903	12	M	ST	59.3	20.2	7.8	3.5
	1937	12	M	ST	33.4	17.4	6.5	3.7
	1949	10	T	ST	25.2	10.6	5.1	4.6
	1949	10	M	ST	12.4	9.9	3.6	2.7
	1949	14	M	ST	26.1	10.3	3.8	3.6
	1967	12	M	ST	28.0	14.5	5.7	3.4
	2082	16	M	ST	44.7	20.0	7.0	3.8
	2082	16	M	ST	25.8	17.8	7.0	3.5
	2082	16	M	ST	22.2	15.3	6.3	3.9
	2133	12	M	IR	30.3	14.6	6.2	3.0
LA 6170	2269	12	M	ST	22.5	15.6	6.5	3.0
	2407	8	T	ST	34.9	9.1	4.0	2.5
	2407	12	M	ST	21.5	11.5	6.0	3.1
	2441	10	M	ST	23.3	11.8	6.3	4.0
Averages		12	22% T	3% IR	29.9	12.5	5.7	3.3
			78% M	97% ST				

36 cobs measured; Rachis segment length, M mid-section, IR irregular, ST straight, T tip

Table 23.86. Comparative *Zea* Cob Morphometrics, from the Middle Rio Grande Valley and San Juan Basin

	Row Number						Cob Diameter mm		Cupule Width mm		RSL mm	
	% 8 or Less	% 10	% 12	%14 or more	n	Average	n	Average	n	Average	n	Average
Peña Blanca	6%	19%	56%	19%	36	12	36	12.5	36	5.7	6	3.3
KP site [Late Developmental][1]	17%	34%	47%	2%	66		66	[85% in 3-5 mm range] rachis	66	[94% in 3.0-3.5 mm range]	-	-
LA 3333 Galisteo Basin	14%	42%	40%	4%	43	10.8	43	12.7	43	6.1	43	3.1
River's Edge I[2]	15%	15%	49%	21%	33	11.2	33	10.7 rachis	33	5.5	33	3.7
River's Edge II[3]	-	10%	64%	26%	50	12.6	49	36.0 cobs with intact kernels	-	-	-	-
LA 3128 AD 650-900												
River's Edge III[4]	-	14%	44%	42%	21	13	-	-	-	-	-	-

[1]KP Site, Wiseman 1989:85, [2]Brandt 1991, Fig 1, Table 13; [3]Brandt 1991b, Appendix 8; [4]Brandt 1992, Table 10.

Table 23.87. Peña Blanca *Zea mays* Kernel Morphometrics

Site	FS #	Lacks Embryo?	Swollen?	Height	Width	Thickness
LA 265	1471	N	N	8.3	6.9	5.5
		Y	Y	3.7	4.8	4.0
LA 6170	1136	Y	Y	5.4	7.3	6.0
		Y	N	7.6	7.7	5.4
		N	Y	6.8	8.0	6.9
		Y	Y	6.7	7.6	5.9
		N	N	7.5	7.9	5.9
		N	N	8.6	8.0	4.5
		N	N	5.2	6.1	4.0
		N	N	4.6	6.1	3.8
		Y	Y	6.8	9.6	4.6
		N	N	6.9	5.9	5.9
		N	Y	6.2	8.1	5.1
		Y	Y	7.7	8.5	4.9
		Y	Y	7.1	8.3	5.9
		Y	Y	6.4	7.9	6.4
	2146	N	N	7.6	7.4	4.5
		N	N	8.3	7.4	4.2
		N	N	8.0	7.9	4.2
		N	N	8.2	8.6	4.4
		N	N	6.9	6.3	5.1
		N	N	8.6	8.0	6.2
		N	N	9.2	7.0	4.4
		N	N	7.9	6.6	4.6
		N	N	6.9	6.5	5.0
		N	N	8.0	7.7	4.0
		N	N	7.9	6.8	4.3
		N	N	8.0	6.8	3.6
		N	N	7.6	7.8	3.8
		N	N	8.3	7.9	4.7
		N	N	7.8	7.6	4.1
		N	N	7.7	7.4	4.4
		N	N	7.4	8.6	3.7
		N	N	8.6	8.0	4.7
		N	N	7.6	7.7	4.8
		N	N	8.7	8.1	5.1
		N	N	9.1	7.6	4.9
		N	N	7.9	7.9	3.4
		Y	Y	7.9	9.6	4.8
		N	Y	6.5	8.0	5.0
		N	Y	10.7	9.2	4.9
		N	N	8.1	7.3	4.2
		N	Y	9.4	8.0	4.1
		N	N	7.8	7.1	5.8
		N	N	8.3	8.1	5.3
		N	N	7.1	7.6	4.4
		N	N	7.1	6.9	4.8
		Y	N	6.8	6.4	4.6
		N	Y	8.2	6.9	6.6
		N	Y	7.1	7.6	6.7
		N	Y	8.2	8.6	7.1
		N	Y	7.6	8.9	7.2
		N	Y	6.4	9.1	5.9
Averages		17% lack embryo 83% have embryo	35% swollen 65% not swollen	7.7	7.8	5.1

N=52 kernels; N no Y yes

Table 23.88. Comparative *Zea* Kernel Morphometrics over Time, from Peña Blanca Sites, the Middle and Northern Rio Grande Valley, and the San Juan Basin

Time	Project	n of Kernels	Embryo Missing	Swollen	Mean HT in mm	Mean W in mm	Mean TH in mm	Endosperm Type
Early Developmental	Peña Blanca							
	LA 265	2	50%	50%	6 [3.7-8.3]	5.9 [4.8-6.7]	4.8 [4.0-5.5]	unk.
	LA 6170	50	18%	34%	7.8 [6.4-10.7]	7.9 [6.4-9.1]	5.1 [3.4-7.2]	unk.
	River's Edge II[1]							
	LA 3128	85	--	15%[2]	8.7[3] [5.3-11.0]	8.9 [5.6-1.2]	4.1 [3.0-6.2]	flint
	River's Edge III[4]							
	LA 59624	(no count; 42.7g)	--	[not measured or described]				flint
Late Developmental	Cochiti[5]							
	LA 6461	61	–	--	7.9	7	3.6	--

All specimens carbonized

[1] Brandt 1991b:Appendix 9 (raw data)

[2] noted as Round

[3] Average computed from raw data is 8.7, however Brandt (p. 26) quotes average height (same dimension as length) as 7.9 mm. All other average dimension match raw data.

[4] Brandt 1992

[5] Ford 1968:242

Table 23.89. LA 6170 *Phaseolus* Morphometrics (dimensions in mm)

FS #	Length	Width	Thickness	Estimated Thickness (Partial Beans)
Whole Beans				
1820	12.5	7.6	5.1	-
2269	11.2	6.8	4.7	-
Partial Beans				
1913	12.9	7.2	2.6	5.2
2272	11.9	6.1	2.9	5.8
2272	broken	5.3	2.0	4.0
Averages	12.1	6.6	5.0	-

Table 23.90. Comparative Morphometrics of Common Beans *(Phaseolus vulgaris)* in Peña Blanca and Chaco (Average Dimensions in mm)

	All Specimens				Whole Beans		Single Cotyledons	
Site and Time Period	Average Length	n	Average Width	n	Average Thickness	n	Average Thickness	n
Peña Blanca:								
LA 6170[1]	12.1	4	6.6	5	4.9	2	2.5	3
Chaco: (Contemporary with Peña Blanca) BM/PI								
29SJ628[2]	12.9	2	6.8	2	5.5	2	-	-
Chaco: (Later periods) PII								
29SJ626[3]	12	6	7	7	5	7	-	-
29SJ629[4]	9.5	12	5.7	14	4.3	5	2.7	9
Chaco: PIII Bc288[5]								
C-11, C-14	13.8	24	7.3	24	5.4	24	-	-
C-15	9.3	5	6.6	5	4.8	5	-	-

[1]This study (carbonized specimens).

[2]Toll 1993a (carbonized specimens).

[3]Toll 1986 (carbonized specimens).

[4]Toll 1993b (carbonized specimens).

[5]Kaplan n.d. (unburned specimens).

Table 23.91. Comparative Ubiquity of Carbonized Flotation Remains from Middle Rio Grande Sites (% Presence in Flotation Samples with Carbonized Floral Remains Other than Wood*)

Project/Site	n of Samples*	Location	Annuals	Grasses	Trees and Shrubs	Other Perennials	Cultivars
Early-Middle Archaic:							
LA 109137[1]	1(11)	On Ceja Mesa between the Rio Puerco and Rio Grande drainages near Bernalillo	*Sporobolus* 100%			*Platyopuntia* 100%	
Middle Archaic:							
LA 190105, 109108, 109109[2]	16 (18)	On Ceja Mesa between the Rio Puerco and Rio Grande drainages near Bernalillo	Cheno-Am 13% *Chenopodium* 19% *Portulaca* 6%	Gramineae 6% *Sporobolus* 6%		*Cylindropuntia* 88% *Echinocereus* 6%	
MAPCO, LA 25675, 25851[1]	2 (4)	Las Huertas and Jemez Valleys	*Chenopodium* 100% *Descurainia* 50%				
Middle-Late Archaic:							
MAPCO, LA 110952[1]	9 (13)	Jemez Valley on Zia Pueblo lands	Cheno-Am 11% *Chenopodium* 11%	Gramineae 78% *Oryzopsis* 22%			
Late Archaic:							
Unit 22, LA 109100, 109105, 109110[2]	12 (19)	On Ceja Mesa between the Rio Puerco and Rio Grande drainages near Bernallilo	*Amaranthus* 17% Cheno-Am 8% *Chenopodium* 42% *Chenopodium berlandieri* 8% *Helianthus* 8% *Physalis* 17%	Gramineae 8%	*Juniperus* 50%	*Cylindropuntia* 42% *Echinocereus* 8%	
MAPCO, LA 25864, 27632, 110942, 110948, 110952[1,3]	32 (38)	On a stabilized dune (LA 25864) and terraces on Santa Ana and Zia Pueblo lands	*Amaranthus* 3% Cheno-Am 50% *Chenopodium* 31% *Portulaca* 6% *Suaeda* 3%	Gramineae 25% *Oryzopsis* 9% *Sporobolus* 47%	*Juniperus* 41%	*Sphaeralcea* 6% *Yucca* 6%	*Zea mays* 16%
Highway 44, LA 91934	4 (13)	On a ridgetop in the Jemez Valley near Zia Pueblo		*Sporobolus* 25%	*Juniperus* 25%		*Zea mays* 50%
Earliest Developmental							
PEÑA BLANCA LA 6171	6 (7)	E edge of Rio Grande floodplain on a terrace,Cochiti Pueblo	*Amaranthus* 33% Cheno-Am 83% *Chenopodium* 100% *Corispermum* 17% *Cycloloma* 33% *Suaeda* 17%	Gramineae 17%	*Juniperus* 17%		*Cucurbita* rind 17% *Zea mays* 83%
MAPCO, LA 25856, 109129[1,3]	24 (24)	On coppice dunes (LA 25856) and a terrace in the Jemez Valley on Zia Pueblo lands	*Amaranthus* 46% Cheno-Am 58% *Chenopodium* 92% *Corispermum* 67% *Cycloloma* 52% *Descurainia/Sisymbrium* 8% *Helianthus* 43% *Nicotiana* 8% *Physalis* 4% *Portulaca* 48% *Salvia* 25%	Gramineae 21% *Oryzopsis* 35% *Phragmites* stems 13% *Sporobolus* 67%	*Juniperus* 33% *Pinus edulis* nutshells 17%	*Boerhavia* 17% *Cylindropuntia* 46% Cyperaceae 38% *Echinocereus* 21% *Eriogonum* 4% *Platyopuntia* 42% *Sphaeralcea* 8% *Yucca* pod 4% *Yucca baccata* 13%	poss. *Cucurbita* 4% *Zea mays* 100%

Table 23.91. Continued.

Project/Site	n of Samples*	Location	Annuals	Grasses	Trees and Shrubs	Other Perennials	Cultivars
Early Developmental							
Rivers Edge I[5]	75 (114)	Terrace just W of Rio Grande, W of Corrales	Cheno-Am 61% *Corispermum* 1% Cruciferae 1% *Cycloloma* 4% *Nicotiana* 1% *Physalis* 4% *Portulaca* 8%	Gramineae 7% *Oryzopsis* 8% *Sporobolus* 4%	*Juniperus* 3% *Pinus edulis* 4%	*Cylindropuntia* 57% Cyperaceae 9% *Echinocereus* 5% Fabaceae 1% *Yucca* 3%	*Zea mays* 99%
Rivers Edge II[6]	60 (68)	Terrace just W of Rio Grande, W of Corrales	*Amaranthus* 3% Cheno-Am 23% *Chenopodium* 32% *Cleome* 2% *Corispermum* 22% *Cycloloma* 7% *Physalis* 2% *Portulaca* 2%	Gramineae 15% *Oryzopsis* 25% *Phragmites* stems 2% *Sporobolus* 12%	*Atriplex* 2% *Celtis* 2% *Juniperus* 10% *Pinus edulis* nutshell 10%	Cyperaceae 2% *Cylindropuntia* 15% Malvaceae 2% *Platyopuntia* 2%	*Cucurbita* 2% *Phaseolus* 3% *Zea mays* 95%
Rivers Edge III LA 59624, 59632, 80899[7]	16 (18)	Terrace just W of Rio Grande, W of Corrales	Cheno-Am 31% *Chenopodium* 19% *Corispermum* 6%	Gramineae 38% *Oryzopsis* 13% *Phragmites* stem 38%	*Juniperus* 6% *Pinus edulis* 13% *Pinus ponderosa* needle 6% *Psuedotsuga menziesii* 6%	*Rhus trilobata* 13% *Sphaeralcea* 6% *Yucca* 6%	*Zea mays* 75%
PEÑA BLANCA LA 265, 6169, 6170, 6171, 11586[2]	133 (142)	Terraces overlooking Rio Grande floodplain, Cochiti Pueblo	*Amaranthus* 19% Cheno-Am 15% *Chenopodium* 54% Compositae 1% *Corispermum* 1% *Cycloloma* 3% *Iva* 1% *Physalis* 1% *Portulaca* 14% *Salvia* 1%	Gramineae 6% stems 2% *Phragmites* stems 3% *Sporobolus* 2%	*Juniperus* 3% *Pinus edulis* 11% *Rhus* 2%	*Cylindropuntia* 2% *Platyopuntia* 5% *Scirpus* 1% *Yucca* 2% *Yucca baccata* 1%	*Cucurbita* 2% *Zea mays* 89%
North Hill[8]	29 (48)	W of the Rio Grande along S edge of Arroyo de los Montoyas near Albuquerque	Cheno-Am 45% cf. *Croton* 3% *Nicotiana* 3%	Gramineae 3% *Oryzopsis* 3% *Sporobolus* 3%	*Juniperus* 3% *Pinus edulis* 11% *Rhus* 2%	*Cylindropuntia* 7% Fabaceae 3% *Platyopuntia* 3% *Sphaeralcea* 3% *Yucca* 7%	*Zea mays* 76%
Highway 44, LA 32698[4]	39 (41)	On top of a dune in Jemez Valley	*Amaranthus* 18% *Amsinckia* 3% Cheno-Am 54% *Chenopodium* 72% *Cleome* 3% *Corispermum* 5% *Cycloloma* 28% *Descurainia/Nicotiana* 3% *Sisymbrium* 18% *Portulaca* 18% *Suaeda* 3%	Gramineae 28% *Oryzopsis* 28% *Sporobolus* 8%	*Atriplex canescens* 8% *Juniperus* 13% *Pinus edulis* nutshell 28%	*Carex* 5% *Cylindropuntia* 13% Cyperaceae 10% *Echinocereus* 10% *Platyopuntia* 21% *Sphaeralcea* 3% *Yucca baccata* 3%	poss. *Cucurbita* 13% *Zea mays* 92%

Table 23.91. Continued.

Project/Site	n of Samples*	Location	Annuals	Grasses	Trees and Shrubs	Other Perennials	Cultivars
MAPCO, LA 25862[3]	14 (17)	Sandy slope on the S edge of Jemez River Valley on Zia Pueblo lands	*Amaranthus* 21% Cheno-Am 64% *Chenopodium* 57% *Corispermum* 36% *Cycloloma* 50%	Gramineae 14% *Oryzopsis* 21% *Phragmites* stems 14%	*Atriplex canescens* 14%	*Cylindropuntia* 14% Cyperaceae 7% *Platyopuntia* 21% *Yucca baccata* 21%	poss. *Cucurbita* 7% *Phaseolus* 7% *Zea mays* 100%
ZIA LA 99529[9]	55 (58)	On top of Kowasaiya Tsia Mesa in the lower Jemez River Valley on Zia Pueblo lands	Cheno-Am 9% *Chenopodium* 9% *Chenopodium berlandieri* 4% *Corispermum* 2% cf. *Cycloloma* 2% *Descurainia/Sisymbrium* 7% cf. *Nicotiana* 2% *Portulaca* 16%	Gramineae 2% *Oryzopsis* 2% *Sporobolus* 4%	*Atriplex canescens* 2% *Juniperus* 7% *Pinus edulis* nutshell 2%	cf. *Boerhavia* 2% *Echinocereus* 4% *Platyopuntia* 5% cf. *Rhus* 2% *Yucca baccata* 2%	*Zea mays* 95%
Middle-Late Developmental							
Unit 20 West, LA 99676, 99689[2]	4 (5)	On Ceja Mesa between the Rio Puerco and Rio Grande drainages near Bernalillo	*Chenopodium* 75% *Chenopodium berlandieri* 25% *Corispermum* 25% *Cycloloma* 25% *Portulaca* 25%	*Sporobolus* 25%	*Juniperus* 25%	*Cylindropuntia* 25%	
LA 25852, 25860, 25869[10]	11 (14)	S of Jemez River in piñon/juniper woodland near Zia Pueblo	*Chenopodium* 45% *Portulaca* 9%			Cyperaceae 9% Malvaceae 9%	*Zea mays* 91%
Highway 44 LA 9193[4]	38 (55)	On a ridgetop in the Jemez River Valley near Zia Pueblo	*Amaranthus* 5% Cheno-Am 16% *Chenopodium* 29% *Cycloloma* 5% *Polanisia* 3% *Portulaca* 5% *Suaeda* 3%	Gramineae 11% *Oryzopsis* 5% *Phragmites* stem 18%	*Pinus edulis* nutshell 3%	*Cylindropuntia* 3% *Echinocereus* 3%	*Zea mays* 79%
Late Developmental							
PEÑA BLANCA LA 249, 6169, 6170	21 (21)	Terraces overlooking Rio Grande floodplain, Cochiti Pueblo	*Amaranthus* 5% Cheno-Am 14% *Chenopodium* 43% *Cycloloma* 5% *Portulaca* 14%	Gramineae stem 14% *Phragmites* stem 10%	*Atriplex canescens* 5% *Pinus edulis* nutshell 10%	*Cylindropuntia* 5% *Echinocereus* 5% *Platyopuntia* 5%	*Zea mays* 100%
Coalition							
PEÑA BLANCA LA 6169	12 (25)	Terraces overlooking Rio Grande floodplain, Cochiti Pueblo	Cheno-Am 25% *Chenopodium* 50% *Cleome* 8% *Corispermum* 8% *Euphorbia* 8% *Plantago* 8% *Portulaca* 25%	Gramineae 8% stem 8% *Oryzopsis* 8% *Sporobolus* 8%	*Juniperus* leaflet 8%	*Carex* 8%	*Zea mays* 83%
GALISTEO LA 33331[1]	52 (56)	Edge of eastern Galisteo Basin	*Amaranthus* 37% *Chenopodium* 42% *Cleome* 2% *Corispermum* 6% *Cycloloma* 4% *Helianthus* 4%	*Oryzopsis* 4%	*Juniperus* leaflet 25% Pinus edulis needle 2%	*Echinocereus* 4% *Opuntia* 2% *Vitis* 2%	*Zea mays* 92%
Coalition-Early Classic							
MAPCO LA 110953[3]	9 (11)	On dunes of an upper terrace 1 km S of the Jemez River on Zia Pueblo	Cheno-Am 11% Chenopodiaceae 11% *Portulaca* 11%	Gramineae 11%	*Atriplex canescens* 11%		*Zea mays* 56%
Classic							
PEÑA BLANCA LA 249	4 (14)	Terrace overlooking Rio Grande floodplain, Cochiti Pueblo					*Zea mays* 100%

[1]Huckell 1999; [2] McBride 1998; [3] McBride 1999; [4] McBride 2001; [5] Brandt1992a; [6] Brandt 1991a; [7] Brandt 1991b; [8] Brandt 1990; [9] McBride 2000; [10] Donaldson 1983; [11] Toll and McBride n.d.

* number of samples outside of parentheses is number with carbonized plant remains, number in parentheses is total number analyzed; percentages are based on number of samples with carbonized remains that contained taxon.

Table 23.92. Comparative Ubiquity of Carbonized Wood from Middle Rio Grande Sites (percent composition by weight or number of pieces)

Project/Site	N of Samples [total weight or pieces]	*Juniperus*	*Pinus*	Other Species/Comments
Late Archaic:				
MAPCO, LA 27632, 110942[1]	4 radiocarbon samples [26.5g]	77%	*Pinus edulis* <1%	*Atriplex/Sarcobatus* 9% *Chrysothamnus* <1% Salicaceae 1% Unknown 1% Unknown conifer 11% Unknown non-conifer <1%
Earliest Developmental:				
LA 6171	2 [.79g]	67%		*Atriplex/Sarcobatus* 3% Salicaceae 9% Unknown conifer 22%
Early Developmental:				
LA 265, 6169, 6170, 6171, 115862	86 [101.71g]	57%	*Pinus* <1% *Pinus edulis* <1%	*Artemisia* <1% *Atriplex/Sarcobatus* 15% *Cylindropuntia* <1% *Quercus* <1% Salicaceae 26% Unknown conifer 1% Unknown non-conifer <1%
Highway 44, LA 32698[2]	23 [459 pieces]	66%		*Atriplex/Sarcobatus* 12% *Cylindropuntia* 1% Rosaceae <1% Salicaceae 5% Unknown 1% Unknown conifer 14% Unknown non-conifer <1%
North Hill, LA 45996[3]	6 [6.3g]	68%	*Pinus edulis* 2%	*Atriplex* 3% cf. *Cercocarpus* 2% *Cylindropuntia* 14% Salicaceae 10% Unknown conifer 2%
Zia, LA 99529[4]	56 [38.6g]	90%	*Pinus edulis* 1%	*Atriplex/Sarcobatus* 1% *Cercocarpus* <1% Compositae 2% *Cylindropuntia* 1% *Chrysothamnus* 1% Salicaceae 1% Unknown conifer 1% Unknown non-conifer <1%
Late Developmental:				
LA 249, 6169, 6170	16 [12.78]	66%	*Pinus edulis* 4%	*Atriplex/Sarcobatus* 6% *Ephedra* 2% *Lycium* <1% Rosaceae 1% Salicaceae 14% Unknown conifer 5% Unknown non-conifer 1%
Coalition:				
LA 6169	9 [5.07g]	25%	*Pinus edulis* 4%	*Atriplex/Sarcobatus* 35% *Chrysothamnus* 2% *Cylindropuntia* 1% *Lycium* 2% Salicaceae 31% Unknown non-conifer 1%
LA 3333[5]	11 [8.8g]	55%	*Pinus edulis* 42%	*Atriplex/Sarcobatu* s <1% Unknown conifer 3% Unknown non-conifer <1%
Classic:				
LA 249	9 [3.27g]	45%	*Pinus edulis* 6% *Pinus ponderosa* 2%	*Atriplex/Sarcobatus* 2% *Ephedra* 9% Rosaceae 5% Salicaceae 7% Unknown conifer 20% Unknown non-conifer 5%

[1] McBride 1999; [2] McBride 2001; [3] Brandt 1990; [4] McBride 2000; [5] Toll and McBride n.d.

Table 23.93. Occurrences of Plant Taxa by Botanical Category and Time Period, in Peña Blanca Sites

Time Period	# of Occurrences	Weedy Annuals	Grasses	Perennials	Domesticates
Earliest Developmental	13	46%	8%	8%	38%
Early Developmental	239	37%	1%	12%	49%
Late Developmental	41	22%	-	17%	61%
Coalition	22	41%	9%	5%	45%
Classic	4	-	-	-	100%

Chapter 24
Pollen Analysis of Six Sites (LA 249, LA 265, LA 6169, LA 6170, LA 6171, and LA 115862)

Richard G. Holloway, Ph.D.
Quaternary Services, Flagstaff, AZ

LA 249 is a multicomponent site, from which pollen samples were collected from the Late Developmental period (AD 1100 to 1200). It is located on a high gravel terrace on the east side of the Rio Grande River at an elevation of 5,330 ft. This is the most northerly site in the project area. The modern vegetation is characterized as a plains-mesa grassland with scattered *Juniperus* plants as the main arboreal component. The understory consists primarily of perennial shrubs such as *Gutierrezia* sp. (snakeweed), and members of the Cactaceae family. Dominant shrubs include *Artemisia* sp. (bigelow sagebrush), *Eurotia* sp. (winterfat), and *Chrysothamnus* sp. (rabbit brush). The grasses include *Bouteloua gracilis* (blue grama), *Bouteloua curtipendula* (sideoats grama), *Hilaria* sp. (galleta grass), *Muhlenbergia* sp. (ring muhly), *Oryzopsis hymenoides* (Indian rice grass), and *Sporobolus* sp. (sacaton/dropseed).

LA 265 is large, multicomponent site near the southern portion of the project area at an elevation of 5,300 ft. The site is located on a terrace immediately south of the confluence of the Rio Grande and Santa Fe River. Ceramic dating indicates a sporadic occupation over a 1,000-year period from the Rio Grande Early Developmental (AD 700 to 900) through to the late Historic period (AD 1700 to 1800). The modern vegetation is described as a Plains-Mesa grassland with scattered Juniperus along the terrace margins and containing similar species to that of LA 249.

LA 6169 is a multicomponent site containing occupations from both the Early (AD 700 to 900) and Late (AD 1100 to 1200) Rio Grande Developmental period through the Coalition (AD 1200 to 1325) and perhaps continuing into the Historic period. The site is located just north of the confluence between the Rio Grande and Santa Fe Rivers at an elevation of 5,275 ft. The modern vegetation consists of a Plains-Mesa grassland with scattered *Juniperus* on the rocky slopes. *Salsola kali* (Russian thistle) is present in addition to those taxa previously described.

LA 6170 dates to both the Early (AD 700 to 900) and Late Developmental period (AD 1100 to1200). The site is located on the edge of the first Pleistocene terrace above the Rio Grande floodplain at an elevation of 5,226 ft. The modern vegetation is essentially a Great Basin Desert Scrub community.

LA 6171 is dated to the Early Developmental period. It is located on the first Pleistocene terraced south and east of the confluence of the Rio Grande and Santa Fe River at an elevation of 5,280 ft. The modern vegetation is essentially a Plains-Mesa grassland whose species composition has been covered elsewhere.

LA 115862 is described as a small sherd and lithic scatter located just south of LA 265 at an elevation of 5,280 ft. It is located on a narrow gravel terrace approximately 100 m east of the Rio Grande floodplain. The site dated to the Early Developmental period, AD 700 to 900. The modern vegetation is essentially a Plains-Mesa grassland whose species composition has been covered elsewhere.

Methods and Materials

Palynological Extraction Methods

Chemical extraction of pollen samples was conducted at the Palynology Laboratory at Texas A&M University, using a procedure designed for semi-arid Southwestern sediments. The method, detailed below, specifically avoids use of such reagents as nitric acid and bleach, which have been demonstrated experimentally to be destructive to pollen grains (Holloway 1981).

From each pollen sample submitted, 25 g of soil were subsampled. Prior to chemical extraction, three tablets of concentrated Lycopodium spores (batch #307862, Department of Quaternary Geology, Lund, Sweden; 13,500 ± 500 marker grains per tablet) were added to each subsample. The addition of marker grains permits calculation of pollen concentration values and provides an indicator for accidental destruction of pollen during the laboratory procedure. Several samples submitted for analysis consisted of pollen washes of artifacts. The actual washing and collection of the residues was conducted by personnel of the Museum of New Mexico. The loose dirt adhering to the interior surface of the artifact was lightly brushed off. The interior surface was initially washed with distilled water. This was followed by a wash with a 10 percent solution of hydrochloric acid (HCI), followed by a second wash with distilled water. The liquid portions of all three washes were combined in a single container and sent to Texas A&M University for extraction. The pollen wash samples were centifuged to consolidate the particulate fraction and the supernatant liquid was discarded. These samples were then processed according to the protocol described below.

The samples were treated with 35 percent HCl overnight to remove carbonates and to release the Lycopodium spores from their matrix. After neutralizing the acid with distilled water, the samples were allowed to settle for a period of at least 3 hours before the supernatant liquid was removed. Additional distilled water was added to the supernatant, and the mixture was swirled and then allowed to settle for five seconds. The suspended fine fraction was decanted through 150-micron mesh screen into a second beaker. This procedure, repeated at least three times, removed lighter materials, including pollen grains, from the heavier fractions. The fine material was concentrated by centrifugation at 2,000 revolutions per minute (RPM).

The fine fraction was treated with concentrated hydrofluoric acid (HF) overnight to remove silicates. After completely neutralizing the acid with distilled water, the samples were treated with a solution of darvan, and sonicated in a Delta D-9 Sonicator for 30 seconds. The Darvan solution was removed by repeated washing with distilled water and centrifuged (2,000 RPM) until the supernatant liquid was clear and neutral. This procedure removed fine charcoal and other associated organic matter and effectively deflocculated the sample.

The samples were dehydrated in glacial acetic acid in preparation for acetolyis. Acetolysis solution (acetic anhydride: concentrated sulfuric acid in 9:1 ratio) following Erdtman (1960) was added to each sample. Centrifuge tubes containing the solution were heated in a boiling water bath for approximately 8 minutes and then cooled for an additional 8 minutes before centrifugation and removal of the acetolysis solution with glacial acetic acid followed by distilled water. Centrifugation at 2,000 rpm for 90 seconds dramatically reduced the size of the sample, yet from periodic examination of the residue, did not remove fossil palynomorphs.

Heavy density separation ensued using zinc bromide ($ZnBr_2$), with a specific gravity of 2.00 to remove much of the remaining detritus from the pollen. The light fraction was diluted with distilled water (10:1) and concentrated by centrifugation. The samples were washed repeatedly in distilled water until neutral. The residues were rinsed in a 1 percent solution of potassium hydroxide (KOH) for less than one minute which was effective in removing the majority of the unwanted alkaline soluable humates.

The material was rinsed in ethanol (ETOH) stained with safranin-O, rinsed twice with ETOH, and transferred to 1-dram vials with tertiary butyl alcohol (TBA). The samples were mixed with a small quantity of glycerine and allowed to stand overnight for evaporation of the TBA. The storage vials were capped and were returned to the Museum of New Mexico at the completion of the project.

A drop of the polliniferous residue was

mounted on a microscope slide for examination under an 18-by-18 mm cover slip sealed with fingernail polish. The slide was examined using 200x or 100x magnification under an aus-Jena Laboval 4 compound microscope. Occasionally, pollen grains were examined using either 400x or 1,000x oil immersion to obtain a positive identification to either the family or genus level.

Abbreviated microscopy was performed on each sample in which either 20 percent of the slide (approximately four transects at 200x magnification) or a minimum of 50 marker grains were counted. If warranted, full counts were conducted by counting to a minimum of 200 fossil grains. Regardless of which method was used, the uncounted portion of each slide was completely scanned at a magnification of 100x for larger grains of cultivated plants such as *Zea mays* and *Cucurbita,* two types of cactus (Platyopuntia and Cylindropuntia), and other large pollen types such as members of the Malvaceae or Nyctaginaceae families.

For those samples warranting full microscopy, a minimum of 200 pollen grains per sample were counted as suggested by Barkley (1934), which allows the analyst to inventory the most common taxa present in the sample. All transects were counted completely (Brookes and Thomas 1967), resulting in various numbers of grains counted beyond 200. Pollen taxa encountered on the uncounted portion of the slide during the low magnification scan are tabulated separately.

Total pollen concentration values were computed for all taxa. In addition, the percentage of indeterminate pollen was also computed. Statistically, pollen concentration values provide a more reliable estimate of species composition within the assemblage. Traditionally, results have been presented by relative frequencies (percentages) where the abundance of each taxon is expressed in relation to the total pollen sum (200+ grains) per sample. With this method, rare pollen types tend to constitute less than 1 percent of the total assemblage. Pollen concentration values, provide a more precise measurement of the abundance of even these rare types. The pollen data are reported here as pollen concentration values using the following formula:

$$PC = \frac{K * \Sigma_p}{\Sigma_L * S}$$

where: PC = pollen concentration
K = *Lycopodium* spores added
Σ_p = fossil pollen counted
Σ_L = *Lycopodium* spores counted
S = sediment weight

The following example should clarify this approach. Taxon X may be represented by a total of 10 grains (1 percent) in a sample consisting of 1,000 grains, and by 100 grains (1 percent) in a second sample consisting of 10,000 grains. Taxon X is 1 percent of each sample, but the difference in actual occurrence of the taxon is obscured when pollen frequencies are used. The use of "pollen concentration values" are preferred because it accentuates the variability between samples in the occurrence of the taxon. The variability, therefore, is more readily interpretable when comparing cultural activity to non-cultural distribution of the pollen rain.

The pollen concentration values for pollen wash samples were calculated using a modification of the above formula. This modification involved the substitution of the area washed (in square centimeters) for the sediment weight (S) variable in the denominator from the above equation because the sample was in liquid form. The resulting concentration value is thus expressed as estimated grains per square centimeter. The resulting pollen concentration values from pollen wash samples are treated independently of those from soil samples in the results and discussion sections, although the data are presented with the other samples in the tables. The use of pollen concentration values from these particular samples are preferred, as explained above, in order to accentuate the variability between pollen wash samples. The use of the area washed also provides a mechanism for the comparison of calculated pollen concentration values between artifacts.

Variability in pollen concentration values can also be attributed to deterioration of the grains through natural processes. In his study of sediment samples collected from a rockshelter, Hall (1981) developed the "1,000 grains/g" rule to assess the degree of pollen destruction. This approach has been used by many palynologists working in other contexts as a guide to determine the degree of preservation of a pollen assemblage and, ultimately, to aid in the selection of samples to be examined in greater detail. According to Hall (1981), a pollen concentration value below 1,000 grains/g indicates that forces of degradation may have severely altered the original assemblage. However, a pollen concentration value of fewer than 1,000 grains/g can indicate the restriction of the natural pollen rain. Samples from pit structures or floors within enclosed rooms, for example, often yield pollen concentration values below 1,000 grains/g.

Pollen degradation also modifies the pollen assemblage because pollen grains of different taxa degrade at variable rates (Holloway 1981, 1989; Bryant and Holloway 1983). Some taxa are more resistant to deterioration than others and remain in assemblages after other types have deteriorated completely. Many commonly occurring taxa degrade beyond recognition in only a short time. For example, most (about 70 percent) angiosperm pollen has either tricolpate (three furrows) or tricolporate (three furrows each with pores) morphology. Because surfaces erode rather easily, once deteriorated, these grains tend to resemble each other and are not readily distinguishable. Other pollen types (e.g., Cheno-am) are so distinctive that they remain identifiable even when almost completely degraded.

Pollen grains were identified to the lowest taxonomic level whenever possible. The majority of these identifications conformed to existing levels of taxonomy with a few exceptions. For example, Cheno-am is an artificial, pollen morphological category which includes pollen of the family Chenopodiaceae (goosefoot) and the genus *Amaranthus* (pigweed), which are indistinguishable from each other (Martin 1963). All members are wind pollinated (anemophilous) and produce very large quantities of pollen. In many sediment samples from the American Southwest, this taxon often dominates the assemblage.

Pollen of the Asteraceae (Sunflower) family was divided into four groups. The high spine and low spine groups were identified on the basis of spine length. High spine Asteraceae contains those grains with spine length greater than or equal to 2.5 microns while the low spine group have spines less than 2.5 microns in length (Bryant 1969; Martin 1963). *Artemisia* pollen is identifiable to the genus level because of its unique morphology of a double tectum in the mesocopial (between furrows) region of the pollen grain. Pollen grains of the Liguliflorae are also distinguished by their fenestrate morphology. Grains of this type are restricted to the tribe Cichoreae, which includes such genera as *Taraxacum* (dandelion) and *Lactuca* (lettuce).

Pollen of the Poaceae (Grass) family are generally indistinguishable below the family level, with the single exception of *Zea mays,* identifiable by its large size (about 80 microns), relatively large pore annulus, and the internal morphology of the exine. All members of the family contain a single pore, are spherical, and have simple wall architecture. Identification of non-corn pollen is dependent on the presence of the single pore. Only complete or fragmented grains containing this pore were tabulated as members of the Poaceae family.

Clumps of four or more pollen grains (anther fragments) were tabulated as single grains to avoid skewing the counts. Clumps of pollen grains (anther fragments) from archaeological contexts are interpreted as evidence for the presence of flowers at the sampling locale (Bohrer 1981). This enables the analyst to infer possible human behavior.

Finally, pollen grains in the final stages of disintegration but retaining identifiable features, such as furrows, pores, complex wall architecture, or a combination of these attributes, were assigned to the indeterminate category. The potential exists to miss counting pollen grains without identifiable characteristics. For example, a grain that is so severely deteriorated that no distinguishing features exist, closely resembles many spores. Pollen grains and spores are similar both in size and are composed of the same material (Sporopollenin). So that spores are not counted as deteriorated pollen, only those grains containing identifiable pollen characteristics are assigned to the indeterminate category. Thus, the indeterminate category contains a minimum estimate of degradation for any assemblage. If the percentage of indeterminate pollen is between 10 and 20 percent, relatively poor preservation of the assemblage is indicated, whereas indeterminate pollen in excess of 20 percent indicates severe deterioration to the assemblage.

In those samples where the total pollen concentration values are approximately at or below 1,000 grains/g, and the percentage of indeterminate pollen is 20 percent or greater, counting was terminated at the completion of the abbreviated microscopy phase. In some cases, the assemblage was so deteriorated that only a small number of taxa remained. Statistically, the concentration values may have exceeded 1,000 grains/g. If the species diversity was low (generally these samples contained only pine, Cheno-am, members of the Asteraceae (sunflower) family and indeterminate category, counting was also terminated after abbreviated microscopy even if the pollen concentration values slightly exceeded 1,000 grains/g.

Results

For convenient reference, Table 24.1 contains a list of the scientific and common names of plant taxa used in this report. Tables 24.2 to 24.6 present the results of the pollen analysis by site, each table containing both the raw counts and the calculated pollen concentration values. The individual results are discussed below by site, structure, and feature.

LA 249

LA 249 is a multicomponent site from which pollen samples were recovered from a Late Developmental component dating between AD 1100 and 1200. A total of seven pollen samples were submitted for analysis from this component.

FS 189 was taken from the 0 to100 cm level, but no further provenience was provided. The pollen sample provided a full count of 518 grains and had a total pollen concentration value of 7,361 grains/g. The total *Pinus* pollen consisted of 3,794 grains/g, with *Pinus ponderosa* (739 grains/g) and *Pinus edulis* (3,055 grains/g). *Juniperus* (398 grains/g) was high with small amounts of *Picea* (28 grains/g), *Salix, Ulmus,* and *Prosopis* (14 grains/g each), and *Quercus* (71 grains/g). Poaceae (199 grains/g) was high with moderate amounts of Cheno-am (1,364 grains/g) and high amounts of both high (583 grains/g) and low spine (554 grains/g) Asteraceae. *Artemisia* (85 grains/g) was high. Along with a moderate amount of *Ephedra* (28 grains/g) pollen. A number of additional taxa were present as single grains and included Fabaceae, Solanaceae, *Shepherdia, Eriogonum,* and Brassicaceae (14 grains/g each).

Feature 3. FS 267 was taken from this extramural cobble concentration and associated ash stain feature. This feature was from an unknown occupation date. The total pollen concentration values were 1,238 grains/g. *Pinus* (368 grains/g) values were very low with a small amount of (23 grains/g) pollen. Poaceae (23 grains/g) and Cheno-am (675 grains/g) pollen were both very low with moderate amounts of high and low spine Asteraceae (45 grains/g each). Cactaceae (3.75 grains/g) pollen was observed in the low magnification scan of the slide.

Feature 6. The remainder of the samples were all taken from this oval pit structure. FS 308 was taken from Stratum 50 with 2,060 grains/g total pollen concentration values. This was based on a full count of 487 grains. *Pinus* (440 grains/g) was very low with small amounts of *Juniperus* (8 grains/g) and Quercus (13 grains/g) pollen. Poaceae (38 grains/g) was low with moderate amounts of Cheno-am (1,129 grains/g), and fairly high amounts of high (110 grains/g) and low spine (203 grains/g) Asteraceae. *Artemisia* (21 grains/g) was present and a small number of Cheno-am pollen clumps (4 grains/g). Cactaceae (4 grains/g) and *Cylindropuntia* (34 grains/g) were both present.

FS 329, 338, and 360 were all taken from Stratum 60. FS 329 had 1,510 grains/g total pollen concentration values. *Pinus* (522 grains/g) pollen was very low, with low amounts of Cheno-am (741 grains/g), and high spine Asteraceae (27 grains/g). Low spine Asteraceae (82 grains/g) and *Artemisia* (55 grains/g) were moderate. Cactaceae (27 grains/g) was moderate and a small amount of *Cylindropuntia* (6.86 grains/g) was present in the low magnification scan of the slide. FS 338 had 1,100 grains/g total pollen concentration values. *Pinus* (253 grains/g) was very low, with a trace of *Quercus* (15 grains/g) pollen. Cheno-am (565 grains/g) pollen was very low, with low amounts of high spine Asteraceae (30 grains/g) and high quantities of low spine Asteraceae (119 grains/g). *Artemisia* (30 grains/g) was present in moderate amounts. FS 360 had 1,652 grains/g total concentration values. *Pinus* (508 grains/g) pollen was very low, with low amounts of Poaceae (32 grains/g) and Cheno-am (731 grains/g). Both high (159 grains/g) and low spine (127 grains/g) Asteraceae were high, with a high amount (32 grains/g) of Cactaceae pollen. A small amount (4.89 grains/g) of *Zea mays* pollen was observed in the low magnification scan of the slide.

FS 378 was taken from Stratum 3 and had only 52 grains/g total pollen concentration values. This was based on a pollen sum of only 4 grains. *Pinus, Quercus,* Cheno-am, and low spine Asteraceae were the only taxa present.

LA 265

This site was dated to the Early Developmental period (AD 750 to 900). The results of the pollen analysis are presented in **Table 24.3.** The results of the individual samples are presented below by period, structure, and feature.

Structure 1

Ten samples were taken from the pit structure in unit 455N/495E. The samples ranged from 100.39 to 100.29 to 98.99 to 98.89 cm and are arranged stratigraphically from Stratum 1 through Stratum 3.1.

Stratum 1. FS 852 was the uppermost sample with 2,109 grains/g total pollen concentration values, which was based on a full count of 513 grains. *Pinus edulis* and *P. ponderosa* together were present in moderate amounts with traces of *Juniperus* (4 grains/g), *Salix* (8 grains/g), and *Quercus* (12 grains/g) pollen. Cheno-am (572 grains/g) and Poaceae (16 grains/g) were both low. High (70 grains/g) and low spine (95 grains/g) Asteraceae were high, with low amounts of *Artemisia* and a trace of *Cylindropuntia* (4 grains/g). *Zea mays* (8 grains/g) pollen was present in small amounts. *Picea* and Onagraceae (3.05 grains/g) pollen were present in the low magnification scan of the slide. FS 854 was from Stratum 1 and contained 593 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only with a fairly high amount of *Salix* (23 grains/g) pollen. Cheno-am (297 grains/g) was low, with moderate to high amounts of high and low spine Asteraceae. *Sphaeralcea* (23 grains/g) was fairly high. Cactaceae (31.59 grains/g), *Cylindropuntia* (10.53 grains/g), and *Zea mays* (63.19 grains/g) were all present from the low magnification scan of the slide. FS 856 had 357 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am, Cactaceae, indeterminate, and *Zea mays* (48 grains/g) were present.

Stratum 2.1. FS 858 was taken from this stratum unit and contained only 49 grains/g total pollen concentration values. Cheno-am was the only taxon present.

Stratum 2.2. FS 859 had 1110 grains/g total pollen concentration values. *Pinus edulis* (60 grains/g) was very low, with low Poaceae (30 grains/g) and Cheno-am (360 grains/g). High and low spine Asteraceae and *Artemisia* (30 grains/g each) were low to moderate with high amounts of Cactaceae (210 grains/g) and moderate *Cylindropuntia* (30 grains/g). *Zea mays* (300 grains/g) was very high.

Stratum 2.3. FS 860 had 432 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only with low Cheno-am, and low high and low spine Asteraceae (31 grains/g each), and *Artemisia* (15 grains/g). Cactaceae (31 grains/g) and *Cylindropuntia* (46 grains/g) were moderate with a small amount of *Zea mays* (15 grains/g). The adjusted value for corn increased to 37.98 grains/g in the low magnification scan of the slide.

Stratum 2.4. FS 861 had 1,112 grains/g total pollen concentration values. *Pinus edulis* was very low, with low amounts of Cheno-am (467 grains/g). Low spine Asteraceae, Cactaceae, and *Cylindropuntia* (62 grains/g each) were high. *Zea mays* (218 grains/g) was present in very high amounts.

Stratum 2.5. FS 862 had 778 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only with low amounts of Cheno-am (432 grains/g), low spine Asteraceae, Cactaceae (65 grains/g each), and *Cylindropuntia* (22 grains/g). *Zea mays* (108 grains/g) was very high.

Stratum 3. FS 864 had 408 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts with a trace of *Salix* (10 grains/g) pollen. Poaceae and Cheno-am were both low, with moderate low spine Asteraceae (52 grains/g) and low *Artemisia* (10 grains/g).

Stratum 3.1. FS 866 had 1,045 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were present in very low amounts. *Salix* (26 grains/g) was moderate. Poaceae (78 grains/g) was moderate to high, with low Cheno-am (627 grains/g), and high low spine Asteraceae (78 grains/g).

Feature 107. FS 1536 was taken from the linear pit that may have been a foot drum. The assemblage contained only 370 grains/g total pollen concentration values. *Pinus ponderosa,* Cheno-am, high and low spine Asteraceae, *Artemisia, Cylindropuntia,* and indeterminate were the only taxa present.

Feature 191. FS 1600 was taken from the unidentified feature and contained 1,789 grains/g total pollen concentration values. *Pinus edulis* was very low. Cheno-am (1,185 grains/g) was moderate with low Poaceae (24 grains/g). Cheno-am pollen clumps (24.g) were high, along with high spine Asteraceae (121 grains/g), but low amounts of low spine (24 grains/g) Asteraceae.

Feature 125. FS 1678 was taken from the bell-shaped vent shaft that had 3,063 grains/g total pollen concentration values. *Pinus edulis* was very low, with low Poaceae and high (2,474 grains/g) Cheno-am pollen. High (88 grains/g) and low spine (118 grains/g) Asteraceae were high, with high *Cylindropuntia* (88 grains/g) and *Zea mays* (59 grains/g).

Structure 4

FS 1028 was taken from the floor of the structure which had 1,170 grains/g total pollen concentration values. Cheno-am (690 grains/g) was low, with a high number of pollen clumps (30/g). High (120 grains/g) and low spine (180 grains/g) Asteraceae were high with high amounts of *Cylindropuntia* (60 grains/g) pollen. *Zea mays* (30 grains/g) was also present in moderate amounts.

Feature 76. FS 1339 was taken from the floor of the sealed pit within Structure 4 which had 1,375 grains/g total pollen concentration. *Pinus edulis* (221 grains/g) was very low. Cheno-am and Poaceae were low to moderate, with high amounts of low spine Asteraceae and *Artemisia* (49 grains/g).

Feature 22. FS 1480 was a pollen wash from a ceramic pitcher associated with the human burial of a 50+ year-old female in Structure 4. The assemblage had 60.31 grains/sq cm total pollen concentration values. *Pinus* (7.96 grains/sq cm) was present and included both

Pinus edulis and *P. ponderosa* pollen. Traces of both *Picea* and *Quercus* (0.11 grains/sq cm) were present. Poaceae (0.98 grains/sq cm) was low with high amounts of Cheno-am (25.41 grains/sq cm). A small amount of Cheno-am pollen clumps (0.11 grains/sq cm) were present. High (1.96 grains/sq cm) and low spine (2.4 grains/sq cm) Asteraceae and *Artemisia* (1.75 grains/sq cm) were present. Cactaceae (0.87 grains/sq cm), *Cylindropuntia* (5.56 grains/sq cm), and *Platyopuntia* (0.22 grains/sq cm) were present in small amounts. Both *Zea mays* (2.62 grains/sq cm) and *Cucurbita* (0.22 grains/sq cm) were also recovered. *Eriogonum* (0.11 grains/sq cm) was present in the low magnification scan of the slide.

Structure 13

Feature 141. FS 1344 was taken from the bell-shaped feature, which had only 393 grains/g total pollen concentration values. A trace of *Juniperus* (26 grains/g) was present with low Cheno-am (230 grains/g), low to moderate high and low spine Asteraceae, moderate to high *Cylindropuntia* and a small amount of *Zea mays* (16 grains/g).

Feature 207. FS 1612 was taken from the slab-covered niche in Structure 13. *Pinus edulis* was very low. Cheno-am was low with a small to moderate number of pollen clumps (27/g). High spine (127 grains/g) was high with low amounts of low spine (27 grains/g) Asteraceae. *Cylindropuntia* (54 grains/g) and *Platyopuntia* (27 grains/g) were both present. *Zea mays* (6.23 grains/g) is present in small amounts.

Feature 27. FS 1256 was taken from the keyhole shaped, shallow structure, which had 1,340 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only. Cheno-am (623 grains/g) and Poaceae (31 grains/g) were low with high amounts of high spine (218 grains/g) and moderate low spine Asteraceae (62 grains/g). Cactaceae (31 grains/g) and *Cylindropuntia* (156 grains/g) were both present.

Feature 41. FS 1223 was taken from this bell-shaped pit on the floor of Feature 27. The assemblage contained 2,227 grains/g total pollen concentration values and was based on a full count of 510 grains. *Pinus edulis* and *P. ponderosa* were present in very low amounts with only a trace of *Juniperus*. Poaceae (61 grains/g) was moderate to high with Cheno-am (1,022 grains/g) with low to moderate amounts. High (105 grains/g) and low spine (140 grains/g) Asteraceae were both high, along with *Artemisia* (48 grains/g). Cactaceae (4 grains/g) and *Cylindropuntia* (44 grains/g) were present along with *Eriogonum* (9 grains/g), *Sphaeralcea* (17 grains/g) and *Zea mays* (44 grains/g).

Feature 33. FS 1228 was taken from the key-hole-shaped, shallow structure that had 1,684 grains/g total pollen concentration values. *Pinus edulis* was present in very low amounts. Poaceae (32 grains/g) and Cheno-am (953 grains/g) were low with high (95 grains/g) and low spine (32 grains/g) Asteraceae ranging from high to low concentration values. Cactaceae (32 grains/g) and *Cylindropuntia* (64 grains/g) were both high.

Extramural Features

Feature 14. A total of nine samples were taken from the large, irregular-shaped, extramural pit. The nine samples were essentially a column through this feature. The samples were from Stratum 1 through Stratum 8.

Stratum 1. FS 892 had 1429 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* and *Juniperus* were present in trace amounts. Poaceae (32 grains/g) was low with moderate Cheno-am (1,144 grains/g). Low spine Asteraceae (95 grains/g) and Cactaceae (64 grains/g) were both high.

Stratum 2. FS 893 contained 1,487 grains/g total pollen concentration values. *Pinus edulis* pollen was very low, with moderate Cheno-am (1,115 grains/g). High spine Asteraceae and Cactaceae (80 grains/g each) were both high, with a moderate amount of *Zea mays* (27 grains/g) pollen.

Stratum A. FS 894 had 5,139 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were very low, with a moderate amount of *Quercus* (56 grains/g). Low spine Asteraceae and *Zea mays* (279 grains/g each) were both very high.

Stratum 3. FS 895 had 1,559 grains/g total pollen concentration values. *Pinus edulis* was very low, with moderate Cheno-am (1,100 grains/g). High (153 grains/g) and low spine (92 grains/g) Asteraceae were both high.

Stratum 4. FS 896 had 9,676 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were very low. Poaceae (197 grains/g) and Cheno-am (6,743 grains/g) were both high, along with high (88 grains/g) and low spine (854 grains/g), and *Artemisia* (263 grains/g). Cactaceae and Cylindropuntia (44 grains/g each) were high with high *Ephedra* (153 grains/g) and very high *Zea mays* (854 grains/g).

Stratum 5. FS 897 had only 470 grains/g total pollen concentration values. *Pinus edulis* pollen was present in trace amounts only with low Cheno-am, moderate to low high and low spine Asteraceae (49 grains/g). Cactaceae (32 grains/g) and Cylindropuntia (16 grains/g) were moderate to low with a small amount of *Zea mays* (16 grains/g).

Stratum 6. FS 898 had 1596 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were both present in trace amounts. Cheno-am (967 grains/g) and Poaceae were very low, but with a high number of Cheno-am pollen clumps (24 g). High (48 grains/g) and low spine (121 grains/g) Asteraceae were moderate to high with high amounts of Cactaceae (121 grains/g)as present in trace amounts only. Poaceae (67 grains/g) and Cheno-am (599 grains/g) pollen were moderate to low, with high amounts of both high (133 grains/g) and low spine (488 grains/g) Asteraceae. Cactaceae (22 grains/g) was moderate.

Stratum 7. FS 899 had 930 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only. Poaceae (80 grains/g) was high, as was Cheno-am (611 grains/g). Low spine Asteraceae and *Cylindropuntia* (53 grains/g) were moderate to high, with high amounts of *Zea mays* (53 grains/g).

Stratum 8. FS 900 had 1,376 grains/g total pollen concentration values. Pinus edulis was present in trace amounts only. Poaceae (67 grains/g) and Cheno-am (599 grains/g) pollen were moderate to low, with high amounts of both high (133 grains/g) and low spine (488 grains/g) Asteraceae. Cactaceae (22 grains/g) was moderate.

Feature 15. FS 952 was taken from the large irregular-shaped feature, which had 3,063 grains/g total pollen concentration values. *Pinus edulis* (29 grains/g) was present in trace amounts only, with a trace of *Juniperus* pollen (29 grains/g). Cheno-am (2,651 grains/g) was high, with high amounts of both high (118 grains/g) and low spine (88 grains/g) Asteraceae. Cactaceae (118 grains/g) was very high.

Feature 17. FS 995 was taken from the large, oval-shaped pit, which had 1,134 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were present in trace amounts. Poaceae (54 grains/g) was moderate with low Cheno-am (738 grains/g). High and low spine Asteraceae were moderate to high, with high amounts of *Artemisia* (90 grains/g). Nyctaginaceae (36 grains/g) was present along with a small amount of *Zea mays* (18 grains/g) pollen.

Feature 127. FS 1713 was taken from this bell-shaped storage feature and contained 4,730 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were very low. Cheno-am (2,268 grains/g) pollen was high. High (32 grains/g) and low spine (95 grains/g) Asteraceae were present along with very high values for Cactaceae (130 grains/g) and Cylindropuntia (486 grains/g). *Zea mays* (259 grains/g) was also present in very high amounts.

Feature 229. FS 1731 was taken from this bell-shaped bit and contained 3,762 grains/g total pollen concentration values. *Pinus edulis* and P.

ponderosa were present in low amounts. Poaceae (82 grains/g) and Cheno-am (2,197 grains/g) were both high, and there was a large number of Cheno-am pollen clumps (27/g) in the assemblage. High (82 grains/g) and low spine (549 grains/g) Asteraceae were high with a small amount of Nyctaginaceae (27 grains/g) pollen.

Animal Burials

Feature 19. FS 1016 was taken from the turkey burial in Feature 15. The assemblage had 5,139 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were both present in low amounts, along with a trace (28 grains/g) of *Juniperus* pollen. Poaceae (112 grains/g) and Cheno-am (3,519 grains/g) were both high. High (196 grains/g) and low spine (614 grains/g) Asteraceae were high, with moderate *Artemisia* (28 grains/g). Cylindropuntia (84 grains/g) was high, along with high *Zea mays* (56 grains/g).

Feature 26. FS 1100 was taken from the bell-shaped storage pit with a dog burial. The assemblage had 1,838 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were present in trace amounts. Poaceae (48 grains/g) and Cheno-am (1,161 grains/g) were present in moderate amounts, high spine (24 grains/g) was low, and low spine (97 grains/g) Asteraceae was high. *Artemisia* and Cactaceae (24 grains/g) were moderate, with high amounts of Cylindropuntia (145 grains/g).

Feature 60. FS 1405 was taken from this bell-shaped storage pit with a dog burial. The assemblage had 3,144 grains/g total pollen concentration values and was based on a full count of 489 grains. *Pinus edulis* and *P. ponderosa* were present in small amounts along with traces of *Juniperus* and *Prosopis* (19 grains/g each). Poaceae (135 grains/g) was high with Cheno-am (926 grains/g) low. High (51 grains/g) and low spine (167 grains/g) Asteraceae were moderate to high, with moderate amounts of *Artemisia* (26 grains/g). Cactaceae (45 grains/g) and Cylindropuntia (489 grains/g) were both high along with *Sphaeralcea* (26 grains/g) and *Zea mays* (630 grains/g). A trace of Solanaceae (6.43 grains/g) pollen was present in the low magnification scan of the slide.

Human Burials

Feature 23. FS 1077 was taken from this bell-shaped pit with an infant burial, which had 4,368 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa* were present in small amounts, along with a trace of *Picea* (29 grains/g). Poaceae (174 grains/g) and Cheno-am (2719 grains/g) were both high, along with high (203 grains/g) and low spine (289 grains/g) Asteraceae, and *Artemisia* (87 grains/g). Cactaceae (29 grains/g) and Cylindropuntia (58 grains/g) were present in high amounts.

Feature 24. FS 1084 was taken from the bell-shaped storage pit with an adult burial of a 45 ± 5-year-old female, which had 1,063 grains/g total pollen concentration values. *Pinus edulis* was present in trace amounts only. Poaceae (25 grains/g) and Cheno-am (734 grains/g) were both low, with low amounts of high and low spine Asteraceae and *Artemisia* (25 grains/g each). Cylindropuntia and *Zea mays* (51 grains/g each) were both present in high amounts.

Two pollen wash samples were also taken from this adult female burial. FS 1486 came from a Tallahogan Red seed jar, which had 13.31 grains/sq cm total pollen concentration values. Solanaceae (0.83 grains/sq cm) was present along with Cactaceae and Cylindropuntia (0.42 grains/sq cm each), *Artemisia* (1.66 grains/sq cm), high and low spine Asteraceae (0.83 grains/sq cm each), and Cheno-am (6.65 grains/sq cm).

FS 1488 was taken from a ceramic pot, located in a bell-shaped storage pit with an adult female burial. The assemblage had 33.05 grains/sq cm total pollen concentration values. Cheno-am (24.79 grains/sq cm) and high spine Asteraceae (2.75 grains/sq cm) were high, with no economic pollen.

Feature 244. FS 1698 was taken from a ceramic mug, recovered from a large oval pit with a secondary burial pit encompassing a 30 ± 5-year-old female. The assemblage had 2.26 grains/sq cm total pollen concentration values. The assemblage included *Pinus edulis,* Cheno-am, and high spine Asteraceae pollen.

FS 1699 was taken from a ceramic jar, which came from a large oval pit with a secondary burial pit and a 30 ± 5-year-old female. The assemblage had 1.9 grains/sq cm total pollen concentration values. Taxa recovered included *Pinus edulis,* Poaceae, Cheno-am, high and low spine Asteraceae, and Cactaceae. *Zea mays* and Cylindropuntia (0.01 grains/sq cm) were present on the low magnification scan of the slide.

LA 6169

LA 6169 is a multicomponent site dating from the Early Developmental period (AD 700 to 900) through the Late Developmental (AD 1100 to 1200) and Coalition period (AD 1200 to 1375). The raw pollen counts and calculated pollen concentration values are presented in Table 24.4. The individual results are discussed below by period, structure, and feature.

Early Developmental Period Structures

Structure 4. FS 499 was taken from the floor of the structure. The assemblage included 3,166 grains/g total pollen concentration values and was based on a full count of 510 grains. Pinus pollen (751 grains/g) was very low, but was dominated by pollen of *Pinus edulis* (670 grains/g). A trace of *Picea* pollen (6 grains/g) was present. Poaceae (43 grains/g) pollen was moderate with high amounts of Cheno-am (1,558 grains/g) pollen, high (93 grains/g) and low spine Asteraceae (329 grains/g), and *Artemisia* (192 grains/g) pollen. *Cylindropuntia* pollen (37 grains/g) was high, with small amounts of Cactaceae (6 grains/g). *Eriogonum* (25 grains/g) was high with a trace of *Polygonum* (6 grains/g) and a moderate to low amount of *Zea mays* and *Sphaeralcea* (12 grains/g each) pollen. The adjusted pollen concentration values for *Zea mays* (23.4 grains/g) and Cactaceae (10.03 grains/g) increased the values for these taxa when additional grains from the low magnification scan of the slide were tabulated.

Feature 41: wall niche. FS 992 was taken from the wall niche in Structure 4. The assemblage contained 6,446 grains/g total pollen concentration values and was based on a full count of 764 grains. *Pinus* pollen (1,055 grains/g) was low to moderate, but higher than from the floors and was still dominated by *Pinus edulis* (894 grains/g) pollen. Cheno-am pollen (4,658 grains/g) dominated the assemblage, with a significant number of Cheno-am pollen clumps (17 grains/g). High (76 grains/g) and low spine (278 grains/g) Asteraceae pollen was high, along with high amounts of *Artemisia* (76 grains/g) pollen. Poaceae (25 grains/g) was low, with a trace of *Polygonum* (8 grains/g) pollen. *Zea mays* (110 grains/g) and *Sphaeralcea* (34 grains/g) were both high. Small amounts of Cactaceae (4.66 grains/g), Cylindropuntia, *Platyopuntia,* and Onagraceae (2.33 grains/g each) were also observed on the low magnification scan of the slide.

Structure 47. A total of four pollen samples were submitted from this pit structure and associated features. FS 1853 was taken from the floor of this structure and contained 1,290 grains/g total pollen concentration values. A trace of *Pinus edulis* (60 grains/g) pollen was present. Cheno-am (1,020 grains/g) pollen was low with moderate amounts of Poaceae (60 grains/g). High amounts of low spine Asteraceae (90 grains/g) and *Zea mays* (30 grains/g) were present.

Feature 163:wall niche. FS 1997 was taken from a wall niche from this pit structure. The assemblage contained only 131 grains/g total pollen concentration values. Onagraceae, Cheno-am, and *Cylindropuntia* pollen were the only taxa present from this feature.

Feature 121: storage bin. FS 2042 was taken from this storage bin feature within Structure 47. The assemblage contained 1,490 grains/g total pollen concentration values. *Pinus* (324 grains/g) pollen was very low but was dominated by *Pinus edulis* (281 grains/g) pollen. Cheno-am (842 grains/g) was low along with Poaceae (22 grains/g). High (108 grains/g) and low spine (43 grains/g) Asteraceae were high to moderate with high amounts of *Zea may*s and Cactaceae (22 grains/g each). Cylindropuntia pollen (4.8 grains/g) was present in the low magnification scan of the slide.

Feature 152: ash dump. FS 1796 was taken from this interior ash dump feature within Structure 47. The assemblage contained 1,320 grains/g total pollen concentration values. *Pinus* (150 grains/g) was very low and consisted entirely of *P. edulis* pollen. A small amount (30 grains/g) of *Ulmus* pollen was present but this was based on only a single grain. Cheno-am (930 grains/g) pollen was very low with high amounts of low spine Asteraceae pollen (210 grains/g).

Early Developmental Period Human Burials

Feature 2: burial. FS 375 was a pollen wash sample from a ceramic utility ware associated with the burial of a 45+ year-old female. The assemblage contained 22.45 grains/sq cm total pollen concentration. *Pinus edulis* and low spine Asteraceae were the only taxa tabulated but only 3 grains were counted.

FS 387 was a pollen wash sample from a ceramic bowl associated with the burial of a 45+ year-old female. The assemblage contained 7.06 grains/sq cm total pollen concentration and was based on a pollen sum of only 6 grains. *Pinus edulis, P. ponderosa, Quercus*, Cheno-am, and high spine Asteraceae were present. *Zea mays* was present in very small amounts in the low magnification scan of the slide.

FS 396 was a pollen wash sample from a ceramic red pitcher associated with the burial of a 45+ year-old female. The assemblage contained 15.63 grains/sq cm total pollen concentration and was based on a pollen sum of only 7 grains. *Pinus edulis, Ulmus,* Rosaceae, and Cheno-am were present in the assemblage. *Picea* pollen was observed in the low magnification scan of the slide.

FS 398 was a pollen wash sample from a ceramic jar associated with the burial of a 45+ year-old female. The assemblage contained 15.63 grains/sq cm total pollen concentration and was based on a pollen sum of only 8 grains. *Pinus edulis, Quercus,* Cheno-am, and low spine Asteraceae were present.

Late Developmental Period

Pollen samples were collected from the floor of the structure and washes taken from vessels within features. Samples were also extracted from extramural features associated with this Late Developmental structure.

Structure 76. FS 1526 was taken from the floor of this pit structure which was located within Structure 47. The assemblage had 5,100 grains/g total pollen concentration values. *Pinus* (1,230 grains/g was low to moderate and consisted entirely of *P. edulis* pollen. Poaceae (60 grains/g) was moderate, with a small amount of *Sarcobatus* (30 grains/g) pollen. Cheno-am (2760 grains/g) was very high, with high amounts of high (120 grains/g) and low spine (150 grains/g) Asteraceae, and *Artemisia* (60 grains/g). Cactaceae (270 grains/g) was very high along with high amounts of Cylindropuntia (60 grains/g), *Ephedra* (180 grains/g), and *Zea mays* (60 grains/g). *Zea mays* concentration values increased to 84 grains/g in the adjusted concentration values.

Feature 49. Two pollen wash samples were collected from Feature 49, a human burial interred in the wall of Structure 76. FS 1046 was a pollen wash of ceramic sherds associated with the child burial. The assemblage contained 107.75 grains/sq cm total pollen concentration values, which were based on a full count of 497 grains. *Pinus edulis* and *P. ponderosa* were both present, along with traces of *Picea, Abies, Alnus,* and *Quercus* pollen. Cheno-am (62.65 grains/sq cm) was present along with Poaceae, low spine Asteraceae and traces of high spine Asteraceae and Cheno-am pollen clumps (0.22/sq cm), *Artemisia, Polygonum,* Cylindropuntia, and *Zea mays* were all present in low amounts.

Cactaceae pollen was also present on the low magnification scan of the slide.

FS 1047 was taken from a ceramic jar associated with the child burial. The assemblage had 279.92 grains/sq cm total pollen concentration values and was based on a full count of 606 grains. *Pinus edulis* and *P. ponderosa* were both present along with traces of *Juniperus* and *Prosopis* pollen. Cheno-am (100.24 grains/sq cm) Poaceae and *Sarcobatus* pollen were present, in addition to high and low spine Asteraceae, and *Artemisia*. Traces of Rosaceae, Cactaceae, Nyctaginaceae, and *Zea mays* (1.49 grains/sq cm) were also present. *Picea* and *Polygonum* were also present on the low magnification scan of the slide.

Feature 81. FS 1210 was a pollen wash sample taken from a vessel that was associated with the burial of an 18 to19-year-old human. The assemblage contained 44.26 grains/sq cm total pollen concentration values. *Pinus edulis* and *P. ponderosa* were both present. Cheno-am, Poaceae, high and low spine Asteraceae and *Artemisia* were present in low amounts. Traces of Platyopuntia, *Sphaeralcea* (0.27 grains/sq cm) and *Zea mays* (0.81 grains/sq cm) were also present.

Feature 126: storage pit. FS 1732 was taken from an extramural storage pit located to the north of Structure 76. The sample had 1,021 grains/g total pollen concentration values. *Pinus edulis* (211 grains/g) was very low. Cheno-am (599 grains/g) pollen was very low although a large number of Cheno-am pollen clumps (18 grains/g) were present in the assemblage. High (123 grains/g) and low spine (70 grains/g) Asteraceae were both high. A small amount of *Zea mays* (2.71 grains/g) was present on the low magnification scan of the slide.

Coalition Period (AD 1200–1325)

Pollen samples were taken from the floors of Rooms 10, 15, 16 and 70 (LA 6169). Several samples from mealing bins inside Room 16 were also processed.

Room 10. FS 632 was taken from the floor contact of this pit room, which had 986 grains/g total pollen concentration values. *Pinus edulis* (117 grains/g) was very low. Cheno-am (822 grains/g) was also very low. Indeterminate pollen was the only other taxon recovered from the assemblage.

Room 15. FS 1061 was taken from the floor of this pit room, which had 1,915 grains/g total pollen concentration values. *Pinus* (172 grains/g) was very low, but *P. edulis* (147 grains/g) was the dominant type. Cheno-am (1,448 grains/g) was low to moderate, with high amounts of high spine Asteraceae (172 grains/g).

Room 16. FS 1881 was taken from the floor of this pit room, which had1,282 grains/g total pollen concentration values. *Pinus edulis* (282 grains/g) was very low, as was Cheno-am (662 grains/g), and moderate amounts of Poaceae (60 grains/g). High (28 grains/g) spine and low spine (169 grains/g) were both present. *Zea mays* (2.17 grains/g) was also present on the low magnification scan of the slide.

Feature 102: mealing bin. FS 1571 was taken from mealing bin, which had 1,842 grains/g total pollen concentration values. *Pinus* (444 grains/g) was very low, although both species were present. Cheno-am (1,198 grains/g) was low with moderate amounts of Poaceae (44 grains/g). Both high and low spine (22 grains/g each) Asteraceae were low. Cactaceae and *Zea mays* (22 grains/g each) were present, but in low amounts. Cylindropuntia (10.24 grains/g) were present on the low magnification scan of the slide.

Feature 103: mealing bin. FS 1674 was taken from a mealing bin inside Structure 16. The assemblage had 1,317 grains/g total pollen concentration values. *Pinus* (374 grains/g) was very low, but contained both *P. edulis* (267 grains/g) and *P. ponderosa* (107 grains/g) types. Cheno-am (730 grains/g) was very low, but had a high number of pollen clumps (36/g). Poaceae (36 grains/g) was moderate with low amounts of both high (18 grains/g) and low spine (36 grains/g) Asteraceae.

Eriogonum (18 grains/g) and *Zea mays* (53 grains/g) were also present. Cactaceae (8.55 grains/g) pollen was present on the low magnification scan of the slide.

Feature 104: mealing bin. FS 1598 was taken from the mealing bin, which had 1578 grains/g total pollen concentration values. *Pinus* (668 grains/g) was very low, but was dominated by *P. edulis* (623 grains/g) pollen. A trace of *Ulmus* (3 grains/g) pollen was also present. Cheno-am (674 grains/g) was very low, but had a high number of pollen clumps (30/g). Poaceae (3 grains/g) was present in trace amounts along with low amounts of high spine (24 grains/g) and moderate to high amounts of low spine Asteraceae (70 grains/g). Cactaceae (6 grains/g) and Cylindropuntia (3 grains/g) were present but in very low amounts. Onagraceae (3 grains/g) and *Zea mays* (30 grains/g) were also present.

Room 70. FS 1707 was taken from this feature, which had only 130 grains/g total pollen concentration values. *Pinus edulis* and *P. ponderosa,* Cheno-am, and Cheno-am pollen clumps were the only taxa present. A small amount of *Zea mays* (3.34 grains/g) was present on the low magnification scan of the slide.

LA 6170

LA 6170 is dated to both the Early Developmental period (AD 700–900) with a few samples collected from Late Developmental period (AD 1100–1200) contexts. The results of the pollen analysis are presented in Table 24.4. Individual results are presented below by period, structure, and feature.

Early Developmental Period

Structure 2. FS 1189 was taken from the floor of the structure, which has 3,604 grains/g total pollen concentration values based on a full count of 554 grains. *Pinus* (579 grains/g) was very low, with only a trace of *Juniperus* (7 grains/g) pollen. Cheno-am (2349 grains/g) pollen was high with a small number of pollen clumps (7 grains/g). High (78 grains/g) and low spine (59 grains/g) Asteraceae were high to moderate, with low amounts of Poaceae and *Artemisia* (7 grains/g each). *Ephedra* (351 grains/g) was very high with moderate Cactaceae (13 grains/g) and high amounts of Cylindropuntia (85 grains/g). *Zea mays* (26 grains/g) was also high. The adjusted pollen concentration values of *Zea mays* and Cactaceae both increased to 33.03 and 38.54 grains/g, respectively. *Eriogonum* (5.51 grains/g) was present on the low magnification scan of the slide.

FS 1203 had 1,804 grains/g total pollen concentration values and was based on a full count of 511 grains. *Pinus* (572 grains/g) was very low with traces of *Juniperus, Picea* (4 grains/g each), and *Quercus* (7 grains/g). Cheno-am (935 grains/g) was low, but contained a small number of pollen clumps (4/g). Poaceae (32 grains/g) was moderate, with moderate to high, high (53 grains/g) and low spine (71 grains/g) Asteraceae. *Artemisia* (18 grains/g) was moderate. *Zea mays* (35 grains/g) was high with small amounts of Cactaceae (4 grains/g) and Cylindropuntia (7 grains/g).

Structure 5. Two samples were submitted from the floor of the structure. FS 1768 had 3,088 grains/g total pollen concentration values. *Pinus* (633 grains/g) was very low. Cheno-am (1,443 grains/g) was moderate to high, with low Poaceae and high spine (25 grains/g each), and high amounts of low spine Asteraceae (177 grains/g). Cylindropuntia (25 grains/g) was also present. *Zea mays* (32.54 grains/g) and Cactaceae (21.7 grains/g) were present on the low magnification scan of the slide.

FS 1823 had 2,700 grains/g total pollen concentration values. *Pinus* (413 grains/g) was very low, with a small amount of *Quercus* (32 grains/g). Cheno-am (1461 grains/g) was moderate with a high amount of pollen clumps (32/g). High (32 grains/g) and low spine (95 grains/g) Asteraceae were present. *Zea mays* (39.1 grains/g) was present on the low magnification scan of the slide.

Feature 14: posthole. FS 1898 was taken from a posthole in Structure 5 that had 2,523 grains/g total pollen concentration values. *Pinus* (156 grains/g) was very low, but Poaceae (125 grains/g) was extremely high. Cheno-am (1402 grains/g) and high spine Asteraceae (31 grains/g) were moderate, while low spine (218 grains/g) Asteraceae and *Artemisia* (249 grains/g) were very high.

Feature 39: posthole sealed by floor. FS 1942 was taken from Structure 5, but contained only 366 grains/g total pollen concentration values. *Pinus edulis,* Poaceae, Cheno-am, *Artemisia,* and indeterminate were the only taxa present. Onagraceae (2.68 grains/g) was present on the low magnification scan of the slide.

Structure 50. FS 2119 was taken from the floor of structure, with only 470 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am, Cylindropuntia, and *Zea mays* (78 grains/g) were the only taxa present. FS 2156 was also taken from the floor, but contained only 216 grains/g total pollen concentration values. Poaceae, Cheno-am, and *Ephedra* were the only taxa present.

Feature 160: posthole for main roof support. FS 2280 was taken from a posthole in Structure 50. The assemblage had 1,080 grains/g total pollen concentration values. *Pinus* (62 grains/g) was only present in trace amounts. Cheno-am (644 grains/g) was very low, with moderate to high amounts of high (62 grains/g) and low spine (83 grains/g) Asteraceae and *Artemisia* (83 grains/g). *Zea mays* (42 grains/g) was present in high amounts.

Feature 173: posthole for main roof support. FS 2286 was taken from a posthole in Structure 50. The assemblage had 5,716 grains/g total pollen concentration values. *Pinus* (336 grains/g) was very low. Cheno-am (4615 grains/g) was high along with Poaceae (61 grains/g) and low spine Asteraceae (367 grains/g).

Feature 156: storage pit with plastered opening. FS 2304 was taken from a storage pit in Structure 50. The assemblage had only 218 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am, high spine Asteraceae, *Artemisia,* and indeterminate pollen were the only taxa present. Cactaceae (3.45 grains/g) pollen was present on the low magnification scan of the slide.

Feature 171: storage pit with plastered opening. FS 2319 was taken from the storage pit in Structure 50. The assemblage had 1,617 grains/g total pollen concentration values based on a full count of 513 grains. *Pinus* (378 grains/g) pollen was low, with a trace (6 grains/g) of *Juniperus*. Cheno-am (769 grains/g) was low, with moderate to high amounts of high and low spine Asteraceae and *Artemisia*. *Polygonum* (3 grains/g) and Cylindropuntia (6 grains/g) were also present. *Zea mays* (3.15 grains/g) was present in the low magnification scan of the slide.

Feature 184: storage pit with plastered opening. FS 2322 was taken from a storage pit in Structure 50. The assemblage had only 447 grains/g total pollen concentration values. *Pinus edulis, Polygonum,* Poaceae, Cheno-am, high and low spine Asteraceae, *Artemisia*, indeterminate, and *Zea mays* (18 grains/g) were the only taxa present.

Feature 166: storage pit with plastered opening. FS 2368 was taken from a storage pit in Structure 50. The assemblage had only 312 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* Poaceae, Cheno-am, low spine Asteraceae, and *Zea mays* (25 grains/g) were the only taxa present. *Abies* (1.92 grains/g) was present on the low magnification scan of the slide.

Feature 183: storage pit with plastered opening. FS 2375 was taken from a storage pit in Structure 50. The assemblage had only 847 grains/g total pollen concentration values. *Pinus ponderosa,* Solanaceae, Cheno-am, high and low spine Asteraceae, Artemisia, and indeterminate pollen were the only taxa present. Onagraceae (2.2 grains/g) was also present on the low magnification scan of the slide.

Feature 182: sipapu. FS 2498 was taken from a sipapu in Structure 50. The assemblage had only 701 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* Poaceae, Cheno-am, high and low spine Asteraceae, Cylindropuntia, *Ephedra,* and *Zea mays* (39 grains/g) were the only taxa present. A small amount of Solanaceae pollen (2.97 grains/g) was present on the low magnification scan of the slide.

Early Developmental Period

Feature 69: storage pit with subfloor pit. FS 2407 was taken from storage pit, which had 1,863 grains/g total pollen concentration values. *Pinus* (773 grains/g) was very low, with small amounts of *Juniperus* (7 grains/g) and *Picea* (15 grains/g). Cheno-am (608 grains/g) was low with moderate Poaceae (44 grains/g). A moderate number of Cheno-am pollen clumps (11/g) was present. High (70 grains/g) and low spine (122 grains/g) Asteraceae were high with low to moderate *Artemisia* (18 grains/g). *Eriogonum* (7 grains/g), Cylindropuntia (18 grains/g), *Sphaeralcea* (4 grains/g) and *Zea mays* (74 grains/g) were also present. *Abies* (1.36 grains/g) and Onagraceae (2.73 grains/g) were also present on the low magnification scan of the slide.

Feature 92: pit with rodent damage. FS 2415 was taken from the pit, which had 759 grains/g total pollen concentration values. *Pinus edulis*, Poaceae, Cheno-am, high and low spine Asteraceae, Cylindropuntia, Indeterminate, and *Zea mays* (41 grains/g) were the only taxa present.

Late Developmental Period

Structure 5A. Two samples, FS 1464 and FS 1484, were taken from the floor of Structure 5A, which superimposes Structure 5. FS 1464 had 1,881 grains/g total pollen concentration values. *Pinus ponderosa* (174 grains/g) was very low, with low amounts of Cheno-am (1097 grains/g). Poaceae (53 grains/g) was moderate, with high amounts of low spine Asteraceae (174 grains/g) and *Artemisia* (52 grains/g). Cylindropuntia and *Zea mays* (17 grains/g each) were present in moderate amounts. Small amounts of Cheno-am pollen clumps were observed on the low magnification scan of the slide.

FS 1484 had 3,468 grains/g total pollen concentration values based on a full count of 501 grains. *Pinus* (533 grains/g) was very low with traces of *Juniperus* and *Shepherdia* (7 grains/g each). Poaceae (42 grains/g) were moderate, with high amounts of Cheno-am (2506 grains/g) and Cheno-am pollen clumps (21/g). High (48 grains/g) and low spine (166 grains/g) were moderate to high with moderate amounts of *Artemisia* (28 grains/g). Fabaceae, Cactaceae, *Sphaeralcea*, and *Zea mays* (7 grains/g each) were present in small amounts.

Feature 6: adobe-lined mealing bin. FS 1505 was extracted from an adobe-lined mealing bin located in Room 5. The assemblage had 1,966 grains/g total pollen concentration values. *Pinus* (302 grains/g) was very low. Cheno-am (1,145 grains/g) was moderate, with moderate amounts of high (43 grains/g) and low spine (22 grains/g) Asteraceae. *Eriogonum* and Poaceae (22 grains/g each) were low to moderate. *Zea mays* (9.26 grains/g), *Sphaeralcea* (4.63 grains/g), and Cactaceae and Cylindropuntia (9.26 grains/g) were present on the low magnification scan of the slide.

Feature 5. FS 1310 was taken from extramural activity area (Feature 5) overlying Structure 5A. The assemblage had 3,559 grains/g total pollen concentration values. *Pinus* (186 grains/g) was very low. Cheno-am (2,364 grains/g) was high, with high amounts of both high and low spine (239 grains/g each) Asteraceae. Poaceae (27 grains/g) was moderate, with high amounts of *Artemisia* (80 grains/g). Cylindropuntia (53 grains/g) was high along with *Sphaeralcea* and *Eriogonum* (27 grains/g each). *Zea mays, Prosopis, Polygonum,* and Cactaceae (5.69 grains/g each) were present on the low magnification scan of the slide.

LA 6171

LA 6171 is a multicomponent site with pit features dating to the earliest Developmental period (AD 500 to 700), pit structures and pits dating to the Early Developmental period (AD 700 to 900), and a possible Coalition period structure and refuse (AD 1200 to 1325). The results of the pollen analysis from this site are provided in Table 24.6. Individual samples are discussed below by structure and feature.

Earliest Developmental Period Features

Feature 53. FS 942 was taken from a large, steep-sided, unburned pit, with undulating walls and base. The pit had only 712 grains/g total pollen concentration values. *Pinus edulis,* Poaceae, Cheno-am, high spine Asteraceae, *Ephedra*, indeterminate, and an unknown type were all present.

Feature 56. FS 613 was taken from a bell-shaped roasting pit, which contained three subfloor pits. The assemblage had 1,350 grains/g total pollen concentration values. *Pinus* (120 grains/g) was very low. Cheno-am (1,110 grains/g) was low, with low amounts of Poaceae (30 grains/g). High and low spine Asteraceae (30 grains/g each) were also low.

Feature 59. FS 621 was one of the subfloor pits, but had 13,890 grains/g total pollen concentration values. *Pinus* (797 grains/g) was low, with a small amount of *Juniperus* (27 grains/g) pollen. Poaceae (398 grains/g) and Cheno-am (11,393 grains/g) were very high. *Sarcobatus* (53 grains/g) was high along with both high (398 grains/g) and low spine (372 grains/g) Asteraceae. *Artemisia* (53 grains/g) was also high.

Feature 104 in 83. FS 580 was taken from a subfloor pit within Feature 83, a thermal pit. It had 297 grains/g total pollen concentration values. *Pinus ponderosa,* Poaceae, Cheno-am, high and low spine Asteraceae, and indeterminate pollen were the only taxa present.

Feature 93 in 92. This sample came from the Early Developmental period, but dated to AD 500 to 650, making it the earliest sample in the project. The sample came from an extramural feature and no contemporaneous structures are present within the excavated site limits. FS 866 was taken from a subcist (Feature 93) in a bell-shaped pit (Feature 92), which had 3,860 grains/g total pollen concentration values. *Pinus edulis* (207 grains/g) was very low, along with a trace (34 grains/g) of *Quercus* pollen. Poaceae (34 grains/g) was low, with high Cheno-am (3206 grains/g) pollen. High (103 grains/g) and low spine (172 grains/g) Asteraceae pollen was high.

Early Developmental Period Components

Structure 9. FS 629 was taken from the southeastern section of the floor of Structure 9, which had only 359 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* Poaceae, Cheno-am, high and low spine Asteraceae, and *Ephedra* pollen were the only taxa present.

FS 630 was taken from the southwestern section of the floor of Structure 9 and had 978 grains/g total pollen concentration values. *Pinus edulis,* Poaceae, Cheno-am, low spine Asteraceae, *Ephedra, Zea mays* (31 grains/g), and indeterminate pollen were the only taxa present.

Structure 18. *Feature 24.* FS 919 was taken from a storage pit in Structure 18. The assemblage had 573 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* Solanaceae (40 grains/g), Poaceae, Cheno-am, high and low spine Asteraceae, Cactaceae, *Ephedra,* Indeterminate, and *Zea mays* (89 grains/g) were present.

Structure 26. *Feature 26.* FS 881 was taken from the floor of Structure 26 with only 767 grains/g total pollen concentration values. *Pinus edulis,* Poaceae, Cheno-am, high and low spine Asteraceae, and indeterminate pollen were the only taxa present.

Feature 31. FS 949 was taken from a double posthole, which had only 118 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am, high spine Asteraceae, *Zea mays* (12 grains/g), and indeterminate were the only taxa present.

FS 950 was taken from a double posthole and had only 354 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am, high and low spine Asteraceae, and indeterminate pollen were the only taxa present.

Structure 60. FS 687 was taken from the floor of Structure 60, which had 3,677 grains/g total pollen concentration values. *Pinus* (334 grains/g) was very low with small amounts of *Juniperus* (51 grains/g) and *Salix* (77 grains/g). Poaceae (180 grains/g) was very high along with Cheno-am (2186 grains/g) and a large number of Cheno-am pollen clumps (26/g). High (77 grains/g) and low spine (283 grains/g) Asteraceae were high along with a moderate amount of Cactaceae (26 grains/g).

Zea mays (23.74 grains/g) was present on the low magnification scan of the slide.

FS 659 was taken from the floor and under a pallet in Structure 60. The assemblage had 665 grains/g total pollen concentration values. *Pinus edulis, P. ponderosa,* Poaceae, Cheno-am, high and low spine Asteraceae, *Artemisia,* and *Zea mays* (14 grains/g) were the only taxa present.

FS 665 was taken from the floor and under a metate in Structure 60. The assemblage had 2,053 grains/g total pollen concentration values. *Pinus* (220 grains/g) was very low, with a small amount of *Juniperus* (21 grains/g). Poaceae (71 grains/g) was high, with low Cheno-am (1258 grains/g). High (57 grains/g) and low spine (227 grains/g) were high, along with *Artemisia* (63 grains/g). Brassicaceae (28 grains/g) was high for this taxon.

Feature 63. FS 699 was taken from a pit in Structure 60. The assemblage had 1,671 grains/g total pollen concentration values. *Pinus edulis* (129 grains/g) was very low with a trace of *Carya* (26 grains/g) pollen. Poaceae (51 grains/g) was high with moderate Cheno-am (1157 grains/g). High (103 grains/g) and low spine (77 grains/g) Asteraceae were moderate. *Sphaeralcea* (26 grains/g) and *Zea mays* (51 grains/g) were also present.

Early Developmental Features

Feature 47. FS 754 was taken from a small pit and had 2,678 grains/g total pollen concentration values. *Pinus edulis* (203 grains/g) was very low, with small amounts of *Juniperus* and Poaceae (23 grains/g each) and a high amount of Cheno-am (2228 grains/g). High and low spine Asteraceae were low along with *Artemisia*.

Feature 85. FS 810 was taken from a human burial. The assemblage had 731 grains/g total pollen concentration values. *Pinus edulis, Sarcobatus,* Poaceae, Cheno-am, high and low spine Asteraceae, *Artemisia, Ephedra,* and indeterminate pollen were all present in small amounts.

Coalition Period Structure

Structure 1. FS 523 was taken from the floor in the northwest quadrangle of Structure 1. The assemblage had only 212 grains/g total pollen concentration values. Only Cheno-am, low spine Asteraceae, and indeterminate pollen were present.

Feature 19. FS 892 was taken from a remodeled posthole within Structure 1. The assemblage had 5,545 grains/g total pollen concentration values. *Pinus edulis* (592 grains/g) was very low with high Poaceae (187 grains/g) and Cheno-am (3,458 grains/g). A high number of Cheno-am pollen clumps (93/g) were also present. High (249 grains/g) and low spine (218 grains/g) Asteraceae was high along with *Artemisia* (125 grains/g). *Ephedra* (125 grains/g) pollen was high as well as *Zea mays* (187 grains/g), and Cylindropuntia (31 grains/g).

Feature 25. FS 935 was taken from a storage pit within Structure 1, which had only 646 grains/g total pollen concentration values. *Pinus edulis,* Cheno-am and Cheno-am pollen clumps, high and low spine Asteraceae, and indeterminate pollen were the only taxa present.

LA 115862

LA 115862 dated to the Early Developmental period (AD 700 to 900). The results of the pollen analysis are presented in Table 24.7. The results of the individual samples are presented below by structure and feature.

Structure 1

Feature 16. FS 221 was taken from a posthole in the southwest quadrant of Structure 1. The assemblage had 1,719 grains/g total pollen concentration values. *Pinus* (324 grains/g) was very low, with moderate Poaceae (42 grains/g) and low Cheno-am (1,000 grains/g) pollen. High (42 grains/g) and low spine (70 grains/g) Asteraceae pollen was moderate to high, with high amounts of *Ephedra* (127 grains/g) pollen. Cactaceae (28 grains/g) and Cylindropuntia (14 grains/g) were both present. *Zea mays* (6.26 grains/g) and *Sphaeralcea* (3.13 grains/g) were present on the low magnification scan of the slide.

Feature 17. FS 223 was taken from a posthole in the northwest quadrant of Structure 1. The assemblage had only 90 grains/g total pollen concentration values. *Pinus* was absent from the assemblage, although it was present on the low magnification scan of the slide (11.43 grains/g). Poaceae, Cheno-am, and *Ephedra* were the only taxa present. Low spine Asteraceae (3.81 grains/g) was also observed on the low magnification scan of the slide.

Feature 20. FS 234 was taken from an ash pit. The assemblage had 752 grains/g total pollen concentration values. *Pinus edulis* (29 grains/g) was only present in trace amounts. Poaceae (58 grains/g) and Cheno-am (405 grains/g) were moderate to low, with moderate amounts of both high (58 grains/g) and low spine (29 grains/g) Asteraceae.

Early Developmental Extramural Features

Feature 6. FS 181 was taken from a hanging ceramic seed jar, associated with a human fetus burial in a shallow pit. The assemblage had only 6.67 grains/ sq cm total pollen concentration values. *Pinus edulis,* Cheno-am, high and low spine Asteraceae was present, along with a small amount of *Zea mays.*

Feature 7. Four pollen wash samples were taken in association with the human burial of an 18-to19-year-old female in a shallow pit. FS 158 came from a ceramic jar that had 4.19 grains/sq cm total pollen concentration values. *Pinus edulis* and *Quercus* were present, along with small amounts of Cheno-am and both high and low spine Asteraceae pollen. *Eriogonum* and *Zea mays* pollen were also present.

FS 159 was taken from a ceramic bowl associated with the female burial. The assemblage had 25.64 grains/sq cm total pollen concentration values. *Pinus edulis,* Cheno-am, and both high and low spine Asteraceae, were present in low amounts. *Zea mays* (1.03 grains/sq cm) was also present and Cactaceae pollen was present on the low magnification scan of the slide.

FS 160 was taken from a Lino Gray ceamic jar associated with the female burial. The assemblage had 42.96 grains/sq cm total pollen concentration values. *Pinus edulis, Picea,* Poaceae, Cheno-am, high and low spine Asteraceae were present in moderate to low amounts. *Zea mays* (4.77 grains/sq cm) was present along with a trace of Liliaceae pollen.

FS 161 was taken from a ceramic seed jar associated with the female burial, which had 33.43 grains/sq cm total pollen concentration values. *Pinus edulis* and *P. ponderosa* were both present in small amounts. Poaceae, Cheno-am, high and low spine Asteraceae and *Sphaeralcea* were also present.

Feature 9. FS 192 was taken from a roasting pit, which had 731 grains/g total pollen concentration values. *Pinus* was absent from the assemblage. Cheno-am, low spine Asteraceae, *Ephedra*, and Indeterminate were the only taxa present.

Feature 11. FS 197 was taken from a roasting pit, with 508 grains/g total pollen concentration values. *Pinus edulis* (95 grains/g) was present in trace amounts only. Cheno-am and indeterminate were the only other taxa present.

Discussion

In order to examine the large amount of data available from these samples, some consolidation of the data is in order. The first logical step is to examine the background pollen rain, consisting primarily of the local arboreal and nonarboreal pollen taxa within the assemblages. The tables compare the mean pollen concentration values of selected background types with the elevation. The sites are ordered from north to south, although these are not provided. The data reveals that most of the distribution of the natural pollen rain appears to be controlled by elevation, and secondarily by north to south topography. While both *Pinus ponderosa* and *P. edulis* pollen are present in low to very low amounts throughout the data set, *Pinus ponderosa* pollen increases above the 5,300 ft level, which includes LA 249, the most northerly site within the project area. *Pinus edulis* pollen, on the other hand is generally low, but with increased values throughout the range of elevations. *Juniperus, Quercus*, and *Salix* are found sporadically throughout the elevation range. These taxa are also common understory components of both ponderosa pine and piñon-juniper forests. *Salix*, however, is a more riparian component requiring a constant moisture source.

While *Picea* pollen is present in several elevation zones, it is never very high. This taxon is generally restricted to higher elevations in the mountains. Its presence within these sites, regardless of elevation, is undoubtedly due to long-distance wind transportation from higher elevation sources and represents a form of modern contamination or human introduction through the use of spruce boughs as a covering layer or in ceremonies.

A small amount of *Ulmus* pollen was present throughout the assemblages. However, this taxon occurred only in the 5,275 ft and 5,330 ft elevation and was available in very low average amounts. *Ulmus* is not native to New Mexico, but rather was introduced historically as an ornamental. The low pollen concentration values probably reflect this historic introduction. *Carya* pollen, likewise, is not native to New Mexico. This taxon was present only at the 5,233 ft level. *Carya* was introduced historically to the areas of southern New Mexico as a commercial crop tree and again, this probably reflects historical introduction, and likely recent contamination.

The nonarboreal pollen taxa revealed the opposite trends. While both high and low spine Asteraceae were present in all elevation levels, low spine Asteraceae was moderate to high throughout the area, with the higher levels recorded in the higher elevations. High spine Asteraceae ranged from low to high, with the lower elevations recording significantly lower mean concentration values than did the upper levels. Cheno-am pollen was low to high, but the higher concentration values generally were present in the lower elevations while Poaceae showed the same trend.

Before proceeding any further, one problem in pollen analysis must always be addressed. Based on the pollen taxa recovered, the question always arises whether economic taxa are absent from these assemblages because they truly are not present, or, they are present in such small amounts, they have been missed during sampling. In order to assess the likelihood of their being missed, the estimated maximum potential concentration values (Dean 1999) of target taxa was computed. Since the entire slide was examined (either by count or low magnification scan on the slide) the estimated number of marker grains per slide was computed by averaging the number of marker grains per transect and multiplying this by the total number of transects examined. Assuming the first grain observed on an hypothetical second slide was one of the target taxa, then the maximum potential concentration value can be computed. Therefore, the number of fossil grains is one, and the number of marker grains per slide is substituted for the number of marker grains counted in the pollen concentration formula. The data is presented in Tables 24.2 to 24.8 with their respective sites. Without examining the total pollen residues we can never be absolutely sure the target taxa is absent from the assemblage. Given the low estimated potential pollen concentration values, I conclude it is more likely the missing taxa are absent from the assemblages.

Principal Components Analysis

The pollen wash samples and soil samples were analyzed using PCA separately. Due to the extremely large size of the ceramic vessels washed, the pollen concentration values were fairly low, ranging from less than 100 grains/sq cm to less than 1 grains/sq cm. If the entire database from Peña Blanca had been examined together, the main separation would have been between soil samples and the pollen wash samples. This would have provided no information not already available through visual inspection. This provided sufficient justification to separate the two components of the database.

Soil Pollen Samples

The results of the Principal Components Analysis (PCA) of the soil samples are provided in Table 24.8. Additionally, the table includes the results of Simpson's Diversity

Index calculations based on a transformation of the data to the log e. The results of the eigenvalue analysis (Table 24.8, part A) revealed that each individual axis accounted for only a small portion of the total variation. The first 2 axes extracted (30.4 percent and 11.3 percent, respectively) accounted for a total of only 41.7 percent of the total variation. The next 13 axes accounted for only 5 percent or less each of the total variation. Axis 1 was dominated by *Pinus edulis,* Poaceae, Cheno-am, and both high and low Asteraceae in addition to the indeterminate pollen type, essentially the background pollen rain, whereas Axis 2 was dominated primarily by *Juniperus*, Fabaceae, and *Shepherdia* pollen. An initial comparison of the first and second principal component by age of the samples revealed the vast majority of all pollen soil samples were overlapped so tightly that the PCA could not effectively separate the samples by any criteria. This might have been anticipated given that the total observed variation in the assemblage was being controlled by the age of the occupation, structure function, and feature function of the various sampling locales. Because of the large amount of overlap, no further analysis of the principal components was attempted.

Pollen Wash Samples

The PCA results of the pollen wash samples are provided in Table 24.9. Additionally, the table includes results of Simpson's Diversity Index calculations based on a transformation of data to the log of base 10. The results of the eigenvalue analysis (Table 24.9, part A) were somewhat less than desired. A total of 27 axes were extracted, although 100 percent of the observed variation was explained by the first 17 axes. The first axis accounted for 31.6 percent of the variation. The second and third axes accounted for an additional 15.3 and 11.1 percent, respectively, but it took the first eight axes to account for 90 percent of the variation.

The first two axes extracted are somewhat interesting in that they seem to separate the background taxa and the economic taxa. The dominant taxa in Axis 1, determined by loadings in excess of 0.2500, all had positive loadings for *Pinus ponderosa, Pinus edulis,* Cheno-am, low-spine Asteraceae, *Artemisia,* and *Ephedra.* This effectively represents the majority of the arboreal pollen taxa with the inclusion of woody grassland elements. The second axis is dominated by *Zea mays,* Cucurbitaceae, Cactaceae, Cylindropuntia, Platyopuntia, Liliaceae, and indeterminate pollen. This is effectively the bulk of the economically important taxa, although the inclusion of Liliaceae and indeterminate pollen is surprising. The loadings for these two taxa are the smallest within the axes and perhaps these should not be included after all.

Axis 8 includes the size of the area washed with a fairly high negative loading. This would suggest an inverse relationship between the size of the ceramic vessel and the pollen concentration values, which is not totally unexpected. Comparison of the first and second principal component by age of the sample provided no clear distinctions. There was a hint that the younger (Pueblo II to III) period could be separated, but the ranges of the earlier periods (Developmental) overlapped. Also, the Pueblo II to III period was represented by only a single sample. Likewise, comparison of the first and second principal component by vessel type was similarly overlapping. There appeared to be some separation of bowls, mug, pitchers, and jars, but these were not very clear and the degree of overlap was fairly large. The many interacting factors related to pollen deposition probably precluded clear separations.

Structure Types

Pivot Table 24.11 shows a breakdown of selected pollen taxa by a gross structure type. This table essentially separates the data by extramural locations and two main types of structures: pit structures and pit rooms. The prior expectations of this distribution would have been for extramural features to have higher pollen concentration values than those from within structures. The effect of structure walls is to block normal ambient pollen deposition. Entrances such as doorways, top hatches, etc., are usually small and cause a precipitous drop in the wind velocity. When this occurs, the pollen load of the wind is dropped and there is a large increase in pollen concentration values in the immediate vicinity of the opening (Tauber 1965; Birks and Birks 1980). However, in the samples from Peña Blanca, the extramural features contain primarily low to very low mean concentration values of the arboreal pollen taxa. The average pollen concentration values for *Pinus edulis* from the entire project is only 255 grains/g and the extramural samples are only 196 grains/g. During AD 500 to 650 and 700 to 900, when the concentration values were slightly elevated, arboreal concentration values are still in the very low category. The nonarboreal pollen types, particularly Cheno-am and grasses, show a slight increase in values from extramural features, but the difference is insignificant. The distribution indicates a lack of well-developed forested areas in the immediate vicinity of the archaeological sites, and places them within a more grassland habitat during occupation. *Ephedra* pollen is also slightly higher from the extramural samples than from within structures. Again, this is consistent with a desert scrub grassland in the vicinity of the site. *Artemisia,* on the other hand, while individually variable, appears to occur in slightly lower concentration values from extramural features than from structures, etc. *Artemisia,* as part of the natural pollen rain, is often masked by other taxa, therefore reducing or minimizing its pollen concentration values. When the plant is intentionally brought into a structure (cultural vector), the opposite occurs. Relatively large amounts of *Artemisia* pollen are brought into the structures, possibly for ceremonial purposes, but the structure itself blocks normal pollen deposition, giving *Artemisia* the appearance of increased pollen concentration values. Two samples that were not dated and both fell within the category of extramural features from LA 249 had slightly elevated concentration values for the arboreal and nonarboreal background pollen taxa. These samples actually were closer to the expected means than the dated samples.

The extramural features (to be examined individually later) had only relatively small amounts of economic pollen with the exception of AD 700 to 900. The extramural samples from this period had fairly high mean concentration values of Cylindropuntia, Cactaceae, and *Zea mays* pollen. Traces of *Sphaeralcea,* Platyopuntia, Solanaceae, and *Eriogonum* were also present.

In all types of structures the arboreal component was very low and appeared slightly lower than the mean concentration values from the extramural samples. Structures were present from both the Early (AD 700 to 900) and Late Developmental periods (AD 1100 to1200). Structures from the project area contain moderate to high amounts of *Zea mays* pollen, which is slightly higher in the earlier period. Cylindropuntia and Cactaceae pollen are slightly higher in the later period, but this may be a function of the number of samples from these periods. Onagraceae, Solanaceae, *Polygonum,* and *Eriogonum* are present in trace amounts, but Fabaceae pollen is present only from this structure type and from the undated extramural features. While not obligate economic taxa, the structures also had generally high amounts of *Artemisia* pollen.

The rooms that were associated with the Late Developmental period (AD 1100 to 1200) and the Coalition period (AD 1200–1325) had the lowest levels of economic pollen. Only traces of *Artemisia* were present in the later occupations with a slightly elevated mean concentration value from the earlier occupation. Cactaceae and Cylindropuntia were present is small amounts, with only traces of Onagraceae and *Eriogonum,* but *Eriogonum* dramatically increases with the earlier occupation. Inside the rooms, *Zea mays* shows an opposite trend with smaller values in the earlier occupation rather than in the later.

The trend to decreasing economic taxa may correlate with room function or specialization. In earlier periods, multiple activities occurred within structures. However, in later periods, there appears to be more specialization. Plant processing activities may have been removed from habitation areas, therefore reducing the amount of pollen-bearing plants stored in the structures. However, at this stage, it is speculative.

Structures by Site

The next level of analysis examines the differences between structures within the same sites and similar temporal periods. This data is presented in Pivot Table 3, Table 24.12.

Coalition Period

The youngest dated samples from AD 1200 to 1325 were taken from LA 6169, which contained samples from four rooms. The arboreal pollen was either absent or in very small mean amounts. *Pinus ponderosa* averaged only 32.6 grains/g from the pit rooms while *Pinus edulis* averaged 276.6 grains/g. In both cases, these taxa are either present in trace or very low amounts. No other arboreal taxa were present in any of the pit rooms associated with the Coalition Period. This is probably due to the blocking effects of the structures themselves. Although, *Pinus* sp. produces large quantities of pollen, ambient deposition is often effectively blocked by the walls and roof of these structures (Tauber 1965). The absence of *Juniperus* pollen is not too surprising. *Juniperus* produces much lower quantities of pollen than other arboreal components and the pollen of *Juniperus* is very thin walled and susceptible to deterioration. In an earlier, experimental study, Holloway (1989) discovered after alternating only 25 cycles of either wet/dry conditions or freezing/thawing temperatures, over 80 percent of fresh *Juniperus* pollen was deteriorated to some degree. So, in addition to the blocking effect of the structure, it is reasonable to account for the absence of *Juniperus* pollen.

Room 16 had moderate to low mean concentration values for the nonarboreal pollen types. Room 15 had elevated averages for Cheno-am and high spine Asteraceae but in general the nonarboreal pollen was low. Economic pollen was fairly low to moderate from the contexts as well. Cactaceae, although in small amounts, was present in Rooms 10 and 16, which also had fairly high mean values for *Zea mays* in Room 10. Room 16 had traces of Onagraceae and *Eriogonum*, although *Zea mays* was completely absent from the assemblage.

Late Developmental Period

The Late Developmental period ranges from AD 1100 to 1200 with several structures at LA 249, LA 6169, and LA 6170 associated with this temporal period. Structure 6 (LA 249) was fairly typical with very low amounts of both *Pinus ponderosa* and *P. edulis* pollen, along with small amounts of *Juniperus* and *Quercus*. The NAP was also reduced, with mean values of Cheno-am, Poaceae, and low levels of *Artemisia*. Very little economic pollen was present at this structure, except for low values of Cactaceae, Cylindropuntia, and *Zea mays.*

The sample from Structure 76 was located within Structure 47 at LA 6169 and had very high pollen concentration values. Moderate quantities of *Pinus edulis* pollen were present, but without any trace of *Pinus ponderosa.* The higher levels of *Pinus* pollen may be related to the rebuilding of Structure 47. Cactaceae, Cylindropuntia, and *Zea mays* were all high and may suggest either plant storage or processing of materials within this structure. Both LA 249 and LA 6169 are located in the northern portion of the project area and separated by an elevation of 55 ft. It is possible, but unlikely that the observed differences in pollen assemblages were caused by topographical changes.

Structure 5A was constructed over the remains of Structure 5 (LA 6170) during the Late Developmental period. Arboreal pollen was low, with very low amounts of *Pinus* and a trace of Juniperus pollen. Cheno-am pollen from Structure 5A was high (mean = 1,801 grains/g) with moderate amounts of grass pollen. A small amount of Cheno-am pollen clumps was present in Structure 5A. The presence of these pollen clumps are usually interpreted as reflecting the presence of flowers (Bohrer 1981).

Cheno-am and other members of Chenopodiaceae have an indeterminate growth habit. So, as the plant continues to grow apically during the growing season, flowering stalks are continually produced laterally. Later in the growing season, it is very common to find plants containing both immature and mature flower buds, opened flowers, immature, mature, and dehisced fruits. These plants are highly branched and an excellent source of kindling wood. The presence of higher pollen concentration values in Structure 5A suggest the gathering of these plants for firewood.

The NAP was also fairly high at this site, with particularly low spine Asteraceae and Artemisia pollen. Once again, the taxa suggest they were intentionally brought into the structure and possibly utilized as fuel. A mealing room in the structure had higher values of NAP and may be an indicator of seasonality. The NAP brought into the room could have adhered to clothing or sandals of the occupants. A late summer-early fall occupation of the mealing room generally coincides with peak harvest periods. The pollen assemblages could reflect numerous trips into the room by transporting the harvest prior to processing. Flotation and macrobotanical data should provide corroborative data for this hypothesis.

The number of economic taxa recovered from the mealing room is somewhat high. Fabaceae pollen was only recovered from the context of Structure 5A. The pollen grain was too deteriorated to permit a genus level identification, but the presence is suggestive. While this particular grain could represent one of the myriad of naturally occurring wild taxa of this family, it is also possible it represents a cultivated member of the group. If the grain represents *Phaseolus* sp., its presence within the mealing room is quite natural. Small amounts of *Eriogonum* and *Sphaeralcea* pollen were present, in addition to larger amounts of Cactaceae, Cylindropuntia, and *Zea mays*. With the exception of *Zea mays,* all of these taxa are insect pollinated (entomophilous) and produce relatively little pollen. Given the context of a mealing room, the presence of all the economic taxa is undoubtedly via a cultural vector. The concentration values of any single taxon are not high. I suspect the pollen concentration values recovered were the product of bringing harvested plant materials into the room for processing. Given the range of pollen types, it is likely inhabitants of the mealing room processed both cultivated and gathered plant materials.

Structure 5A was sufficiently different, palynologically, to be effectively separated from the other structures examined in the later occupational periods. The proposed function of the mealing room is supported by palynological evidence. Other structures and rooms did not contain pollen assemblages sufficient for effective separation of function on this level. The separations are based on mean pollen concentration values, and I suspect the determination of function for these structures will be based on the number and type of individual features found within each structure.

Early Developmental Period

The period from AD 700 to 900 had the largest number of structures. A total of 14 pit structures were sampled from five sites, LA 115862, LA 265, LA 6169, LA 6170, and LA 6171.

LA 115862. Structure 1 had very low arboreal and nonarboreal pollen averages. Economic pollen was also low, with very small amounts of Cactaceae, Cylindropuntia, *Sphaeralcea, and Zea mays.*

LA 265. At Structure 1, eight pollen samples were taken in a column. The pollen concentration values of selected taxa from the column are presented in Pivot Table 12. Figure 24.21 diagrams five economic taxa by level. Stratum 1 was an ashy upper fill, probably of colluvial deposition. This stratum contained low values for AP, although very small amounts of a larger number of taxa were present. These included *Juniperus, Picea, Salix,* and *Quercus* in addition to the more common *Pinus ponderosa* and *P. edulis*. NAP was generally low, with low amounts of Onagraceae, Cactaceae, Cylindropuntia, *Sphaeralcea,* and a moderate to high amount of *Zea mays.* Stratum 2.1 was structure fill and probably represents a trash dump. This assemblage contained no AP, and only Cheno-am (low) for NAP. No economic pollen was present from this sample.

Stratum 2.2 was a combination of alluvial deposition and cultural trash. This assemblage had trace amounts of AP, and very low amounts of NAP. Cylindropuntia was moderate with high amounts of Cactaceae and *Zea mays* pollen.

Stratum 2.3 was a dumping episode and consisted of trace amounts of AP and low NAP. Cactaceae and Cylindropuntia were moderate to high, with low to moderate *Zea mays* pollen. Stratum 2.4 was a combination of alluvial deposit and trash. This sample had low AP and NAP. Cactaceae, Cylindropuntia, and *Zea mays* were all very high. Stratum 2.5 was also a combination of alluvial deposition and cultural trash. The assemblage contained a trace of AP and low to moderate NAP. The economic taxa present were moderate amounts of Cylindropuntia and high amounts of both Cactaceae and *Zea mays.*

Stratum 3 was a sandy clay containing adobe. Traces of AP were present, but with Salix pollen, and the NAP was quite low. Only a small amount of Cactaceae pollen was present. Stratum 3.1 was defined as a loose, charcoal-stained sand. This was similar to Stratum 3, which contained traces of AP and *Salix*. NAP was generally low, with high amounts of Poaceae and low spine Asteraceae. No economic taxa were present. In general, Stratum 3, the underlying material had very little pollen. The trash dumping episode contained higher concentration values of members of the Cactaceae and corn families.

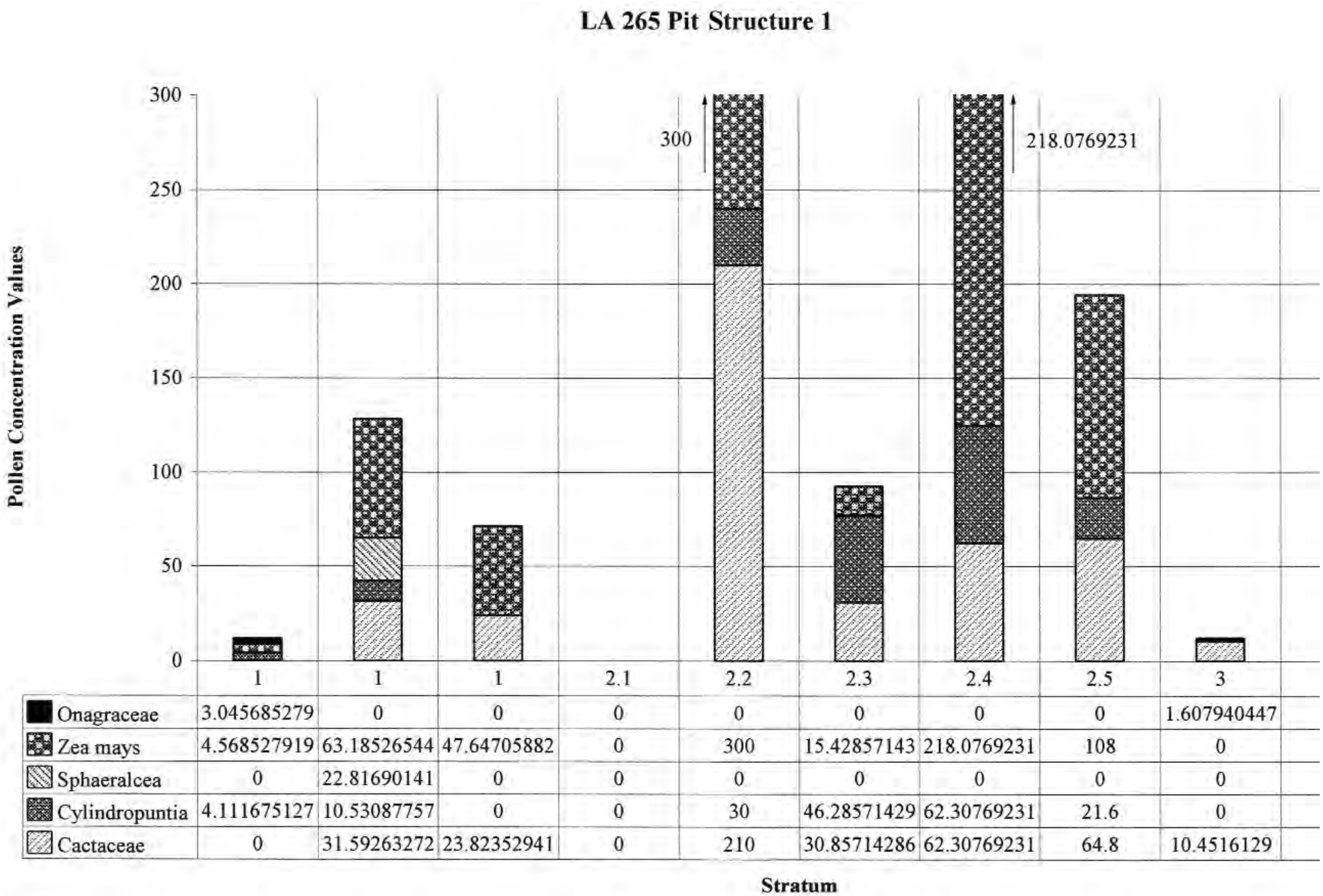
A similar column was taken through extramural Feature 14, a large irregular-shaped pit. A total of nine stratigraphic units were sampled and essentially reflected a series of trash dumping episodes. Figure 24.2 diagrams three economic taxa by level. Stratum 1 had low AP and moderate NAP. Cactaceae was the only economic taxon, which was present in fairly high levels. Stratum 2 had low AP and NAP. Cactaceae and *Zea mays* were both present. Stratum A was an ash layer containing low AP, fairly high NAP, along with very high amounts of Zea mays. Stratum 3 had low AP and moderate NAP. No economic pollen was present. Stratum 4 had low AP and high NAP along with high amounts of Cactaceae, Cylindropuntia, and very high values for *Zea mays.* Stratum 5 was characterized by only traces of AP and low NAP. Cactaceae, Cylindropuntia, and *Zea mays* were present. Stratum 6 had low AP, and moderate to low NAP. Cactaceae and Cylindropuntia were high with moderate amounts of corn pollen. Stratum 7 had traces of AP, and low to moderate NAP. Corn and Cylindropuntia were high. Stratum 8 also had traces of AP and moderate NAP, although members of Asteraceae were high. Cactaceae pollen was the only economic taxon recovered.

The dumping episodes between Structure 1 and Feature 14 are somewhat similar. These particular strata are characterized by elevated concentration values for Cactaceae, *Cylindropuntia,* and/or *Zea mays.* The levels from the storage pit are generally much higher, than those from Structure 1. While the strata from Feature 14 represent discrete dumping episodes, it is not possible to determine the precise origin of these assemblages. The dumps may represent activities related to cleaning out storage facilities. However, if this is the case, these dumps had higher levels of important economic taxa when compared with other sites or features. For example Feature 14, plant materials such as *Zea mays,* Cactaceae, and *Cylindropuntia* were possibly stored on top of the dumped materials. This could explain the high pollen concentration values obtained from Feature 14.

Structure 13 had extremely low AP and NAP pollen concentration values. Whereas, *Cylindropuntia, Platyopuntia,* and *Zea mays* pollen were present in either high or moderate mean amounts.

The average concentration values from Structure 4 seem to compare with different aspects of the other two structures. The arboreal component is very similar to Structure 13, whereas the NAP component has slightly higher values in comparison to Structure 1. The economic types include: Onagraceae, Cactaceae, *Cylindropuntia,* and *Zea mays.* This is more like Structure 1 than Structure 13. The variations in many of the pollen assemblages are thought to be due to variations within the feature functions. However, based on the average concentration values, there is some indication of specialization among the plants within these structures. While individual features may be more important than the structures, it might appear that a type of specialization was occurring with Cylindropuntia concentrated in Structures 4 and 13, and corn in Structures 1 and 4, but this is by no means an absolute.

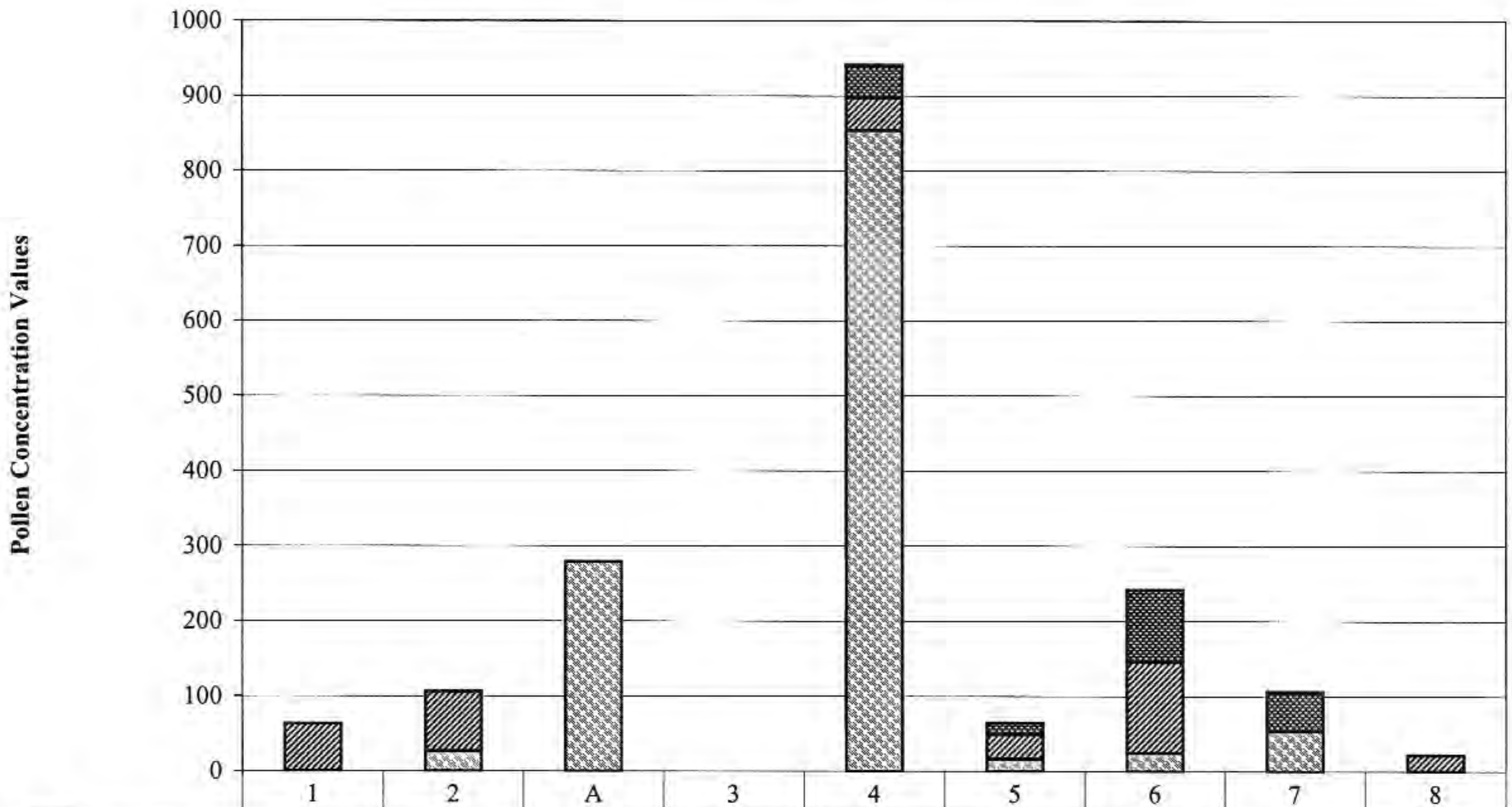
LA 6169. The arboreal component is very low in



	1	1	1	2.1	2.2	2.3	2.4	2.5	3
Onagraceae	3.045685279	0	0	0	0	0	0	0	1.607940447
Zea mays	4.568527919	63.18526544	47.64705882	0	300	15.42857143	218.0769231	108	0
Sphaeralcea	0	22.81690141	0	0	0	0	0	0	0
Cylindropuntia	4.111675127	10.53087757	0	0	30	46.28571429	62.30769231	21.6	0
Cactaceae	0	31.59263272	23.82352941	0	210	30.85714286	62.30769231	64.8	10.4516129

Figure 24.1. LA 265, Structure 1 economic taxa by level.

LA 265 Feature 14



Stratum	1	2	A	3	4	5	6	7	8
Cylindropuntia	0	0	0	0	43.7837838	16.2	96.7164179	53.1147541	0
Cactaceae	63.5294118	79.6721311	0	0	43.7837838	32.4	120.895522	0	22.1917808
Zea mays	0	26.557377	279.310345	0	853.783784	16.2	24.1791045	53.1147541	0

Stratum

Figure 24.2. Feature 14 economic taxa by level.

both Structures 4 and 47, although somewhat higher than previous sites. In part, this may be due to the slightly higher elevation of the site (Pivot Table, Table 24.10). The NAP was significantly higher in Structure 4 than Structure 47 and the mean concentration values for *Artemisia* were extremely high (134 grains/g). The high amount of Artemisia pollen may suggest a ceremonial function, but this is speculative. Structure 4 also has a larger number of economic taxa (n = 8) present and in higher concentration values (n = 4) than Structure 47.

LA 6170. The overall average concentration values of the assemblages are lower in LA 6170 than other sites. Arboreal pollen is very low, but average concentrations of Poaceae and Cheno-am are somewhat elevated. While the number of Cheno-am pollen clumps is small, they are consistently present at all three structures, suggesting that plants containing flowers were brought into structures (Bohrer 1981). *Artemisia* is very high in Structure 50, which also contains small amounts of Solanaceae pollen. Evidence suggests ceremonial activities could have taken place in this structure.

Structure 5 contains the smallest amounts of Onagraceae, Cactaceae, Cylindropuntia, and *Zea mays*. This may be a function of preservation, but also suggests the structure was occupied for a shorter period of time before burning. There is a *slight* increase in the number of economic taxa present from LA 6170 structures when compared to the other sites. This could be caused by a number of factors. LA 6170 is located at the lowest elevation of all sites in the project area, although the differences are minor. The increase in number of taxa could represent nothing more than an increased availability of suspected economic taxa due to this topographical variable. Though possible, this is probably unlikely. Alternatively, the functions of the pit structures could be more focused on activities utilizing more economic taxa, thus indicating a type of specialization between pit structures.

LA 6171. Structure 60 contains a slightly larger number of arboreal pollen taxa, which may reflect aspects of construction. The NAP, particularly Poaceae and Cheno-am, are moderate to high mean values. The structure contains small mean concentration values for *Polygonum, Eriogonum,* Brassicaceae, Cactaceae, and Cylindropuntia, along with moderate values for *Zea mays.* All of these values reflect cultural vectors for deposition, and the diversity of taxa suggests a reliance upon gathered plant materials.

The AP and NAP are very low from the remainder of the structures. LA 6171 was another lower elevation site examined, and the reduced AP may reflect this distribution. Structure 18 contains a small amount of Solanaceae pollen, but the mean values of *Artemisia* are decreased in amount. Given the rather small concentration values of *Artemisia*, I hesitate to ascribe a ceremonial function to this structure. *Zea mays* pollen is high, with Cactaceae, Cylindropuntia, Onagraceae, and Sphaeralcea pollen present, but in low mean amounts. The distribution of taxa may suggest a habitation structure, but this is by no means clear.

No economic taxa were present from either Structure 2 or 26 at LA 6171. The AP and NAP values are also extremely low, possibly a problem with preservation. The same characteristics appear to apply to Structure 9, with the exception of moderate quantities of *Zea mays* pollen, which was the only economic taxon present. The average pollen concentration value for this taxon was 15 grains/g, suggesting either a storage or processing activity occurred in this structure.

Structure Floor Samples

A number of samples were derived from floors or floor contact areas within several structures, pit structures, and pit rooms from the sites in this project area. Pivot Table 7, Table 24.16 contains the average concentration values of selected taxa organized by period, floor type, site structure, and feature.

Coalition Period (AD 1200 to 1325). The floor samples from this period were taken from LA 6169. The AP was very low from this period and none of the samples contained additional taxa, other than *Pinus*. Rooms 15, 16, and 70 had very low NAP with two exceptions: high values of low spine Asteraceae from Room 16 and moderate values of Cheno-am and high values of high spine Asteraceae from Room 15. The only economic taxa present in Rooms 16 and 70 consisted of low concentration values of *Zea mays,* which was absent from Room 15. In fact, the average concentration values were quite close (2.17 and 3.34 grains/g, respectively), therefore, the functions of the three pit rooms appears to be quite similar. There is no evidence to suggest plant processing functions occurred in these pit rooms. The lack of evidence may suggest rooms were for habitation, rather than food preparation.

The floor contact sample was taken from Room 10. Again, AP and NAP were very low or absent. However, higher values of Cactaceae and *Zea mays* pollen were recovered. While the floor contact did appear slightly different than the floors, it is still inferred that Room 10 functioned as a habitation structure without a great deal of plant processing activity.

Late Developmental Period (AD 1100 to 1200). Floor samples were taken from structures at LA 249, LA 6170, and LA 6169 from this period. AP was very low and consisted almost entirely of *Pinus edulis, Pinus ponderosa,* with small amounts of *Juniperus*. NAP was somewhat variable, with relatively low quantities from LA 249, moderate from LA 6170, and high values from LA 6169. Cactaceae, Cylindropuntia, and *Zea mays* pollen were present from the floors of Structure 6 at LA 249.

Structure 5A had low amounts of Fabaceae, Cactaceae, Cylindropuntia, and *Sphaeralcea,* along with more moderate values for *Zea mays.* This suggests Structure 5A functioned somewhat in plant processing activities. Some or all of these taxa were likely brought into the structure intentionally, via cultural vectors.

Structure 76 located within Feature 47 had very high amounts of Cactaceae, Cylindropuntia, and *Zea mays* pollen. Processing activities of these three taxa undoubtedly occurred within the structure. The main differences between the floors from this period and the Coalition period indicate more prevalent plant processing activities within structures from the Late Developmental period. Perhaps, the later Coalition period activities were more localized and/or specialized.

Early Developmental Period (AD 700 to 900). Floor samples were obtained from a total of nine structures at four sites dating to this period. Floor samples were taken from Structure 4 at LA 265. They were characterized by no AP or low NAP, but with high amounts of Asteraceae, and moderate to high amounts of economic pollen including Cactaceae, Cylindropuntia, and *Zea mays.*

Floor samples were collected from two keyhole structures at LA 265 (Features 27 and 33), both are from extramural locations. The AP was very low, as was the NAP, with the exception of the Asteraceae pollen. Cactaceae and Cylindropuntia were present in high amounts and *Zea mays* was low from Feature 33. The high concentration values for the Cactaceae suggest a storage function for these pits. These features are shallow, possibly seasonal structures with a few intramural features. They should be treated as structures, but can be differentiated from other structures due to their shallowness. These shallow structures are important in our interpretive framework, because they may represent different subsistence organization and occupations during the Early Developmental period. The pollen concentrations from these structures are particularly interesting because they suggest seasonality.

Floors samples at LA 6169 came from Structures 4 and 47. Structure 4 assemblage contained very low AP, moderate to high mean values of NAP, small amounts of *Polygonum*, Cactaceae, and moderate to high values of *Eriogonum,* Cylindropuntia, *Sphaeralcea,* and *Zea mays.* A single floor contact sample was taken from Structure 47. The assemblage had extremely low AP and low NAP pollen. The only economic taxon present was *Zea mays,* which was present in high amounts. Structure 47 assemblage is more similar to the structure samples from LA 6171, than from Structure 4 at this site.

The floors of three structures at LA 6170 were sampled. Structure 2 had very low AP, but had traces of *Juniperus, Picea,* and *Quercus* in addition to the more common *Pinus*. NAP was low to moderate, but there was a low number of Cheno-am pollen clumps (5 grains/g) from the floors. *Eriogonum* and Cactaceae were low, with high amounts of Cylindropuntia and *Zea mays.* Structure 5 had very low AP, but a small amount of *Quercus* pollen. The NAP was low to moderate, with high mean values for low spine Asteraceae and *Artemisia* pollen. Cactaceae, Cylindropuntia, and *Zea mays* were moderate to high. Structure 50 had only a trace of AP with low to trace amounts of NAP. Cylindropuntia and *Zea mays* pollen were both very high. The relatively high values of *Zea mays* and members of the Cactaceae family suggest plant processing, preparation, and storage activities conducted in conjunction with other domestic activities.

LA 6171 floor samples came from four structures. Structure 60 had low amounts of AP, with fairly high amounts of both *Juniperus* and *Salix* pollen. This may reflect roofing material preferences. NAP was very high comprising 88 percent of the assemblage and Cylindropuntia and *Zea mays* were also high. Two additional floor samples were taken from this structure, but were taken from underneath specific artifacts. A floor sample taken from under a metate had low AP, but had both *Pinus* and *Juniperus* pollen. NAP was moderate to high, but the assemblage had small amounts of *Polygonum, Eriogonum,* and Brassicaceae. Given the provenience of this sample, it is likely the metate was used in the preparation of wild plant materials. A second floor sample was taken from below a pallet. AP was low, but included *Pinus, Juniperus, Picea, Salix,* and *Quercus* pollen. NAP was low and the only economic taxon present was *Zea mays.*

Structure 18 had no AP and the NAP was quite low. Also, no economic pollen was present. Therefore, inferences regarding the function of this structure are not possible. Structure 2 had very low AP and moderate to low NAP. Again, no economic pollen was present. Structure 9 had very low AP and low amounts of NAP. Only a small amount of *Zea mays* pollen was present. In general, these structures had very little pollen. Most had no economic pollen, or at best only minimal values of corn, suggesting limited plant processing activities in these structures. Based on this negative evidence, it is possible these were utilized as habitation structures.

Mealing Bin Feature

An adobe-lined mealing bin was sampled from the Late Developmental period component at LA 6170. The mealing bin was located in Structure 5A. Arboreal pollen was low, with a small amount of Poaceae, but with moderate concentration values of Cheno-am pollen. The assemblage had high values for *Eriogonum* pollen, and small to trace amounts of Cactaceae, Cylindropuntia, *Sphaeralcea,* and *Zea mays.* The pollen assemblage indicates a variety of plant materials were possibly processed within this feature.

Ventilator Shaft

This particular feature (Feature 125) was associated with Structure 1 at LA 265. The pollen assemblage had a slightly higher than expected pollen concentration value. AP was very low, with low amounts of Poaceae. Cheno-am, Asteraceae, and *Artemisia* were moderate to high in values. The presence of a small amount of Cheno-am pollen clumps suggests that flowers were present. However, these could have been growing on the surface and simply fallen into the shaft without human intervention. Onagraceae, Cylindropuntia, and *Zea mays* are present in fairly high amounts. These are probably derived from the activities of the room connected to the ventilator shaft. As such, we can note their presence but an interpretation of function is beyond the scope of these data.

Features

The third form of investigation centered on the similarity of feature type. The data for these are presented separately in Pivot Tables 4 to 11, Tables 24.12 to 24.20. The feature types can be separated into those that occurred in intramural or extramural locations. Intramural features were below structure floors or in structure walls. Extramural features were in structure fill, attached to a structure exterior (ventilator shaft, for example), or from the general site area. Intramural features for which samples were processed include (the list of feature types). Extramural features for which samples were processed include (the list of extramural features). A third class of features is the large pit features, some of which had smaller interior features from the Earliest Developmental component at LA 6171.

LA 6171 Earliest Developmental Pit Features

All of these feature types were dated to the earliest Developmental period (AD 500 to 650). These features were associated with the earliest occupation of LA 6171. They appear to represent a different aspect of subsistence organization.

Feature 59, located in Feature 56, was defined as a subfloor pit. The assemblage contained low AP and high amounts of NAP, most notably Cheno-am, Asteraceae, Poaceae, and even *Sarcobatus*. The high amounts of NAP could be accounted for by their extramural position, but alternatively, high NAP counts may signify the subfloor pit was covered. Brassicaceae was high for this taxon and was the only economic taxon present.

An unburned, steep-sided pit (Feature 53) was located in an extramural area. The AP and NAP were very low, with no economic taxa present. No function for this feature could be inferred from the pollen.

A cist in a burned bell-shaped pit (Feature 93 in Feature 92) yielded no economic pollen. AP was low with high amounts of NAP, particularly Cheno-am and low spine Asteraceae.

A bell-shaped roasting pit (Feature 56) was sampled and contained no economic pollen taxa. The AP was present only in trace amounts and the NAP contained low or moderate (Cheno-am) amounts of pollen. No feature function could be inferred from these results.

Feature 104, located within Feature 83 (LA 6171), was a subfloor cist or pit. AP was present in trace amounts only. NAP was very low and no economic taxa were present.

Intramural Pit Features

Mealing Basin Features. This feature type was present only during the Coalition period (AD 1200 to 1325). Samples were taken from three mealing basins (Features 102, 103, and 104) in Room 16 (LA 6169). Arboreal pollen consisted entirely of *Pinus ponderosa* and *Pinus edulis,* which was present in very small to trace amounts. Cheno-am pollen was moderate to low in all three features and Poaceae was moderate in Features 102 and 103, but present in trace amounts only in Feature 104. No Cheno-am pollen clumps were present at Feature 102, but present in fairly high amounts (35.6 and 30.2/g) in the other two features. The high number of clumps suggest Cheno-am plants were brought into the basin features. However, the sample from Feature 102, which had the highest pollen concentration values for Cheno-am pollen, had no pollen clumps.

Cactaceae pollen was present from all three mealing basin features, with similar pollen concentration values. Cylindropuntia pollen was highest from Feature 102, with smaller amounts in Feature 104. *Zea mays* pollen was also present in all three features, but exhibited higher values (53.4 and 30.2 grains/g) from Features 103 and 104. Although there is some overlap of pollen taxa from these features, some degree of specialization may be indicated. Feature 102 seems to be used primarily for processing Cylindropuntia, with perhaps a little *Zea mays.* Feature 103 shows high concentration values for *Zea mays, Eriogonum*, and some Cactaceae. Feature 104 contains high amounts of *Zea mays* pollen and traces of Onagraceae, Cylindropuntia, and Cactaceae. Since all three mealing basins were located in Room 16, some degree of specialization within each feature may be expected and pollen could easily be mixed between the features. At the least, processing of both cultivated and wild, gathered plant material occurred within Room 16.

Ash Pit or Area. Pollen samples were submitted from one ash pit and one ash area. Both features were from Early Developmental period structures.

Feature 20 from within Structure 1 at LA 115862 yielded only traces of AP, and low amounts of NAP and no economic taxa were recovered. The characteristics of the ash pit are a very low pollen concentration value consisting primarily of NAP and a trace of AP. Much of the pollen assemblage from this feature could have been destroyed by the heat.

Feature 152 from within Structure 47 at LA 6169 was an ash area. Both the AP and NAP were very low and no economic pollen was recovered. The assemblage contained 1,320 grains/g total pollen concentration values which consisted of *Pinus edulis, Carya,* Cheno-am, and low spine Asteraceae. *Carya* was undoubtedly contamination.

Bell-Shaped Storage Pits. Fifteen bell-shaped or vertical-walled storage pits were sampled from the project. Features 41, 141, 191, and 229 came from structures at LA 265; Feature 121 came from LA 6169; and Features 24, 25, 61, 63,121, 156, l66, 171,183, and 184 came from LA 6171. Five pits from LA 6171 had adobe-plastered openings.

Three samples were submitted from LA 265. One sample came from a bell-shaped pit (Feature 141) within Structure 13, and two (Features 41 and 229) came from extramural locations. AP was very low, although Feature 141 and one extramural feature had small amounts of *Juniperus* pollen. As expected, NAP was slightly higher from the extramural features than from the structure. Only Feature 229 had Cheno-am pollen clumps. Asteraceae was particularly high in the extramural samples. Feature 141 had high Cylindropuntia, and a small amount of *Zea mays.* The extramural features had a trace of *Eriogonum,* high Cylindropuntia, and a trace of Cactaceae. Both *Sphaeralcea* and *Zea mays* were high from Feature 41, located within Feature 27, also an extramural feature. Although the indications are slight, it is possible these features served as storage units.

Feature 191 (from Structure 1) was at LA 265. AP was very low with moderate to high amounts of NAP. Cactaceae pollen was present in small amounts and may suggest a storage function for this taxon.

Small Storage Pit. This type of pit (Feature 63) was present at LA 6171, within Structure 50. The assemblage had very low AP and moderate to high NAP. The pit contained moderate to high amounts of both *Sphaeralcea* and *Zea mays. Sphaeralcea* is an insect-pollinated taxon, and the concentration values recovered suggest flowers were being stored. *Zea mays* produced fairly high concentration values (51.43 grains/g) and was probably present in the form of corn cobs rather than pollen bearing structures of the plant. This feature was most likely a storage unit.

The storage bin (Feature 121) at LA 6169 had higher than anticipated values for *Zea mays,* which probably reflects some of the plant material stored. Although wind pollinated (anemophilous), *Zea mays* pollen is released by mid-summer, but much of it is trapped in the husks and at the base of the peduncle where the ear is attached to the stalk. The values of *Zea mays* indicate that more likely the fruits were being stored within the bin feature, probably with the husks attached, suggesting intramural storage of corn or corn products.

Storage Pits. Two storage pits (Feature 24 and 25) were inside Structure 18 at LA 6171. Feature 24 had low AP and very low NAP. Onagraceae, *Sphaeralcea,* and Cactaceae were present in low amounts, but *Zea mays* was very high, suggesting this pit was used primarily for the storage of corn materials and other plant taxa.

Feature 25 had very low AP and low NAP. Significant amounts of Cheno-am pollen clumps were present and it would be interesting to determine whether *Chenopodium* seeds were also numerous in this feature. The only economic taxon present was *Zea mays* in very low amounts. This evidence indicates a storage unit for harvested corn materials.

Small Storage Pit. A sample was obtained from a small storage pit (Feature 61) that was within the wall of Feature 56 at LA 6171. AP was present in trace amounts only and NAP was quite low. Traces of Cylindropuntia were the only economic taxa present. Based on the low occurrence of this taxon, no function can be interpreted.

Samples from five storage pits with adobe-plastered openings were submitted from Structure 50 at LA 6170. AP was very low and consisted almost entirely of *Pinus ponderosa* and *Pinus edulis.* NAP pollen was generally low, with the exception of low spine Asteraceae. *Artemisia* pollen was generally moderate to high in these features and economic pollen was quite variable. Feature 156 had only Cactaceae pollen and this taxon was absent from the remaining four features. Feature 166 had a small amount of Cylindropuntia and a moderate amount of corn pollen. Feature 171 had a small amount of *Polygonum,* Cylindropuntia, and *Zea mays* pollen. Feature 183 had Onagraceae and a large amount of Solanaceae, while Feature 184 had very high amounts of *Polygonum,* traces of Cylindropuntia, and a moderate amount of *Zea mays.* Since these pits all came from Structure 50, I suspect each pit served a unique purpose. The taxa seemed to have a degree of overlap between the pits, but each was unique in either the combination or concentration values of the taxa present. The exact purpose of these pits is unknown, but it is possible they were ceremonial in nature.

Intramural Posthole Features

All postholes are from the Early Developmental period (AD 700 to 900) structures. Samples were taken at LA 265, LA 6170, LA 6171, and LA 115862. Each of the posthole features will be discussed separately. The data for these features are found in Pivot Table 9.

LA 265. A sealed posthole (Feature 76) was in Structure 4 (LA 265). AP was low with low to moderate NAP. Onagraceae, Cylindropuntia, and *Zea mays* pollen were all present. These taxa were probably brought in via cultural vectors, considering the provenience is a sealed pit within a structure. The likelihood of this being a natural deposition is minimal.

LA 6170. Features 14 and 39 were sampled from Structure 5. Feature 14 yielded only *Pinus edulis* pollen as the arboreal component and pollen concentration values were extremely low. Poaceae pollen was high along with a moderate amount of Cheno-am pollen. Low spine Asteraceae and *Artemisia* pollen were very high. These taxa may represent the NAP natural deposition into the area. *Artemisia,* however, had significantly higher pollen concentration values (249 grains/g) from this feature and it is possible *Artemisia* pollen indicates a ritual use of this taxon. *Artemisia* has long been used as a ceremonial cleansing agent among Native American populations.

Feature 39 in Structure 5 was sealed by the floor. The pollen assemblage was similar to Feature 14 in the distribution of taxa if not in pollen concentration values. Pinus edulis pollen was the only arboreal component present and it was present in trace amounts. Poaceae and Cheno-am pollen were both low, Asteraceae were absent, but *Artemisia* was high (69.98 grains/g). Again, it is possible *Artemisia* pollen was used ceremonially. Onagraceae pollen (2.68 grains/g) was the only economic taxon present within the feature, based only on the presence of a single grain, so its presence may be accidental. Hopefully, the flotation and macrobotanical data will verify this interpretation.

Structure 50 had two postholes (Features 160 and 173) sampled. These were thought to be main roof supports. Feature 160 had only one-fifth the pollen concentration values obtained from Feature 173, although Feature 160 had a fairly large amount of economic pollen. Pinus values were quite low, although Cheno-am pollen was extremely high (4,615 grains/g) from Feature 173. While there was a small amount of Cylindropuntia pollen from Feature 160, the majority of the economic taxa consisted of corn. Since Feature 160 was a main roof support, I suspect the corn pollen was used ceremonially. The other main support post had very high Cheno-am pollen and if it was located near the opening of the structure, the natural pollen rain may have masked the ritual use of corn pollen from the other feature, or perhaps it was not used.

LA 6171. Two samples from postholes (Features 19 and 31) were submitted from LA 6171. Feature 19 was a remodeled posthole in Structure 18, and Feature 31 was a double posthole in Structure 26. Feature 19 had very low values of Pinus edulis pollen, high amounts of Poaceae and Cheno-am pollen, along with high values for other NAP including Asteraceae, *Artemisia*, and *Ephedra*. Cylindropuntia, *Sphaeralcea,* and *Zea mays* pollen were all very high. This suggests some sort of ritual or ceremonial activity occurred during the placement of the posts, or the economic taxa was inserted during remodeling.

A double posthole (Feature 31) was in Structure 26. Arboreal and NAP taxa were very low and the total pollen concentration values were two of the lowest of this feature type. Only a small amount of *Zea mays* pollen was present in one of the structures. I suspect *Zea mays* pollen was used sparingly during a ritual in this posthole.

LA 115862. Two postholes in Structure 1 were sampled, one from the northwest quadrant (Feature 223) and the other from the southwest quadrant (Feature 221). *Pinus* pollen was low from both samples, although the southwest quadrant contained a trace of *Picea* pollen. This sample also had slightly larger values for Poaceae and Cheno-am than the other posthole. The northwest posthole had no economic pollen, while the southwest posthole had a small amount of *Zea mays,* in addition to Cactaceae, Cylindropuntia, and *Sphaeralcea*. This is very similar to the main roof supports from LA 6170 (Structure 50, Feature 160) where only one contained economic pollen taxa. This is extremely interesting and may indicate pollen was used only ceremonially in specific instances of roof supports. The archaeological and macrobotanical data may provide more insight into this situation.

In examining the pollen assemblages from these postholes, it is apparent some type of ritual behavior was conducted. Several of the individual postholes contain large amounts of Artemisia pollen, which is extremely high, and too high to have been deposited naturally. *Zea mays* pollen is the next most common pollen taxa and is known to have been widely used ceremonially in these structures. Cylindropuntia and Cactaceae pollen are also present in quantities too high to suggest natural deposition. While used to a lesser extent than other economic taxa, they were probably also used ceremonially. The main roof supports are very intriguing because only one posthole in each pair appears to have been ritually treated.

Ceremonial Features

Features included are sipapus, niches, and a possible foot drum. These features may indicate that structures served a ceremonial function, in addition to their use as residences. Niche features are also found in habitation structures. The grouping of the sipapu, foot drum, and wall niches were done to facilitate discussion of possible ritual features.

A single sipapu (Feature 182) was sampled from LA 6170 and it was the only one from the project. The feature was located in Structure 50. *Pinus* pollen was extremely low, with no other arboreal pollen types present. NAP was also extremely low and Artemisia was completely absent. Solanaceae and Cylindropuntia pollen were present in low amounts, whereas *Zea mays* pollen (38.5 grains/g) was fairly high. This is consistent with the known function of sipapus. Interestingly, when comparing previously analyzed sipapu features from New Mexico, Solanaceae pollen was a common constituent of the pollen flora from these features (Holloway, personal data files). Also, *Zea mays* pollen, although present, was normally present in small amounts. While the exact ceremonial function of the sipapu remains unknown, it is becoming increasingly apparent that corn and Solanaceae were included to some degree.

A sample from a slab-covered wall niche

from Feature 207 in Structure 13 was submitted from LA 265. This sample provenience was unique for the project. Both the AP and NAP had very low pollen concentration values. The feature yielded fairly high concentration values for Cylindropuntia (54 grains/g) and Platyopuntia (27 grains/g), but fairly low amounts of *Zea mays* (6.2 grains/g). All of these economic pollen taxa were likely deposited via a cultural vector. The pollen concentration values, particularly for Cylindropuntia and Platyopuntia suggest that the fruits of the various cacti may have been placed within the niche. The low concentration values for corn also suggest that the fruits were being left. Perhaps the macrobotanical and flotation data can support this idea. Also, a fairly high number of Cheno-am pollen clumps (27/g) were present. This is strong evidence that *Chenopodium* flowers were also placed within this niche. Since the sample was taken from within a niche, covered by a slab within a structure, there are sufficient avenues of blockage to effectively screen out most of the normal pollen rain that could have entered this structure. Given the total pollen concentration value of over 1,300 grains/g, I also suspect that this feature was used repeatedly.

Two wall niches were sampled from LA 6169; Feature 41 from Structure 4 and Feature 163 from Structure 47. The sample from Feature 41 in Structure 4 had a very large total pollen concentration value of 6,446 grains/g which was 49 times the amount of pollen recovered from the other feature. AP was low but there was a trace of Picea pollen. Cheno-am pollen was very high (4,657 grains/g) which accounted for 72 percent of the assemblage. Poaceae pollen was low, but Asteraceae, *Artemisia,* and *Ephedra* pollen were all very high. It may be unlikely that *Chenopodium* type plants were placed within the wall niche, although a fairly large number of Cheno-am pollen clumps (16.8/g) were recovered. However, Cheno-am pollen clumps were also found within the slab-covered wall niche (above). The two similar occurrences indicating the presence of flowers (Bohrer 1981) cannot be a coincidence. While the wall niche may have been located in close proximity to the door or roof opening, giving the possibility that Cheno-am pollen was accidentally deposited, I strongly suspect that the high Cheno-am values are best interpreted as an intentional offering. Alternatively, it appears as if the economic taxa were deposited ritually (see below). At a later time, it is possible that this structure was re-used, and perhaps the wall niche was used to store *Chenopodium* type plants. Thus the enormous quantities of Cheno-am pollen may have been added later to this assemblage. This interpretation does not refute any of the above data, but I believe it would be harder to verify. Also, this might indicate that the same occurrence occurred in the slab-covered niche from LA 265. While re-use is certainly possible, I believe the simplest explanation is that *Chenopodium*, on occasion, has been used in either a ritual or ceremonial capacity. Perhaps these suggestions can be verified by other archaeological data.

A rather large number of economic taxa were present within this assemblage. Onagraceae, *Polygonum,* Cactaceae, Cylindropuntia, and Platyopuntia were present in small amounts along with very high amounts of both *Sphaeralcea* and *Zea mays*. The presence of Platyopuntia is interesting because Platyopuntia is not often found in these samples, most often Cylindropuntia pollen is recovered. The fact that Platyopuntia pollen was consistently recovered from niche samples suggests that these plants were routinely left within these features. The pollen concentration values for Cylindropuntia, Cactaceae, and Platyopuntia are low enough to suggest that fruits of these plants were left within the feature. Onagraceae, *Polygonum,* and *Sphaeralcea* pollen likely indicate that flowers were being left. Onagraceae and *Polygonum* produce relatively little pollen but *Sphaeralcea* has an indeterminate growth habit, producing flowers continually throughout the growing season. Thus, a plant of *Sphaeralcea,* in the middle to later portion of the growing season, would have large numbers of flowers still on the plant. The very high amounts of *Zea mays,* on the other hand, suggest that corn pollen was being added to the assemblage. This would suggest that the niche feature was used ceremonially.

The second wall niche, Feature 163, was from Structure 47, but the sample contained only 131 grains/g total pollen concentration values. Cylindropuntia and Onagraceae pollen were the only economic taxa present. I suspect that both cholla fruits and Onagraceae flowers were placed within this feature. However, a concentration value of only 131 grains/g is suspicious. No Indeterminate pollen was recovered from this sample, but I suspect that this assemblage has been severely altered by weathering. Perhaps other economic indicators had been destroyed completely.

Feature 107 was a linear foot drum excavated into the floor of Structure 1 at LA 265. The AP was present in trace amounts only and the NAP was very low. Cylindropuntia was the only economic taxon present and it had low amounts.

Extramural Features

Bell-Shaped Storage Pits. A number of bell-shaped or vertical-walled storage pits were sampled from the project: Features 41, 141, 229 from LA 265; Feature126 at LA 6169; Feature 69 at LA 6170; and Feature 47 at LA 6171.

A bell-shaped pit (Feature 127) at LA 265 came from an extramural area. AP was low, with low to moderate NAP and high Cheno-am pollen. Cactaceae, Cylindropuntia, and *Zea mays* pollen were all very high, suggesting these taxa were stored in this pit.

A bell-shaped storage pit (Feature 69) was excavated at LA 6170. Arboreal pollen was low, but small amounts of *Juniperus* and *Picea* pollen, in addition to *Pinus* were present. NAP was low, with the exception of Asteraceae, but a significant number of Cheno-am pollen clumps were also recovered. Onagraceae, *Eriogonum,* and *Sphaeralcea* were present in low amounts, with moderate Cylindropuntia. High amounts of *Zea mays* suggest corn was the dominant taxon stored in the bell-shaped pit along with other plant materials.

Feature 126, a large storage pit from LA 6169, was sampled. The AP was very low and NAP was low, but it did contain a significant number of Cheno-am pollen clumps (17/g). The only economic taxon present was a small amount of *Zea mays.* This particular storage pit could have been used to store harvested corn. The low pollen concentration values for *Zea mays* is consistent with the storage of the fruit. Extramural storage of corn appears to be consistent with the organization of the habitation structures for the Late Developmental and Coalition periods. This may be particularly true for Coalition period features, when plant processing activities appear to have shifted away from habitation structures to specialized areas. This storage pit may reflect elaboration of a more specialized use of space and facilities.

Small Storage Pit. A small pit (Feature 47) was located at LA 6171. It is included with the extramural bell-shaped storage pit group. AP was present in trace amounts only, NAP was low, and Cheno-am pollen was high. Cactaceae was present in small amounts and the only economic taxon present. The pollen assemblage suggests this small pit feature was used to store fruits of the Cactaceae family.

Miscellaneous Pit Features. Miscellaneous pit features include large irregular pits, large oval pits, and a roasting pit. These features were located at LA 265 (Features 14, 15, and 17) and LA 115862 (Features 9 and 11).

Large Irregular Pits. Two large irregular pits were present at LA 265 (Features 14 and 15), and both came from extramural locations. The AP was present in trace amounts with moderate to high values of NAP. Cactaceae and Cylindropuntia dominated Feature 15, while *Zea mays* dominated Feature 14. This undoubtedly demonstrates a storage function with a specialization as to storage content between the two samples. Feature 14 however, was represented by nine samples, while Feature 15 had only a single sample. While the average concentration values reflect this suspected specialization, the distribution of economic pollen taxa from Feature 14 reflects a much higher pollen concentration value for these economic taxa than might be suspected. In conclusion, these two irregular-shaped pits served entirely different and separate functions.

Large Oval Pit. This pit type (Feature 17) was located at LA 265. AP was very low, with low to moderate NAP. Only a small to moderate amount of *Zea mays* was present as the only economic taxon. Potentially this might indicate storage of corn cobs.

Roasting Pits. Two roasting pits identified at LA 115862 (Features 9 and 11) were from extramural locations. The AP was either absent or only in trace amounts. NAP was very low, with the exception of low spine Asteraceae from Feature 9. No economic pollen was present from either of the two features.

Bell-Shaped Pits Containing Human or Dog Burials. A number of bell-shaped pits associated with burials were also extramural features (Features 23, 24, 26 and 60) at LA 265.

Feature 24 contained an adult burial, which was only characterized by traces of AP and very low NAP. The pollen sample was taken from the floor of the feature, not from the burial matrix, and was intended to yield subsistence information relating to the storage function of the feature. Both Cylindropuntia and *Zea mays* were fairly high. The pollen concentration values might indicate a storage of flowers, corn remains, or possibly fruits. The extramural location of the feature would probably indicate storage of fruits rather than flowers.

Feature 23 was an infant burial pit at LA 265. According to the archaeologist, the pollen sample was taken from Stratum 3, below the burial and near the floor. This fill is different from the upper Strata 1 and 2, which appear to be eolian post-occupational fill that predates the burial. The burial was placed on top of this stratum and covered with upper strata, which contained more charcoal and cultural materials. No pollen sample was taken from the burial matrix. Again, the sample was designed for subsistence information relating to storage function. Arboreal pollen was low, but higher than in the adult burial. This assemblage contained small amounts of Picea pollen. NAP was high, particularly Cheno-am. The burial had high amounts of Cactaceae and Cylindropuntia, but no corn pollen. This may suggest storage of certain gathered plant materials.

Two of the features at LA 265 (Features 26 and 60) were from bell-shaped pits that contained dog burials. The sample was taken 8 cm above the floor, just under the dog bones to elicit information on the refuse. The AP from these features was low, although Feature 60 contained small amounts of Prosopis pollen. NAP was moderate to high, but the NAP appeared slightly higher from Feature 60, than Feature 26. Cactaceae and Cylindropuntia pollen was high in both features. Feature 60 had small amounts of Solanaceae and Platyopuntia pollen, which was absent from Feature 26. *Zea mays* pollen was moderate in Feature 26 and extremely high (630 grains/g) in Feature 60. Corn pollen, and quite likely flowers of several members of the Cactaceae, appeared to have been present, possibly accumulations from other storage facilities or habitation floor sweepings.

Burial Features. Two burial features were sampled in addition to pollen wash samples from ceramic vessels associated with burials. Both samples date to the Developmental period.

The sample from Feature 85 (LA 6171), a human burial, yielded no economic pollen and the total pollen concentration values were only 730 grains/g. There was no indication of where the samples were taken within the gravesite, but it is likely the low pollen concentration values were the result of preservation. Surprisingly, no indicators of graveside rituals were present.

A turkey burial (Feature 19) was excavated from within Feature 15 (LA 265). It was surprising the burial had a fairly large quantity of economic pollen types. Cylindropuntia (83 grains/g) and Cactaceae (12.4 grains/g) were high, with high amounts of *Sphaeralcea* (24.8) and *Zea mays* (55.86 grains/g). The sample was taken from an extramural location, but the concentration values are too high to interpret the presence of these economic taxa as being deposited via the natural pollen rain. Rather, these taxa appear to have been deposited via a cultural vector.

The pollen assemblage was collected from inside the gizzard stones, which were collected in the laboratory, therefore decreasing the possibility that the assemblage was either rodent or human introduced and probably reflects the turkey's diet just prior to death. The tibia exhibits a healed fracture, suggesting it did not roam freely later in its life.

The presence of *Sphaeralcea,* Cylindropuntia, Cactaceae, and *Zea mays* probably reflect different plant materials that may have been fed to the turkey. At least, in the case of Sphaeralcea, these may have been growing locally. Some corn materials may have been fed to the turkey and possibly cactus fruits, which were either fed to the turkey, or were growing in the vicinity for the bird to eat. The presence of fruits would therefore, infer a late summer or early fall time period. If flowers were eaten, the time period represented might be slightly earlier. If a large number of seeds were present in the flotation sample, this would suggest the ingestion of fruits rather than flowers and might be a way to infer the food being eaten.

Extramural Activity Areas

Two extramural activity areas were recovered at the project. A cobble concentration and ash stain in Feature 3 at LA 249, and a possible plant procuring area in Feature 5 at LA 6170.

Feature 3 from LA 249 was a cobble concentration associated with an ash stain, which had 1,237.5 grains/g total pollen concentration values. The occupation period is unknown. AP and NAP is very low, although a small amount of Salix pollen is present. The only economic taxa present was Cactaceae in very small amounts.

Feature 5, from LA 6170, is an activity area dating to the Late Developmental period (AD 1100 to 1200). The AP is very low, although there is a small amount of *Prosopis* pollen. Cheno-am, high and low spine Asteraceae, and *Artemisia* are high with small amounts of Poaceae and *Ephedra.* A total of six economic taxa are present including *Polygonum, Eriogonum,* Cactaceae, Cylindropuntia, *Sphaeralcea,* and *Zea mays. Sphaeralcea,* Cylindropuntia, and *Erigonum* are high. This probably suggests an outdoor plant preparation area that concentrated upon locally available naturally occurring plants with a lesser emphasis upon cultivated varieties such as corn.

Pollen Wash Data Set

All of the pollen wash samples were taken from ceramic artifacts found in conjunction with human burial features. Pivot Table 14 provides the mean pollen concentration values of selected taxa by the type of burial.

A single pollen wash was taken from a plain utility jar associated with this adult burial (LA 265, Feature 24). Interestingly, this sample had almost no background or arboreal pollen concentration values. While Cheno-am pollen was somewhat high, no economic pollen taxa were present either. This may suggest that either this adult was buried during the winter months, when ambient pollen deposition is at the lowest point, or perhaps, ceremonial activities associated with interment did not include the use of pollen or flowers

Two pollen wash samples were submitted from vessels associated with child burials from LA 6169 (Feature 49) and LA 115862 (Feature 6). The burial from LA 6169 had the highest values for *Pinus edulis, P. ponderosa,* and had the only occurrence of *Abies* pollen. This burial was placed within a structure limit, but along the upper wall with interment occurring after the structure was abandoned. The presence inside a structure may explain the higher concentration values for certain arboreal taxa, specifically *Picea, Abies, Alnus,* and *Quercus*.

The burial vessel from LA 115862 had very little pollen in the assemblage although *Zea mays* was present in amounts of 0.48 grains/sq cm. The *Zea mays* pollen from this context suggests that *Zea mays* pollen may have been used ceremonially, although somewhat sparingly.

The ceramics associated with the child burial (Feature 49) from LA 6169 included a partial vessel and a jar. As might be expected, the sherds produced a smaller pollen assemblage than did the jar. Overall the samples yielded a slightly large number of taxa than did the vessel from LA 115862. The samples yielded Cactaceae, Cylindropuntia, *Zea mays,* Rosaceae, and *Polygonum* pollen that may have certain ceremonial functions within the burial context. Based on the pollen taxa present, the variety of economic plant taxa recorded for these ceramics suggests a mid-late summer period of burial.

A number of female burials (n = 5) were sampled from three sites: LA 265 (Features 22, 24, and 244), LA 6169 (Feature 2), and LA 115862 (Feature 7). The burial from LA 6169 (Feature 2) had four vessels that yielded ceramic pollen wash samples. The arboreal pollen concentration values were low, no Poaceae pollen was present and the Cheno-am concentration values were extremely low. The economic pollen concentration values were also low and these were restricted to the presence of *Zea mays* and Rosaceae pollen in single instances. The limited suite of pollen taxa precluded any determination of season of interment from this feature.

Nine additional pollen wash samples were associated with female burials from sites LA 115862 (Feature 7) and LA 265 (Features 22, 24, and 244). *Pinus* values were low, but these had the highest mean concentration values of economic taxa. *Zea mays* pollen was fairly common in these burials, but in lower values. Traces of Cactaceae and Cylindropuntia pollen were present, but these two taxa were present from three of the four burials. *Eriogonum* and Liliaceae pollen were intermittently present and only from single samples from LA 115862. This again precludes a determination of seasonality.

The single male burial for which pollen wash samples were submitted was from the Late Developmental period. The burial was interred in the lower post-abandonment trash fill of Structure 76. This is the same structure that had Feature 49 located along the upper wall. The male burial had slightly higher values of both *Pinus ponderosa* and *P. edulis,* but these were not significantly higher. The increased Pinus values could simply have been because the burial was within a structure, near an opening. Economic pollen was also slightly increased from other pollen wash samples and consisted of small amounts of *Erigonum,* Platyopuntia, *Sphaeralcea,* and *Zea mays.* These taxa indicate some type of graveside ritual that included the flowers of these taxa. This might place the time of interment in the late spring or early summer period.

Tables 24.15 and 24.16 categorize the data essentially by period although in Table 24.15 this is broken down further by ceramic vessel type. Several interesting correlations appear. *Zea mays* is present in all periods. The average concentration values within the Early Developmental period (AD 750 to 900) from both LA 265 and LA 6169 are virtually the same. However, they are slightly elevated from LA 115862 during this same period. Cucurbitaceae pollen is present only from LA 265 and *Sphaeralcea* pollen is present only from the Late Developmental period at LA 6169 and from the Early Developmental period at LA 115862. *Artemisia,* Solanaceae, Rosaceae, and *Polygonum* are all absent from LA 115862. Platyopuntia pollen is present only from the PII–III period components (LA 6169) and from the Early Developmental period at LA 6169. Solanaceae is present only at LA 265, whereas Rosaceae and *Polygonum* are present only at LA 6169. This suggests that many of the economic taxa utilized within these burials were used only when locally available.

Bowls were present in both major periods and all had corn pollen. Cactaceae pollen was present from the Early Developmental, but Platyopuntia and *Artemisia* were present only in the Late Developmental period. Jars were present from the Early Developmental period and had both *Zea mays* and Cactaceae pollen. This suggests that corn pollen and perhaps Cactaceae fruits were used as offerings.

Mugs and pitchers were present only from the Early Developmental period. The mug had no corn pollen, but small traces of Cylindropuntia pollen was present. The pitcher had corn, Cucurbitaceae, Cactaceae, Cylindropuntia, Platyopuntia, and *Artemisia* pollen. This suggests that either a variety of cultivated and gathered plants were present within this ceramic or perhaps more of a liquid offering may have been presented.

Seed jars were all from the Early Developmental period. These had *Zea mays,* *Sphaeralcea,* Cactaceae, Cylindropuntia, and Solanaceae. This also suggests that a variety of plant offerings were being presented.

There was no direct correlation between the type of ceramic vessel and the total pollen concentration values obtained. There was also no correlation between the total pollen concentration values and the size of the area washed. The highest concentration values were obtained from jars, but this type also had some of the lowest values recovered. Likewise there was little correlation between specific taxa, vessel form, and the occupation period. This may be related to the relative size of the sample. Of the 17 pollen wash samples, 16 were taken from Early Developmental period samples and only one sample was from the Late Developmental period. Perhaps this would change with a larger sample from the later period.

Review of Economic Taxa Recovered

Arboreal

Juglandaceae.

Carya. Carya (hickory, pecan) is not native to New Mexico. Historically, this taxon was introduced into both southern New Mexico and Arizona commercially. It was present in only a few isolated locations. Interestingly, Gish (1993) noted the infrequent occurrence of this taxon from the Colorado Plateau and she interpreted this as representing long-distance transport from the southern areas of Arizona and New Mexico.

Ulmaceae.

Ulmus. Ulmus (elm) is not native to this portion of New Mexico. The American elm *(Ulmus americana)* is the most widespread ranging from the New England area and adjacent Canada to Florida and west to the western border of North and South Dakota in the north and to approximately central Kansas, Oklahoma, and Texas in the southern portion of its range (Fowells 1965). Several other species are more restricted to either the upper Midwest or the southeastern U.S. Ulmus currently is present on the Colorado Plateau, but this is a recent historic introduction. Given the limited archaeological occurrence of this taxon it is fairly evident that a modern source is likely. As such, this taxon was excluded from the tables.

Salicaceae.

Salix sp. Among the Navajo, willow sticks and ash are used ceremonially (Elmore 1943, 1944). It was also used as ties or cordage. Among the Tewa, this wood was used in roof construction, prayer sticks, and in basket construction and the charcoal was used as a body paint (Robbins et al. 1916).

Both the Jemez (Cook 1930) and Isleta (Jones 1931) Pueblos used willow stems and branches for roofing material. Isleta also had medicinal uses for this plant. The Zuni also used it in construction (Stevenson 1915).

Fabaceae.

Prosopis. This taxon was present in only a limited number of samples. *Prosopis* pollen is distinguishable from other members of the Fabaceae, however, the surface ornamentation is easily degraded from this pollen grain and very little deterioration to the grain removes all identifying features. Thus, once degraded, it would be placed in the indeterminate category. I suspect that *Prosopis* was much more extensive in these sediments than the numbers indicate but that the vast majority of these grains are within the indeterminate category. *Prosopis* seeds are used by the Kawaiisu as a food source (Zigmond 1981). The seeds are removed from the pods, pounded, and made into cakes. Other informants indicated that the pods were utilized but not the seeds. McCown (1929) suggested that both the pods and seeds were ground into meal and then mixed with water and allowed to dry. Castetter and Bell (1937) also indicated that there were differences in uses among several groups throughout the Southwest.

Prosopis glandulosa was utilized as a food or beverage among both the southern Tiwa (Sandia and Isleta) and among the Western Keres (Acoma, Isleta) Pueblos (Dunmire and Tierney 1995). This was based on references by Castetter (1935). The plant was also used medicinally and in the construction of implements (Jones 1931).

Prosopis julifera or *P. velutina* is present in the Sonoran Desert area of central and southern Arizona and was used by the Pima and

Papago groups. The Papago used the plant primarily as a dermatological aid in which the pulverized or chewed leaves were applied topically to sores or red ant bites (Moerman 1986; Castetter and Underhill 1935a, 1935b). The Pima used this taxon in a variety of ways. A cold infusion of leaves was used for headache and stomach problems while a decoction of the gum was applied topically for sores or open wounds, or as an eye wash or placed in the mouth for painful gums. An infusion of the roots was taken for diarrhea while a decoction of the beans were used for severe sunburn (Moerman 1986; Curtin 1949; Russell 1908).

Castetter and Bell (1937) noted that mesquite beans were a principal article of Pima and Papago food. The beans were ground by the Papago in rock mortars called *perchita* holes. Screwbean *(P. pubescens)* was widely used by the Pima as food. This taxon was common along the Gila River although rarely used by the Papago (Castetter and Bell 1951). Mesquite was used as fencing around fields, as agricultural implements and in dam construction. Mesquite pods were pounded with a wooden mortar, seeds removed, and the flour mixed with parched cotton seed flour. These two flours were mixed and molded into a cake-like tortilla (Castetter and Bell 1951).

The Pima also used *Prosopis pubescens* as a dermatological aid (Curtin 1949) and the pods were twisted into the ear to cure an earache by the Tewa (Robbins et al. 1916).

Herbaceous Taxa

Onagraceae. This plant is normally used either medicinally or ceremonially. Castetter (1935), Wyman and Harris (1951), Elmore (1944), and Moerman (1986) all report these various uses. Oenothera caespitosa pollen was used by the Kayenta Navajo singers in sand paintings (Wyman and Harris 1951). *Oenothera pallida* was also used with other medicinal plants as an infusion for kidney disease (Wyman and Harris 1951). *Oenothera albicaulis* fruits were used as food by the Mescalero Apache (Castetter 1935). *Oenothera trichocalyx* was eaten by the Papago and was prepared by boiling the plant (Castetter and Bell 1951).

Onagraceae (Evening Primrose Family) pollen was present in nine samples. This is a very large pollen grain, is entomophilous, and produces very small quantities of pollen. Thus, its presence is usually indicative of a cultural behavioral pattern. This taxon appeared to be primarily associated with pit features or wall niche features. In addition, a fairly large concentration value was obtained from the vent shaft in an extramural feature from LA 265.

Fabaceae. Pollen of this family (Bean Family) was recovered from only two samples. None of the pollen was attributed to the cultivated genus *Phaeseolus,* but rather is probably from one of the many wild members of this family common in the area. One of the samples containing this taxon was from the floor of Structure 5A, dating to the Late Developmental period. The other sample, which had the higher concentration value, was from an unknown feature from this same time period.

Solanaceae. Several genera of the Solanaceae Family (Nightshade Family) are native to New Mexico, and notably, *Nicotiana* and *Datura* were extensively utilized prehistorically. *Lycium* is also commonly associated with archaeological sites in the Four Corners area of New Mexico. Several genera or at least groups of genera (Holloway and Dean 2000) can be distinguished by morphological characteristics of the pollen grain. *Datura* and *Nicotiana* pollen can both be identified at least to genus based upon several characteristics. Although several species of *Nicotiana* are known from this area and were domesticated prehistorically (Winter 1974), the Solanaceae pollen recovered from this project belonged to neither *Nicotiana* nor *Datura*.

The grains were generally small and fell within the size range of the *Solanum/Physalis* group of this family. Both of these genera are common in the area and probably were exploited prehistorically. Winter (1974) has listed the wild potato *(Solanum jamesii)* and the wild tomato *(Solanum triflorum)* as probable encouraged plants, the latter being used ceremonially. Species of both genera are used medicinally (Moermann 1986) as well as for food by the Navajo and other populations of this area. Several important subsistence genera including *Lycium* sp. (wolfberry), *Nicotiana* sp. (tobacco), and *Physalis* sp. (groundcherry) are common in the local flora and would have been available for exploitation.

Solanaceae pollen was present in five samples. It was present from one of the dog burials (bell-shaped pit at LA 265), a storage pit with plastered opening (Feature 183, Structure 50, LA 6170), and a storage pit from Structure 18 at LA 6171. The latter two occurrences had very high concentration values. It was also present in small amounts from the sipapu sample (Feature 182) from Structure 50 at LA 6170.

Polygonaceae.

Polygonum. This pollen type was present in only six samples. It is also entomophilous and is generally extremely rare in archaeological samples. It was present from the floor and wall niche samples from Structure 4 (LA 6169): from two pits with plastered openings (Features 171 and 184) from Structure 50 (LA 6170); Feature 5, a mano and metate cache from LA 6170; and from a floor sample under a metate in Structure 60, LA 6171. Wild dock was semicultivated by the Hopi and the Kayenta Navajo for food and medicine (Winter 1974).

Eriogonum. This taxon, a member of the Polygonaceae Family, was slightly more common than *Polygonum*, occurring in nine samples. The highest values occurred in the turkey burial (LA 265), floor of Structure 4 (LA 6169), mealing basin from Room 16 (LA 6169), and the activity area and adobe-lined mealing bin from LA 6170. It was present in smaller amounts from a bell-shaped storage pit, Feature 127, LA 265); floor of Structure 2 and bell-shaped subfloor storage pit from LA 6170; and the floor under a metate from Structure 60 in LA 6171. Winter (1974) has reported that the Hopi cultivated this plant as a tobacco substitute. The presence of this pollen type from the pits and from the floor samples may indicate an economic or perhaps food usage for this taxon.

Brassicaceae. The pollen of the Brassicaceae Family (Mustard Family) was rare (n = 3 samples). This family is entomophilous, the flowers are small and produce very little pollen. Thus, their occurrence, even in small amounts, is important. This taxon occurred in a subfloor pit and a floor from LA 6171, as well as from the unidentified extramural feature from LA 265. Given the dispersion mechanism for this taxon, I suspect they were used economically but it is equally possible that they reflect simply the background pollen rain. Members of this family were widely used historically for spice and greens (Castetter and Bell 1951; Felger and Moser 1985).

Descurainia sp. (tansy mustard). The seeds and greens of this early spring plant are often used as food items (Dunmire and Tierney 1995). These plants are classified as weeds growing in disturbed habitats and along roadsides. It is very common within the ruins of Kuaua Pueblo (Coronado State Monument) and on the talus slopes beneath cliff dwellings at Frijoles Canyon and Tsankawi Pueblo. Dunmire and Tierney (1995) suggest that it may be an indicator of prehistoric fields when found in abundance on bottomlands.

It is used in making a black pottery paint. According to Dunmire and Tierney (1995:181) "the seeds . . . are ground in a mortar until an oily liquid forms. This liquid is then mixed with iron pigment and used to paint patterns on the pottery."

Descurainia pinnata was a source of spring greens among the Navajo (Reed 1999; Allen and Nelson 1982:678). Among the Pueblo (Reed 1999; Allen and Nelson 1982:671), the seeds were made into flour or mush. This was often mixed with other foods because of a "peppery" taste. The Hopi also used this plant as spring greens and in making pottery paste (Reed 1999; Whiting 1939:77).

In a summary of flotation data from the WCRM Project in McKinley County, New Mexico, Reed (1999) noted the abundance of this seed type from several temporal periods. *Descurainia* was slightly less than 20 percent in Archaic period samples. It was approximately 18 percent in the Middle Archaic and slightly above 20 percent from the Late Archaic. It was approximately 15 percent from Basketmaker II samples, increasing to approximately 22 percent in early Basketmaker III, but decreasing to about 18 percent in Late Basketmaker III. Pueblo I period samples contained about 19 percent, dropping to just above 10 percent in Early Pueblo II and 5 percent in Late Pueblo II and Pueblo III. In summary, this taxon is present in just below 20 percent of the samples from the Archaic through Pueblo I, with a decline in abundance in the following periods.

Two species were associated with the Kawaiisu (Zigmond 1981) from Southeastern California, *Descurainia pinnata* and *D. sophia* (a native of Europe). The plant was an important food source for this desert group. "When the plant is turning brown early in June, the seeds are beaten out with a seed-beater into a gathering basket, parched with hot coals on a flat tray, pounded in a bedrock mortar-hole, sifted for fineness on the flat tray, and mixed with cold water. The end result is a nourishing beverage. The seeds may be stored as gathered or after pounding" (Zigmond 1981:26).

Castetter and Bell (1951) noted that the Papago utilized tansy mustard along with other small seeds. No indication of preparation was given, however. Fish et al. (1992) reported that *Descurainia* seeds were present from the early Pioneer and early Colonial periods from the Dairy site (AZ AA:12:285). This taxon was less ubiquitous from the late Pioneer period at the same site however.

Cactaceae Family. The fruits of all cacti, young pads and flower buds of prickly pear, and flower buds of cholla cactus were important historic Indian resources (Castetter and Bell 1951; Crosswhite 1982; Curtin 1949; Felger and Moser 1985). The Hohokam (Gasser and Kwiatkowski 1991a) emphasized a subsistence use of various cacti and there is increasing evidence for the cultivation of cholla and other cacti (Bohrer 1991; Fish 1984) as well as agave (Fish et al. 1992).

Cylindropuntia. Tunas were cooked and prepared for consumption. A large amount of Cylindropuntia pollen was obtained from a prehistoric pueblo near the Petroglyph National Monument at Albuquerque, New Mexico. This site dated between AD 1 and 500 and had grinding stones, but no evidence of pottery or corn. It was interpreted that the people were subsisting on wild plant foods, including Cylindropuntia. Cholla contains few calories but a 2-tablespoon serving contains as much calcium as a glass of milk (Dunmire and Tierney 1995).

This taxon was present in 35 features. The highest concentration values appeared associated with bell-shaped or keyhole structures that occurred at LA 265. It was also present in significant numbers from floors and other pit features.

Platyopuntia. The pollen of Platyopuntia is extremely large and thus is not easily naturally dispersed, especially into sealed archaeological sediments. Its presence generally indicates its intentional deposition into the sediments (Bohrer 1972). This plant is used medicinally (Moerman 1986), as well as a food source (Cushing 1920).

Surprisingly, this was present from three features, which is slightly more than normal. The presence of the taxon was correlated with wall niche features but it was also present from the dog burial at LA 265.

Non-Opuntia Cactaceae. Various components of these plants have routinely been used as food. A combination of cactus and cleome have been used as a dye on thread or weaving fiber at Zuni (Dunmire and Tierney 1995).

Non-Opuntia Cactaceae pollen was recovered in 32 of the features. These pollen types are very similar and probably represent taxa such as *Echinocerus* and *Mammalaria.* As with other members of the Cactaceae family, these plants are entomophilous and produce relatively little pollen. Thus, their presence in these types of deposits are illustrative. There is no correlation with time period for this taxon. It was commonly found within the pit features, on floors, and within other storage features.

Malvaceae.

Sphaeralcea. Sphaeralcea is distinguishable from the other members of this family on the basis of surface morphology and aperturation and was the only genus of this family recovered. The pollen of this genera is fairly large and its presence is normally associated with human behavior. The plant was used medicinally (Whiting 1939; Castetter 1935; Moerman 1986).

Sphaeralcea pollen was fairly rare in these assemblages, occurring in a total of 10 feature types. The majority of occurrences of this taxon are again from floors, non-human burials, and storage pit features.

This taxon was also reported to have been smoked among the Navajo (Mayes and Bayless Lacy 1989). This plant is very common in disturbed habitats in northern and central New Mexico. The fruits of all species are edible and both pollen and seeds have been previously recovered from Chaco Canyon, Pecos, Zia, and Santa Ana pueblos from archaeological contexts. Santo Domingo residents have boiled the plant, adding it to gypsum as a glue for calcimine house paint. The pulp of *Sphaeralcea* has been mixed with mud at Taos pueblo to make very hard floors and the root was pounded and mixed with saltwater as a poultice for sores and boils. At Santa Clara, the leaves were rubbed on sore muscles. The peltate trichomes probably irritate the skin, thus bringing blood to the infected area (Dunmire and Tierney 1995).

Cucurbitaceae.

Cucurbita. Cucurbita pollen is one of the few obligate economic type pollen grains. The grains of this taxon are very fragile and often are present only in a broken condition. These plants are entomophilous and produce very little pollen. The taxon is monoecious meaning that separate male and female flowers are produced on the same plant but at different times. Thus, a very small amount of this pollen is usually indicative of much wider usage.

Cucurbita has been long used by Southwestern Native populations. The flowers were eaten as a soup among the Hopis (Beaglehole 1937) and Navajo (Bailey 1940; Vestal 1952) and as a seasoning among several of the Rio Grande Pueblos (Bailey 1940; Hughes 1972). The blossoms were also utilized medicinally by the Zuni (Stevenson 1915). The wild relatives of cultivated squash, such as *Cucurbita foetidissima* (buffalo gourd) were also utilized. The gourd was crushed and mixed with water at Cochiti and then sprinkled on plants as an insect repellent. The compound cucurbitacin is a known effective insecticide. At Isleta, the roots were boiled to extract a compound used in treating chest pains and ground root was also used by the Tewa as a laxative (Dunmire and Tierney 1995).The Hopi used the flowers as baking containers (Cutler and Whitaker 1961).

This taxon, while rare in most archaeological deposits, has been recovered from the Navajo Reservoir Project (Schoenwetter 1962), the Chuska Valley (Schoenwetter 1964), and from Arroyo Hondo (Bohrer 1986), and more recently by Gish (1993) from the transwestern pipeline project.

Cucurbita pollen was present only from pollen wash samples, which is very surprising. It was likely present in features from this site but did not preserve sufficiently to be picked up by the analysis.

Poaceae.

Zea mays. The ubiquitous presence of corn pollen is probably a reflection of the utilization of other parts of the corn plant with the introduction of pollen-bearing materials as a byproduct (Bohrer 1972, 1981). Corn pollen played an important role among the Anasazi and was certainly used ceremonially and ritually (Lange 1959; Stevenson 1904; Cushing 1920). Corn was prepared and stored a variety of ways by different populations. For example, ethnographically, much of the corn may have been roasted and stored (Cushing 1920), stored in specialized rooms such as among the Zuni and Hopi (Cushing 1920; Whiting 1939). White (1945) notes that several of the Keresan pueblos stored and roasted the corn while still in the husk. Hill (1938) observed the Navajo practice of placing six complete corn stalks where the harvested corn was to be stacked. Each of these particular practices would have caused differing amounts of pollen to be deposited within a site.

Conclusions

In general, the arboreal pollen was present in very low to trace amounts only. This suggests that forest cover was some distance removed from the site areas. The preponderance of the arboreal pollen consists of *Pinus edulis* and *Pinus ponderosa,* which are both found locally in the area today. While other higher elevation taxa such as *Picea* were undoubtedly used by the inhabitants, these stands were likely no closer to the project area than today and signify a substantial energy expenditure to procure these woods. The macrobotanical and flotation data should provide additional data for the types of wood recovered.

The presence of *Salix* pollen indicates that a well developed riparian habitat was also located nearby. *Salix* appeared to have been used substantially in the construction of the structures. While no pollen of *Populus* (cottonwood) was recovered, it is likely that this taxon was also available. Evidence also suggests that *Prosopis* (mesquite) was present at least within the local area. Taken together, this indicates an area that supported at least three or perhaps four distinct vegetational communities. This area would have been an ideal habitation area in order to maximize the food procurement strategy. I believe that this intermixing of habitats is reflected in the principal components analysis' failure to effectively separate much of the data.

Coalition Period, AD 1200 to 1325

Coalition period samples were obtained from LA 6169 only. All of the structures dating from this time period were identified as pit rooms. Sampled feature types consisted of prepared floors, basin mealing features, and a storage pit that spanned the Rio Grande Late Developmental and Coalition periods (AD 1100 to 1325). This feature inventory stands in marked contrast to features from earlier occupations. There is sufficient data to infer that plant processing activities became much more specialized during this later period. Much of the plant processing activities appeared to have been moved out of habitation structures and into structures specifically designed for this purpose. The implications of this trend may shed light on the social organization and cultural complexity of the population, but I leave these interpretations to the archaeologist.

Late Developmental Period, AD 1100 to 1200

Samples from this period were present from LA 249, LA 6169, and LA 6170. Sampled contexts from LA 249 were a structure, an unidentified feature type, and a cobble concentration associated with an ash stain. LA 6169 had a structure and extramural storage pit associated with this temporal period. Sampled contexts from LA 6170 included an activity and a structure that also had an adobe-lined mealing bin. Again, this seems to confirm a movement away from plant processing activities within the habitation zone and into more specialized areas. The trend, more pronounced in the Coalition period, may thus have actually started within this temporal period.

Early Developmental Period, AD 700 to 900

This period had the largest number of sites and features. Samples submitted from this period were present at LA 265, LA 6169, LA 6170, LA 6171, and from LA 115862.

LA 265. The sampled contexts at this site included Structures 4 and 13, each containing samples taken from floors as well as from pits. Structure 13 had a bell-shaped pit and a wall niche, while Structure 4 had a sealed floor pit. This site had the largest variety of feature types from the project area.

The remainder of the samples were all taken from extramural locations. The individual features consisted of several types of pits. A total of eight extramural bell-shaped pits were present from this site, and interestingly, four of these contained burials. The burials consisted of one adult, one infant, and two dog burials. The human burials, although containing evidence of ritual use of plants, had lower concentration values for several of these economic taxa than did the dog burials. Since the samples containing the dog burials were actually taken from the pit strata not in association with the burials, this probably reflects the higher concentration values normally associated with storage features. A separate turkey burial also had relatively high pollen concentration values. This sample was taken from the area containing the gizzard stones and likely reflects evidence of diet shortly before death.

The remainder of the pits provided good evidence for storage functions. Primarily, Cactaceae, Cylindropuntia, and *Zea mays* materials were stored and there is good evidence for storage of separate materials as well as mixtures within types of pits. The keyhole structures appeared to function primarily as storage with corn being the dominant taxon.

LA 6169. Two structures were sampled from this site from this occupation period. Wall niches were present and sampled in both structures. Structure 47 also had a storage bin and a dump area. The wall niches were interesting in that both had Platyopuntia pollen. Platyopuntia pollen is rare elsewhere, thus suggesting an intentional deposition. The pollen evidence also indicates that Cheno-am plants were also being deposited within these features. The ash dump had no economic pollen and was likely deposited after the structure had been abandoned.

LA 6170. Samples were submitted from two extramural features and two structures from this site. Structure 50 had five storage pits that had their openings plastered over. These pits appeared to have been used to store various combinations of plant materials and no two had the same combination of taxa. However, the specific function of these pits remains undetermined. Structure 50 also had a sipapu feature. Interestingly, the sipapu had Solanaceae pollen, which appears similar to other sipapu features recovered from the Colorado Plateau. In fact, the presence of Solanaceae pollen appears to be a distinguishing feature for sipapu features.

LA 6171. This site provided samples from five structures in addition to several extramural features. The features sampled were from pits of several types, floor samples, and postholes. The pits primarily functioned in storage. A floor sample taken from beneath a metate revealed evidence of plant processing activities but surprisingly, the sample under a palette had very little diagnostic material.

This site also had a single feature from an earlier AD 500 to 650 occupation and consisted of a burned, bell-shaped subcist. Unfortunately, no economic pollen was present.

LA 115862. The site contexts sampled included a single structure and an extramural roasting pit feature. The roasting pits had no diagnostic taxa. Basically, the features from the structure included postholes and an ash pit that also had very little diagnostic taxa.

Pollen Wash Samples

The pollen wash samples were all taken from ceramic vessels associated with human burials. All but one of these was from the Early Developmental period; a single sample was from the Late Developmental period. There did not appear to be any correlation between vessel type and age or gender of the deceased. Likewise, there were no correlations between the pollen recovered and the vessel type nor between the pollen types and the area washed. The vessels did appear to mainly contain mixtures of plant taxa.

Table 24.1. Scientific and Common Names of Plant Taxa Used in this Report

Family	Scientific Name	Common Name
Agavaceae		Yucca Family
	Agave sp.	Agave
	Dasylirion sp.	Sotol
	Nolina sp.	Bear grass
	Yucca sp.	Yucca
Amaranthaceae	Amaranthus	Pigweed
Apiaceae		Carrot Family
Asteraceae		Composite Family
	Ambrosia	bursage
	Artemisia	sagebrush
	Chrysothamnus sp.	Rabbit brush
	Guterrizia sp.	Snakeweed
	Helianthus	sunflower
	Lactuca	Lettuce
	Taraxacum	dandelion
	Chichoreae	Tribe of Asteraceae, heads comprised entirely of ligulate flowers
	Liguliflorae	Pollen morphological group, Fenestrate type pollen
	Low Spine	Pollen morphological group, spines <2.5 height
	High Spine	Pollen morphological group, spines >2.5 height
Betulaceae		Birch Family
	Alnus	Alder
Brassicaceae		Mustard Family
	Descurainia sp.	Tansy Mustard
	Descurainia pinnata	Tansy Mustard
	Descurainia sophia	Tansy Mustard, European Native
Cactaceae		Cactus Family
	Echinocereus sp	none given
	Mammilaria sp	Pincushion/Fishhook Cactus
	Opuntia	Prickly Pear or Cholla Cactus
	Cylindropuntia	Sub-genus of Opuntia, Cholla Cactus
	Platyopuntia	Sub-genus of Opuntia, Prickly Pear Cactus
Campanulaceae		Bluebell Family
	Campanula	Blue Bells
Caryophyllaceae		Pink Family
Chenopodiaceae		Goosefoot Family
	Atriplex canescens	Saltbush
	Chenopodium	Goosefoot, Lambs quarters
	Eunotia sp.	Winterfat
	Salsola kali	Russian Thistle
	Sarcobatus vermiculatus	greasewood
	Cheno-am	Pollen morphological group, members of the family Chenopodiaceae and the genus *Amaranthus*
Cucurbitaceae		Gourd Family
	Cucurbita	Squash, gourd
	Cucurbita foetidissima	Buffalo Gourd
Cupressaceae	*Juniperus*	Juniper
Eleagnaceae		Russian Olive Family
	Shepherdia	Buffaloberry, Soapberry
Ephedraceae		Joint Fir Family
	Ephedra	Mormon Tea

Table 24.1. Continued.

Family	Scientific Name	Common Name
Fabaceae		Bean Family
	Phaseolus sp.	bean
	Prosopis	Mesquite
	Prosopis glandulosa	Mesquite
	Prosopis julifera	Mesquite
	Prosopis pubescens	Screwbean Mesquite
	Prosopis velutina	Mesquite
Fagaceae		Oak Family
	Quercus sp.	Oak
Juglandaceae		Walnut Family
	Carya	Hickory, Pecan
Lycopodiaceae		Club-Moss Family
	Lycopodium	Club-moss
Malvaceae		Cotton Family
	Sphaeralcea	Globe mallow
Nyctaginaceae		Desert Four O''Clock Family
Onagraceae		Evening Primrose Family
	Oenothera albicaulis	
	Oenothera caespitosa	
	Oenothera pallida	
	Oenothera trichocalyx	
Pinaceae		Pine Family
	Abies	fir
	Picea	spruce
	Pinus	pine
	Pinus edulis	Colorado Piñon
	Pinus ponderosa	Ponderosa Pine
Poaceae		Grass Family
	Bouteloua gracilis	Blue grama
	Bouteloua curtipendula	sideoats grama
	Hilaria sp.	galleta grass
	Muhlenbergia sp.	Ring Muhly
	Oryzopsis hymenoides	Indian Rice Grass
	Sporobolus sp.	Sacaton/dropseed
	Zea mays	corn
Polygalaceae		Milkwort Family
	Polygala	Milkwort
Polygonaceae		Buckwheat Family
	Eriogonum	Wild Buckwheat
	Polygonum	smart weed, knotweed
Rhamnaceae		Buckthorn Family
Salicaceae		Willow Family
	Populus sp.	cottonwood
	Salix sp.	willow
Solanaceae		Nightshade Family
	Datura sp.	Jimson weed
	Lycium	Wolfberry
	Nicotiana	Tobacco
	Physalis sp.	groundcherry
	Solanum sp.	none given
	Solanum jamesii	wild potato
	Solanum triflorum	wild tomato
Ulmaceae		Elm Family
	Ulmus	elm

Table 24.2. Results of Pollen Analysis from Site LA 249, Sandoval County, New Mexico

Bag #	Provenience	Locus/ Unit	Structure	Stratum	Level	Feature	Type	Period	Age
189	N114/E116	1			0-100.5	0			
267	N111/E110	1	extramural	29	100.52-100.44	3	cobble concentration associated ash stain		
308	N106/E115	1	pit structure 6	50	99.42-99.38	6	floor	Pueblo II-III	AD 1000-1200
329	N106/E115	1	pit structure 6	60	99.27-99.15	6	floor	Pueblo II-III	AD 1000-1200
338	N105/E115	1	pit structure 6	60	99.27-99.23	6	floor	Pueblo II-III	AD 1000-1200
360	N104.1/E115.1	1	pit structure 6	60	99.3	6	floor	Pueblo II-III	AD 1000-1200
378	N107/E114	1	pit structure 6	3	0-99.7	0	floor	Pueblo II-III	AD 1000-1200

Table 24.2. Continued.

Bag #	*Pinus* all	*P. ponderosa*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Ulmus*	*Quercus*	*Prosopis*	Fabaceae	Solanaceae	*Shepherdia*	*Eriogonum*
Raw Counts													
189	267	52	215	28	2	1	1	5	1	1	1	1	1
267	17	3	14	-	-	1	-	-	-	-	-	-	-
308	104	13	91	2	-	-	-	3	-	-	-	-	-
329	19	8	11	-	-	-	-	-	-	-	-	-	-
338	17	3	14	-	-	-	-	1	-	-	-	-	-
360	16	-	16	-	-	-	-	-	-	-	-	-	-
378	1	-	1	-	-	-	-	1	-	-	-	-	-
Concentration Values													
189	3794	739	3055	398	28	14	14	71	14	14	14	14	14
267	383	68	315	0	0	23	0	0	0	0	0	0	0
308	440	55	385	8	0	0	0	13	0	0	0	0	0
329	522	220	302	0	0	0	0	0	0	0	0	0	0
338	253	45	208	0	0	0	0	15	0	0	0	0	0
360	508	0	508	0	0	0	0	0	0	0	0	0	0
378	13	0	13	0	0	0	0	13	0	0	0	0	0

Bag #	Brassicaceae	Poaceae	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls	*Artemisia*	Cactaceae	*Cylindropuntia*	*Ephedra*	Indeterminate
Raw Counts											
189	1	14	96	-	41	39	6	-	-	2	9
267	-	1	30	-	2	2	-	-	-	-	2
308	-	9	267	1	26	48	5	1	8	2	11
329	-	-	27	-	1	3	2	1	-	-	2
338	-	-	38	-	2	8	2	-	-	-	6
360	-	1	23	-	5	4	-	1	-	-	2
378	-	-	1	-	-	1	-	-	-	-	-
Concentration Values											
189	14	199	1364	0	583	554	85	0	0	28	128
267	0	23	675	0	45	45	0	0	0	0	45
308	0	38	1129	4	110	203	21	4	34	8	47
329	0	0	741	0	27	82	55	27	0	0	55
338	0	0	565	0	30	119	30	0	0	0	89
360	0	32	731	0	159	127	0	32	0	0	64
378	0	0	13	0	0	13	0	0	0	0	0

Table 24.2. Continued.

Bag #	*Zea mays*	Sum	Total	marker	% Indeterminate	trans	tot trans	mark/slide	Lycopodium added	Wt/area
Raw Counts										
189	1	**518**	7361	114	1.74	8	22	313.5	40500	25
267		55	1238	72	3.64	4	24	432	40500	25
308		**487**	2060	383	2.26	27	27	383	40500	25
329		55	1510	59	3.64	6	24	236	40500	25
338		74	1100	109	8.11	4	26	708.5	40500	25
360		52	1652	51	3.85	4	26	331.5	40500	25
378		4	52	124	0	10	26	322.4	40500	25
Concentration Values										
189	14	518	7361	114	1.74	8	22	313.5	40500	25
267	0	55	1238	72	3.64	4	24	432	40500	25
308	0	487	2060	383	2.26	27	27	383	40500	25
329	0	55	1510	59	3.64	6	24	236	40500	25
338	0	74	1100	109	8.11	4	26	708.5	40500	25
360	0	52	1652	51	3.85	4	26	331.5	40500	25
378	0	4	52	124	0	10	26	322.4	40500	25

Table 24.2. Continued.

	Based on Counts and Low Magnification Scan of Slide											
Bag #	*Picea*	*P. ponderosa*	*Quercus*	*Zea mays*	Cactaceae	*Cylindropuntia*	Solanaceae	*Prosopis*	Fabaceae	*Shepherdia*	*Eriogonum*	*Ulmus*
Raw Counts												
189	4	4	5	3	-	-	1	1	1	1	1	1
267	-	-	-	-	1	-	-	-	-	-	-	-
308	-	-	-	-	2	3	-	-	-	-	-	-
329	-	-	-	-	4	1	-	-	-	-	-	-
338	-	-	-	-	-	-	-	-	-	-	-	-
360	-	-	-	1	-	-	-	-	-	-	-	-
378	-	-	-	-	-	-	-	-	-	-	-	-
Concentration Values												
189	20.7	20.67	25.84	15.5	0	0	5.17	5.17	5.17	5.17	5.17	5.17
267	0	0	0	0	3.75	0	0	0	0	0	0	0
308	0	0	0	0	8.46	12.69	0	0	0	0	0	0
329	0	0	0	0	27.46	6.86	0	0	0	0	0	0
338	0	0	0	0	0	0	0	0	0	0	0	0
360	0	0	0	4.89	0	0	0	0	0	0	0	0
378	0	0	0	0	0	0	0	0	0	0	0	0

Bag #	
Max. Potential Concentration	
189	5.17
267	3.75
308	4.23
329	6.86
338	2.29
360	4.89
378	5.02

Table 24.3. Results of Pollen Analysis, Site LA 265, Sandoval County, New Mexico

Bag #	Prov	Area	Locus/Unit	Structure	Stratum	Level	Feature	Type
852	N455/E495	1	1	pit structure 1	1	100.39-100.29	0	floor
854	N455/E495	1	1	pit structure 1	1	100.19-100.09	0	floor
856	N455/E495	1	1	pit structure 1	1	99.99-99.89	0	floor
858	N455/E495	1	1	pit structure 1	2.1	99.79-99.69	0	floor
859	N455/E495	1	1	pit structure 1	2.2	99.69-99.59	0	floor
860	N455/E495	1	1	pit structure 1	2.3	99.59-99.49	0	floor
861	N455/E495	1	1	pit structure 1	2.4	99.49-99.39	0	floor
862	N455/E495	1	1	pit structure 1	2.5	99.39-99.29	0	floor
864	N455/E495	1	1	pit structure 1	3	99.19-99.09	0	floor
866	N455/E495	1	1	pit structure 1	3.1	98.99-98.89	0	floor
892	N486/E497	1	3	pit structure 6	1	99.65	14	pit:lg:irregular
893	N486/E497	1	3	pit structure 6	2	99.48	14	pit:lg:irregular
894	N486/E497	1	3	pit structure 6	A	99.31	14	pit:lg:irregular
895	N486/E497	1	3	pit structure 6	3	99.47	14	pit:lg:irregular
896	N486/E497	1	3	pit structure 6	4	99.38	14	pit:lg:irregular
897	N486/E497	1	3	pit structure 6	5	99.31	14	pit:lg:irregular
898	N486/E497	1	3	pit structure 6	6	99.13	14	pit:lg:irregular
899	N486/E497	1	3	pit structure 6	7	99.03	14	pit:lg:irregular
900	N486/E497	1	3	pit structure 6	8	98.85	14	pit:lg:irregular
952	N483/E497	1	3	pit structure 6	4	99.15	15	pit:lg:irregular
995	N448.7/E491.8	1	9	extramural		99.75-99.71	17	pit:oval:lg
1016	N483.5/E497.65	1	3	pit structure 6	4	98.2	19	burial:turkey
1028	N445.05/E491.4	1	4	pit structure 4	SF	99.15	0	
1077	N464.95/E492.65	1	2	extramural:SU1	3	99.42	23	pit:bell shaped:storage w/ infant burial
1084	N466.88/E490.15	1	2	extramural:SU1	B	99.36-99.33	24	pit:bell shaped:storage w/ adult burial
1100	N467.74/E500.71	1	2	extramural:SU1	1	99.6	26	pit:bell shaped:storage w/ dog burial
1223	N467.7/E494.7	1	2	extramural:SU1		99.45	41	pit:bell shaped:in feat 27
1228	N466.35/E502.4	1	2	extramural:SU1		99.88	33	pit:keyhole
1256	N467.4/E494.02	1	2	extramural:SU1		99.93	27	pit:keyhole
1339	N444.85/E493.6	1	4	pit structure 4	SO	98.62	76	pit:floor:sealed
1344	N460.5/E539.05	2	13	pit structure 13	1	97.95	141	pit:bell shaped
1405	N470/E488.05	1	2	extramural:SU1	9	98.9	60	pit:bell shaped:storage w/ dog burial
1420	N432.1/E503.34	1	14	extramural		100.25	156	pit:cist:wall of f56
1536	N455.95/E495.53	1	1	pit structure 1	SO	98.74	107	pit:linear:floor:?foot drum
1600	N456.55/E497.5	1	1	pit structure 1	SO	98.32	191	
1612	N464.4/E539.44	2	13	pit structure 13	SO	99.01	207	niche:slab covered
1678	N453.85/E501	1	1	pit structure 1	4	98.84	125	vent shaft:bell shaped
1713	N471.6/E493.64	1	2	extramural:SU1		99.5	127	pit:bell shaped:storage
1731	N464.45/E542.38	2	12	extramural	A	99.96	229	pit:bell shaped

Table 24.3. Continued.

Bag #	Period	Age	*Pinus*	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Abies*	*Alnus*	*Salix*	*Ulmus*	*Quercus*
852	Early Rio Grande Developmental	AD 700-900	289	31	258	1	-	-	-	2	-	3
854	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	1	-	-
856	Early Rio Grande Developmental	AD 700-900	1	-	1	-	-	-	-	-	-	-
858	Early Rio Grande Developmental	AD 700-900	0	-	-	-	-	-	-	-	-	-
859	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
860	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
861	Early Rio Grande Developmental	AD 700-900	7	-	7	-	-	-	-	-	-	-
862	Early Rio Grande Developmental	AD 700-900	1	-	1	-	-	-	-	-	-	-
864	Early Rio Grande Developmental	AD 700-900	9	-	9	-	-	-	-	1	-	-
866	Early Rio Grande Developmental	AD 700-900	7	1	6	-	-	-	-	1	-	-
892	Early Rio Grande Developmental	AD 700-900	2	1	1	1	-	-	-	-	-	-
893	Early Rio Grande Developmental	AD 700-900	5	-	5	-	-	-	-	-	-	-
894	Early Rio Grande Developmental	AD 700-900	6	1	5	-	-	-	-	-	-	1
895	Early Rio Grande Developmental	AD 700-900	5	-	5	-	-	-	-	-	-	-
896	Early Rio Grande Developmental	AD 700-900	11	2	9	-	-	-	-	-	-	-
897	Early Rio Grande Developmental	AD 700-900	1	-	1	-	-	-	-	-	-	-
898	Early Rio Grande Developmental	AD 700-900	4	2	2	-	-	-	-	-	-	-
899	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
900	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
952	Early Rio Grande Developmental	AD 700-900	1	-	1	1	-	-	-	-	-	-
995	Early Rio Grande Developmental	AD 700-900	6	1	5	-	-	-	-	-	-	-
1016	Early Rio Grande Developmental	AD 700-900	12	2	10	1	-	-	-	-	-	-
1028	Early Rio Grande Developmental	AD 700-900	0	-	-	-	-	-	-	-	-	-
1077	Early Rio Grande Developmental	AD 700-900	19	5	14	-	1	-	-	-	-	-
1084	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
1100	Early Rio Grande Developmental	AD 700-900	9	6	3	-	-	-	-	-	-	-
1223	Early Rio Grande Developmental	AD 700-900	149	13	136	1	-	-	-	-	-	-
1228	Early Rio Grande Developmental	AD 700-900	6	-	6	-	-	-	-	-	-	-
1256	Early Rio Grande Developmental	AD 700-900	2	-	2	-	-	-	-	-	-	-
1339	Early Rio Grande Developmental	AD 700-900	9	-	9	-	-	-	-	-	-	-
1344	Early Rio Grande Developmental	AD 700-900	0	-	-	1	-	-	-	-	-	-
1405	Early Rio Grande Developmental	AD 700-900	39	2	37	3	-	-	-	-	-	-
1420	Early Rio Grande Developmental	AD 700-900	1	-	1	-	-	-	-	-	-	-
1536	Early Rio Grande Developmental	AD 700-900	1	1	-	-	-	-	-	-	-	-
1600	Early Rio Grande Developmental	AD 700-900	8	-	8	-	-	-	-	-	-	-
1612	Early Rio Grande Developmental	AD 700-900	5	-	5	-	-	-	-	-	-	-
1678	Early Rio Grande Developmental	AD 700-900	5	-	5	-	-	-	-	-	-	-
1713	Early Rio Grande Developmental	AD 700-900	22	6	16	-	-	-	-	-	-	-
1731	Early Rio Grande Developmental	AD 700-900	10	9	1	-	-	-	-	-	-	-

Table 24.3. Continued.

Bag #	*Carya*	*Prosopis*	Onagraceae	Fabaceae	Solanaceae	Rosaceae	*Shepherdia*	*Polygonum*	*Eriogonum*	Brassicaceae	Liliaceae
852	-	-	-	-	-	-	-	-	-	-	-
854	-	-	-	-	-	-	-	-	-	-	-
856	-	-	-	-	-	-	-	-	-	-	-
858	-	-	-	-	-	-	-	-	-	-	-
859	-	-	-	-	-	-	-	-	-	-	-
860	-	-	-	-	-	-	-	-	-	-	-
861	-	-	-	-	-	-	-	-	-	-	-
862	-	-	-	-	-	-	-	-	-	-	-
864	-	-	-	-	-	-	-	-	-	-	-
866	-	-	-	-	-	-	-	-	-	-	-
892	-	-	-	-	-	-	-	-	-	-	-
893	-	-	-	-	-	-	-	-	-	-	-
894	-	-	-	-	-	-	-	-	-	-	-
895	-	-	-	-	-	-	-	-	-	-	-
896	-	-	-	-	-	-	-	-	-	-	-
897	-	-	-	-	-	-	-	-	-	-	-
898	-	-	-	-	-	-	-	-	-	-	-
899	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-
952	-	-	-	-	-	-	-	-	-	-	-
995	-	-	-	-	-	-	-	-	-	-	-
1016	-	-	-	-	-	-	-	-	-	-	-
1028	-	-	-	-	-	-	-	-	-	-	-
1077	-	-	-	-	-	-	-	-	-	-	-
1084	-	-	-	-	-	-	-	-	-	-	-
1100	-	-	-	-	-	-	-	-	-	-	-
1223	-	-	-	-	-	-	-	-	2	-	-
1228	-	-	-	-	-	-	-	-	-	-	-
1256	-	-	-	-	-	-	-	-	-	-	-
1339	-	-	-	-	-	-	-	-	-	-	-
1344	-	-	-	-	-	-	-	-	-	-	-
1405	-	3	-	-	-	-	-	-	-	-	-
1420	-	-	-	-	-	-	-	-	-	-	-
1536	-	-	-	-	-	-	-	-	-	-	-
1600	-	-	-	-	-	-	-	-	-	-	-
1612	-	-	-	-	-	-	-	-	-	-	-
1678	-	-	-	-	-	-	-	-	-	-	-
1713	-	-	-	-	-	-	-	-	-	-	-
1731	-	-	-	-	-	-	-	-	-	-	-

Table 24.3. Continued.

Bag #	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.	Aster. hs.	Aster. ls	*Artemisia*	Cactaceae	*Cylindropuntia*	*Platyopuntia*	*Ephedra*
852	-	4	139	-	17	23	3	-	1	-	14
854	-	-	13	-	3	4	-	-	-	-	1
856	-	-	9	-	-	-	-	1	-	-	-
858	-	-	2	-	-	-	-	-	-	-	-
859	-	1	12	-	1	1	1	7	1	-	-
860	-	-	14	-	2	2	1	2	3	-	-
861	-	-	15	-	-	2	-	2	2	-	-
862	-	-	20	-	3	3	-	3	1	-	-
864	-	3	16	-	-	5	-	1	-	-	-
866	-	3	24	-	-	3	-	-	-	-	-
892	-	1	36	-	-	3	-	2	-	-	-
893	-	-	42	-	3	-	-	3	-	-	-
894	-	1	70	-	-	5	-	-	-	-	-
895	-	-	36	-	5	3	-	-	-	-	-
896	-	9	308	-	4	39	12	2	2	-	7
897	-	-	18	-	3	3	-	2	1	-	-
898	-	1	40	1	2	5	-	5	4	-	-
899	-	3	23	-	-	2	-	-	2	-	-
900	-	3	27	-	6	22	-	1	-	-	-
952	-	-	90	-	4	3	-	4	-	-	-
995	-	3	41	-	2	3	5	-	-	-	-
1016	-	4	126	-	7	22	1	-	3	-	-
1028	-	-	23	1	4	6	-	-	2	-	-
1077	-	6	94	-	7	10	3	1	2	-	-
1084	-	1	29	-	1	1	1	-	2	-	2
1100	-	2	48	-	1	4	1	1	6	-	-
1223	-	14	234	-	24	32	11	1	10	-	7
1228	-	1	30	-	3	1	-	1	2	-	3
1256	-	1	20	-	7	2	-	1	5	-	-
1339	-	2	34	-	-	3	2	-	-	-	1
1344	-	-	15	-	1	3	-	-	3	-	-
1405	-	21	144	-	8	26	4	7	76	1	1
1420	-	1	25	-	1	2	1	-	-	-	-
1536	-	-	10	-	2	3	1	-	1	-	-
1600	-	1	49	1	5	1	-	-	-	-	-
1612	-	-	31	1	5	1	-	-	2	1	-
1678	-	1	84	-	3	4	-	-	3	-	-
1713	-	-	70	-	1	3	-	4	15	-	-
1731	-	3	80	1	3	20	-	-	-	-	-

Table 24.3. Continued.

Bag #	Nyctaginaceae	Indeterminate	unk triporate	unk sm tricolpate	*Sphaeralcea*	*Zea mays*	Cucurbitaceae	Sum
852	-	15	-	-	-	2	-	**513**
854	-	1	-	-	1	-	-	26
856	-	2	-	-	-	2	-	15
858	-	-	-	-	-	-	-	2
859	-	1	-	-	-	10	-	37
860	-	1	-	-	-	1	-	28
861	-	1	-	-	-	7	-	36
862	-	-	-	-	-	5	-	36
864	-	4	-	-	-	-	-	39
866	-	2	-	-	-	-	-	40
892	-	-	-	-	-	-	-	45
893	-	2	-	-	-	1	-	56
894	-	4	-	-	-	5	-	92
895	-	2	-	-	-	-	-	51
896	-	9	-	-	-	39	-	**442**
897	-	-	-	-	-	1	-	29
898	-	3	-	-	-	1	-	66
899	-	1	-	-	-	2	-	35
900	-	1	-	-	-	-	-	62
952	-	1	-	-	-	-	-	104
995	2	-	-	-	-	1	-	63
1016	-	5	-	1	-	2	-	184
1028	-	2	-	-	-	1	-	39
1077	-	7	-	1	-	-	-	151
1084	-	1	-	-	-	2	-	42
1100	-	4	-	-	-	-	-	76
1223	-	11	-	-	4	10	-	**510**
1228	-	6	-	-	-	-	-	53
1256	-	5	-	-	-	-	-	43
1339	-	5	-	-	-	-	-	56
1344	-	1	-	-	-	1	-	25
1405	-	15	-	-	4	98	-	**489**
1420	-	4	-	-	-	-	-	35
1536	-	3	-	-	-	-	-	21
1600	-	9	-	-	-	-	-	74
1612	-	3	-	-	-	-	-	49
1678	-	2	-	-	-	2	-	104
1713	-	1	-	-	-	8	-	146
1731	1	7	-	2	-		-	137

Table 24.3. Continued.

Bag #	Total	Marker	% Indeterminate	Trans	Tot Trans	Mark/Slide	Total Marker	*Lycopodium* added	Wt/area
852	2109	394	2.92	10	27	1064	1064	40500	25
854	593	71	3.85	6	26	308	308	40500	25
856	357	68	13.33	4	26	442	442	40500	25
858	49	66	0	6	26	286	286	40500	25
859	1110	54	2.7	16	26	88	88	40500	25
860	432	105	3.57	4	26	683	683	40500	25
861	1122	52	2.78	10	23	120	120	40500	25
862	778	75	0	6	28	350	350	40500	25
864	408	155	10.26	4	26	1008	1008	40500	25
866	1045	62	5	8	26	202	202	40500	25
892	1429	51	0	10	26	133	133	40500	25
893	1487	61	3.57	18	29	98	98	40500	25
894	5139	29	4.35	26	26	29	29	40500	25
895	1559	53	3.92	4	25	331	331	40500	25
896	9676	74	2.04	28	28	74	74	40500	25
897	470	100	0	4	26	650	650	40500	25
898	1596	67	4.55	6	26	290	290	40500	25
899	930	61	2.86	10	25	153	153	40500	25
900	1376	73	1.61	4	26	475	475	40500	25
952	3063	55	0.96	10	26	143	143	40500	25
995	1134	90	0	4	24	450	450	40500	25
1016	5139	58	2.72	12	27	131	131	40500	25
1028	1170	54	5.13	6	27	243	243	40500	25
1077	4368	56	4.64	20	27	76	76	40500	25
1084	1063	64	2.38	6	22	235	235	40500	25
1100	1838	67	5.26	8	26	218	218	40500	25
1223	2227	371	2.16	16	26	603	603	40500	25
1228	1684	51	11.32	6	28	238	238	40500	25
1256	1340	52	11.63	10	27	140	140	40500	25
1339	1375	66	8.93	4	23	380	380	40500	25
1344	393	103	4	4	26	670	670	40500	25
1405	3144	252	3.07	27	27	252	252	40500	25
1420	915	62	11.43	6	28	289	289	40500	25
1536	370	92	14.29	4	28	644	644	40500	25
1600	1789	67	12.16	6	26	290	290	40500	25
1612	1323	60	6.12	6	26	260	260	40500	25
1678	3063	55	1.92	12	26	119	119	40500	25
1713	4730	50	0.68	10	28	140	140	40500	25
1731	3762	59	5.11	8	26	192	192	40500	25

Table 24.3. Continued.

Bag #	*Pinus*	*Picea*	Based on Counts and Low Magnification Scan of Slide *Zea mays*	*Sphaeralcea*	Cactaceae	*Cylindropuntia*	Onagraceae	Cheno-am af	Poaceae
852	-	2	3	-	-	1	2	-	-
854	-	-	12	1	6	2	-	-	-
856	-	-	3	-	3	-	-	-	-
858	-	-	-	-	-	-	-	-	-
859	-	-	15	-	9	1	-	-	-
860	-	-	16	-	4	7	-	-	-
861	2	-	14	-	3	6	-	-	-
862	-	-	5	-	7	7	-	-	-
864	-	-	-	-	1	-	1	-	-
866	-	-	-	-	-	-	-	-	-
892	-	-	-	-	2	-	-	-	-
893	-	-	1	-	4	-	-	-	-
894	-	-	5	-	-	-	-	-	-
895	-	-	-	-	-	-	-	-	-
896	-	-	39	-	2	2	-	-	-
897	-	-	2	-	4	-	-	-	-
898	-	-	3	-	6	6	-	-	-
899	-	-	2	-	-	4	-	-	-
900	-	-	-	-	1	-	-	-	-
952	-	-	1	-	7	-	-	-	1
995	-	-	1	-	-	-	-	-	-
1016	-	-	2	2	1	3	-	-	-
1028	-	-	-	-	3	-	-	2	-
1077	-	-	-	-	1	2	-	-	-
1084	-	-	8	-	-	6	-	-	-
1100	-	-	3	-	2	8	-	-	-
1223	-	-	12	5	2	10	-	-	-
1228	-	-	2	-	2	3	-	-	-
1256	-	-	-	-	1	5	-	-	-
1339	-	-	3	-	-	4	2	-	-
1344	-	-	2	-	-	6	-	-	-
1405	-	-	98	2	10	76	-	-	-
1420	-	-	-	-	-	1	-	-	-
1536	-	-	-	-	-	-	-	-	-
1600	-	-	-	-	2	-	-	-	-
1612	-	-	1	-	-	3	-	-	-
1678	-	-	3	-	-	6	1	-	-
1713	-	-	15	-	4	24	-	-	-
1731	-	-	-	-	-	-	-	-	-

Table 24.3. Continued.

Bag #	Based on Counts and Low Magnification Scan of Slide										
	Pinus	*Picea*	*Zea mays*	*Sphaeralcea*	Cactaceae	*Cylindropuntia*	*Platyopuntia*	Onagraceae	Solanaceae	Nyctaginaceae	Cheno-am af
852	0	3.05	4.57	0	0	1.52	0	3.05	0	0	0
854	0	0	63.19	5.27	31.59	10.53	0	0	0	0	0
856	0	0	11	0	11	0	0	0	0	0	0
858	0	0	0	0	0	0	0	0	0	0	0
859	0	0	276.92	0	166.15	18.46	0	0	0	0	0
860	0	0	37.98	0	9.49	16.62	0	0	0	0	0
861	27.09	0	189.63	0	40.64	81.27	0	0	0	0	0
862	0	0	23.14	0	32.4	32.4	0	0	0	0	0
864	0	0	0	0	1.61	0	0	1.61	0	0	0
866	0	0	0	0	0	0	0	0	0	0	0
892	0	0	0	0	24.43	0	0	0	0	0	0
893	0	0	16.48	0	65.94	0	0	0	0	0	0
894	0	0	279.31	0	0	0	0	0	0	0	0
895	0	0	0	0	0	0	0	0	0	0	0
896	0	0	853.78	0	43.78	43.78	0	0	0	0	0
897	0	0	4.98	0	9.97	0	0	0	0	0	0
898	0	0	16.74	0	33.48	33.48	0	0	0	0	0
899	0	0	21.25	0	0	42.49	0	0	0	0	0
900	0	0	0	0	3.41	0	0	0	0	0	0
952	0	0	11.33	0	79.3	0	0	0	0	0	0
995	0	0	0.59	0	0	0	0	0	0	0	0
1016	0	0	24.83	24.83	12.41	37.24	0	0	0	0	0
1028	0	0	0	0	20	0	0	0	0	0	13.33
1077	0	0	0	0	21.43	42.86	0	0	0	0	0
1084	0	0	55.23	0	0	41.42	0	0	0	0	0
1100	0	0	22.32	0	14.88	59.52	0	0	0	0	0
1223	0	0	32.25	13.44	5.37	26.87	0	0	0	0	0
1228	0	0	13.61	0	13.61	20.42	0	0	0	0	0
1256	0	0	0	0	11.54	57.69	0	0	0	0	0
1339	0	0	12.81	0	0	17.08	0	8.54	0	0	0
1344	0	0	4.84	0	0	14.52	0	0	0	0	0
1405	0	0	630	12.86	64.29	488.57	0	0	6.43	0	0

Table 24.3.Continued.

Bag #	Solanaceae	Rosaceae	*Shepherdia*	*Polygonum*	*Eriogonum*	Brassicaceae	Liliaceae	*Sarcobatus*	Poaceae	Cheno-am
852	0	0	0	0	0	0	0	0	16	572
854	0	0	0	0	0	0	0	0	0	297
856	0	0	0	0	0	0	0	0	0	214
858	0	0	0	0	0	0	0	0	0	49
859	0	0	0	0	0	0	0	0	30	360
860	0	0	0	0	0	0	0	0	0	216
861	0	0	0	0	0	0	0	0	0	467
862	0	0	0	0	0	0	0	0	0	432
864	0	0	0	0	0	0	0	0	31	167
866	0	0	0	0	0	0	0	0	78	627
892	0	0	0	0	0	0	0	0	32	1144
893	0	0	0	0	0	0	0	0	0	1115
894	0	0	0	0	0	0	0	0	56	3910
895	0	0	0	0	0	0	0	0	0	1100
896	0	0	0	0	0	0	0	0	197	6743
897	0	0	0	0	0	0	0	0	0	292
898	0	0	0	0	0	0	0	0	24	967
899	0	0	0	0	0	0	0	0	80	611
900	0	0	0	0	0	0	0	0	67	599
952	0	0	0	0	0	0	0	0	0	2651
995	0	0	0	0	0	0	0	0	54	738
1016	0	0	0	0	0	0	0	0	112	3519
1028	0	0	0	0	0	0	0	0	0	690
1077	0	0	0	0	0	0	0	0	174	2719
1084	0	0	0	0	0	0	0	0	25	734
1100	0	0	0	0	0	0	0	0	48	1161
1223	0	0	0	0	9	0	0	0	61	1022
1228	0	0	0	0	0	0	0	0	32	953
1256	0	0	0	0	0	0	0	0	31	623
1339	0	0	0	0	0	0	0	0	49	835
1344	0	0	0	0	0	0	0	0	0	236
1405	0	0	0	0	0	0	0	0	135	926
1420	0	0	0	0	0	0	0	0	26	653
1536	0	0	0	0	0	0	0	0	0	176
1600	0	0	0	0	0	0	0	0	24	1185
1612	0	0	0	0	0	0	0	0	0	837
1678	0	0	0	0	0	0	0	0	29	2474
1713	0	0	0	0	0	0	0	0	0	2268
1731	0	0	0	0	0	0	0	0	82	2197

Table 24.3. Continued.

Bag #	Cheno-am af.	Aster. Hs	Aster. Is	*Artemisia*	Cactaceae	*Cylindropuntia*	*Platyopuntia*	*Ephedra*	Nyctaginaceae	Indeterminate
852	0	70	95	12	0	4	0	58	0	62
854	0	68	91	0	0	0	0	23	0	23
856	0	0	0	0	24	0	0	0	0	48
858	0	0	0	0	0	0	0	0	0	0
859	0	30	30	30	210	30	0	0	0	30
860	0	31	31	15	31	46	0	0	0	15
861	0	0	62	0	62	62	0	0	0	31
862	0	65	65	0	65	22	0	0	0	0
864	0	0	52	0	10	0	0	0	0	42
866	0	0	78	0	0	0	0	0	0	52
892	0	0	95	0	64	0	0	0	0	0
893	0	80	0	0	80	0	0	0	0	53
894	0	0	279	0	0	0	0	0	0	223
895	0	153	92	0	0	0	0	0	0	61
896	0	88	854	263	44	44	0	153	0	197
897	0	49	49	0	32	16	0	0	0	0
898	24	48	121	0	121	97	0	0	0	73
899	0	0	53	0	0	53	0	0	0	27
900	0	133	488	0	22	0	0	0	0	22
952	0	118	88	0	118	0	0	0	0	29
995	0	36	54	90	0	0	0	0	36	0
1016	0	196	614	28	0	84	0	0	0	140
1028	30	120	180	0	0	60	0	0	0	60
1077	0	203	289	87	29	58	0	0	0	203
1084	0	25	25	25	0	51	0	51	0	25
1100	0	24	97	24	24	145	0	0	0	97
1223	0	105	140	48	4	44	0	31	0	48
1228	0	95	32	0	32	64	0	95	0	191
1256	0	218	62	0	31	156	0	0	0	156
1339	0	0	74	49	0	0	0	25	0	123
1344	0	16	47	0	0	47	0	0	0	16
1405	0	51	167	26	45	489	6	6	0	96
1420	0	26	52	26	0	0	0	0	0	105
1536	0	35	53	18	0	18	0	0	0	53
1600	24	121	24	0	0	0	0	0	0	218
1612	27	135	27	0	0	54	27	0	0	81
1678	0	88	118	0	0	88	0	0	0	59
1713	0	32	97	0	130	486	0	0	0	32
1731	27	82	549	0	0	0	0	0	27	192

Table 24.3. Continued.

Bag #	unk sm tricolpate	*Sphaeralcea*	*Zea mays*	Sum	Total	marker	mark/slide	total marker	Lyco added	Wt/area
852	0	0	8	513	2109	394	1064	1064	40500	25
854	0	23	0	26	593	71	308	308	40500	25
856	0	0	48	15	357	68	442	442	40500	25
858	0	0	0	2	49	66	286	286	40500	25
859	0	0	300	37	1110	54	88	88	40500	25
860	0	0	15	28	432	105	683	683	40500	25
861	0	0	218	36	1122	52	120	120	40500	25
862	0	0	108	36	778	75	350	350	40500	25
864	0	0	0	39	408	155	1008	1008	40500	25
866	0	0	0	40	1045	62	202	202	40500	25
892	0	0	0	45	1429	51	133	133	40500	25
893	0	0	27	56	1487	61	98	98	40500	25
894	0	0	279	92	5139	29	29	29	40500	25
895	0	0	0	51	1559	53	331	331	40500	25
896	0	0	854	442	9676	74	74	74	40500	25
897	0	0	16	29	470	100	650	650	40500	25
898	0	0	24	66	1596	67	290	290	40500	25
899	0	0	53	35	930	61	153	153	40500	25
900	0	0	0	62	1376	73	475	475	40500	25
952	0	0	0	104	3063	55	143	143	40500	25
995	0	0	18	63	1134	90	2754	2754	40500	25
1016	28	0	56	184	5139	58	131	131	40500	25
1028	0	0	30	39	1170	54	243	243	40500	25
1077	29	0	0	151	4368	56	76	76	40500	25
1084	0	0	51	42	1063	64	235	235	40500	25
1100	0	0	0	76	1838	67	218	218	40500	25
1223	0	17	44	510	2227	371	603	603	40500	25
1228	0	0	0	53	1684	51	238	238	40500	25
1256	0	0	0	43	1340	52	140	140	40500	25
1339	0	0	0	56	1375	66	380	380	40500	25
1344	0	0	16	25	393	103	670	670	40500	25
1405	0	26	630	489	3144	252	252	252	40500	25
1420	0	0	0	35	915	62	289	289	40500	25
1536	0	0	0	21	370	92	644	644	40500	25
1600	0	0	0	74	1789	67	290	290	40500	25
1612	0	0	0	49	1323	60	260	260	40500	25
1678	0	0	59	104	3063	55	119	119	40500	25
1713	0	0	259	146	4730	50	140	140	40500	25
1731	55	0	0	137	3762	59	192	192	40500	25

Table 24.3. Continued.

Bag #	Based on Counts and Low Magnification Scan of Slide										
	Pinus	*Picea*	*Zea mays*	*Sphaeralcea*	Cactaceae	*Cylindropuntia*	*Platyopuntia*	Onagraceae	Solanaceae	Nyctaginaceae	Cheno-am af
852	0	3.05	4.57	0	0	1.52	0	3.05	0	0	0
854	0	0	63.19	5.27	31.59	10.53	0	0	0	0	0
856	0	0	11	0	11	0	0	0	0	0	0
858	0	0	0	0	0	0	0	0	0	0	0
859	0	0	276.92	0	166.15	18.46	0	0	0	0	0
860	0	0	37.98	0	9.49	16.62	0	0	0	0	0
861	27.09	0	189.63	0	40.64	81.27	0	0	0	0	0
862	0	0	23.14	0	32.4	32.4	0	0	0	0	0
864	0	0	0	0	1.61	0	0	1.61	0	0	0
866	0	0	0	0	0	0	0	0	0	0	0
892	0	0	0	0	24.43	0	0	0	0	0	0
893	0	0	16.48	0	65.94	0	0	0	0	0	0
894	0	0	279.31	0	0	0	0	0	0	0	0
895	0	0	0	0	0	0	0	0	0	0	0
896	0	0	853.78	0	43.78	43.78	0	0	0	0	0
897	0	0	4.98	0	9.97	0	0	0	0	0	0
898	0	0	16.74	0	33.48	33.48	0	0	0	0	0
899	0	0	21.25	0	0	42.49	0	0	0	0	0
900	0	0	0	0	3.41	0	0	0	0	0	0
952	0	0	11.33	0	79.3	0	0	0	0	0	0
995	0	0	0.59	0	0	0	0	0	0	0	0
1016	0	0	24.83	24.83	12.41	37.24	0	0	0	0	0
1028	0	0	0	0	20	0	0	0	0	0	13.33
1077	0	0	0	0	21.43	42.86	0	0	0	0	0
1084	0	0	55.23	0	0	41.42	0	0	0	0	0
1100	0	0	22.32	0	14.88	59.52	0	0	0	0	0
1223	0	0	32.25	13.44	5.37	26.87	0	0	0	0	0
1228	0	0	13.61	0	13.61	20.42	0	0	0	0	0
1256	0	0	0	0	11.54	57.69	0	0	0	0	0
1339	0	0	12.81	0	0	17.08	0	8.54	0	0	0
1344	0	0	4.84	0	0	14.52	0	0	0	0	0
1405	0	0	630	12.86	64.29	488.57	0	0	6.43	0	0
1420	0	0	0	0	0	5.6	0	0	0	0	0
1536	0	0	0	0	0	0	0	0	0	0	0
1600	0	0	0	0	11.16	0	0	0	0	0	0
1612	0	0	6.23	0	0	18.69	12.46	0	0	0	0
1678	0	0	40.78	0	0	81.57	0	13.59	0	0	0
1713	0	0	173.57	0	46.29	277.71	0	0	0	0	0
1731	0	0	0	0	0	0	0	0	0	8.45	0

Table 24.3. Continued.

Bag #	Max. Potential Concentration
852	1.52
854	5.27
856	3.67
858	5.66
859	18.46
860	2.37
861	13.55
862	4.63
864	1.61
866	8.04
892	12.22
893	16.48
894	55.86
895	4.89
896	21.89
897	2.49
898	5.58
899	10.62
900	3.41
952	11.33
995	0.59
1016	12.41
1028	6.67
1077	21.43
1084	6.9
1100	7.44
1223	2.69
1228	6.81
1256	11.54
1339	4.27
1344	2.42
1405	6.43
1420	5.6
1536	2.52
1600	5.58
1612	6.23
1678	13.59
1713	11.57
1731	8.45

Table 24.4. Raw Pollen Counts and Concentration Values, LA 6169, Sandoval County, New Mexico

Bag #	Provenience	Area	Locus/ Unit	Structure	Stratum	Level	Feature	Type
499	N0/E0	1	1	Pit structure 4:D shaped	9	98.39	4	floor
632	N73/E87	1	12	Pit room 10	-	99.05-99.00	10	floor:contact
992	N85.36/E86.3	1	1	Pit structure 4	-	98.41	41	niche:wall
1061	N84/E89	1	1	Pit room 15	1	99.52-98.4	15	pit room
1526	N118.15/E132.35	2	8	Pit structure 76 w/I 47	11	98.2	76	floor
1598	N81/E87	1	12	Pit room 16	-	98.33	104	basin:mealing
1674	N81/E88	1	12	Pit room 16	-	98.4-98.3	103	basin:mealing
1707	N91/E89	1	10	Pit room 70	11	98.3	70	floor
1732	N140/E137	2	9	Extramural	4	98.35	126	pit:storage
1853	N116.6/E134.32	2	8	Pit structure 47:circular	10	98.18	47	floor:contact
1881	N82.55/E89.05	1	12	Pit room 16	-	98.46	16	floor
1997	N120/E137.26	2	8	Pit structure 47	-	97.88	163	niche:wall
2042	N121.53/E136.29	1	11	Pit structure 47	08-8	98.09	121	bin:storage
1571	N81/E88	1	12	Pit room 16	2	98.27	102	basin:mealing
1796	N119/E135	2	8	Pit structure 47	Bottom	98.15	152	dump:ash/refuse

Table 24.4. Continued

Bag #	Period	Age	*Pinus*	*P. pond.*	*P. edulis*	*Picea*	*Ulmus*	Onagraceae	*Polygonum*	*Eriogonum*
499	Early Rio Grande Developmental	AD 750-900	121	13	108	1	-	-	1	4
632	Coalition	AD 1200-1325	5	-	5	-	-	-	-	-
992	Early Rio Grande Developmental	AD 750-900	125	19	106	-	-	-	1	-
1061	Coalition	AD 1200-1325	7	1	6	-	-	-	-	-
1526	Late Rio Grande Developmental/Coalition	AD 1000-1200	41	-	41	-	-	-	-	-
1598	Coalition	AD 1200-1325	221	15	206	-	1	1	-	-
1674	Coalition	AD 1200-1325	21	6	15	-	-	-	-	-
1707	Coalition	AD 1200-1325	15	1	14	-	-	-	-	-
1732	Late Rio Grande Developmental/Coalition	AD 1000-1200	12	-	12	-	-	-	-	-
1853	Early Rio Grande Developmental	AD 750-900	2	-	2	-	-	-	-	-
1881	Coalition	AD 1200-1325	20	-	20	-	-	-	-	-
1997	Early Rio Grande Developmental	AD 750-900	0	-		-	-	1	-	-
2042	Early Developmental	AD 750-900	15	2	13	-	-	-	-	-
1571	Coalition	AD 1200-1300	20	2	18	-	-	-	-	-
1796	Early Developmental	AD 750-900	5	-	5	-	1	-	-	-
1881	Coalition	AD 1200-1325	20	-	20	-	-	-	-	-
1997	Early Rio Grande Developmental	AD 750-900	0	-		-	-	1	-	-
2042	Early Developmental	AD 750-900	15	2	13	-	-	-	-	-
1571	Coalition	AD 1200-1300	20	2	18	-	-	-	-	-
1796	Early Developmental	AD 750-900	5	-	5	-	1	-	-	-

Table 24.4. Continued

Bag #	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls	*Artemisia*	Cactaceae	*Cylindropuntia*	*Ephedra*	Indeterminate	*Sphaeralcea*	*Zea mays*	Sum	% Indeterminate
499	-	7	251	-	15	53	31	1	6	3	12	2	2	510	2.35
632	-	-	35	-	-	-	-	-	-	-	2	-	-	42	4.76
992	-	3	552	2	9	33	9	-	-	6	7	4	13	764	0.92
1061	-	-	59	-	7	-	-	-	-	3	2	-	-	78	2.56
1526	1	2	92	-	4	5	2	9	2	6	4	-	2	170	2.35
1598	-	1	223	10	8	23	1	2	1	16	4	-	10	522	0.77
1674	-	2	41	2	1	2	-	-	-	1	-	-	3	74	0
1707	-	-	2	1	-	-	-	-	-	-	-	-	-	18	0
1732	-	-	34	1	7	4	-	-	-	-	-	-	-	58	0
1853	-	2	34	-	-	3	-	-	-	1	-	-	1	43	0
1881	-	4	47	-	2	12	-	-	-	1	5	-	-	91	5.49
1997	-	-	4	-	-	-	-	-	1	-	-	-	-	6	0
2042	-	1	39	-	5	2	-	1	-	-	5	-	1	69	7.25
1571	-	2	54	-	1	1	-	-	1	1	2	-	1	83	2.41
1796	-	-	31	-	-	7	-	-	-	-	-	-	-	44	0

Table 24.4. Continued.

Based on Counts and Low Magnification Scan of Slide

Bag #	*Pinus*	*Picea*	*Zea mays*	*Sphaeralcea*	Cactaceae	Cylindropuntia	Platyopuntia	Onagraceae	*Polygonum*	Cheno-am af	*Eriogonum*	unknown triporate	*Ephedra*
499	-	2	7	3	3	8	-	-	2	-	4	-	-
632	-	-	5	-	2	-	-	-	-	-	-	-	-
992	-	4	43	11	2	1	1	1	1	-	-	-	5
1061	-	-	-	-	-	-	-	-	-	-	-	-	-
1526	-	-	7	-	12	-	-	-	-	-	-	-	-
1598	-	-	13	-	2	1	-	1	-	-	-	-	-
1674	-	-	11	-	3	-	-	-	-	4	-	-	-
1707	-	-	3	-	-	-	-	-	-	-	-	-	-
1732	-	-	1	-	-	-	-	-	-	-	-	-	-
1853	-	-	-	-	-	-	-	-	-	-	-	-	-
1881	-	-	1	-	-	-	-	-	-	-	-	-	-
1997	2	-	-	-	-	2	-	-	-	-	-	-	-
2042	-	-	4	-	2	1	-	-	-	1	-	-	-
1571	-	-	1	-	1	2	-	-	-	-	-	1	-
1796	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 24.4. Continued.

Bag #	*Pinus*	*P. pond.*	*P. edulis*	*Picea*	*Ulmus*	Onagra-ceae	*Poly-gonum*	*Eriogo-num*	*Sarco-batus*	Poaceae	Cheno-am	Cheno-am af.	Astera-ceae hs.
499	751	81	670	6	-	-	6	25	-	43	1558	-	93
632	117	-	117	-	-	-	-	-	-	-	822	-	-
992	1055	160	894	-	-	-	8	-	-	25	4658	17	76
1061	172	25	147	-	-	-	-	-	-	-	1448	-	172
1526	1230	-	1230	-	-	-	-	-	30	60	2760	-	120
1598	668	45	623	-	3	3	-	-	-	3	674	30	24
1674	374	107	267	-	-	-	-	18	-	36	730	36	18
1707	108	7	101	-	-	-	-	-	-	-	14	7	-
1732	211	-	211	-	-	-	-	-	-	-	599	18	123
1853	60	-	60	-	-	-	-	-	-	60	1020	-	-
1881	282	-	282	-	-	-	-	-	-	56	662	-	28
1997	-	-	-	-	-	22	-	-	-	-	88	-	-
2042	324	43	281	-	-	-	-	-	-	22	842	-	108
1571	444	44	399	-	-	-	-	-	-	44	1198	-	22
1796	150	-	150	-	30	-	-	-	-	-	930	-	-

Table 24.4. Continued.

Bag #	Astera-ceae ls	*Artemisia*	Cactaceae	Cylindro-puntia	*Ephedra*	Indeter-minate	*Sphaer-alcea*	*Zea mays*	Sum	Total	Marker	Trans	Tot Trans
499	329	192	6	37	19	74	12	12	510	3166	261	14	26
632	0	-	-	-	-	47	-	-	42	986	69	6	26
992	278	76	-	-	51	59	34	110	764	6446	192	8	29
1061	-	-	-	-	74	49	-	-	78	1915	66	6	26
1526	150	60	270	60	180	120	-	60	170	5100	54	10	25
1598	70	3	6	3	48	12	-	30	522	1578	536	20	26
1674	36	-	-	-	18	-	-	53	74	1317	91	4	25
1707	-	-	-	-	-	-	-	-	18	130	224	4	26
1732	70	-	-	-	-	-	-	-	58	1021	92	4	26
1853	90	-	-	-	30	-	-	30	43	1290	54	10	25
1881	169	-	-	-	14	70	-	-	91	1282	115	4	26
1997	-	-	-	22	-	-	-	-	6	131	74	4	24
2042	43	-	22	-	-	108	-	22	69	1490	75	6	27
1571	22	-	-	22	22	44	-	22	83	1842	73	6	26
1796	210	-	-	-	-	-	-	-	44	1320	54	26	26

Table 24.4. Continued.

				Based on Counts and Low Magnification Scan of Slide							
Bag #	Mark/ Slide	Lycopodium added	Wt/Area	*Pinus*	*Picea*	*Zea mays*	*Sphaeralcea*	Cactaceae	Cylindropuntia	Platyopuntia	Onagraceae
499	485	40500	25	-	6.68	23.4	10.03	10.03	26.74	-	-
632	299	40500	25	-	-	27.09	-	10.84	-	-	-
992	696	40500	25	-	9.31	100.1	25.6	4.66	2.33	2.33	2.33
1061	286	40500	25	-	-	-	-	-	-	-	-
1526	135	40500	25	-	-	84	-	144	-	-	-
1598	697	40500	25	-	-	30.22	-	4.65	2.32	-	2.32
1674	569	40500	25	-	-	31.33	-	8.55	-	-	-
1707	1456	40500	25	-	-	3.34	-	-	-	-	-
1732	598	40500	25	-	-	2.71	-	-	-	-	-
1853	135	40500	25	-	-	-	-	-	-	-	-
1881	748	40500	25	-	-	2.17	-	-	-	-	-
1997	444	40500	25	7.3	-	-	-	-	7.3	-	-
2042	338	40500	25	-	-	19.2	-	9.6	4.8	-	-
1571	316	40500	25	-	-	5.12	-	5.12	10.24	-	-
1796	54	40500	25	-	-	-	-	-	-	-	-

Table 24.4. Continued.

	Based on Counts and Low Magnification Scan of Slide					
Bag #	*Polygonum*	Cheno-am af	*Eriogonum*	Unknown Triporate	*Ephedra*	Max. Potential Concentration
499	6.68	-	13.37	-	-	3.34
632	-	-	-	-	-	5.42
992	2.33	-	-	-	11.64	2.33
1061	-	-	-	-	-	5.66
1526	-	-	-	-	-	12
1598	-	-	-	-	-	2.32
1674	-	11.39	-	-	-	2.85
1707	-	-	-	-	-	1.11
1732	-	-	-	-	-	2.71
1853	-	-	-	-	-	12
1881	-	-	-	-	-	2.17
1997	-	-	-	-	-	3.65
2042	-	4.8	-	-	-	4.8
1571	-	-	-	5.12	-	5.12
1796	-	-	-	-	-	30

Table 24.5. Raw Pollen Counts and Concentration Values, LA 6170, Sandoval County, New Mexico

Bag #	Provenience	Area	Locus/Unit	Structure	Stratum	Level	Elevation	Feature	Type
1189	N94/E102	1	2	pit structure 2:ovoid	255	98.84-98.76	5226	2	?floor
1203	N93/E101	1	2	pit structure 2:ovoid	255	98.82-98.78	5226	2	?floor
1310	N105.76/E102.08	1	4	pit structure 5	510	100.01	5226	5	
1464	N102/E102	1	4	pit structure 5	530	99.46-99.32	5226	5	
1484	N101/E103	1	4	pit structure 5	540	99.32	5226	5	
1505	N102.5/E103.62	1	4	pit room 5	540	99.16	5226	6	bin:mealing:adobe lined
1768	N103.3/E102.1	1	4	pit structure 5	555	98.76	5226	5	
1823	N102/E102	1	4	pit structure 5	555	98.88-98.73	5226	5	
1898	N104.52/E103.97	1	4	pit structure 5	580	98.34	5226	14	posthole
1942	N102.6/E103.25	1	4	pit structure 5	585	98.49	5226	39	posthole:sealed by floor
2119	N124/E144	2	10	pit structure 50	755	99.05	5226	50	floor?
2156	N122/E141	2	10	pit structure 50	755	99.39-99.05	5226	50	floor?
2280	N125.62/E141.02	2	10	pit structure 50	780	99.1-98.37	5226	160	posthole:main roof support
2286	N121.67/E143.95	2	10	pit structure 50	780	98.7-98.43	5226	173	posthole:main roof support
2304	N122.7/E139.65	2	10	pit structure 50	785	99.18-98.79	5226	156	pit:storage:opening plastered over
2319	N121/E143	2	10	pit structure 50	785	98.97-98.28	5226	171	pit:storage:opening plastered over
2322	N125/E139.35	2	10	pit structure 50	785	99.17-98.82	5226	184	pit:storage:opening plastered over
2368	N125.28/E145.5	2	10	pit structure 50	785	99.08-98.65	5226	166	pit:storage:opening plastered over
2375	N126.68/E142.45	2	10	pit structure 50	785	99.0-98.7	5226	183	pit:storage:opening plastered over
2407	N110.3/E145.5	2	12	extramural	25	98	5226	69	pit:storage:bell shaped w/ subfl pit
2415	N111.4/E147.1	2	12	extramural	2	100.29-100.20	5226	92	pit:rodent damage
2498	N126.14/E142.9	2	10	pit structure 50	780	99.08-99.01	5226	182	sipapu

Table 24.5. Continued

Bag #	Period	Age	*Pinus*	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Quercus*	Fabaceae
1189	Rio Grande Developmental	AD 750-1200	89	15	74	1	-	-	-
1203	Early Rio Grande Developmental	AD 750-900	162	18	144	1	1	2	-
1310	Early Rio Grande Developmental	AD 750-900	7	2	5	-	-	-	-
1464	Early Rio Grande Developmental	AD 750-900	10	10	-	-	-	-	-
1484	Early Rio Grande Developmental	AD 750-900	77	10	67	1	-	-	1
1505	Early Rio Grande Developmental	AD 750-900	14	2	12	-	-	-	-
1768	Early Rio Grande Developmental	AD 750-900	25	7	18	-	-	-	-
1823	Early Rio Grande Developmental	AD 750-900	13	1	12	-	-	1	-
1898	Early Rio Grande Developmental	AD 750-900	5	-	5	-	-	-	-
1942	Early Rio Grande Developmental	AD 750-900	1	-	1	-	-	-	-
2119	Early Rio Grande Developmental	AD 750-900	2	-	2	-	-	-	-
2156	Early Rio Grande Developmental	AD 750-900	-	-	-	-	-	-	-
2280	Early Rio Grande Developmental	AD 750-900	3	1	2	-	-	-	-
2286	Early Rio Grande Developmental	AD 750-900	11	1	10	-	-	-	-
2304	Early Rio Grande Developmental	AD 750-900	1	-	1	-	-	-	-
2319	Early Rio Grande Developmental	AD 750-900	120	45	75	2	-	-	-
2322	Early Rio Grande Developmental	AD 750-900	3	-	3	-	-	-	-
2368	Early Rio Grande Developmental	AD 750-900	12	3	9	-	-	-	-
2375	Early Rio Grande Developmental	AD 750-900	2	2	-	-	-	-	-
2407	Rio Grande Developmental	AD 750-1200	210	95	115	2	4	-	-
2415	Rio Grande Developmental	AD 750-1200	3	-	3	-	-	-	-
2498	Rio Grande Developmental	AD 750-1200	52	9	43	-	-	-	-

Table 24.5. Continued.

Bag #	Solanaceae	*Shepherdia*	*Polygonum*	*Eriogonum*	*Sarcobatus*	*Poaceae*	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls
1189	-	-	-	1	-	1	361	1	12	9
1203	-	-	-	-	-	9	265	1	15	20
1310	-	-	-	1	-	1	89	-	9	9
1464	-	-	-	-	-	3	63	-	-	10
1484	-	1	-	-	-	6	362	3	7	24
1505	-	-	-	1	-	1	53	-	2	1
1768	-	-	-	-	-	1	57	-	1	7
1823	-	-	-	-	-	-	46	1	1	3
1898	-	-	-	-	-	4	45	-	1	7
1942	-	-	-	-	-	1	11	-	-	-
2119	-	-	-	-	-	-	9	-	-	-
2156	-	-	-	-	-	1	6	-	-	-
2280	-	-	-	-	-	-	31	-	3	4
2286	-	-	-	-	-	2	151	-	-	12
2304	-	-	-	-	-	-	4	-	1	-
2319	-	-	1	-	1	11	244	-	20	89
2322	-	-	3	-	-	4	14	-	1	19
2368	-	-	-	-	-	1	3	-	-	7
2375	5	-	-	-	-	-	17	-	2	16
2407	-	-	-	2		12	165	3	19	33
2415	-	-	-	-	-	1	25	-	1	2
2498	-	-	-	-	-	3	36	-	5	5

Table 24.5. Continued.

Bag #	*Artemisia*	Cactaceae	Cylindro- puntia	*Ephedra*	Indeter- minate	*Sphaer- alcea*	*Zea mays*	Sum	% Indeterminate
1189	1	2	13	54	5	-	4	554	0.9
1203	5	1	2	13	4	-	10	511	0.78
1310	3	-	2	1	4	1	-	134	2.99
1464	3	-	1	2	5	-	1	108	4.63
1484	4	1	-	5	7	1	1	501	1.4
1505	2	-	-	1	2	-	-	91	2.2
1768	-	-	1	-	5	-	-	122	4.1
1823	3	-	-	-	4	-	-	85	4.71
1898	8	-	-	-	6	-	-	81	7.41
1942	4	-	-	-	3	-	-	21	14.29
2119	-	-	2	-	-	-	3	18	-
2156	-	-	-	1	-	-	-	8	-
2280	4	-	-	-	2	-	2	52	3.85
2286	-	-	-	-	-	-	-	187	-
2304	1	-	-	-	1	-	-	9	11.11
2319	10	-	2	4	9	-	-	513	1.75
2322	2	-	-	-	3	-	2	51	5.88
2368	-	-	-	-	-	-	2	25	-
2375	5	-	-	-	10	-	-	57	17.54
2407	5	-	5	14	10	1	20	506	1.98
2415	-	-	2	-	1	-	2	37	2.7
2498	-	-	1	1	-	-	6	109	-

Table 24.5. Continued.

	Based on Counts and Low Magnification Scan of Slide														
	Picea	*Abies*	*Zea mays*	*Sphaer-alcea*	Cacta-ceae	Cylindro-puntia	Onagra-ceae	Solan-aceae	*Prosopis*	Fabaceae	*Polygo-num*	Cheno-am af	*Shepher-dia*	*Eriogo-num*	*Ephedra*	*P. ponder-osa*
1189	-	-	6	-	7	14	-	-	-	-	-	-	-	1	-	-
1203	1	1	20	-	2	8	-	-	-	-	-	2	-	-	-	-
1310	-	-	1	1	1	4	-	-	1	-	1	-	-	-	-	-
1464	-	-	6	-	-	4	-	-	-	-	-	1	-	-	-	6
1484	-	-	1	1	1	-	-	-	-	1	-	2	1	-	2	-
1505	-	-	2	1	2	2	-	-	-	-	-	-	-	1	-	-
1768	-	-	3	-	2	2	-	-	-	-	-	-	-	-	-	-
1823	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
1898	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1942	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
2119	-	-	3	-	-	2	-	-	-	-	-	-	-	-	-	-
2156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2280	-	-	6	-	-	1	-	-	-	-	-	-	-	-	1	-
2286	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2304	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
2319	-	-	2	-	-	2	-	-	-	-	1	-	-	-	-	-
2322	-	-	18	-	-	2	-	-	-	-	-	-	-	-	-	1
2368	-	1	3	-	-	1	-	-	-	-	-	-	-	-	-	-
2375	-	-	-	-	-	-	1	10	-	-	-	-	-	-	-	-
2407	9	1	39	3	-	10	2	-	-	-	-	-	-	2	-	-
2415	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 24.5. Continued.

Bag #	*Pinus*	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Quercus*	Fabaceae	Solanaceae	*Shepherdia*	*Polygonum*	*Eriogonum*	*Sarcobatus*	Poaceae
1189	579	98	481	7	-	-	-	-	-	-	7	-	7
1203	572	64	508	4	4	7	-	-	-	-	-	-	32
1310	186	53	133	-	-	-	-	-	-	-	27	-	27
1464	174	174	-	-	-	-	-	-	-	-	-	-	52
1484	533	69	464	7	-	-	7	-	7	-	-	-	42
1505	302	43	259	-	-	-	-	-	-	-	22	-	22
1768	633	177	456	-	-	-	-	-	-	-	-	-	25
1823	413	32	381	-	-	32	-	-	-	-	-	-	-
1898	156	-	156	-	-	-	-	-	-	-	-	-	125
1942	17	-	17	-	-	-	-	-	-	-	-	-	17
2119	52	-	52	-	-	-	-	-	-	-	-	-	-
2156	-	-	-	-	-	-	-	-	-	-	-	-	27
2280	62	21	42	-	-	-	-	-	-	-	-	-	-
2286	336	31	306	-	-	-	-	-	-	-	-	-	61
2304	24	-	24	-	-	-	-	-	-	-	-	-	-
2319	378	142	236	6	-	-	-	-	-	3	-	3	35
2322	26	-	26	-	-	-	-	-	-	26	-	-	35
2368	150	37	112	-	-	-	-	-	-	-	-	-	12
2375	30	30	-	-	-	-	-	74	-	-	-	-	-
2407	773	350	423	7	15	-	-	-	-	-	7	-	44
2415	62	-	62	-	-	-	-	-	-	-	-	-	21
2498	334	58	276	-	-	-	-	-	-	-	-	-	19

Table 24.5. Continued.

Bag #	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls	*Artemisia*	Cactaceae	*Cylindro-puntia*	*Ephedra*	Indeter-minate	*Sphaer-alcea*
1189	2349	7	78	59	7	13	85	351	33	-
1203	935	4	53	71	18	4	7	46	14	-
1310	2364	-	239	239	80	-	53	27	106	27
1464	1097	-	-	174	52	-	17	35	87	-
1484	2506	21	48	166	28	7	-	35	48	7
1505	1145	-	43	22	43	-	-	22	43	-
1768	1443	-	25	177	-	-	25	-	127	-
1823	1461	32	32	95	95	-	-	-	127	-
1898	1402	-	31	218	249	-	-	-	187	-
1942	192	-	-	-	70	-	-	-	52	-
2119	235	-	-	-	-	-	52	-	-	-
2156	162	-	-	-	-	-	-	27	-	-
2280	644	-	62	83	83	-	-	-	42	-
2286	4615	-	-	367	-	-	-	-	-	-
2304	97	-	24	-	24	-	-	-	24	-
2319	769	-	63	281	32	-	6	13	28	-
2322	123	-	9	166	18	-	-	-	26	-
2368	37	-	-	87	-	-	-	-	-	-
2375	253	-	30	238	74	-	-	-	149	-
2407	608	11	70	122	18	-	18	52	37	4
2415	513	-	21	41	-	-	41	-	21	-
2498	231	-	32	32	-	-	6	6	-	-

Table 24.5. Continued.

Bag #	*Zea mays*	Sum	Total	Marker	% Indeter-minate	Trans	Tot Trans	Mark/ Slide	Lyco Added	Wt/ Area
1189	26	554	3604	249	0.9	22	26	294	40500	25
1203	35	511	1804	459	0.78	10	26	1193	40500	25
1310	-	134	3559	61	2.99	6	28	285	40500	25
1464	17	108	1881	93	4.63	4	25	581	40500	25
1484	7	501	3468	234	1.4	14	24	401	40500	25
1505	-	91	1966	75	2.2	6	28	350	40500	25
1768	-	122	3088	64	4.1	12	28	149	40500	25
1823	-	85	2700	51	4.71	8	26	166	40500	25
1898	-	81	2523	52	7.41	12	26	113	40500	25
1942	-	21	366	93	14.29	4	26	605	40500	25
2119	78	18	470	62	-	14.5	14.5	62	40500	25
2156	-	8	216	60	-	10	28	168	40500	25
2280	42	52	1080	78	3.85	4	28	546	40500	25
2286	-	187	5716	53	-	29	29	53	40500	25
2304	-	9	218	67	11.11	4	28	469	40500	25
2319	-	513	1617	514	1.75	13	26	1028	40500	25
2322	18	51	447	185	5.88	4	26	1203	40500	25
2368	25	25	312	130	-	4	26	845	40500	25
2375	-	57	847	109	17.54	4	27	736	40500	25
2407	74	506	1863	440	1.98	10	27	1188	40500	25
2415	41	37	759	79	2.7	29	29	79	40500	25
2498	39	109	701	252	-	12	26	546	40500	25

Table 24.5. Continued.

	Based on Counts and Low Magnification Scan of Slide																
Bag #	*Picea*	*Abies*	*Zea mays*	*Sphaeralcea*	Cactaceae	*Cylindropuntia*	Onagraceae	Solanaceae	*Prosopis*	Fabaceae	*Polygonum*	Chenoam af	*Shepherdia*	*Eriogonum*	*Ephedra*	*P. pond*	Max. Potential Concentration
1189	-	-	33.3	-	38.54	77.07	-	-	-	-	-	-	-	5.51	-	-	5.51
1203	1.4	1.4	27.2	-	2.71	10.86	-	-	-	-	-	2.71	-	-	-	-	1.36
1310	-	-	5.69	5.69	5.69	22.76	-	-	5.69	-	5.69	-	-	-	-	-	5.69
1464	-	-	16.7	-	-	11.15	-	-	-	-	-	2.79	-	-	-	16.7	2.79
1484	-	-	4.04	4.04	4.04	-	-	-	-	4.04	-	8.08	4.04	-	8.08	-	4.04
1505	-	-	9.26	4.63	9.26	9.26	-	-	-	-	-	-	-	4.63	-	-	4.63
1768	-	-	32.5	-	21.7	21.7	-	-	-	-	-	-	-	-	-	-	10.85
1823	-	-	39.1	-	-	-	-	-	-	-	-	-	-	-	-	-	9.77
1898	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.38
1942	-	-	-	-	-	-	2.68	-	-	-	-	-	-	-	-	2.68	2.68
2119	-	-	78.4	-	-	52.26	-	-	-	-	-	-	-	-	-	-	26.13
2156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.64
2280	-	-	17.8	-	-	2.97	-	-	-	-	-	-	-	-	2.97	-	2.97
2286	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30.57
2304	-	-	-	-	3.45	-	-	-	-	-	-	-	-	-	-	-	3.45
2319	-	-	3.15	-	-	3.15	-	-	-	-	1.58	-	-	-	-	-	1.58
2322	-	-	24.3	-	-	2.69	-	-	-	-	-	-	-	-	-	1.35	1.35
2368	-	1.9	5.75	-	-	1.92	-	-	-	-	-	-	-	-	-	-	1.92
2375	-	-	-	-	-	-	2.2	22.02	-	-	-	-	-	-	-	-	2.2
2407	12	1.4	53.2	4.09	-	13.64	2.73	-	-	-	-	-	-	2.73	-	-	1.36
2415	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.51
2498	-	-	38.6	-	-	8.9	-	2.97	-	-	-	-	-	-	-	-	2.97

Table 24.6. Raw Pollen Counts and Concentration Values, LA 6171, Sandoval County, New Mexico

Bag #	Provenience	Locus/ Unit	Structure	Stratum	Level	Feature	Type	Period	Age	*Pinus*	*P. pond.*	*P. edulis*	*Juniperus*
523	N185.05/E192.99	4	structure 18	40	98.19	18	floor	Early Rio Grande Developmental	AD 700-900	-	-	-	-
580	N192.1/E183.7	6	extramural	74	97.29	104 in 83	pit:subfloor:cist	Early Rio Grande Developmental	AD 700-900	1	1	-	-
613	N180/E184	6	extramural	92	96.96	56	pit: bell shaped: roasting: 3 subfloor pits	Early Rio Grande Developmental	AD 700-900	4	1	3	-
621	N179/E184	6	extramural	70	96.62	59 in 56	pit:subfloor	Early Rio Grande Developmental	AD 700-900	30	5	25	1
629	N232/E176.15	3	structure 9	400	97.5	9	floor: se	Early Rio Grande Developmental	AD 775-825	16	4	12	-
630	N230.85/E172.84	3	structure 9	400	97.5	9	floor: sw	Early Rio Grande Developmental	AD 775-825	2	-	2	-
659	N185.4/E183.82	6	pit structure 60	41	97.11-97.09	60	floor:under pallet	Early Rio Grande Developmental	AD 740-835	10	1	9	-
665	N186/E183.4	6	pit structure 60	41	97.19	60	floor:under metate	Early Rio Grande Developmental	AD 740-835	31	8	23	3
687	N186.35/E186.3	6	pit structure 60	41	97.16	60	floor	Early Rio Grande Developmental	AD 740-835	13	1	12	2
699	N184.88/E186.02	6	pit structure 60	floor cont	97.03	63	pit:	Early Rio Grande Developmental	AD 740-835	5	-	5	-
754	N173.84/E179.2	5	extramural	77	0	47	pit:small	Early Rio Grande Developmental	AD 700-900	9	-	9	1
810	N185.8/E178.5	6	extramural	42	97.41	85	burial:human	Early Rio Grande Developmental	AD 700-900	2	-	2	-
866	N200/E187	7	extramural		96.5	92	subcist:in bell shaped:burned	Early Rio Grande Developmental	AD 605-665	6	-	6	-
881	N186.24/E196.12	4	structure 26	401	97.86	26	floor	Early Rio Grande Developmental	AD 700-900	5	-	5	-
892	N185.75/E193.65	4	structure 18	71	97.92	19	pit:posthole:remodeled	Early Rio Grande Developmental	AD 700-900	19	-	19	-
919	N/E	4	structure 18			24	pit:storage	Early Rio Grande Developmental	AD 700-900	8	4	4	-
935	N184.58/E193.8	4	structure 18	75	97.75	25	pit:storage	Early Rio Grande Developmental	AD 700-900	14	-	14	-
942	N176.5/E185.4	5	extramural	92	97.04	53	stain, ?pot rest	Early Rio Grande Developmental	AD 700-900	16	-	16	-
949	N182/E195.4	4	structure 26	70	97.58	31	posthole:double	Early Rio Grande Developmental	AD 700-900	2	-	2	-
950	N182.03/E195.5	4	structure 26	70	97.6	31	posthole:double	Early Rio Grande Developmental	AD 700-900	9	-	9	-

Table 24.6. Continued.

Bag #	*Salix*	*Quercus*	*Carya*	Solan-aceae	*Brassic-aceae*	*Sarco-batus*	Poaceae	Cheno-am	Cheno-am af.	Astera-ceae hs.	Astera-ceae ls	*Artemisia*	Cacta-ceae	Cylindro-puntia
523	-	-	-	-	-	-	-	10	-	-	8	-	-	-
580	-	-	-	-	-	-	1	4	-	1	3	-	-	-
613	-	-	-	-	-	-	1	37	-	1	1	-	-	-
621	-	-	-	-	1	2	15	429	-	15	14	2	-	-
629	-	-	-	-	-	-	1	9	-	1	2	-	-	-
630	-	-	-	-	-	-	1	23	-	-	1	-	-	-
659	-	-	-	-	-	-	1	26	-	5	4	1	-	-
665	-	-	-	-	4	-	10	177	-	8	32	9	-	-
687	3	-	-	-	-	-	7	85	1	3	11	-	1	-
699	-	-	1	-	-	-	2	45	-	4	3	-	-	-
754	-	-	-	-	-	-	1	99	-	1	2	1	1	-
810	-	-	-	-	-	1	3	22	-	2	9	1	-	-
866	-	1		-	-	-	1	93	-	3	5	-	-	-
881	-	-	-	-	-	-	2	14	-	2	3	-	-	-
892	-	-	-	-	-	-	6	111	3	8	7	4	-	1
919	-	-	-	4	-	-	2	14	-	1	7	-	1	-
935	-	-	-	-	-	-	-	27	1	6	1	-	-	-
942	-	-	-	-	-	-	1	31	-	10	-	-	-	-
949	-	-	-	-	-	-	-	5	-	1	-	-	-	-
950	-	-	-	-	-	-	1	17	-	5	2	-	-	-

Table 24.6. Continued.

								Based on Counts and Low Magnification Scan of Slide						
Bag #	*Ephedra*	Indeterminate	Unk Triporate	*Sphaeralcea*	*Zea mays*	Sum	% Indeterminate	*Pinus*	*Zea mays*	*Sphaeralcea*	Cactaceae	Onagraceae	Solanaceae	Nyctaginaceae
523	-	2	-	-	-	20	10.00	-	-	-	-	-	-	-
580	-	1	-	-	-	11	9.09	5	-	-	-	-	-	-
613	-	1	-	-	-	45	2.22	11	-	-	-	-	-	-
621	4	10	-	-	-	523	1.91	-	-	-	-	-	-	-
629	2	-	-	-	-	31	0.00	-	-	-	-	-	-	-
630	1	3	-	-	1	32	9.38	-	1	-	-	-	-	-
659	-	-	-	-	1	48	0.00	-	2	-	-	-	-	-
665	4	11	-	-	-	289	3.81	-	-	-	-	-	-	-
687	4	13	-	-	-	143	9.09	-	3	-	-	-	-	-
699	-	2	-	1	2	65	3.08	-	3	2	-	-	-	-
754	3	1	-	-	-	119	0.84	-	-	-	-	-	-	-
810	4	2	-	-	-	46	4.35	5		-	-	-	-	-
866	1	2	-	-	-	112	1.79	-	-	-	-	-	-	-
881	-	1	-	-	-	27	3.70	-	-	-	-	-	-	-
892	4	9	-	-	6	178	5.06	-	10	1	-	-	-	-
919	1	11	-	-	9	58	18.97	-	37	1	1	1	4	1
935	-	4	-	-	-	53	7.55	-	1	-	-	-	-	-
942	4	13	1	-	-	76	17.11	-	-	-	-	-	-	-
949	-	1	-	-	1	10	10.00	5	-	-	-	-	-	-
950	-	4	-	-	-	38	10.53	-	-	-	-	-	-	-

Table 24.6. Continued.

	Based on Counts and low magnification scan of slide														
Bag #	*Polygonum*	Cheno-am af	*Eriogonum*	*Ephedra*	*Pinus*	*Zea mays*	*Sphaeralcea*	Cactaceae	Onagraceae	Solanaceae	Brassicaceae	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.
523	-	-	-	-	-	-	-	-	-	-	-	-	-	106	-
580	-	-	-	-	5	-	-	-	-	-	-	-	27	108	-
613	-	-	-	-	11	-	-	-	-	-	-	-	30	1110	-
621	-	-	-	-	-	-	-	-	-	-	27	53	398	11393	-
629	-	-	-	-	-	-	-	-	-	-	-	-	12	104	-
630	-	-	-	-	-	1	-	-	-	-	-	-	31	703	-
659	-	-	-	-	-	2	-	-	-	-	-	-	14	360	-
665	1	-	1	3	-	-	-	-	-	-	28	-	71	1258	-
687	-	-	-	-	-	3	-	-	-	-	-	-	180	2186	26
699	-	-	-	-	-	3	2	-	-	-	-	-	51	1157	-
754	-	-	-	-	-	-	-	-	-	-	-	-	23	2228	-
810	-	1	-	6	5	-	-	-	-	-	-	16	48	349	-
866	-	-	-	-	-	-	-	-	-	-	-	-	34	3206	-
881	-	-	-	-	-	-	-	-	-	-	-	-	57	398	-
892	-	-	-	-	-	10	1	-	-	-	-	-	187	3458	93
919	-	-	-	2	-	37	1	1	1	4	-	-	20	138	-
935	-	-	-	-	-	1	-	-	-	-	-	-	-	329	12
942	-	-	-	-	-	-	-	-	-	-	-	-	9	290	-
949	-	-	-	-	5	-	-	-	-	-	-	-	-	59	-
950	-	-	-	-	-	-	-	-	-	-	-	-	9	158	-

Table 24.6. Continued.

Bag #	Aster-aceae hs.	Aster-aceae ls	*Arte-misia*	Cacta-ceae	Cylindro-puntia	*Ephedra*	Indeter-minate	Unk Triporate	*Sphaer-alcea*	*Zea mays*	Sum	Total	Marker	Trans	Tot Trans	Mark/Slide	Wt/Area
523	-	85	-	-	-	-	21	-	-	-	20	212	153	4	27	1033	25
580	27	81	-	-	-	-	27	-	-	-	11	297	60	6	26	260	25
613	30	30	-	-	-	-	30	-	-	-	45	1350	54	6	26	234	25
621	398	372	53	-	-	106	266	-	-	-	523	13890	61	8	26	198	25
629	12	23	-	-	-	23	-	-	-	-	31	359	140	4	26	910	25
630	-	31	-	-	-	31	92	-	-	31	32	978	53	6	26	230	25
659	69	55	14	-	-	-	-	-	-	14	48	665	117	4	26	761	25
665	57	227	64	-	-	28	78	-	-	-	289	2053	228	10	25	570	25
687	77	283	-	26	-	103	334	-	-	-	143	3677	63	8	26	205	25
699	103	77	-	-	-	-	51	-	26	51	65	1671	63	6	27	284	25
754	23	45	23	23	-	68	23	-	-	-	119	2678	72	6	25	300	25
810	32	143	16	-	-	64	32	-	-	-	46	731	102	4	26	663	25
866	103	172	-	-	-	34	69	-	-	-	112	3860	47	27	27	47	25
881	57	85	-	-	-	-	28	-	-	-	27	767	57	8	25	178	25
892	249	218	125	-	31	125	280	-	-	187	178	5545	52	12	26	113	25
919	10	69	-	10	-	10	109	-	-	89	58	573	164	4	28	1148	25
935	73	12	-	-	-	-	49	-	-	-	53	646	133	4	28	931	25
942	94	-	-	-	-	37	122	9	-	-	76	712	173	4	26	1125	25
949	12	-	-	-	-	-	12	-	-	12	10	118	137	4	28	959	25
950	47	19	-	-	-	-	37	-	-	-	38	354	174	4	26	1131	25

Table 24.6. Continued.

Bag #	*Pinus*	*Zea mays*	*Sphaer-alcea*	Cacta-ceae	Onagra-ceae	Solan-aceae	Nyctagin-aceae	*Polygo-num*	Cheno-am af	*Eriogo-num*	*Ephedra*	Max. Potential Concentration
523	-	-	-	-	-	-	-	-	-	-	-	1.57
580	31.2	-	-	-	-	-	-	-	-	-	-	6.23
613	76.2	-	-	-	-	-	-	-	-	-	-	6.92
621	-	-	-	-	-	-	-	-	-	-	-	8.17
629	-	-	-	-	-	-	-	-	-	-	-	1.78
630	-	7.05	-	-	-	-	-	-	-	-	-	7.05
659	-	4.26	-	-	-	-	-	-	-	-	-	2.13
665	-	-	-	-	-	-	-	2.84	-	2.84	8.53	2.84
687	-	23.7	-	-	-	-	-	-	-	-	-	7.91
699	-	17.1	11.43	-	-	-	-	-	-	-	-	5.71
754	-	-	-	-	-	-	-	-	-	-	-	5.4
810	12.2	-	-	-	-	-	-	-	2.44	-	14.7	2.44
866	-	-	-	-	-	-	-	-	-	-	-	34.47
881	-	-	-	-	-	-	-	-	-	-	-	9.09
892	-	144	14.38	-	-	-	-	-	-	-	-	14.38
919	-	52.2	1.41	1.41	1.41	5.64	1.41	-	-	-	2.82	1.41
935	-	1.74	-	-	-	-	-	-	-	-	-	1.74
942	-	-	-	-	-	-	-	-	-	-	-	1.44
949	8.45	-	-	-	-	-	-	-	-	-	-	1.69
950	-	-	-	-	-	-	-	-	-	-	-	1.43

Table 24.7. Raw Pollen Counts and Concentration Values, LA 115862, Sandoval County, New Mexico

Bag #	Provenience	Structure	Stratum	Level	Feature	Type	Period	Age
192	N113/E120	extramural	PF	99.16	9	pit:roasting	Early Rio Grande Developmental	AD 800
197	N112.1/E114	extramural	PF	99.17	11	pit:roasting	Early Rio Grande Developmental	AD 800
221	N106.46/E109.55	pit structure 1	PH	97.24	16	posthole:main structure SW1/4	Early Rio Grande Developmental	AD 800
223	N108.96/E109.77	pit structure 1	PH	97.10	17	posthole:main structure NW1/4	Early Rio Grande Developmental	AD 800
234	N107.4/E111.35	pit structure 1	AS	97.46	20	pit:ash	Early Rio Grande Developmental	AD 800

Table 24.7. Continued.

Bag #	*Pinus*	*P. pond.*	*P. edulis*	Poaceae	Cheno-am	Astera-ceae hs.	Astera-ceae ls	Cacta-ceae	Cylindr-opuntia	*Ephedra*	Indeter-minate
Raw Counts											
192	-	-	-	-	11	-	8	-	-	1	3
197	3	-	3	-	7	-	-	-	-	1	2
221	23	3	20	3	71	3	5	2	1	9	5
223	-	-	-	1	5	-	-	-	-	1	-
234	1	-	1	2	14	2	1	-	-	-	5
Concentration Values											
192	-	-	-	-	349	-	254	-	-	32	95
197	95	-	95	-	222	-	-	-	-	32	64
221	324	42	282	42	1000	42	70	28	14	127	70
223	-	-	-	13	64	-	-	-	-	13	-
234	29	-	29	58	405	58	29	-	-	-	145

Table 24.7. Continued.

Bag #	Sum	Total	Marker	% Indeter-minate	Trans	Tot Trans	Mark/Slide	Lyco Added	Wt/Area
192	23	731	51	13.04	10	26	133	40500	25
197	16	508	51	12.5	10	26	133	40500	25
221	122	1719	115	4.1	6	27	518	40500	25
223	7	90	126	-	4	27	851	40500	25
234	26	752	56	19.23	6	25	233	40500	25

Table 24.7. Continued.

	Based on Counts and Low Magnification Scan of Slide								
Raw Counts									
Bag #	*Pinus*	*Picea*	*Zea mays*	*Sphaer-alcea*	Cacta-ceae	*Cylindr-opuntia*	*Ephedra*	Aster-aceae ls	Max. Potential Concentration
192	-	-	-	-	-	-	-	-	
197	-	-	-	-	-	-	-	-	
221	-	1	2	1	4	1	8	-	
223	6	-	-	-	-	-	2	2	
234	-	-	-	-	-	-	-	-	
Concentration Values									
192	-	-	-	-	-	-	-	-	12.22
197	-	-	-	-	-	-	-	-	12.22
221	-	3.1	6.26	3.13	12.5	3.13	25	-	3.13
223	11.4	-	-	-	-	-	3.81	3.81	1.9
234	-	-	-	-	-	-	-	-	6.94

Table 24.8. Raw Pollen Counts and Concentration Values, Pollen Wash Samples, Pena Blañca Project, Sandoval County, New Mexico

Site	Bag #	Prov	Area	Locus/ Unit	Structure	Stratum	Level	Feature	Type	Period	Age
LA 265	1480	N441.6/E493.36	1	4	pit structure 4	S	99.39	22	ceramic:pitcher:burial:human	Early Rio Grande Developmental	AD 750-900
LA 265	1486	N467.08/E490.55	1	2	extramural:SU1		99.37	24	ceramic:Tallahoga red seed jar w/ burial	Early Rio Grande Developmental	AD 750-900
LA 265	1488	N466.77/E490.6	1	2	extramural:SU1	B	99.44	24	ceramic: pot: pit: bell-shaped: storage w/ adult burial	Early Rio Grande Developmental	AD 750-900
LA 265	1698	N460.02/E499.89	1	2	extramural:SU1	A	99.87	244	ceramic:mug:pit:oval:lg w/ 2 pit-burial	Early Rio Grande Developmental	AD 750-900
LA 265	1699	N459.65/E500.31	1	2	extramural:SU1		99.83	244	ceramic:jar:pit:oval:lg w/ 2 pit-burial	Early Rio Grande Developmental	AD 750-900
LA 6169	375	N0/E0	1	11	burial	T1wall cl	0	2	ceramic:utility:burial:human:45+yr female	Early Rio Grande Developmental	AD 750-900
LA 6169	387	N94/E100	1	11	burial		0	2	ceramic:bowl:burial:human:45+yr female	Early Rio Grande Developmental	AD 750-900
LA 6169	396	N94/E102	1	11	burial	1	99.97-99.68	2	ceramic: red pitcher: burial: human45+yr female	Early Rio Grande Developmental	AD 750-900
LA 6169	398	N99.7/E102	1	11	burial	3	99.72	2	ceramic:jar:burial:human: 45+yr female	Early Rio Grande Developmental	AD 750-900
LA 6169	1046	N121.9/E133.4	2	8	pit structure 47		99.76	49	ceramic:sherds:burial:child	Early Rio Grande Developmental	AD 750-900
LA 6169	1047	N121.85/E133.3	2	8	pit structure 47	4	98.81	49	ceramic:jar:burial:child	Early Rio Grande Developmental	AD 750-900
LA 6169	1210	N118.55/E132	2	8	pit structure 76 w/l 47	4	98.45-98.25	81	ceramic:bowl:burial:human:18-19yr male	Late Rio Grande Developmental/Coalition	AD 1000-1200
LA 115862	158	N100.75/E111.45	0	2	extramural	BPF	99.03	7	ceramic:jar:burial:human:in shallow pit	Early Rio Grande Developmental	AD 800
LA 115862	159	N110.48/E111.35	0	2	extramural	BPF	99.01	7	ceramic:bowl:burial:human:in shallow pit	Early Rio Grande Developmental	AD 800
LA 115862	160	N100.56/E111.4	0	2	extramural	BPF	98.98	7	ceramic: jar lino gray: burial: human: inshallow pit	Early Rio Grande Developmental	AD 800
LA 115862	161	N100.6/E111.2	0	2	extramural	BPF	99	7	ceramic: seed jar: burial: human: in shallow pit	Early Rio Grande Developmental	AD 800
LA 115862	181	N99.2/E107.65	0	2	extramural	00-BPF	98.98	6	ceramic: seed jar hanging: burial: human w/ fetus in shallow pit	Early Rio Grande Developmental	AD 800

Table 24.8. Continued.

Site	Bag #	*Pinus*	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Abies*	*Alnus*	*Ulmus*	*Quercus*	*Prosopis*	Solanaceae	Rosaceae	*Polygonum*
LA 265	1480	73	10	63	-	1	-	-	-	1	-	-	-	-
LA 265	1486	-	-	-	-	-	-	-	-	1	-	2	-	-
LA 265	1488	2	-	2	-	-	-	-	-	-	-	-	-	-
LA 265	1698	1	-	1	-	-	-	-	-	-	-	-	-	-
LA 265	1699	4	-	4	-	-	-	-	-	-	-	-	-	-
LA 6169	375	2	-	2	-	-	-	-	-	-	-	-	-	-
LA 6169	387	3	1	2	-	-	-	-	-	1	-	-	-	-
LA 6169	396	4	-	4	-	-	-	-	1	-	-	-	1	-
LA 6169	398	2	-	2	-	-	-	-	-	2	-	-	-	-
LA 6169	1046	147	39	108	-	1	1	1	-	2	-	-	-	1
LA 6169	1047	325	111	214	1	-	-	-	-	-	2	-	1	-
LA 6169	1210	54	8	46	-	-	-	-	-	-	-	-	-	-
LA 115862	158	1	-	1	-	-	-	-	-	1	-	-	-	-
LA 115862	159	7	-	7	-	-	-	-	-	-	-	-	-	-
LA 115862	160	4	-	4	-	1	-	-	-	-	-	-	-	-
LA 115862	161	8	2	6	-	-	-	-	-	-	-	-	-	-
LA 115862	181	1	-	1	-	-	-	-	-	-	-	-	-	-

Table 24.8. Continued.

Site	Bag #	*Eriog-onum*	Lili-aceae	*Sarco-batus*	Poaceae	Cheno-am	Cheno-am af.	Aster-aceae hs.	Aster-aceae ls	*Arte-misia*	Cacta-ceae
LA 265	1480	-	-	-	9	233	1	18	22	16	8
LA 265	1486	-	-	-	-	16	-	2	2	4	1
LA 265	1488	-	-	-	-	9	-	1	-	-	-
LA 265	1698	-	-	-	-	9	-	2	-	-	-
LA 265	1699	-	-	-	1	15	-	25	4	-	1
LA 6169	375	-	-	-	-	-	-	-	1	-	-
LA 6169	387	-	-	-	-	1	-	1	-	-	-
LA 6169	396	-	-	-	-	-	1	-	-	-	-
LA 6169	398	-	-	-	-	1	-	-	1	-	-
LA 6169	1046	-	-	-	6	289	1	1	23	11	-
LA 6169	1047	-	-	1	4	217	-	5	21	11	1
LA 6169	1210	-	-	-	7	63	-	4	12	7	-
LA 115862	158	1	-	-	-	3	-	1	1	-	-
LA 115862	159	-	-	-	-	5	-	3	2	-	-
LA 115862	160	-	1	-	2	3	-	2	3	-	-
LA 115862	161	-	-	-	2	25	-	3	5	-	-
LA 115862	181	-	-	-	-	6	-	4	1	-	-

Table 24.8. Continued.

Site	Bag #	*Cylindr-opuntia*	*Platy-opuntia*	*Ephedra*	Nyctagin-aceae	Indeter-minate	*Sphaer-alcea*	*Zea mays*	Cucurbi-taceae	Sum	% Indeter-minate
LA 265	1480	51	2	2	-	17	-	24	2	553	3.07
LA 265	1486	1	-	-	-	3	-	-	-	32	9.38
LA 265	1488	-	-	-	-	-	-	-	-	12	-
LA 265	1698	-	-	-	-	2	-	-	-	14	14.29
LA 265	1699	-	-	-	-	1	-	-	-	51	1.96
LA 6169	375	-	-	-	-	-	-	-	-	3	-
LA 6169	387	-	-	-	-	-	-	-	-	6	-
LA 6169	396	-	-	-	-	-	-	-	-	7	-
LA 6169	398	-	-	-	-	2	-	-	-	8	25
LA 6169	1046	1	-	1	-	9	-	2	-	**497**	**1.81**
LA 6169	1047	-	-	9	1	4	-	3	-	**606**	**0.66**
LA 6169	1210	-	1	1	-	10	1	3	-	163	6.13
LA 115862	158	-	-	-	-	-	-	1	-	10	-
LA 115862	159	-	-	-	-	-	-	1	-	25	-
LA 115862	160	-	-	1	-	3	-	3	-	27	11.11
LA 115862	161	-	-	-	-	1	3	-	-	55	1.82
LA 115862	181	-	-	-	-	-	-	1	-	14	-

Table 24.8. Continued.

		Based on Counts and Low Magnification Scan of Slide										
		Pinus	*Picea*	*Abies*	*Quercus*	*Zea mays*	*Sphaer-alcea*	Cacta-ceae	*Cylindro-puntia*	*Platy-opuntia*	Solana-ceae	Nyctagin-aceae
LA 265	1480	-	-	-	-	24	-	8	51	2	-	-
LA 265	1486	-	-	-	-	1	-	-	-	-	2	-
LA 265	1488	-	-	-	-	-	-	-	-	-	-	-
LA 265	1698	-	-	-	-	-	-	-	-	-	-	-
LA 265	1699	-	-	-	-	2	-	2	2	-	-	-
LA 6169	375	-	-	-	-	-	-	-	-	-	-	-
LA 6169	387	-	-	-	-	1	-	-	-	-	-	-
LA 6169	396	6	2	-	-	-	-	-	-	-	-	-
LA 6169	398	-	-	-	-	-	-	-	-	-	-	-
LA 6169	1046	-	1	1	-	2	-	1	1	-	-	-
LA 6169	1047	-	5	-	-	12	-	4	-	-	-	2
LA 6169	1210	-	-	-	-	6	1	-	-	1	-	-
LA 115862	158	-	-	-	-	2	-	-	-	-	-	-
LA 115862	159	-	-	-	-	1	-	2	-	-	-	-
LA 115862	160	-	2	-	1	12	-	1	-	-	-	-
LA 115862	161	-	-	-	-	-	3	-	-	-	-	1
LA 115862	181	-	-	-	-	5	-	-	-	-	-	-

Table 24.8. Continued.

		Based on Counts and Low Magnification Scan of Slide							
		Polygo-num	Cucurbi-taceae	Cheno-am af	Rosa-ceae	*Eriogo-num*	*Ulmus*	*P. pond*	*P. edulis*
LA 265	1480	-	2	-	-	1	-	-	-
LA 265	1486	-	-	1	-	-	-	1	-
LA 265	1488	-	-	-	-	-	-	-	-
LA 265	1698	-	-	-	-	-	-	-	8
LA 265	1699	-	-	-	-	-	-	5	-
LA 6169	375	-	-	-	-	-	-	-	-
LA 6169	387	-	-	-	-	-	-	-	-
LA 6169	396	-	-	-	-	-	2	-	-
LA 6169	398	-	-	-	-	-	-	-	-
LA 6169	1046	1	-	-	-	-	-	-	-
LA 6169	1047	2	-	2	1	-	1	-	-
LA 6169	1210	-	-	-	-	1	-	-	-
LA 115862	158	-	-	-	-	-	-	-	-
LA 115862	159	-	-	-	-	-	-	-	-
LA 115862	160	-	-	-	-	-	-	-	-
LA 115862	161	-	-	-	-	-	-	-	-
LA 115862	181	-	-	-	-	-	-	-	-

Table 23.8. Continued.

Site	Bag #	Liliaceae	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.	Astera-ceae hs.	Astera-ceae ls	*Artemisia*	Cacta-ceae	Cylindro-puntia
LA 265	1480	-	-	0.98	25.41	0.11	1.96	2.4	1.75	0.87	5.56
LA 265	1486	-	-	-	6.65	-	0.83	0.83	1.66	0.42	0.42
LA 265	1488	-	-	-	24.79	-	2.75	-	-	-	-
LA 265	1698	-	-	-	1.45	-	0.32	-	-	-	-
LA 265	1699	-	-	0.04	0.56	-	0.93	0.15	-	0.04	-
LA 6169	375	-	-	-	-	-	-	7.48	-	-	-
LA 6169	387	-	-	-	1.18	-	1.18	-	-	-	-
LA 6169	396	-	-	-	-	2.23	-	-	-	-	-
LA 6169	398	-	-	-	1.95	-	-	1.95	-	-	-
LA 6169	1046	-	-	1.3	62.65	0.22	0.22	4.99	2.38	-	0.22
LA 6169	1047	-	0.46	1.85	100.24	-	2.31	9.7	5.08	0.46	-
LA 6169	1210	-	-	1.9	17.11	-	1.09	3.26	1.9	-	-
LA 115862	158	-	-	-	1.26	-	0.42	0.42	-	-	-
LA 115862	159	-	-	-	5.13	-	3.08	2.05	-	-	-
LA 115862	160	1.59	-	3.18	4.77	-	3.18	4.77	-	-	-
LA 15862	161	-	-	1.22	15.2	-	1.82	3.04	-	-	-
LA 115862	181	-	-	-	2.86	-	1.91	0.48	-	-	-

Table 24.8. Continued.

Site	Bag #	*Platy-opuntia*	*Ephedra*	Nyctag-inaceae	Indeter-minate	*Sphaer-alcea*	*Zea mays*	Cucur-bitaceae
LA 265	1480	0.22	0.22	-	1.85	-	2.62	0.22
LA 265	1486	-	-	-	1.25	-	-	-
LA 265	1488	-	-	-	-	-	-	-
LA 265	1698	-	-	-	0.32	-	-	-
LA 265	1699	-	-	-	0.04	-	-	-
LA 6169	375	-	-	-	-	-	-	-
LA 6169	387	-	-	-	-	-	-	-
LA 6169	396	-	-	-	-	-	-	-
LA 6169	398	-	-	-	3.91	-	-	-
LA 6169	1046	-	0.22	-	1.95	-	0.43	-
LA 6169	1047	-	4.16	0.46	1.85	-	1.39	-
LA 6169	1210	0.27	0.27	-	2.72	0.27	0.81	-
LA 115862	158	-	-	-	-	-	0.42	-
LA 115862	159	-	-	-	-	-	1.03	-
LA 115862	160	-	1.59	-	4.77	-	4.77	-
LA 115862	161	-	-	-	0.61	1.82	-	-
LA 115862	181	-	-	-	-	-	0.48	-

Table 24.8. Continued.

										Based on Counts and Low Magnification Scan of Slide					
		Sum	Total	Marker	Trans	Tot Trans	Mark/S lide	Lyco Added	Wt/Area	*Pinus*	*Picea*	*Abies*	*Quercus*	*Zea mays*	*Sphaer-alcea*
LA 265	1480	553	60.3	1182	27	27	1182	40500	314.16	-	-	-	-	2.62	-
LA 265	1486	32	13.3	77	4	27	520	40500	1264.66	-	-	-	-	0.06	-
LA 265	1488	12	33.1	85	14	14	85	40500	173	-	-	-	-	-	-
LA 265	1698	14	2.26	318	6	22	1166	40500	788.34	-	-	-	-	-	-
LA 265	1699	51	1.9	164	4	27	1107	40500	6614.43	-	-	-	-	0.01	-
LA 6169	375	3	22.5	44	26	26	44	40500	123	-	-	-	-	-	-
LA 6169	387	6	7.06	244	12	28	569	40500	141	-	-	-	-	0.5	-
LA 6169	396	7	15.6	216	12	20	360	40500	84	8.04	2.68	-	-	-	-
LA 6169	398	8	15.6	128	12	22	235	40500	162	-	-	-	-	-	-
LA 6169	1046	497	108	834	25	25	834	40500	224	-	0.22	0.22	-	0.43	-
LA 6169	1047	606	280	206	2	25	2575	40500	425.63	-	0.18	-	-	0.44	-
LA 6169	1210	163	44.3	314	8	30	1178	40500	475	-	-	-	-	0.43	0.07
LA 115862	158	10	4.19	108	6	22	396	40500	895.35	-	-	-	-	0.23	-
LA 115862	159	25	25.6	57	4	26	371	40500	692.72	-	-	-	-	0.16	-
LA 115862	160	27	43	84	8	26	273	40500	303	-	0.98	-	0.49	5.88	-
LA 115862	161	55	33.4	53	16	25	83	40500	1257.16	-	-	-	-	-	1.17
LA 115862	181	14	6.67	56	4	26	364	40500	1518.01	-	-	-	-	0.37	-

Table 23.8. Continued.

		Based on Counts and Low Magnification Scan of Slide													
		Cacta-ceae	Cylindro-puntia	Platy-opuntia	Solana-ceae	Nyctagi-naceae	*Poly-gonum*	Cucurbit-aceae	Cheno-am af	Rosa-ceae	*Eriog-onum*	*Ulmus*	*P. pond.*	*P. edulis*	Max. Potential Concentration
LA 265	1480	0.87	5.56	0.22	-	-	-	0.22	-	-	0.11	-	-	-	0.11
LA 265	1486	-	-	-	0.12	-	-	-	0.06	-	-	-	0.06	-	0.06
LA 265	1488	-	-	-	-	-	-	-	-	-	-	-	-	-	2.75
LA 265	1698	-	-	-	-	-	-	-	-	-	-	-	-	0.35	0.04
LA 265	1699	0.01	0.01	-	-	-	-	-	-	-	-	-	0.03	-	0.01
LA 6169	375	-	-	-	-	-	-	-	-	-	-	-	-	-	7.48
LA 6169	387	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
LA 6169	396	-	-	-	-	-	-	-	-	-	-	2.68	-	-	1.34
LA 6169	398	-	-	-	-	-	-	-	-	-	-	-	-	-	1.07
LA 6169	1046	0.22	0.22	-	-	-	0.22	-	-	-	-	-	-	-	0.22
LA 6169	1047	0.15	-	-	-	0.07	0.07	-	0.07	0.04	-	0.04	-	-	0.04
LA 6169	1210	-	-	0.07	-	-	-	-	-	-	0.07	-	-	-	0.07
LA 115862	158	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11
LA 115862	159	0.32	-	-	-	-	-	-	-	-	-	-	-	-	0.16
LA 115862	160	0.49	-	-	-	-	-	-	-	-	-	-	-	-	0.49
LA 115862	161	-	-	-	-	0.39	-	-	-	-	-	-	-	-	0.39
LA 115862	181	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07

Table 24.9. Results of PCA, Soil Samples, Peña Blanca Project

A: Eigenvalue Analysis, Standardized			
Axis	Eigenvalues	Percentage	Cumulative Percentage
Axis 1	11.7423	30.4018	30.4018
Axis 2	4.3831	11.3481	41.7499
Axis 3	2.2537	5.835	47.585
Axis 4	1.8958	4.9083	52.4933
Axis 5	1.5694	4.0633	56.5566
Axis 6	1.4522	3.76	60.3166
Axis 7	1.3173	3.4106	63.7272
Axis 8	1.2112	3.1358	66.863
Axis 9	1.126	2.9152	69.7783
Axis 10	1.0905	2.8233	72.6015
Axis 11	1.038	2.6874	75.289
Axis 12	0.9868	2.555	77.844
Axis 13	0.9353	2.4215	80.2655
Axis 14	0.8733	2.2612	82.5266
Axis 15	0.8247	2.1353	84.662
Axis 16	0.7618	1.9723	86.6343
Axis 17	0.6771	1.753	88.3873
Axis 18	0.6505	1.6841	90.0714
Axis 19	0.6042	1.5644	91.6359
Axis 20	0.5183	1.3419	92.9778
Axis 21	0.4466	1.1563	94.1341
Axis 22	0.3955	1.0241	95.1582
Axis 23	0.3538	0.916	96.0742
Axis 24	0.3214	0.8322	96.9064
Axis 25	0.2799	0.7246	97.631
Axis 26	0.2276	0.5893	98.2204
Axis 27	0.1882	0.4873	98.7077
Axis 28	0.1287	0.3332	99.0409
Axis 29	0.1221	0.3162	99.3571
Axis 30	0.1088	0.2816	99.6387
Axis 31	0.084	0.2176	99.8563
Axis 32	0.0555	0.1437	100
Axis 33	-	-	100

Table 24.9. Continued.

B: PCA variable loadings

	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	Axis 9	Axis 10	Axis 11
P. ponderosa	0.2479	-0.2081	0.0088	-0.1045	0.0532	-0.0849	-0.0565	-0.152	-0.0033	0.1169	-0.042
P. edulis	***0.2963***	-0.1679	0.0051	0.099	-0.026	0.1064	-0.0521	-0.203	-0.0336	0.1105	-0.0523
Juniperus	0.1894	***-0.3385***	-0.0153	0.0541	0.062	0.0112	0.0391	0.0374	-0.0386	-0.0491	0.0012
Picea	0.1733	-0.2199	0.012	-0.1329	-0.018	-0.0649	-0.0491	-0.121	-0.0147	0.1306	-0.0184
Salix	0.0821	0.0009	-0.0751	-0.0296	0.1375	0.4473	0.093	0.1088	-0.275	-0.2129	-0.1152
Ulmus	0.0845	-0.1861	-0.0035	0.0074	0.0424	-0.0174	-0.0451	0.0309	-0.0514	-0.0703	-0.0499
Quercus	0.1580	-0.2386	-0.0144	0.0046	0.0935	0.0689	-0.0811	0.1128	-0.0333	-0.1025	0.0088
Carya	0.0176	0.0309	0.0826	-0.0462	-0.253	0.0065	0.4218	0.1514	-0.5445	0.1556	-0.0663
Prosopis	0.1442	-0.1715	***0.3583***	0.1234	0.0535	-0.1274	0.1741	0.1447	0.0964	-0.0825	0.0771
Onagraceae	0.0301	0.0297	0.0314	-0.0301	0.0006	0.0878	-0.1707	0.19	0.1049	0.7202	-0.4105
Fabaceae	0.1658	***-0.3538***	0.0005	0.0288	0.0437	0.0259	0.0092	0.0003	-0.0188	-0.0439	-0.0065
Solanaceae	0.0542	-0.0385	0.0559	-0.057	0.0836	0.0424	-0.2158	0.5032	0.0461	0.2533	0.1014
Shepherdia	0.1658	***-0.3538***	0.0005	0.0288	0.0437	0.0259	0.0092	0.0003	-0.0188	-0.0439	-0.0065
Polygonum	0.0447	0.0391	0.0816	-0.1068	-0.427	-0.0594	-0.1502	-0.066	0.165	-0.0522	0.0436
Eriogonum	0.1209	-0.0753	0.1344	-0.0787	-0.441	0.0384	-0.1391	-0.241	0.1115	0.0207	0.0613
Brassicaceae	0.1396	-0.0458	***-0.3043***	0.2176	-0.122	-0.2503	0.1685	0.1743	0.1781	-0.0303	0.0161
Sarcobatus	0.1063	0.1402	***-0.3378***	***0.3516***	-0.051	-0.2321	0.1555	-0.044	0.0706	0.0938	-0.0199
Poaceae	***0.2975***	0.1581	-0.1677	0.0411	0.0138	-0.0889	0.1167	0.167	-0.01	-0.1262	-0.0259
Cheno-am	***0.2847***	***0.2732***	-0.1636	0.0993	-0.066	-0.1157	0.0174	0.0223	0.0117	-0.0132	-0.0723
Cheno-am af.	0.1111	0.1292	0.0074	-0.2013	0.0591	0.4576	0.1492	-0.188	0.2548	-0.0871	-0.1526
Asteraceae hs.	***0.3211***	-0.0273	-0.0808	0.0256	-0.067	0.0385	0.2108	-0.087	0.0718	0.1346	0.0721
Asteraceae ls	***0.3191***	0.148	0.0104	-0.2175	0.0132	-0.146	-0.1593	0.1215	-0.0817	-0.1238	-0.0134
Artemisia	0.2034	0.1427	0.067	-0.1106	-0.204	-0.0496	-0.3906	0.105	0.0771	-0.1586	0.0566
Cactaceae	0.1010	0.1521	0.1568	***0.3081***	0.2609	-0.0516	-0.1352	-0.403	-0.2288	0.1448	-0.0139
Cylindropuntia	0.1055	0.1279	***0.4602***	0.1969	0.2226	-0.1505	0.112	-0.057	0.0735	0.106	0.0058
Platyopuntia	0.0299	0.0398	0.1833	0.0213	0.0797	0.137	0.3708	0.0345	0.5836	-0.0183	-0.0466
Ephedra	0.1656	0.1746	-0.089	0.2075	-0.049	0.2447	-0.1598	-0.286	-0.0736	0.0256	-0.0128
Nyctaginaceae	0.0364	0.0545	-0.0631	***-0.4104***	0.2291	-0.2661	0.0652	-0.168	0.0225	0.0072	0.0234
Indeterminate	***0.3166***	0.266	-0.0924	-0.1253	0.1537	0.2753	0.0093	0.1923	-0.0106	0.03	0.1217
Unk Triporate	0.0118	0.0172	-0.0302	0.0039	0.0246	0.1634	0.0408	-0.015	-0.0084	0.2998	0.8526
Unk Sm Tricolpate	0.0776	0.0815	-0.058	***-0.4891***	0.2381	-0.2816	0.1504	-0.175	-0.0505	0.0951	0.0175
Sphaeralcea	0.1186	0.1118	***0.3382***	-0.1159	-0.389	0.0076	0.2887	0.0106	-0.1652	0.0485	-0.0266
Zea mays	0.1377	0.1947	***0.3845***	0.1406	0.1592	-0.1036	-0.1731	0.1562	-0.0672	-0.2133	0.0161

Table 24.9. Continued.

B: continued	Axis 12	Axis 13	Axis 14	Axis 15	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis 22
P. ponderosa	0.0583	-0.0251	-0.0589	0.0670	-0.0302	-0.0677	0.1389	-0.0747	0.2506	0.3269	-0.2616
P. edulis	-0.0520	-0.0279	0.0444	0.0338	0.0537	-0.0321	0.0302	-0.0648	0.0442	-0.1005	-0.2064
Juniperus	0.0612	-0.0060	-0.0164	-0.0117	0.0910	-0.0345	-0.0216	0.0540	-0.0693	0.0381	0.0888
Picea	0.0735	0.0212	-0.0420	0.2927	-0.3092	-0.2518	0.1818	0.2605	0.2531	-0.2471	-0.2419
Salix	0.5912	0.0208	-0.0082	-0.1492	0.0371	-0.2455	-0.1307	-0.0005	-0.0536	0.0772	-0.1944
Ulmus	-0.1743	0.1766	0.5619	-0.6098	-0.3543	0.0311	-0.0521	0.0463	0.1721	-0.1061	-0.0074
Quercus	-0.1829	0.1445	0.0336	0.2542	0.1387	0.1595	-0.1470	-0.5997	0.1367	-0.2035	-0.1794
Carya	-0.3206	-0.0736	0.1004	0.0769	0.1743	-0.1905	-0.0572	0.0306	0.3051	0.1593	0.1359
Prosopis	0.1656	0.0329	-0.1735	-0.1738	0.0657	0.1067	0.0612	0.0174	0.0026	-0.2989	0.0844
Onagraceae	0.0790	0.3786	-0.0555	-0.0925	0.1311	-0.0202	-0.1221	0.0435	-0.0966	-0.0050	0.0407
Fabaceae	-0.0835	-0.0076	-0.0209	0.0158	0.1827	0.0314	0.0297	0.1686	-0.2571	0.0759	0.1741
Solanaceae	-0.0215	-0.6850	0.0790	-0.1219	0.0000	0.0521	0.2060	-0.0430	-0.0296	0.0354	-0.1535
Shepherdia	-0.0835	-0.0076	-0.0209	0.0158	0.1827	0.0314	0.0297	0.1686	-0.2571	0.0759	0.1741
Polygonum	0.3866	0.0224	0.5444	0.1862	0.3978	0.1108	0.1563	0.0385	0.1436	-0.0533	0.0999
Eriogonum	0.1064	-0.1696	-0.2914	-0.2482	-0.2008	-0.0093	-0.3462	-0.2676	0.0424	0.2250	0.0704
Brassicaceae	0.1010	0.0018	-0.0687	-0.0859	0.0824	0.0806	-0.0573	0.1164	0.2123	0.4171	-0.0923
Sarcobatus	0.0401	-0.1387	0.0221	-0.0889	0.0470	0.0140	-0.0235	0.0065	-0.0778	-0.2766	-0.2153
Poaceae	0.1164	0.1029	-0.1184	-0.0127	-0.0249	-0.0337	0.0147	0.2165	0.0662	-0.1039	0.0059
Cheno-am	-0.1093	0.1409	0.0407	0.0370	-0.0290	0.0502	0.0514	-0.2107	-0.1683	0.0643	-0.1668
Cheno-am af.	-0.2640	-0.0522	-0.0110	-0.0504	0.1114	0.4567	0.0386	0.3044	0.1019	0.1326	-0.2403
Asteraceae hs.	-0.0353	-0.0908	0.0184	0.0657	-0.1158	0.1226	-0.1286	-0.0021	-0.1085	-0.1253	0.3298
Asteraceae ls	-0.0191	0.0936	0.1855	0.0048	-0.0910	-0.0394	0.0489	-0.1168	-0.3135	0.3094	0.0759
Artemisia	-0.2194	-0.0143	-0.1485	0.0156	0.0308	-0.2692	-0.2654	0.3529	0.0839	-0.1697	0.0304
Cactaceae	0.0340	-0.2891	0.2772	0.1255	0.0579	-0.0165	-0.3626	0.1353	-0.1434	0.0538	-0.0634
Cylindropuntia	0.1889	0.0331	-0.0631	-0.0460	-0.0648	0.1785	0.0607	-0.0243	0.3195	0.1314	0.1617
Platyopuntia	-0.1231	-0.0683	0.2222	0.0889	-0.0102	-0.5736	-0.0624	-0.1356	-0.0966	0.0738	-0.0097
Ephedra	-0.1001	-0.0339	-0.1396	-0.2616	0.1411	-0.2418	0.5927	-0.1633	0.0586	-0.0473	0.2560
Nyctaginaceae	-0.0205	-0.0900	-0.0943	-0.3716	0.5330	-0.1309	-0.1795	-0.0845	0.1248	-0.1766	-0.0843
Indeterminate	0.0805	-0.0668	0.0187	0.1375	-0.0948	0.1171	-0.1616	-0.0820	0.2256	-0.1712	0.3059
Unk triporate	-0.0101	0.2862	0.0355	-0.0705	0.0697	-0.0434	-0.0161	0.0751	-0.0651	0.0927	-0.1604
Unk sm tricolpate	0.1038	-0.0197	0.0166	0.0639	-0.1933	0.0304	0.1815	-0.0189	-0.1429	0.0434	0.1059
Sphaeralcea	0.0335	-0.0297	-0.0486	-0.0952	-0.0544	0.1173	0.0941	-0.0097	-0.3455	-0.1999	-0.3223
Zea mays	-0.1486	0.2034	-0.0573	0.0180	0.1326	-0.0550	0.0783	0.0560	-0.0076	0.1374	-0.1813

Table 24.9. Continued

B: Continued	Axis 23	Axis 24	Axis 25	Axis 26	Axis 27	Axis 28	Axis 29	Axis 30	Axis 31	Axis 32	Axis 33
P. ponderosa	-0.2532	-0.1046	-0.1053	-0.1750	-0.4488	0.2053	0.3452	0.1071	-0.1126	0.2201	0.0000
P. edulis	-0.2064	0.0938	-0.0933	-0.2882	-0.0413	-0.2095	-0.7118	0.1381	0.1264	-0.0399	0.0000
Juniperus	0.1091	0.0552	0.0798	-0.1409	0.0498	0.0328	0.1544	0.2977	-0.3451	-0.7267	0.0000
Picea	0.1427	0.0031	0.2515	0.2784	0.1370	-0.1130	0.0852	-0.2630	0.1961	-0.1424	0.0000
Salix	-0.0267	-0.0028	0.0128	-0.0003	0.2051	0.1897	0.0088	0.0411	0.1569	0.1002	0.0000
Ulmus	0.0211	0.0119	-0.0437	0.0978	-0.0269	0.0661	0.0067	0.0145	-0.0451	0.0467	0.0000
Quercus	0.2053	0.0920	-0.1061	0.0041	0.2960	0.0568	0.1220	-0.1182	-0.1534	0.1732	0.0000
Carya	0.0921	-0.1783	-0.0257	-0.0663	0.0818	-0.0277	0.0078	0.0490	0.1115	-0.0035	0.0000
Prosopis	0.2737	-0.0549	-0.0108	-0.2392	-0.1524	-0.2693	0.2125	0.2272	0.3904	0.1689	0.0000
Onagraceae	0.1264	-0.0021	-0.0123	-0.0216	0.0049	0.0152	0.0274	-0.0143	-0.0215	0.0155	0.0000
Fabaceae	-0.0850	-0.1197	-0.1793	0.2770	0.0117	0.0380	-0.0338	-0.1381	0.0636	0.1081	-0.7071
Solanaceae	0.0167	-0.0513	0.0875	0.0578	0.1227	-0.0021	-0.0456	0.0688	-0.0450	0.0527	0.0000
Shepherdia	-0.0850	-0.1197	-0.1792	0.2770	0.0117	0.0380	-0.0338	-0.1381	0.0636	0.1081	0.7071
Polygonum	0.0646	-0.0977	0.0148	0.0381	0.0095	0.0584	-0.0180	0.0578	-0.0196	0.0144	0.0000
Eriogonum	0.2364	-0.3030	0.0146	0.1497	0.0274	-0.0361	-0.1057	-0.0529	-0.0172	-0.0539	0.0000
Brassicaceae	0.2427	0.5368	-0.0643	0.0966	0.0294	-0.0295	-0.0817	-0.0862	0.1033	0.0457	0.0000
Sarcobatus	0.0478	-0.3852	-0.2437	-0.1918	0.0353	0.3197	0.0650	-0.2660	0.1192	-0.1844	0.0000
Poaceae	0.0452	-0.2836	0.0854	0.0070	0.0282	-0.3408	-0.1111	-0.0006	-0.6166	0.2978	0.0000
Cheno-am	-0.2116	-0.1226	0.1060	0.4335	0.1029	-0.1346	0.1374	0.5105	0.2545	-0.0785	0.0000
Cheno-am af.	0.1530	-0.1191	0.0264	-0.0988	0.1421	-0.0347	0.1094	-0.0142	0.0631	-0.0513	0.0000
Asteraceae hs.	-0.1135	0.1544	0.5706	-0.1480	0.0567	0.4099	-0.0108	0.0303	0.0139	0.2247	0.0000
Asteraceae ls	-0.0487	-0.0236	0.0943	-0.3845	0.0896	-0.2759	0.1281	-0.4130	0.1753	-0.1196	0.0000
Artemisia	-0.1233	0.1677	-0.2846	-0.1598	0.2411	0.1827	0.1345	0.1910	0.0437	0.0769	0.0000
Cactaceae	0.2375	0.1328	-0.0139	0.0656	-0.0395	-0.1819	0.1680	0.0355	-0.0862	0.1172	0.0000
Cylindropuntia	-0.3821	-0.0258	-0.1424	0.0663	0.4281	0.0494	-0.0099	-0.1283	-0.0583	-0.1079	0.0000
Platyopuntia	0.0339	-0.0124	-0.0761	0.0224	-0.0160	-0.0298	-0.0028	-0.0082	-0.0634	0.0163	0.0000
Ephedra	0.1757	0.1649	-0.0405	0.0190	0.0683	-0.0013	0.1209	-0.0602	-0.0609	0.0448	0.0000
Nyctaginaceae	-0.1435	0.0698	0.2134	0.1335	-0.0354	-0.0674	-0.0034	-0.1262	0.0187	-0.0743	0.0000
Indeterminate	0.0001	0.0745	-0.2578	0.2028	-0.4516	-0.0222	-0.0341	-0.1298	0.0847	-0.2239	0.0000
Unk triporate	0.0161	-0.0579	-0.0191	-0.0221	0.0818	-0.0278	0.0296	0.0099	-0.0126	0.0099	0.0000
Unk sm tricolpate	0.3619	0.0004	-0.3227	-0.0199	0.1767	0.2175	-0.1926	0.2561	-0.0153	0.0783	0.0000
Sphaeralcea	-0.1000	0.3579	-0.1550	0.1231	-0.1156	0.0541	0.0741	-0.1495	-0.2333	-0.0445	0.0000
Zea mays	0.2924	-0.1222	0.2392	0.1136	-0.2235	0.4085	-0.2999	-0.0574	-0.0024	-0.0742	0.0000

Table 24.9. Continued.

C: Component Scores

	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	Axis 9	Axis 10	Axis 11
LA249-189	1.9502	-1.6089	0.0053	0.0663	0.0762	-0.0072	0.0034	0.0239	-0.0204	-0.0293	0.0138
LA249-267	0.1362	0.0106	-0.0402	-0.0112	0.0436	0.1239	0.0262	0.0149	-0.0749	-0.0355	-0.0300
LA249-308	0.2374	0.0198	-0.0144	-0.0149	0.0179	0.0140	-0.0146	0.0021	0.0007	-0.0054	-0.0009
LA249-329	0.1803	0.0070	0.0080	-0.0231	0.0137	-0.0124	-0.0714	-0.0472	-0.0117	0.0278	-0.0007
LA249-338	0.1520	0.0101	-0.0169	-0.0347	0.0178	0.0295	-0.0456	0.0365	-0.0070	-0.0149	0.0143
LA249-360	0.1952	0.0428	-0.0250	0.0197	0.0176	0.0197	0.0151	-0.0366	-0.0173	0.0352	0.0103
LA249-378	0.0242	-0.0294	-0.0019	-0.0009	0.0119	0.0078	-0.0119	0.0147	-0.0051	-0.0138	0.0008
LA265-852	0.2830	-0.0495	-0.0315	0.0055	0.0210	0.1126	-0.0631	-0.0499	-0.0363	0.1045	-0.0649
LA265-854	0.1507	0.0890	0.1179	-0.0151	-0.0667	0.1205	0.1025	-0.0002	-0.1505	-0.0314	-0.0326
LA265-856	0.0391	0.0377	0.0163	0.0171	0.0311	0.0107	-0.0144	-0.0048	-0.0168	0.0022	0.0069
LA265-858	0.0009	0.0009	-0.0005	0.0003	-0.0002	-0.0004	0.0001	0.0001	0.0000	0.0000	-0.0002
LA265-859	0.1628	0.1679	0.1839	0.1923	0.1742	-0.0578	-0.1240	-0.1480	-0.1270	0.0117	0.0045
LA265-860	0.0545	0.0372	0.0414	0.0298	0.0294	-0.0127	-0.0138	-0.0261	-0.0104	0.0133	0.0050
LA265-861	0.1112	0.0811	0.1274	0.0812	0.0941	-0.0336	-0.0540	-0.0387	-0.0468	-0.0034	-0.0002
LA265-862	0.0799	0.0570	0.0640	0.0633	0.0561	-0.0283	-0.0250	-0.0526	-0.0382	0.0112	0.0020
LA265-864	0.0712	0.0341	-0.0190	-0.0068	0.0321	0.0650	-0.0023	0.0337	-0.0372	0.0139	-0.0348
LA265-866	0.1364	0.0476	-0.0575	-0.0189	0.0527	0.1313	0.0326	0.0638	-0.0893	-0.0772	-0.0356
LA265-892	0.0994	0.0267	0.0029	0.0448	0.0436	-0.0319	-0.0228	-0.0477	-0.0438	0.0076	-0.0115
LA265-893	0.1080	0.0653	0.0131	0.0666	0.0541	0.0078	-0.0105	-0.0738	-0.0405	0.0411	0.0066
LA265-894	0.4188	0.0893	0.0006	-0.0148	0.1270	0.0388	-0.1046	0.1810	-0.0539	-0.1211	0.0181
LA265-895	0.1376	0.0400	-0.0333	-0.0088	-0.0034	0.0183	0.0277	0.0020	0.0063	0.0227	0.0155
LA265-896	0.8430	0.6134	0.1808	0.0510	0.0509	-0.1223	-0.4289	0.2010	-0.0930	-0.3019	0.0273
LA265-897	0.0477	0.0253	0.0207	0.0273	0.0231	-0.0132	-0.0038	-0.0323	-0.0159	0.0146	0.0013
LA265-898	0.1922	0.1398	0.0868	0.0554	0.1334	0.0561	0.0025	-0.1363	-0.0139	0.0375	-0.0252
LA265-899	0.0939	0.0638	0.0187	0.0192	0.0288	-0.0257	0.0108	0.0356	-0.0025	-0.0216	-0.0018
LA265-900	0.2198	0.0881	-0.0291	-0.0455	0.0116	-0.0497	-0.0134	0.0285	-0.0296	-0.0248	0.0036
LA265-952	0.1719	0.0824	0.0054	0.0968	0.0676	-0.0257	-0.0152	-0.1059	-0.0629	0.0470	-0.0022
LA265-995	0.1486	0.0978	-0.0580	-0.3461	0.1436	-0.2411	-0.0125	-0.1027	0.0305	-0.0341	0.0245
LA265-1016	0.5516	0.2644	0.0777	-0.2877	-0.0003	-0.1772	0.1511	0.0109	-0.1030	0.0242	0.0096
LA265-1028	0.1678	0.1032	0.0320	-0.0427	0.0519	0.0983	0.0457	-0.0451	0.0540	-0.0048	-0.0206
LA265-1077	0.6409	0.0820	-0.0780	-0.3295	0.1185	-0.1761	0.0050	-0.1013	-0.0348	0.1228	0.0226
LA265-1084	0.0985	0.0721	0.0226	0.0359	0.0074	0.0086	-0.0283	-0.0093	-0.0014	-0.0094	0.0039
LA265-1100	0.2042	0.0896	0.0727	0.0202	0.0766	-0.0348	-0.0109	-0.0062	-0.0021	0.0260	0.0066
LA265-1223	0.3026	0.0776	0.1138	-0.0268	-0.1812	0.0109	0.0116	-0.0584	-0.0257	0.0187	0.0075
LA265-1228	0.2297	0.1492	-0.0137	0.0607	0.0623	0.0998	-0.0067	-0.0448	-0.0247	0.0416	0.0296
LA265-1256	0.2290	0.1144	0.0541	0.0427	0.0830	0.0216	0.0690	-0.0103	0.0102	0.0641	0.0401
LA265-1339	0.1730	0.1103	-0.0112	-0.0224	0.0073	0.0638	-0.0997	0.0991	0.0297	0.2035	-0.1106
LA265-1344	0.0437	0.0121	0.0287	0.0090	0.0207	-0.0102	0.0057	0.0069	0.0010	0.0011	0.0032
LA265-1405	0.5576	0.2063	0.9311	0.2763	0.1926	-0.2229	0.2822	0.2314	0.1319	-0.0946	0.0674

Table 24.9. Continued.

C: Component Scores	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	Axis 9	Axis 10	Axis 11
LA265-1420	0.1082	0.0707	-0.0231	-0.0236	0.0096	0.0254	-0.0129	0.0429	0.0023	-0.0092	0.0186
LA265-1536	0.0667	0.0320	0.0020	-0.0164	0.0074	0.0089	-0.0090	0.0153	0.0040	0.0021	0.0124
LA265-1600	0.2237	0.1294	-0.0537	-0.0551	0.0515	0.1693	0.0587	0.0006	0.0472	0.0131	0.0089
LA265-1612	0.1814	0.1152	0.1850	-0.0127	0.1110	0.2539	0.4323	-0.0055	0.6382	-0.0041	-0.0584
LA265-1678	0.1925	0.1164	0.0413	0.0127	0.0317	0.0169	-0.0633	0.1160	0.0575	0.3613	-0.2000
LA265-1713	0.3157	0.1713	0.4149	0.2480	0.2699	-0.1547	-0.0251	-0.1734	-0.0451	0.1051	-0.0160
LA265-1731	0.4970	0.2594	-0.1585	-0.8148	0.3951	-0.3176	0.1630	-0.2113	0.0011	0.0500	0.0055
LA6169-499	0.4818	0.0841	0.1606	-0.1613	-0.4544	-0.0262	-0.2370	-0.1262	0.0714	-0.0219	0.0519
LA6169-632	0.0518	0.0356	-0.0016	0.0114	0.0167	0.0121	-0.0077	0.0007	-0.0088	0.0037	0.0027
LA6169-992	0.5217	0.1660	0.1883	-0.1354	-0.3343	0.0322	0.0064	-0.0788	0.0361	0.0718	-0.0830
LA6169-1061	0.1569	0.0530	-0.0511	0.0382	-0.0158	0.0555	0.0169	-0.0573	0.0022	0.0393	0.0112
LA6169-1526	0.5335	0.3367	-0.0969	0.4732	0.1295	-0.0350	-0.1100	-0.3892	-0.1417	0.1606	-0.0182
LA6169-1598	0.1669	0.0286	0.0006	-0.0177	0.0177	0.1460	-0.0229	-0.0848	0.0493	0.0720	-0.0979
LA6169-1674	0.1864	0.0172	0.0513	-0.0679	-0.1339	0.1319	-0.0272	-0.1736	0.0996	-0.0103	-0.0332
LA6169-1707	0.0172	0.0020	0.0016	-0.0092	0.0035	0.0283	0.0063	-0.0171	0.0136	-0.0017	-0.0106
LA6169-1732	0.1055	0.0226	-0.0152	-0.0251	-0.0044	0.0644	0.0411	-0.0436	0.0407	0.0066	-0.0175
LA6169-1853	0.0876	0.0564	-0.0229	0.0156	-0.0014	-0.0115	-0.0117	0.0092	-0.0121	-0.0236	-0.0095
LA6169-1881	0.1480	0.0625	-0.0356	-0.0146	0.0103	0.0139	-0.0072	0.0241	-0.0134	-0.0107	0.0032
LA6169-1997	0.0307	0.0275	0.0380	-0.0183	0.0072	0.0642	-0.1332	0.1488	0.0860	0.5786	-0.3280
LA6169-2042	0.1682	0.0530	-0.0201	0.0072	0.0313	0.0324	0.0125	-0.0113	-0.0102	0.0308	0.0164
LA6169-1571	0.1367	0.0411	-0.0130	0.0281	0.0148	0.0122	-0.0033	-0.0197	-0.0090	0.0125	-0.0061
LA6169-1796	0.1513	-0.1385	-0.0113	-0.0143	0.0354	-0.0392	-0.0648	0.0384	-0.0590	-0.0777	-0.0537
LA6170-1189	0.3340	0.1587	-0.0144	0.1696	-0.0617	0.1813	-0.1219	-0.2942	-0.0250	0.0579	-0.0182
LA6170-1203	0.1917	-0.0045	-0.0125	0.0123	0.0006	0.0269	-0.0380	-0.0528	-0.0084	0.0113	-0.0134
LA6170-1310	0.4801	0.1039	0.2835	-0.1015	-0.4839	-0.0181	0.0157	-0.0949	0.0679	0.0090	0.0793
LA6170-1464	0.2091	0.0801	-0.0176	-0.0405	0.0089	-0.0077	-0.0709	0.0190	-0.0077	-0.0179	0.0042
LA6170-1484	0.4055	-0.2083	-0.0086	-0.0125	-0.0009	0.0999	0.0205	-0.0484	-0.0060	-0.0482	-0.0436
LA6170-1505	0.1978	0.0233	0.0707	-0.0321	-0.2320	0.0289	-0.0801	-0.1230	0.0374	0.0164	0.0292
LA6170-1768	0.2412	0.0556	-0.0031	-0.0174	0.0548	0.0055	-0.0297	-0.0163	-0.0252	0.0289	0.0004
LA6170-1823	0.2791	0.0526	-0.0099	-0.0871	0.0275	0.1635	-0.0783	0.0294	0.0606	-0.0764	-0.0136
LA6170-1898	0.3535	0.2192	-0.0415	-0.1012	-0.0710	0.0026	-0.1951	0.1512	0.0259	-0.1127	0.0489
LA6170-1942	0.0706	0.0513	-0.0010	-0.0257	-0.0190	0.0184	-0.0701	0.0528	0.0205	0.0458	-0.0245
LA6170-2119	0.0254	0.0241	0.0566	0.0266	0.0254	-0.0180	-0.0041	0.0039	0.0004	-0.0054	-0.0003
LA6170-2156	0.0260	0.0199	-0.0145	0.0145	-0.0027	0.0083	-0.0033	-0.0079	-0.0044	-0.0046	-0.0027
LA6170-2280	0.1220	0.0597	0.0101	-0.0285	-0.0261	-0.0075	-0.0686	0.0311	0.0115	-0.0272	0.0178
LA6170-2286	0.2279	0.1138	-0.0630	-0.0154	-0.0153	-0.0739	-0.0283	0.0326	-0.0208	-0.0350	-0.0332
LA6170-2304	0.0351	0.0177	-0.0017	-0.0054	-0.0054	0.0077	-0.0151	0.0050	0.0035	-0.0014	0.0083
LA6170-2319	0.2180	0.0395	-0.0254	-0.0396	-0.0532	-0.0473	-0.0561	-0.0097	0.0114	-0.0072	0.0003
LA6170-2322	0.1245	0.0815	0.0701	-0.1240	-0.3880	-0.0695	-0.1627	-0.0254	0.1435	-0.0748	0.0436

Table 24.9. Continued.

C: Component Scores	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	Axis 9	Axis 10	Axis 11
LA6170-2368	0.0481	0.0039	0.0066	-0.0093	0.0062	-0.0136	-0.0141	0.0018	-0.0074	-0.0063	-0.0044
LA6170-2375	0.2247	0.0687	0.0388	-0.1324	0.0746	0.0686	-0.2825	0.5269	0.0482	0.2498	0.0889
LA6170-2407	0.3666	-0.0802	0.0507	-0.0949	-0.0664	0.0257	-0.0842	-0.1382	0.0250	0.1717	-0.0799
LA6170-2415	0.0616	0.0372	0.0239	0.0133	0.0193	-0.0123	0.0049	0.0125	0.0004	-0.0039	0.0017
LA6170-2498	0.0803	-0.0054	0.0077	0.0073	0.0081	-0.0037	-0.0133	-0.0008	-0.0029	0.0166	-0.0021
LA6171-523	0.0299	0.0185	-0.0033	-0.0156	0.0050	-0.0008	-0.0087	0.0130	-0.0049	-0.0063	0.0024
LA6171-580	0.0629	0.0209	-0.0143	-0.0164	0.0063	-0.0035	0.0022	0.0150	-0.0031	-0.0040	0.0034
LA6171-613	0.0823	0.0305	-0.0266	-0.0006	0.0016	-0.0027	0.0088	0.0081	-0.0002	0.0025	-0.0016
LA6171-621	1.1055	0.4968	-0.8017	0.4909	-0.1575	-0.3640	0.3029	0.1639	0.1699	0.0279	-0.0123
LA6171-629	0.0485	-0.0013	-0.0090	0.0069	-0.0015	0.0072	-0.0096	-0.0246	-0.0054	0.0084	-0.0049
LA6171-630	0.0959	0.0722	-0.0236	0.0040	0.0190	0.0378	-0.0106	0.0204	-0.0101	-0.0080	0.0099
LA6171-659	0.0730	0.0112	-0.0071	-0.0025	-0.0103	-0.0075	-0.0018	-0.0022	0.0031	0.0012	0.0025
LA6171-665	0.3496	0.0515	-0.2397	0.1015	-0.1672	-0.1791	0.0345	0.1386	0.1398	-0.0589	0.0286
LA6171-687	0.5697	0.2560	-0.1915	-0.0616	0.2146	0.6048	0.0971	0.1207	-0.2438	-0.2265	-0.0968
LA6171-699	0.2054	0.1346	0.1853	-0.0871	-0.3955	0.0094	0.5530	0.1825	-0.6102	0.1689	-0.0685
LA6171-754	0.1460	0.0689	-0.0359	0.0548	-0.0055	0.0208	-0.0409	-0.0486	-0.0228	0.0012	-0.0086
LA6171-810	0.1517	0.1063	-0.1188	0.0883	-0.0190	-0.0301	0.0101	-0.0210	0.0093	0.0064	-0.0056
LA6171-866	0.2654	0.0289	-0.0723	0.0101	0.0224	0.0323	-0.0232	0.0434	-0.0184	-0.0318	0.0019
LA6171-881	0.1007	0.0336	-0.0290	-0.0056	0.0012	-0.0022	0.0151	0.0182	-0.0024	-0.0054	0.0026
LA6171-892	0.7065	0.4453	0.0048	-0.1436	-0.0396	0.4332	0.0802	-0.0646	0.1475	-0.1126	-0.0698
LA6171-919	0.1412	0.0552	0.0425	-0.0515	0.0814	0.0420	-0.1236	0.2682	0.0067	0.1463	0.0425
LA6171-935	0.0831	0.0284	-0.0152	-0.0211	0.0085	0.0682	0.0296	-0.0199	0.0281	0.0087	-0.0042
LA6171-942	0.1374	0.0751	-0.0678	0.0073	0.0385	0.2361	0.0534	-0.0185	-0.0094	0.3254	0.8809
LA6171-949	0.0164	0.0042	0.0007	-0.0003	0.0034	0.0036	0.0005	0.0011	-0.0001	0.0019	0.0022
LA6171-950	0.0529	0.0161	-0.0135	-0.0041	0.0037	0.0148	0.0108	0.0054	0.0015	0.0077	0.0079
LA115862-192	0.1155	0.0795	-0.0204	-0.0388	0.0187	0.0260	-0.0362	0.0291	-0.0201	-0.0158	0.0119
LA115862-197	0.0515	0.0353	-0.0165	0.0061	0.0092	0.0423	-0.0107	-0.0061	-0.0065	0.0071	0.0079
LA115862-221	0.2078	0.0886	-0.0198	0.0555	0.0012	0.0658	-0.0331	-0.0985	-0.0466	0.0365	-0.0038
LA115862-223	0.0152	0.0067	-0.0066	0.0055	-0.0006	0.0030	-0.0023	-0.0056	-0.0022	-0.0008	-0.0017
LA115862-234	0.1333	0.0779	-0.0454	-0.0211	0.0271	0.0459	0.0248	0.0521	0.0001	0.0009	0.0250

Table 24.9. Continued.

C: Component Scores	Axis 12	Axis 13	Axis 14	Axis 15	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis 22
LA249-189	-0.0210	-0.0078	-0.0117	0.0104	0.0736	-0.0197	-0.0143	0.0345	-0.0184	-0.0053	0.0384
LA249-267	0.1538	0.0024	0.0050	-0.0157	-0.0048	-0.0568	-0.0371	-0.0196	0.0013	0.0256	-0.0543
LA249-308	-0.0368	0.0226	0.0198	0.0524	-0.0094	0.0386	-0.0245	-0.0836	0.0065	-0.0003	0.0090
LA249-329	-0.0132	-0.0251	0.0049	0.0432	-0.0135	-0.0358	-0.0314	0.0040	0.0541	0.0559	-0.0462
LA249-338	-0.0369	0.0182	0.0147	0.0645	-0.0009	0.0191	-0.0491	-0.0995	0.0333	-0.0294	0.0026
LA249-360	-0.0048	-0.0280	0.0439	0.0407	-0.0283	0.0247	-0.0548	-0.0142	-0.0358	-0.0242	0.0540
LA249-378	-0.0237	0.0192	0.0061	0.0326	0.0170	0.0199	-0.0181	-0.0778	0.0146	-0.0235	-0.0230
LA265-852	0.0258	0.0487	-0.0089	0.0335	0.0178	-0.0584	0.0410	-0.1041	0.0619	-0.0343	-0.0618
LA265-854	0.1531	-0.0182	0.0071	-0.0618	-0.0092	-0.0255	-0.0084	-0.0129	-0.1575	-0.0325	-0.1238
LA265-856	-0.0005	-0.0112	0.0159	0.0182	0.0023	0.0053	-0.0280	0.0012	0.0048	-0.0027	0.0062
LA265-858	-0.0003	0.0004	0.0001	0.0001	-0.0001	0.0002	0.0002	-0.0007	-0.0005	0.0002	-0.0005
LA265-859	-0.0227	-0.0909	0.1158	0.0771	0.0521	-0.0249	-0.1878	0.1044	-0.0571	0.0467	-0.0514
LA265-860	0.0036	-0.0185	0.0171	0.0136	-0.0051	0.0072	-0.0373	0.0131	0.0048	0.0069	0.0203
LA265-861	-0.0085	0.0000	0.0368	0.0299	0.0215	0.0037	-0.0330	0.0081	0.0058	0.0560	-0.0378
LA265-862	-0.0097	-0.0248	0.0475	0.0266	0.0063	0.0064	-0.0542	0.0143	-0.0403	0.0305	0.0004
LA265-864	0.0837	0.0230	0.0057	-0.0109	0.0044	-0.0272	-0.0378	0.0046	-0.0103	0.0034	-0.0080
LA265-866	0.1914	0.0238	-0.0053	-0.0307	-0.0040	-0.0720	-0.0392	0.0034	-0.0046	0.0198	-0.0527
LA265-892	0.0087	-0.0243	0.0485	0.0234	0.0062	-0.0085	-0.0452	0.0110	-0.0478	0.0405	-0.0205
LA265-893	-0.0037	-0.0559	0.0602	0.0453	-0.0039	0.0184	-0.0882	0.0036	-0.0314	-0.0102	0.0182
LA265-894	-0.1299	0.1656	0.0443	0.2025	0.0523	0.1067	-0.0790	-0.4030	0.0680	-0.0563	-0.1013
LA265-895	-0.0103	-0.0075	0.0212	0.0282	-0.0345	0.0320	-0.0293	-0.0324	-0.0291	-0.0179	0.0702
LA265-896	-0.2477	0.2215	-0.0515	0.0151	0.0505	-0.2291	0.0665	0.0832	-0.1015	0.1254	0.0379
LA265-897	-0.0001	-0.0188	0.0278	0.0139	-0.0049	0.0084	-0.0308	0.0027	-0.0238	0.0129	0.0133
LA265-898	-0.0137	-0.0797	0.0833	0.0456	0.0051	0.1197	-0.0985	0.0696	0.0172	0.0773	-0.0169
LA265-899	0.0203	0.0318	-0.0139	0.0031	-0.0093	0.0105	0.0081	0.0140	0.0234	0.0073	0.0092
LA265-900	0.0011	0.0159	0.0683	0.0234	-0.0514	0.0066	-0.0246	-0.0183	-0.1195	0.0696	0.0746
LA265-952	-0.0089	-0.0674	0.0996	0.0571	-0.0054	0.0200	-0.1176	-0.0038	-0.0989	0.0237	0.0194
LA265-995	-0.0573	-0.0571	-0.1064	-0.2893	0.4244	-0.1563	-0.1898	0.0031	0.1040	-0.1687	-0.0655
LA265-1016	0.0596	0.0374	0.0490	0.0483	-0.1840	0.0883	0.0759	-0.0637	-0.2707	0.0329	0.0426
LA265-1028	-0.0551	-0.0195	0.0328	0.0140	-0.0092	0.1467	-0.0252	0.0480	0.0021	0.0570	0.0226
LA265-1077	0.1005	0.0110	-0.0196	0.3015	-0.3664	-0.1489	0.0984	0.1979	0.1481	-0.1605	-0.0080
LA265-1084	-0.0148	0.0141	-0.0276	-0.0202	0.0075	-0.0219	0.0498	-0.0038	0.0277	-0.0064	0.0434
LA265-1100	0.0440	0.0017	-0.0047	0.0334	-0.0356	0.0268	-0.0172	-0.0073	0.0996	0.0608	0.0271
LA265-1223	0.0056	-0.0282	-0.0774	-0.0565	-0.0626	0.0039	-0.0297	-0.0456	-0.0617	-0.0182	-0.0386
LA265-1228	0.0125	-0.0373	-0.0026	0.0030	-0.0132	0.0107	0.0423	-0.0527	0.0668	-0.0532	0.1589
LA265-1256	0.0523	-0.0383	0.0203	0.0488	-0.0657	0.0925	-0.0781	-0.0167	0.0647	-0.0298	0.1759
LA265-1339	0.0136	0.1251	-0.0345	-0.0138	0.0294	-0.0263	-0.0536	0.0248	0.0124	-0.0432	0.0675
LA265-1344	0.0115	0.0066	0.0018	0.0018	-0.0065	0.0139	0.0005	-0.0075	0.0084	0.0166	0.0244
LA265-1405	0.1782	0.0724	-0.1504	-0.1470	0.0370	0.0795	0.1069	0.0318	0.0441	-0.1508	-0.0113

Table 24.9. Continued.

C: Component Scores

	Axis 12	Axis 13	Axis 14	Axis 15	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis 22
LA265-1420	-0.0001	0.0003	-0.0021	0.0246	-0.0218	0.0068	-0.0377	0.0033	0.0228	-0.0297	0.0535
LA265-1536	0.0002	-0.0041	0.0011	0.0145	-0.0165	0.0061	-0.0211	-0.0017	0.0151	-0.0034	0.0378
LA265-1600	-0.0364	-0.0366	0.0174	0.0502	-0.0249	0.1418	-0.0643	0.0242	0.0581	-0.0439	0.0722
LA265-1612	-0.1683	-0.0883	0.2220	0.1024	-0.0206	-0.4151	-0.0821	-0.0940	-0.0528	0.0768	0.0223
LA265-1678	0.0426	0.2208	-0.0175	-0.0250	0.0328	0.0333	-0.0621	-0.0202	-0.0482	0.0186	0.0622
LA265-1713	0.0937	-0.0127	0.0464	0.0462	-0.0131	0.0981	-0.0252	-0.0279	0.1857	0.2059	-0.0282
LA265-1731	0.0421	-0.0473	0.0031	-0.1189	0.1063	0.0587	0.0541	-0.0858	-0.0310	0.0916	0.0338
LA6169-499	0.0640	-0.0740	-0.0689	-0.0298	-0.0946	-0.0976	-0.1851	-0.0135	0.0361	0.0161	0.0015
LA6169-632	-0.0046	-0.0008	0.0108	0.0161	-0.0016	0.0078	-0.0150	-0.0139	0.0038	-0.0068	-0.0007
LA6169-992	0.0175	0.0654	0.1446	0.0890	0.0449	-0.0166	0.1745	0.0301	-0.1041	-0.0834	-0.2728
LA6169-1061	-0.0273	-0.0168	-0.0121	-0.0102	-0.0099	-0.0021	0.0622	-0.0551	-0.0044	-0.0340	0.0961
LA6169-1526	-0.0332	-0.2466	0.1489	-0.0080	0.0868	-0.0879	-0.0752	0.0143	-0.0899	-0.1675	-0.0340
LA6169-1598	-0.0956	0.0443	0.0455	-0.0869	0.0242	0.0811	0.0553	0.0423	0.0338	0.0299	-0.0701
LA6169-1674	-0.0420	-0.0669	-0.1165	-0.0995	-0.0369	0.1066	-0.0792	-0.0253	0.0614	0.1577	-0.0861
LA6169-1707	-0.0168	-0.0033	0.0000	-0.0014	0.0080	0.0249	0.0044	0.0152	0.0089	0.0079	-0.0223
LA6169-1732	-0.0507	-0.0117	0.0139	0.0060	-0.0031	0.0800	-0.0069	0.0252	-0.0202	0.0123	-0.0013
LA6169-1853	-0.0072	0.0283	-0.0077	-0.0137	0.0030	-0.0195	0.0470	-0.0082	-0.0192	0.0113	0.0020
LA6169-1881	0.0043	0.0142	0.0132	0.0120	-0.0190	0.0007	0.0083	-0.0193	-0.0123	-0.0022	0.0353
LA6169-1997	0.0686	0.3036	-0.0464	-0.0744	0.1023	-0.0110	-0.0943	0.0322	-0.0664	0.0029	0.0344
LA6169-2042	0.0049	-0.0221	0.0223	0.0436	-0.0267	0.0277	-0.0451	-0.0202	0.0148	-0.0202	0.0492
LA6169-1571	0.0003	0.0091	-0.0053	0.0078	-0.0024	-0.0022	0.0279	-0.0227	0.0261	-0.0029	-0.0056
LA6169-1796	-0.1697	0.1810	0.5411	-0.5497	-0.3344	0.0243	-0.0361	0.0102	0.1035	-0.0526	-0.0144
LA6170-1189	-0.0703	-0.0426	-0.1285	-0.1968	0.0605	-0.1266	0.3862	-0.1843	0.0811	0.0434	0.1649
LA6170-1203	-0.0386	0.0165	-0.0117	0.0344	-0.0041	-0.0294	0.0598	-0.0331	0.0417	-0.0248	-0.0426
LA6170-1310	0.1475	-0.0944	-0.1087	-0.1406	-0.0949	0.0885	-0.1563	-0.1490	-0.0977	-0.0464	0.0852
LA6170-1464	-0.0078	0.0171	-0.0233	0.0138	-0.0185	-0.0457	0.0319	-0.0057	0.0527	0.0538	0.0105
LA6170-1484	-0.1435	0.0001	-0.0173	0.0083	0.1641	0.0886	0.0732	0.1599	-0.2640	0.0877	0.0772
LA6170-1505	0.0256	-0.0815	-0.1447	-0.1057	-0.0967	-0.0201	-0.1562	-0.1145	0.0151	0.0697	0.0210
LA6170-1768	0.0150	-0.0027	0.0301	0.0528	-0.0299	0.0105	-0.0069	-0.0533	0.0435	0.0640	-0.0184
LA6170-1823	-0.1744	0.0354	-0.0018	0.1068	0.0562	0.1316	-0.1051	-0.0870	0.0990	-0.0683	-0.0893
LA6170-1898	-0.0853	0.0186	-0.0652	0.0503	-0.0326	-0.1160	-0.1719	0.1716	0.0556	-0.1152	0.0989
LA6170-1942	-0.0167	0.0345	-0.0288	0.0038	0.0094	-0.0334	-0.0620	0.0538	0.0200	-0.0412	0.0286
LA6170-2119	0.0011	0.0179	-0.0072	-0.0010	0.0046	0.0094	0.0109	-0.0021	0.0205	0.0183	-0.0061
LA6170-2156	-0.0013	0.0044	-0.0128	-0.0147	0.0064	-0.0145	0.0342	-0.0012	0.0046	-0.0068	0.0128
LA6170-2280	-0.0458	0.0045	-0.0147	0.0199	-0.0106	-0.0347	-0.0544	0.0413	0.0028	-0.0176	0.0311
LA6170-2286	-0.0274	0.0728	0.0475	0.0158	-0.0304	-0.0033	0.0360	-0.0766	-0.1091	0.0872	-0.0557
LA6170-2304	-0.0102	-0.0074	-0.0036	0.0089	-0.0043	-0.0063	-0.0254	0.0146	0.0071	-0.0180	0.0186
LA6170-2319	0.0334	0.0103	0.0726	0.0344	0.0192	-0.0160	0.0335	-0.0140	-0.0015	0.0520	0.0017
LA6170-2322	0.3503	0.0374	0.5067	0.1772	0.3505	0.0906	0.1342	0.0438	0.1107	-0.0319	0.1114

Table 24.9. Continued.

C: Component Scores

	Axis 12	Axis 13	Axis 14	Axis 15	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis22
LA6170-2368	-0.0009	0.0107	0.0061	0.0041	-0.0029	-0.0073	0.0116	-0.0066	-0.0055	0.0294	-0.0160
LA6170-2375	-0.0341	-0.5743	0.0749	-0.0768	-0.0251	0.0234	0.1035	-0.0209	-0.0214	0.0242	-0.0487
LA6170-2407	0.0273	0.0328	-0.1021	0.0532	-0.1152	-0.0941	0.1021	0.0379	0.1584	0.0634	-0.1587
LA6170-2415	0.0060	0.0153	-0.0015	0.0051	-0.0080	0.0133	0.0024	-0.0055	0.0106	0.0096	0.0130
LA6170-2498	-0.0052	-0.0169	-0.0004	0.0018	0.0003	-0.0048	0.0265	-0.0101	0.0098	0.0184	-0.0265
LA6171-523	0.0006	0.0043	0.0115	0.0047	-0.0083	0.0016	-0.0018	-0.0106	-0.0123	0.0130	0.0125
LA6171-580	0.0073	0.0047	0.0046	0.0093	-0.0146	0.0031	-0.0026	-0.0032	-0.0028	0.0114	0.0181
LA6171-613	0.0006	0.0097	0.0012	0.0133	-0.0130	0.0075	-0.0009	-0.0138	0.0000	0.0017	0.0013
LA6171-621	0.0654	-0.0054	-0.0634	-0.0694	-0.0122	0.0692	0.0045	-0.0010	0.0113	-0.0337	-0.0809
LA6171-629	-0.0031	-0.0007	-0.0068	-0.0069	0.0036	-0.0154	0.0359	-0.0129	0.0106	0.0115	-0.0038
LA6171-630	0.0003	0.0077	-0.0076	0.0038	-0.0037	-0.0021	0.0227	-0.0212	0.0233	-0.0198	0.0426
LA6171-659	-0.0124	0.0026	0.0022	0.0089	-0.0102	-0.0018	-0.0108	0.0035	-0.0153	-0.0015	0.0137
LA6171-665	0.0928	0.0113	-0.0211	-0.0422	0.0648	0.0237	-0.0507	0.0848	0.1569	0.3021	0.0039
LA6171-687	0.4999	0.0120	-0.0076	-0.1110	0.0217	-0.1274	-0.0669	0.0121	0.0143	0.0389	-0.0167
LA6171-699	-0.3149	-0.0685	0.0873	0.0631	0.1322	-0.1284	-0.0370	0.0184	0.1574	0.0708	0.0535
LA6171-754	-0.0320	-0.0006	-0.0018	-0.0164	0.0183	-0.0393	0.0511	-0.0271	-0.0238	-0.0094	0.0243
LA6171-810	-0.0075	-0.0276	-0.0075	-0.0472	0.0136	-0.0249	0.0603	-0.0055	-0.0261	-0.0660	0.0001
LA6171-866	-0.0856	0.0730	0.0310	0.0978	0.0181	0.0648	-0.0200	-0.2693	-0.0056	-0.0663	-0.0087
LA6171-881	0.0064	0.0092	0.0039	0.0113	-0.0179	0.0074	-0.0084	0.0031	-0.0122	-0.0099	0.0271
LA6171-892	-0.2653	-0.0032	-0.0871	-0.0349	0.0432	0.3038	0.0715	0.2460	0.0565	-0.0678	-0.0340
LA6171-919	-0.0024	-0.2996	0.0357	-0.0507	0.0145	0.0260	0.0782	-0.0331	0.0062	0.0134	-0.0485
LA6171-935	-0.0282	-0.0148	0.0062	0.0128	-0.0044	0.0623	-0.0156	0.0153	0.0123	-0.0104	0.0135
LA6171-942	-0.0099	0.2664	0.0309	-0.0579	0.0528	-0.0293	-0.0104	0.0451	-0.0336	0.0412	-0.0631
LA6171-949	-0.0009	-0.0002	-0.0001	0.0044	-0.0019	0.0025	-0.0021	-0.0027	0.0041	-0.0007	0.0036
LA6171-950	0.0017	-0.0049	0.0039	0.0119	-0.0120	0.0117	-0.0136	-0.0061	0.0026	-0.0154	0.0290
LA115862-192	-0.0012	0.0079	0.0263	0.0034	-0.0201	-0.0054	0.0262	-0.0468	-0.0230	0.0281	0.0680
LA115862-197	-0.0021	-0.0070	-0.0057	-0.0031	0.0015	-0.0052	0.0255	-0.0229	0.0232	-0.0204	0.0369
LA115862-221	-0.0086	-0.0203	-0.0177	-0.0195	-0.0049	-0.0623	0.1412	-0.0355	0.0248	-0.0374	0.0455
LA115862-223	0.0002	0.0017	-0.0069	-0.0062	0.0027	-0.0078	0.0179	-0.0013	0.0054	0.0007	0.0030
LA115862-234	0.0223	-0.0045	-0.0016	0.0331	-0.0322	0.0296	-0.0383	-0.0039	0.0360	-0.0475	0.0821

Table 24.9. Continued.

C: Component Scores	Axis 23	Axis 24	Axis 25	Axis 26	Axis 27	Axis 28	Axis 29	Axis 30	Axis 31	Axis 32	Axis 33
LA249-189	0.0323	0.0012	0.0216	-0.0355	0.0014	0.0166	0.0066	0.0192	-0.0256	-0.0336	0
LA249-267	-0.0554	-0.0030	0.0118	-0.0240	-0.0015	0.0363	-0.0297	0.0331	0.0408	0.0409	0
LA249-308	-0.0551	0.0169	0.0358	-0.0757	0.0421	-0.0137	-0.0064	-0.0107	-0.0106	0.0248	0
LA249-329	-0.0946	0.0152	-0.0593	-0.0676	-0.1026	0.0298	0.0594	0.0518	0.0120	0.0430	0
LA249-338	-0.0173	0.0328	-0.0453	-0.0284	-0.0105	0.0019	0.0127	-0.0225	0.0171	0.0047	0
LA249-360	-0.0417	0.0349	0.0873	-0.0557	-0.0263	-0.0159	-0.0805	0.0038	0.0144	0.0269	0
LA249-378	0.0248	0.0117	-0.0129	-0.0035	0.0384	0.0039	0.0142	-0.0178	-0.0173	0.0208	0
LA265-852	-0.0490	0.0528	-0.0118	-0.0948	-0.0165	-0.0082	-0.1101	0.0074	0.0305	0.0357	0
LA265-854	-0.0223	0.1428	0.0031	0.0301	0.0053	0.0862	0.0291	-0.0606	-0.0271	0.0178	0
LA265-856	0.0215	0.0067	-0.0078	0.0265	-0.0413	0.0015	-0.0076	-0.0012	0.0050	-0.0129	0
LA265-858	-0.0007	-0.0004	0.0003	0.0014	0.0003	-0.0004	0.0004	0.0016	0.0008	-0.0002	0
LA265-859	0.1627	0.0381	0.0470	0.0570	-0.0575	0.0098	0.0031	0.0113	-0.0606	0.0500	0
LA265-860	-0.0164	0.0180	0.0013	0.0002	0.0242	0.0058	0.0099	-0.0022	0.0018	0.0027	0
LA265-861	0.0303	-0.0038	0.0177	0.0207	-0.0401	0.0302	-0.0561	-0.0130	0.0046	-0.0189	0
LA265-862	0.0355	0.0166	0.0657	0.0052	-0.0035	0.0248	0.0028	-0.0044	0.0010	0.0178	0
LA265-864	0.0035	-0.0077	-0.0083	-0.0034	0.0013	-0.0175	-0.0133	-0.0085	-0.0009	0.0123	0
LA265-866	-0.0288	-0.0387	-0.0016	-0.0040	0.0255	-0.0147	-0.0234	0.0099	-0.0085	0.0481	0
LA265-892	0.0188	-0.0039	0.0184	-0.0019	-0.0028	-0.0668	0.0560	0.0447	-0.0470	-0.0293	0
LA265-893	0.0196	0.0377	0.0405	0.0377	-0.0361	-0.0067	0.0063	0.0401	0.0138	0.0178	0
LA265-894	0.0934	-0.0171	-0.0436	0.0994	-0.0220	-0.0005	-0.0023	-0.0528	-0.0162	0.0009	0
LA265-895	-0.0469	0.0279	0.0889	-0.0138	-0.0184	0.0360	-0.0169	0.0103	0.0441	0.0059	0
LA265-896	0.0653	-0.0581	0.1000	-0.0015	-0.0264	0.0857	-0.0274	0.0022	0.0199	-0.0260	0
LA265-897	0.0014	0.0143	0.0362	-0.0060	0.0112	0.0032	0.0119	-0.0025	0.0038	0.0130	0
LA265-898	0.0174	0.0011	0.0037	0.0072	0.0155	-0.0617	0.0817	-0.0171	-0.0110	0.0066	0
LA265-899	-0.0214	-0.0479	0.0087	0.0178	0.0143	-0.0436	-0.0313	-0.0098	-0.0677	0.0131	0
LA265-900	-0.0264	-0.0103	0.1239	-0.1262	0.0286	-0.0847	0.0326	-0.1128	-0.0013	0.0254	0
LA265-952	0.0228	0.0439	0.0949	0.0464	0.0014	-0.0314	0.0791	0.0936	0.0104	-0.0196	0
LA265-995	-0.1564	0.0598	0.1569	0.0690	0.0177	-0.0451	0.0078	-0.0500	-0.0141	-0.0138	0
LA265-1016	-0.0248	0.0991	-0.0622	-0.0534	0.0447	0.0177	-0.0247	0.0085	-0.0876	-0.0358	0
LA265-1028	-0.0070	-0.0075	0.0742	-0.0430	0.0461	0.0135	0.0431	-0.0484	0.0480	-0.0232	0
LA265-1077	0.0918	-0.0181	0.0584	0.1232	0.0943	-0.0366	-0.0131	-0.0262	0.0388	0.0233	0
LA265-1084	-0.0172	0.0091	-0.0024	0.0162	0.0324	0.0134	-0.0015	0.0076	-0.0148	0.0032	0
LA265-1100	-0.1244	-0.0250	-0.0558	0.0102	-0.0242	-0.0042	0.0525	-0.0018	-0.0381	0.0074	0
LA265-1223	-0.0690	0.0535	-0.0120	-0.0173	-0.0183	-0.0010	-0.0757	-0.0207	-0.0813	0.0074	0
LA265-1228	-0.0120	0.0579	-0.0173	0.0587	-0.0647	-0.0093	-0.0101	-0.0236	-0.0068	-0.0219	0
LA265-1256	-0.1043	0.0411	0.0676	0.0234	0.0107	0.0575	-0.0069	-0.0408	-0.0099	0.0001	0
LA265-1339	0.0073	0.0102	-0.0697	0.0036	-0.0322	-0.0370	-0.0194	0.0009	-0.0139	-0.0152	0
LA265-1344	-0.0234	0.0007	0.0064	-0.0035	0.0219	0.0062	0.0065	-0.0053	-0.0057	-0.0424	0
LA265-1405	0.0860	-0.0215	-0.0299	-0.0531	-0.0259	-0.0613	0.0077	0.0149	0.0487	0.0289	0

Table 24.9. Continued.

C: Component Scores

	Axis 23	Axis 24	Axis 25	Axis 26	Axis 27	Axis 28	Axis 29	Axis 30	Axis 31	Axis 32	Axis 33
LA265-1420	-0.0233	0.0069	-0.0272	0.0205	-0.0410	-0.0126	0.0022	-0.0012	0.0051	-0.0177	0.0000
LA265-1536	-0.0274	0.0135	-0.0075	-0.0072	-0.0166	0.0157	0.0143	-0.0116	0.0143	-0.0085	0.0000
LA265-1600	-0.0059	0.0092	0.0131	0.0371	-0.0986	-0.0006	-0.0161	0.0013	0.0415	-0.0426	0.0000
LA265-1612	0.0015	-0.0109	-0.0138	0.0120	0.0076	0.0114	-0.0036	-0.0063	-0.0190	-0.0020	0.0000
LA265-1678	-0.0243	-0.0202	0.0509	0.0321	0.0340	0.0056	-0.0090	0.0204	0.0190	-0.0135	0.0000
LA265-1713	-0.2348	-0.0210	-0.0497	0.0553	0.1272	0.0563	-0.0233	-0.0033	-0.0190	-0.0331	0.0000
LA265-1731	0.1209	-0.0407	-0.1096	-0.0433	-0.0317	0.0445	-0.0093	0.0436	0.0226	0.0113	0.0000
LA6169-499	-0.0193	-0.0428	-0.0580	-0.0154	0.0784	-0.0123	-0.0456	-0.0275	0.0255	-0.0245	0.0000
LA6169-632	-0.0047	0.0022	-0.0096	0.0318	-0.0326	-0.0106	-0.0204	0.0222	0.0209	-0.0192	0.0000
LA6169-992	-0.1128	0.1383	-0.0099	0.0679	-0.0526	-0.0086	0.0162	0.0207	0.0228	-0.0456	0.0000
LA6169-1061	-0.0308	0.0509	0.0938	0.0117	-0.0139	0.0651	0.0070	0.0437	0.0254	0.0330	0.0000
LA6169-1526	0.0894	-0.0116	-0.1353	-0.0948	0.0172	-0.0216	-0.0326	-0.0395	0.0368	-0.0137	0.0000
LA6169-1598	0.0173	-0.0031	0.0008	-0.0695	0.0101	-0.0265	-0.0561	0.0199	0.0354	-0.0033	0.0000
LA6169-1674	0.1011	-0.1679	0.0278	0.0020	-0.0021	-0.0255	-0.0238	0.0091	-0.0175	0.0047	0.0000
LA6169-1707	0.0018	-0.0056	-0.0011	-0.0143	0.0031	-0.0052	-0.0114	0.0041	0.0065	-0.0027	0.0000
LA6169-1732	-0.0165	0.0048	0.0898	-0.0532	0.0335	0.0248	-0.0164	0.0102	0.0363	0.0140	0.0000
LA6169-1853	0.0029	-0.0303	0.0237	0.0051	0.0129	-0.0539	-0.0066	0.0053	-0.0382	0.0186	0.0000
LA6169-1881	-0.0241	-0.0111	0.0084	-0.0306	-0.0281	-0.0745	-0.0458	-0.0290	-0.0120	-0.0053	0.0000
LA6169-1997	0.0862	-0.0040	-0.0143	-0.0141	0.0139	0.0144	0.0250	-0.0116	-0.0184	0.0104	0.0000
LA6169-2042	-0.0375	0.0201	0.0346	0.0012	-0.0809	0.0121	-0.0350	0.0147	0.0104	0.0081	0.0000
LA6169-1571	-0.0460	-0.0114	-0.0024	0.0035	-0.0301	-0.0375	-0.0581	0.0384	-0.0164	0.0113	0.0000
LA6169-1796	-0.0088	0.0040	-0.0238	0.0483	-0.0072	0.0042	0.0034	-0.0094	0.0044	0.0191	0.0000
LA6170-1189	0.0395	0.0703	-0.0026	0.0270	0.0597	-0.0003	0.0451	0.0276	-0.0090	0.0157	0.0000
LA6170-1203	-0.0152	0.0157	0.0313	-0.0296	0.0187	-0.0180	-0.0400	0.0082	0.0009	0.0220	0.0000
LA6170-1310	0.0419	-0.0055	0.0343	0.0358	-0.0384	0.0183	0.0685	0.0072	0.0391	0.0261	0.0000
LA6170-1464	-0.0692	-0.0191	-0.0597	-0.0341	-0.0807	-0.0101	0.0932	0.0037	-0.0281	0.0279	0.0000
LA6170-1484	-0.1345	-0.0895	-0.1580	0.2157	0.0022	-0.0230	-0.0229	-0.0735	0.0646	0.0827	0.0000
LA6170-1505	0.0518	-0.0924	-0.0183	0.0681	-0.0065	-0.0087	-0.0525	0.0193	-0.0170	-0.0091	0.0000
LA6170-1768	-0.0927	-0.0138	-0.0355	-0.0328	-0.1420	-0.0362	-0.0065	0.0082	0.0214	-0.0059	0.0000
LA6170-1823	0.0301	0.0405	-0.0986	-0.0405	0.0844	0.0253	0.0348	0.0131	0.0378	0.0093	0.0000
LA6170-1898	-0.0945	0.0427	-0.1608	-0.0636	0.0348	-0.0296	0.0386	0.0578	-0.0319	0.0262	0.0000
LA6170-1942	-0.0081	0.0205	-0.0591	-0.0063	0.0040	0.0139	0.0149	0.0240	-0.0041	0.0038	0.0000
LA6170-2119	-0.0138	-0.0106	0.0062	0.0149	0.0166	0.0261	-0.0290	-0.0034	0.0013	-0.0145	0.0000
LA6170-2156	0.0097	-0.0053	0.0028	0.0059	0.0062	-0.0173	0.0030	0.0019	-0.0294	0.0155	0.0000
LA6170-2280	-0.0405	0.0331	-0.0096	-0.0333	0.0123	0.0566	0.0225	0.0273	0.0328	0.0079	0.0000
LA6170-2286	-0.0956	-0.0677	0.0527	0.0043	0.0378	-0.1552	0.0129	0.0639	0.0610	-0.0178	0.0000
LA6170-2304	-0.0102	0.0165	-0.0075	-0.0040	-0.0017	0.0164	0.0030	0.0105	0.0073	0.0027	0.0000
LA6170-2319	-0.0718	-0.0372	0.0079	-0.1158	-0.0361	0.0041	0.0434	-0.0238	0.0040	0.0153	0.0000
LA6170-2322	0.0505	-0.1007	0.0181	-0.0045	0.0117	0.0157	-0.0137	0.0125	-0.0278	0.0119	0.0000

Table 24.9. Continued.

C: Component Scores	Axis 23	Axis 24	Axis 25	Axis 26	Axis 27	Axis 28	Axis 29	Axis 30	Axis 31	Axis 32	Axis 33
LA6170-2368	-0.0135	-0.0118	0.0054	-0.0347	-0.0166	-0.0133	-0.0090	-0.0163	-0.0031	0.0048	0.0000
LA6170-2375	-0.0178	-0.0066	0.0094	0.0017	0.0535	-0.0025	0.0094	0.0078	0.0130	0.0060	0.0000
LA6170-2407	-0.0024	-0.0597	0.0781	-0.0005	-0.1060	0.0239	0.0824	-0.0706	-0.0038	0.0197	0.0000
LA6170-2415	-0.0241	-0.0130	0.0141	0.0092	0.0105	-0.0013	-0.0202	-0.0047	-0.0070	-0.0060	0.0000
LA6170-2498	-0.0288	-0.0092	0.0237	-0.0331	-0.0226	0.0068	-0.0417	0.0153	-0.0128	0.0241	0.0000
LA6171-523	-0.0042	0.0001	-0.0017	-0.0129	-0.0079	-0.0174	0.0073	-0.0242	0.0144	-0.0142	0.0000
LA6171-580	-0.0129	-0.0106	0.0149	-0.0196	-0.0217	-0.0140	0.0111	-0.0202	-0.0168	0.0115	0.0000
LA6171-613	-0.0309	-0.0163	0.0172	0.0144	-0.0222	-0.0180	-0.0016	0.0303	-0.0065	0.0116	0.0000
LA6171-621	-0.0321	-0.1088	0.0111	0.0336	-0.0050	0.0471	0.0127	0.0197	-0.0096	0.0031	0.0000
LA6171-629	-0.0147	0.0015	0.0010	-0.0236	-0.0170	-0.0044	-0.0036	0.0050	-0.0113	0.0180	0.0000
LA6171-630	0.0071	-0.0024	-0.0205	0.0381	-0.0538	-0.0255	-0.0136	-0.0056	-0.0080	-0.0196	0.0000
LA6171-659	-0.0257	0.0071	0.0441	-0.0319	0.0074	0.0178	-0.0143	0.0100	0.0028	0.0223	0.0000
LA6171-665	0.1373	0.3493	-0.0470	0.0180	0.0119	-0.0577	-0.0295	-0.0415	0.0343	0.0176	0.0000
LA6171-687	0.0205	-0.0341	-0.0013	0.0165	0.0356	-0.0031	0.0216	0.0068	0.0156	-0.0264	0.0000
LA6171-699	0.0324	-0.0571	-0.0071	-0.0150	0.0153	-0.0036	0.0009	0.0053	0.0093	-0.0002	0.0000
LA6171-754	-0.0068	0.0236	0.0074	0.0282	0.0248	-0.0420	0.0197	0.0841	-0.0024	-0.0312	0.0000
LA6171-810	0.0189	-0.0930	-0.0506	-0.0816	0.0174	0.0441	0.0418	-0.1003	0.0011	-0.0277	0.0000
LA6171-866	0.0095	0.0291	0.0377	0.0336	0.0974	-0.0256	0.0415	0.0116	-0.0024	0.0517	0.0000
LA6171-881	-0.0193	-0.0153	0.0403	-0.0231	-0.0057	-0.0345	-0.0296	-0.0088	-0.0345	0.0245	0.0000
LA6171-892	0.0303	0.0208	0.0463	-0.0298	0.0181	-0.0024	-0.0029	0.0091	-0.0670	-0.0028	0.0000
LA6171-919	0.0226	-0.0191	0.0301	0.0489	-0.0458	0.0076	-0.0301	-0.0092	-0.0304	0.0005	0.0000
LA6171-935	-0.0088	0.0082	0.0324	-0.0153	-0.0123	0.0159	-0.0222	0.0058	0.0260	-0.0061	0.0000
LA6171-942	0.0057	-0.0185	-0.0053	-0.0050	0.0153	-0.0036	0.0036	0.0011	-0.0011	0.0005	0.0000
LA6171-949	-0.0030	0.0014	0.0048	0.0008	-0.0131	0.0094	-0.0047	0.0014	0.0024	0.0000	0.0000
LA6171-950	-0.0129	0.0084	0.0188	-0.0041	-0.0194	0.0060	-0.0174	-0.0022	0.0031	0.0018	0.0000
LA115862-192	-0.0016	0.0142	-0.0194	-0.0274	-0.0397	-0.0536	0.0284	-0.0813	0.0435	-0.0501	0.0000
LA115862-197	0.0031	0.0183	-0.0271	0.0185	-0.0364	-0.0095	-0.0117	-0.0049	0.0107	-0.0197	0.0000
LA115862-221	0.0164	0.0557	0.0055	0.0302	-0.0267	-0.0507	0.0145	-0.0248	-0.0260	0.0113	0.0000
LA115862-223	0.0017	-0.0037	0.0000	0.0003	-0.0026	-0.0057	0.0055	0.0018	-0.0156	0.0101	0.0000
LA115862-234	-0.0112	-0.0053	-0.0026	0.0343	-0.0831	-0.0214	-0.0184	-0.0187	-0.0319	-0.0063	0.0000

Table 24.9. Continued.

D:Simpson's Diversity Index, Log Base e			
Sample	Index	Evenness	Number of Species
LA249-189	0.7672	0.8056	21
LA249-267	0.6323	0.7113	9
LA249-308	0.6499	0.6999	14
LA249-329	0.6943	0.7811	9
LA249-338	0.679	0.7759	8
LA249-360	0.6941	0.7933	8
LA249-378	0.75	1	4
LA265-852	0.6659	0.7103	16
LA265-854	0.774	0.8514	11
LA265-856	0.5956	0.7444	5
LA265-858	0	0	1
LA265-859	0.7787	0.8652	10
LA265-860	0.7143	0.8036	9
LA265-861	0.7523	0.8597	8
LA265-862	0.6497	0.758	7
LA265-864	0.7462	0.8528	8
LA265-866	0.6025	0.7029	7
LA265-892	0.3516	0.4102	7
LA265-893	0.4222	0.5066	6
LA265-894	0.41	0.4685	8
LA265-895	0.4775	0.5969	5
LA265-896	0.4965	0.5416	12
LA265-897	0.585	0.6825	7
LA265-898	0.612	0.6732	11
LA265-899	0.5469	0.6381	7
LA265-900	0.6712	0.783	7
LA265-952	0.2526	0.2886	8
LA265-995	0.5568	0.6264	9
LA265-1016	0.5176	0.5574	14
LA265-1028	0.6241	0.7133	8
LA265-1077	0.5918	0.6456	12
LA265-1084	0.5113	0.5682	10
LA265-1100	0.5902	0.6492	11
LA265-1223	0.7088	0.7595	15
LA265-1228	0.6507	0.723	10
LA265-1256	0.7247	0.8282	8
LA265-1339	0.6135	0.6816	10
LA265-1344	0.6048	0.7056	7
LA265-1405	0.8083	0.8588	17
LA265-1420	0.4766	0.5447	8
LA265-1536	0.7166	0.836	7
LA265-1600	0.5357	0.6123	8
LA265-1612	0.5762	0.6483	9
LA265-1678	0.3471	0.3905	9
LA265-1713	0.6418	0.722	9
LA265-1731	0.5688	0.632	10
LA6169-499	0.6959	0.7423	16
LA6169-632	0.34	0.425	5
LA6169-992	0.459	0.486	18
LA6169-1061	0.4116	0.4939	6
LA6169-1526	0.6424	0.7007	12
LA6169-1598	0.657	0.7039	15
LA6169-1674	0.6455	0.7101	11
LA6169-1707	0.4067	0.5083	5

Table 24.9. Continued.

D:Simpson's Diversity Index, Log Base e			
Sample	Index	Evenness	Number of Species
LA6169-1732	0.5961	0.7153	6
LA6169-1853	0.3645	0.4374	6
LA6169-1881	0.6631	0.7579	8
LA6169-1997	0.5485	0.7313	4
LA6169-2042	0.6346	0.7051	10
LA6169-1571	0.5298	0.5828	11
LA6169-1796	0.4649	0.6198	4
LA6170-1189	0.5459	0.5849	15
LA6170-1203	0.6465	0.6896	16
LA6170-1310	0.5017	0.5352	16
LA6170-1464	0.5608	0.6309	9
LA6170-1484	0.4566	0.487	16
LA6170-1505	0.5175	0.5573	14
LA6170-1768	0.6234	0.6927	10
LA6170-1823	0.5712	0.6347	10
LA6170-1898	0.6163	0.7191	7
LA6170-1942	0.6356	0.7627	6
LA6170-2119	0.6172	0.8229	4
LA6170-2156	0.4063	0.6094	3
LA6170-2280	0.5797	0.6522	9
LA6170-2286	0.2559	0.3198	5
LA6170-2304	0.698	0.8377	6
LA6170-2319	0.713	0.7678	14
LA6170-2322	0.7686	0.854	10
LA6170-2368	0.7581	0.8845	7
LA6170-2375	0.7847	0.8968	8
LA6170-2407	0.7975	0.8473	17
LA6170-2415	0.5259	0.6011	8
LA6170-2498	0.7226	0.8029	10
LA6171-523	0.58	0.87	3
LA6171-580	0.7603	0.9124	6
LA6171-613	0.317	0.3699	7
LA6171-621	0.322	0.3512	12
LA6171-629	0.7388	0.8619	7
LA6171-630	0.4668	0.5446	7
LA6171-659	0.6519	0.7451	8
LA6171-665	0.6029	0.6531	13
LA6171-687	0.6259	0.678	13
LA6171-699	0.5056	0.5688	9
LA6171-754	0.3008	0.3343	10
LA6171-810	0.7254	0.7979	11
LA6171-866	0.3044	0.3479	8
LA6171-881	0.6722	0.8066	6
LA6171-892	0.5921	0.646	12
LA6171-919	0.8529	0.9185	14
LA6171-935	0.6533	0.7622	7
LA6171-942	0.7396	0.8629	7
LA6171-949	0.7168	0.8601	6
LA6171-950	0.7119	0.8543	6
LA115862-192	0.6314	0.8418	4
LA115862-197	0.6272	0.8363	4
LA115862-221	0.6289	0.6813	13
LA115862-223	0.5535	0.738	4
LA115862-234	0.6304	0.7565	6

Table 24.10. Results of PCA, Pollen Wash Samples, Peña Blanca Project

A: Eigenvalue Analysis

Axis	Eigenvalues	Percentage	Cumulative Percentage
Axis 1	8.5501	31.6672	31.6672
Axis 2	4.1519	15.3775	47.0447
Axis 3	3.01	11.1481	58.1928
Axis 4	2.6136	9.6801	67.8729
Axis 5	2.286	8.4666	76.3394
Axis 6	1.5026	5.5652	81.9046
Axis 7	1.2129	4.4924	86.397
Axis 8	1.0367	3.8395	90.2365
Axis 9	0.8481	3.1412	93.3777
Axis 10	0.7901	2.9264	96.3041
Axis 11	0.5287	1.9581	98.2623
Axis 12	0.3087	1.1433	99.4056
Axis 13	0.1069	0.396	99.8015
Axis 14	0.0441	0.1635	99.965
Axis 15	0.0087	0.0321	99.9971
Axis 16	0.0008	0.0029	100
Axis 17	0	0	100
Axis 18	0	0	100
Axis 19	0	0	100
Axis 20	0	0	100
Axis 21	0	0	100
Axis 22	0	0	100
Axis 23	0	0	100
Axis 24	0	0	100
Axis 25	0	0	100
Axis 26	0	0	100
Axis 27	0	0	100

Table 24.10. Continued.

B: PCA variable loadings	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8	Axis 9	Axis 10	Axis 11	Axis 12	Axis 13	Axis 14
P. ponderosa	***0.3186***	0.1485	-0.0326	-0.0337	-0.0883	0.0683	-0.0579	-0.0162	0.0254	0.0097	-0.0070	0.0960	-0.0963	-0.1268
P. edulis	***0.3215***	0.1414	0.0086	-0.0435	-0.0550	0.0435	-0.0851	-0.0035	-0.0348	0.0735	0.0230	-0.0920	0.0906	0.0228
Picea	-0.0098	0.0807	***0.5622***	-0.0102	-0.0324	-0.0332	0.0606	-0.0259	0.0900	-0.0630	-0.0249	-0.0427	0.0137	0.0877
Abies	0.0635	0.0584	-0.0059	-0.1773	***0.5878***	-0.0870	0.0823	-0.1987	0.0403	-0.1348	-0.0704	-0.0013	0.0002	-0.0943
Juniperus	0.3070	0.1468	-0.0268	0.0002	-0.1801	0.1082	-0.0703	0.0003	0.0151	0.0154	0.0288	0.1017	-0.0611	-0.0699
Solanaceae	-0.0287	-0.0051	-0.0745	-0.0599	-0.0108	0.3910	***0.5717***	***0.4978***	0.0545	-0.2826	-0.1333	-0.1441	-0.0477	0.1709
Rosaceae	0.0062	0.1963	***0.4905***	-0.1410	-0.1480	-0.0517	0.0532	0.0019	0.0590	-0.0055	-0.0555	-0.0104	0.1133	-0.0200
Polygonum	0.1623	0.1046	-0.0145	-0.1710	0.5080	-0.0484	0.0563	-0.1917	0.0438	-0.1250	-0.0584	0.0322	-0.0199	-0.1140
Eriogonum	-0.0452	-0.0733	-0.0771	-0.1484	-0.0811	-0.0254	***-0.5696***	0.1853	0.2933	-0.6717	-0.0948	-0.0366	0.2117	0.0636
Liliaceae	0.0570	***-0.2703***	0.2311	***0.3992***	0.1183	0.1086	-0.0198	-0.0345	0.0892	-0.1277	0.1090	-0.0537	-0.2969	0.2980
Sarcobatus	0.3070	0.1468	-0.0268	0.0002	-0.1801	0.1082	-0.0703	0.0003	0.0151	0.0154	0.0288	0.1017	-0.0611	-0.0700
Poaceae	0.2209	-0.2327	0.1218	0.2078	0.1495	-0.2202	-0.0005	0.1062	0.2093	0.0227	-0.1668	-0.1132	-0.2748	0.0762
Cheno-am	***0.3104***	0.0803	-0.0612	-0.1416	0.1149	-0.0509	0.0323	-0.1062	-0.0278	-0.0398	-0.1817	0.1302	0.0257	0.5434
Cheno-am af.	-0.0497	0.1577	***0.5012***	-0.1790	-0.0631	-0.0881	0.0790	-0.0255	0.0586	-0.0221	-0.0570	-0.0269	0.1223	-0.0041
Asteraceae hs.	0.1195	-0.2185	-0.0469	***0.2536***	-0.1953	0.0083	0.1292	***-0.3933***	-0.2494	-0.0955	-0.5438	-0.0377	0.4218	0.1420
Asteraceae ls	***0.2775***	-0.0020	-0.0179	0.0623	0.1169	-0.0921	-0.0647	0.1167	-0.1066	0.1108	0.4170	-0.6733	0.3736	0.1616
Artemisia	***0.3018***	0.0263	-0.0585	-0.2140	0.0440	0.0673	0.0840	0.1714	0.1113	0.0486	-0.2124	-0.0349	-0.0896	-0.0830
Cactaceae	0.1780	***-0.3251***	0.0442	-0.1742	-0.0636	0.1822	0.2582	-0.0976	-0.0245	-0.1926	0.1066	-0.0718	0.2239	-0.4543
Cylindropuntia	0.0327	***-0.3289***	-0.0104	***-0.4007***	-0.1431	-0.0742	0.0982	*-0.1350*	-0.0319	-0.0295	0.2315	0.0885	-0.1111	0.2283
Platyopuntia	0.0299	***-0.2764***	-0.0265	***-0.2662***	-0.0758	-0.2467	-0.1342	***0.2832***	0.1637	0.4207	-0.4382	-0.2102	-0.0444	-0.0979
Ephedra	***0.3223***	0.0231	0.0571	0.1176	-0.1062	0.1206	-0.0813	-0.0003	0.0622	-0.0061	0.0301	0.0617	-0.1718	0.0301
Nyctaginaceae	0.2399	0.1487	-0.0925	0.1102	-0.2095	***-0.3431***	0.1773	0.0254	0.0280	-0.1867	0.1273	0.1284	-0.0451	-0.0858
Indeterminate	0.1380	***-0.2635***	0.1140	0.1541	0.2252	0.0007	-0.0055	***0.3639***	0.1185	0.2101	0.1629	0.5888	0.4979	0.0331
Sphaeralcea	-0.0021	0.0376	-0.1116	0.1623	-0.0954	***-0.6769***	0.3184	0.1097	0.0589	-0.2205	0.0470	0.0217	0.0089	-0.0903
Zea mays	0.1404	***-0.3836***	0.1751	0.1697	0.0107	0.0742	-0.0756	-0.1235	0.0309	-0.1033	0.0174	-0.0802	-0.1683	-0.3605
Cucurbitaceae	0.0323	***-0.3296***	-0.0045	***-0.3878***	-0.1646	-0.0998	0.0520	-0.1639	-0.0372	-0.0032	0.2430	0.0983	-0.1038	0.2201
Wt/area	-0.0720	0.0606	-0.1708	0.0715	-0.1065	0.1167	0.1842	***-0.3512***	0.8359	0.1709	0.0774	-0.0808	0.1632	0.0578

Table 24.10. Continued.

	Axis 15	Axis 16	Axis 17	Axis 18	Axis 19	Axis 20	Axis 21	Axis 22	Axis 23	Axis 24	Axis 25	Axis 26	Axis 27
P. ponderosa	-0.1359	-0.3314	-0.0504	-0.3885	-0.0729	-0.1934	0.5949	-0.2069	-0.0776	0.1557	0.1413	-0.0636	-0.2177
P. edulis	0.1036	-0.6390	0.0293	0.0464	0.0508	-0.0724	-0.5230	0.0920	-0.0527	0.0519	-0.1802	0.1875	-0.2307
Picea	0.0151	0.0223	0.0617	-0.1645	-0.0668	-0.0403	-0.0146	0.4600	0.0909	-0.1887	0.5413	0.1795	-0.1724
Abies	-0.1150	0.0373	0.3209	-0.0039	-0.6018	-0.0200	-0.0493	-0.0933	-0.0067	-0.0522	-0.1192	0.1155	-0.0813
Juniperus	-0.0571	0.2380	0.6682	0.2231	0.2241	-0.1916	0.0956	0.1986	0.1310	-0.1403	-0.1784	-0.1956	-0.1244
Solanaceae	-0.2032	-0.1031	-0.0040	0.0142	0.0021	0.0283	0.0598	0.0037	0.0624	-0.1530	-0.1220	0.0756	-0.0706
Rosaceae	-0.0442	0.0352	0.0341	0.0093	0.0664	-0.0076	-0.1951	-0.7099	0.1913	-0.1733	0.0113	-0.1871	0.0316
Polygonum	-0.1297	0.1150	-0.3289	0.1224	0.6130	-0.0660	0.0394	0.0143	0.0121	-0.1260	0.0044	0.0839	-0.1985
Eriogonum	-0.0131	0.0110	-0.0005	-0.0202	0.0002	-0.0150	-0.0069	-0.0039	-0.0073	0.0120	-0.0073	0.0092	-0.0289
Liliaceae	0.1687	0.0478	-0.0215	0.3365	-0.0512	-0.2221	0.0195	-0.2068	-0.3168	0.1427	0.0360	-0.0851	-0.3143
Sarcobatus	-0.0572	0.2400	-0.5687	0.1800	-0.4225	-0.1752	-0.0914	0.1684	0.2152	-0.2035	-0.1364	-0.1908	-0.0937
Poaceae	0.1351	0.0761	-0.0052	-0.5143	0.0855	0.1646	-0.1072	0.0923	0.3056	0.0581	-0.3276	-0.2077	-0.0212
Cheno-am	0.3476	-0.2058	-0.0032	0.2126	-0.0184	0.1770	0.2245	0.0138	0.0973	-0.1356	0.1352	-0.1459	0.3728
Cheno-am af.	-0.0521	-0.0101	-0.0959	0.1437	-0.0061	0.0512	0.2547	0.2498	-0.2714	0.3502	-0.5154	-0.0036	0.1529
Asteraceae hs.	-0.2238	0.1108	-0.0017	-0.0849	0.0019	-0.0615	-0.0342	-0.0148	-0.0306	0.0489	-0.0332	0.0386	-0.1209
Asteraceae ls	-0.1409	0.1354	-0.0073	-0.0133	-0.0126	0.0148	0.1275	-0.0235	0.0132	-0.0091	0.0439	-0.0435	0.0516
Artemisia	-0.1365	0.2022	0.0214	-0.0442	0.0076	-0.0790	-0.3437	0.0291	-0.3372	0.4152	0.3643	-0.2688	0.2485
Cactaceae	0.6290	0.0661	-0.0048	-0.0335	-0.0073	-0.0125	0.0623	-0.0186	-0.0095	0.0062	0.0157	-0.0123	-0.0094
Cylindropuntia	-0.1729	0.0311	0.0063	0.1179	0.0024	-0.0695	-0.0193	-0.0361	0.4838	0.4615	0.0526	0.1806	-0.1214
Platyopuntia	0.0639	0.0139	-0.0052	0.2728	-0.0550	0.0012	0.1771	-0.0630	-0.0575	-0.1665	0.0250	0.1940	-0.2201
Ephedra	0.0063	0.2510	0.0012	-0.1176	0.0266	-0.0721	-0.0103	-0.1637	-0.0930	-0.0690	-0.0935	0.7338	0.3698
Nyctaginaceae	-0.0540	0.1078	0.0125	0.1310	-0.0438	0.6802	-0.0052	-0.0603	-0.1589	0.0494	0.0882	0.0812	-0.2932
Indeterminate	-0.1030	-0.0101	0.0000	-0.0076	0.0004	-0.0072	-0.0068	-0.0011	-0.0026	0.0066	-0.0041	0.0059	-0.0143
Sphaeralcea	0.0182	-0.1188	-0.0038	0.0822	0.0078	-0.5022	-0.0083	0.0225	0.0114	-0.0522	0.0274	0.0211	0.1948
Zea mays	-0.3994	-0.3499	0.0085	0.2685	0.0006	0.1881	0.0526	0.0569	0.1035	-0.1409	0.0831	-0.1026	0.3563
Cucurbitaceae	-0.1649	0.0047	-0.0020	-0.2632	0.0179	-0.0360	-0.0891	0.0341	-0.4526	-0.4404	-0.1364	-0.1377	-0.0202
Wt/area	-0.0396	-0.0409	0.0005	0.0203	-0.0008	0.0082	0.0034	0.0021	0.0031	-0.0074	0.0079	-0.0028	0.0190

Vales in Boldface >0.2500 in first 8 axes

Table 24.10. Continued.

C: PCA case scores	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	Axis 8
LA 265-1480	0.2680	-1.3276	-0.0130	-0.9832	-0.3651	-0.1455	0.0612	-0.1649
LA 265-1486	-0.2383	-0.0203	-0.2177	-0.1518	-0.0240	0.5700	0.6728	0.5007
LA 265-1488	-0.2865	0.1081	-0.1649	0.1078	-0.0950	0.0620	-0.0219	-0.2240
LA 265-1698	-0.4382	0.1947	-0.1372	0.0153	-0.0076	0.0775	-0.0772	0.0010
LA 265-1699	-0.4865	0.2195	-0.3074	0.1099	-0.1462	0.1932	0.1234	-0.4036
LA 6169-375	-0.2185	0.2391	-0.1308	0.0172	0.0727	0.0118	-0.1627	0.1259
LA 6169-387	-0.3863	0.1286	-0.1171	0.0653	-0.0487	0.0772	-0.0824	-0.0704
LA 6169-396	-0.4750	0.6749	1.4607	-0.3605	-0.2482	-0.1086	0.0802	0.0019
LA 6169-398	-0.2959	0.0543	-0.0515	0.0901	0.1702	0.0514	-0.1232	0.3017
LA 6169-1046	0.5265	0.2351	-0.0172	-0.4495	1.3035	-0.1269	0.0968	-0.1999
LA 6169-1047	2.5467	0.5913	-0.0781	0.0005	-0.3994	0.1577	-0.0827	0.0003
LA 6169-1210	0.0935	-0.3172	-0.0856	-0.0490	0.0844	-0.3300	-0.2454	0.4865
LA 115862-158	-0.4677	0.0996	-0.2110	-0.1188	-0.1027	0.0572	-0.6564	0.1487
LA 115862-159	-0.2020	-0.0933	-0.1251	0.1505	-0.1366	0.1369	0.0474	-0.2975
LA 115862-160	0.4724	-1.0886	0.6748	1.0121	0.2624	0.1583	-0.0233	-0.0347
LA 115862-161	-0.0312	0.1989	-0.3136	0.4196	-0.2246	-0.9394	0.4119	0.0380
LA 115862-181	-0.3810	0.1029	-0.1652	0.1245	-0.0951	0.0972	-0.0185	-0.2099

	Axis 9	Axis 10	Axis 11	Axis 12	Axis 13	Axis 14	Axis 15	Axis 16
LA 265-1480	-0.0306	-0.0025	0.1247	0.0294	-0.0108	0.0094	-0.0014	0.0000
LA 265-1486	0.0448	-0.2166	-0.0683	-0.0431	-0.0050	0.0073	-0.0017	-0.0001
LA 265-1488	-0.3135	0.0151	-0.2739	0.0801	0.0266	0.1515	0.0194	-0.0029
LA 265-1698	-0.0776	0.1007	0.0822	0.1016	-0.1748	-0.0384	0.0519	0.0124
LA 265-1699	0.6740	0.2342	0.0810	-0.0220	0.0246	0.0152	0.0069	-0.0045
LA 6169-375	-0.2307	0.1627	0.3832	-0.3750	0.0083	0.0446	-0.0018	-0.0008
LA 6169-387	-0.2174	0.0446	-0.0383	0.0627	-0.1537	-0.0594	-0.0236	-0.0189
LA 6169-396	0.0464	-0.0067	-0.0317	-0.0094	0.0132	-0.0002	-0.0003	0.0000
LA 6169-398	-0.0935	0.2371	0.2819	0.3448	0.1415	-0.0045	-0.0068	-0.0011
LA 6169-1046	0.0331	-0.1033	-0.0361	-0.0004	0.0000	-0.0040	-0.0010	0.0000
LA 6169-1047	0.0124	0.0118	0.0147	0.0305	-0.0063	-0.0030	-0.0005	0.0002
LA 6169-1210	0.1920	0.4028	-0.3795	-0.1019	0.0029	-0.0128	0.0018	0.0000
LA 115862-158	0.2206	-0.5936	-0.0164	-0.0012	0.0247	0.0025	-0.0001	0.0000
LA 115862-159	-0.2770	-0.0290	-0.1628	-0.1140	0.1689	-0.1159	0.0223	0.0005
LA 115862-160	0.0734	-0.0979	0.0559	-0.0161	-0.0308	0.0128	0.0014	0.0000
LA 115862-161	0.0199	-0.2293	0.0807	0.0217	0.0005	-0.0020	-0.0001	-0.0001
LA 115862-181	-0.0765	0.0699	-0.0971	0.0124	-0.0299	-0.0031	-0.0666	0.0154

Axes 17-27 contained only 0

Table 24.10. Continued.

D:Simpsons Index Log_{10}, Pollen Wash Samples, Peña Blanca Project

Cat #	Index	Evenness	Number of Species
LA 6169-1210	0.1617	0.1741	14
LA 265-1480	0.2592	0.2755	17
LA 265-1486	0.0201	0.0224	10
LA 265-1488	0.2797	0.3729	4
LA 265-1698	0.0057	0.0069	6
LA 265-1699	0.0006	0.0007	9
LA 6169-375	0.2716	0.4075	3
LA 6169-387	0.0844	0.1013	6
LA 6169-396	0.2857	0.3572	5
LA 6169-398	0.1291	0.1614	5
LA 6169-1046	0.5011	0.5325	17
LA 6169-1047	0.5899	0.6246	18
LA 115862-158	0.0074	0.0087	7
LA 115862-159	0.0519	0.0606	7
LA 115862-160	0.202	0.2203	12
LA 115862-161	0.0444	0.0493	10
LA 115862-181	0.0081	0.0097	6

Table 24.11. Pivot Table 1, Mean Pollen Concentration Values sorted by Northing, Pena Blañca Project, Sandoval County, New Mexico

Arboreal Pollen

Elevation	Site	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Ulmus*	*Quercus*	*Carya*	*Prosopis*
5330	LA 249	160.812	683.797	58.051	4.06	5.244	2.03	15.953	0	2.03
5275	LA 6169	34.654	362.238	0	1.034	0	2.201	0	0	0
5226	LA 6170	62.623	200.696	1.392	0.83	0	0	1.765	0	0.259
5233	LA 6171	19.633	166.076	6.09	0	3.857	0	1.723	1.286	0
5300	LA 265	32.123	152.501	3.401	0.82	1.734	0	1.749	0	0.495
5280	LA 115862	10.738	81.192	0	0.626	0	0	0	0	0

Non-Arboreal Pollen

Elevation	Site	*Sarcobatus*	Poaceae	Cheno-am	Asteraceae hs.	Asteraceae ls	*Artemisia*
5330	LA 249	0	41.611	745.477	136.23	163.376	27.293
5275	LA 6169	2	23.315	1200.187	52.298	97.826	22.092
5226	LA 6170	0.143	27.356	1053.633	39.115	119.868	40.463
5233	LA 6171	3.45	60.032	1454.896	73.586	101.377	14.695
5300	LA 265	0	38.321	1191.755	65.159	136.557	19.006
5280	LA 115862	0	22.595	408.245	20.024	70.696	0

Table 24.12. Pivot Table 2, Mean Concentration Values by Structure Type and Age, Peña Blanca Project, Sandoval County, New Mexico

		AP							NAP		
Structure Type	Age	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	*Prosopis*	Poaceae	Cheno-am	Cheno-am af.
Extramural	unknown	403.244	1685.13	198.947	14.21	18.355	35.526	7.105	110.724	1019.605	0
	AD 1100-1325	0	211.304	0	0	0	0	0	0	598.696	17.609
	AD 700-1200	12.217	31.765	0	0	0	0	0	47.647	349.412	2.443
	AD 700-900	67.921	198.062	4.004	2.183	0	0	0.964	61.035	1540.706	1.925
	AD 500- 650	0	206.809	0	0	0	34.468	0	34.468	3205.532	0
Extramural Total		59.922	196.922	3.336	1.819	0.938	1.436	0.804	55.222	1485.115	2.44
	AD 1200-1325	32.616	276.679	0	0	0	0	0	19.908	792.673	10.437
	AD 1100-1200	43.2	259.2	0	0	0	0	0	21.6	1144.8	0
Pit Room Total		33.939	274.494	0	0	0	0	0	20.12	836.689	9.133
	AD 1100-1200	68.419	360.328	1.709	0	0	4.513	0.632	27.798	1322.923	2.778
	AD 700-900	27.434	172.609	3.475	0.443	2.54	1.878	0	31.589	1104.531	3.329
Pit Structure Total		33.023	198.207	3.234	0.382	2.193	2.237	0.086	31.072	1134.312	3.254
	AD 700-900	10.472	139.055	0	0	0	0	0	34.997	605.953	11.738
Structure Total		10.472	139.055	0	0	0	0	0	34.997	605.953	11.738

Table 24.12. Continued

		NAP					
Structure Type	Age	Asteraceae hs	Asteraceae ls	*Artemisia*	*Ephedra*	Economic	Non-economic
Extramural	Unknown	313.816	299.605	42.632	14.211	38.05	4261.23
	AD 1100-1325	123.261	70.435	0	0	2.71	1018.6
	AD 700-1200	31.765	142.941	15.882	63.529	0	730.59
	AD 700-900	78.023	125.465	21.009	25.459	156.59	2292.89
	AD 500-650	103.404	172.34	0	34.468	0	3860.43
Extramural Total		77.662	122.501	18.169	25.299	130.76	2195.88
Pit room	AD 1200-1325	37.738	42.336	0.432	25.154	30.71	1262.1
	AD 1100-1200	43.2	21.6	43.2	21.6	54	1911.6
Pit Room Total		38.421	39.744	5.778	24.709	33.63	1343.29
Pit Structure	AD 1100-1200	81.495	141.532	36.157	31.608	76.1	2188.61
	AD 700-900	48.515	128.547	25.091	18.8	93.16	1652.97
Pit Structure Total		53.012	130.318	26.6	20.546	90.83	1726.01
Structure	AD 700-900	50.998	60.189	13.846	20.911	46.41	1014.91
Structure Total		50.998	60.189	13.846	20.911	46.41	1014.91

Table 24.12. Continued.

		Economic Taxa										
Structure Type	Age	Onagraceae	Fabaceae	Solanaceae	*Polygonum*	*Eriogonum*	Brassicaceae	Cactaceae	*Cylindropuntia*	*Platyopuntia*	*Sphaeralcea*	*Zea mays*
Extramural	unknown	0	7.105	7.105	0	7.105	7.105	1.875	0	0	0	7.751
	AD 1100-1325	0	0	0	0	0	0	0	0	0	0	2.709
	AD 700-1200	0	0	0	0	0	0	0	0	0	0	0
	AD 700-900	0.184	0	0.321	0	0.805	1.328	15.875	77.806	0.321	2.343	57.604
	AD 500-650	0	0	0	0	0	0	0	0	0	0	0
Extramural Total		0.153	0	0.268	0	0.671	1.107	13.385	64.838	0.268	1.953	48.116
Pit room	AD 1200-1325	0.432	0	0	0	2.543	0	4.364	3.602	0	0	19.774
	AD 1100-1200	0	0	0	0	21.6	0	9.257	9.257	0	4.629	9.257
Pit Room Total		0.378	0	0	0	4.925	0	4.976	4.309	0	0.579	18.459
Pit structure	AD 1100-1200	0	0.769	0	0.632	2.951	0	38.452	19.026	0	3.72	10.547
	AD 700-900	0.98	0	1.356	0.823	0.6	0.499	19.048	17.939	0.515	2.152	49.244
Pit Structure Total		0.847	0.105	1.171	0.797	0.92	0.431	21.694	18.088	0.444	2.366	43.967
	AD 700-900	0.157	0	4.39	0	0	0	1.098	3.462	0	1.754	35.551
Structure Total		0.157	0	4.39	0	0	0	1.098	3.462	0	1.754	35.551

Table 24.13. Pivot Table 3, Mean Concentration Values of Selected Taxa by Age, Site, and Structure, Peña Blanca Project, Sandoval County, New Me

			AP							NAP	
Age	Site	Structure	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	*Prosopis*	Poaceae	Chenc
Unknown	LA 249	Extramural	403.224	1685.13	198.947	14.211	18.355	35.526	7.105	110.72	1019.6
AD 1200-1325	LA 6169	Pit room 10	0	117.391	0	0	0	0	0	0	821.73
		Pit room 15	24.545	147.273	0	0	0	0	0	0	1448.1
		Pit room 16	49.133	392.709	0	0	0	0	0	34.84	816.08
		Pit room 70	7.232	101.25	0	0	0	0	0	0	14.46
	LA 6169 Total		32.616	276.679	0	0	0	0	0	19.908	792.67
AD 1100-1325	LA 6169	Extramural	0	211.304	0	0	0	0	0	0	598.69
AD 1100-1200	LA 249	Pit structure 6	63.847	283.263	1.692	0	0	8.123	0	13.967	635.82
	LA 6169	Pit structure 76 w/l 47	0	1230	0	0	0	0	0	60	276
	LA 6170	Extramural	53.115	132.787	0	0	0	0	5.691	26.557	2363.6
		Structure 5A	95.541	241.015	2.308	0	0	0	0	38.466	1582.7
	LA 6170 Total		84.935	213.958	1.731	0	0	0	1.423	35.488	177
AD 1100-1200 Total			65.897	350.215	1.538	0	0	4.062	0.569	27.179	1305.1
AD 700-1200	LA 6171	Extramural	12.217	31.765	0	0	0	0	0	47.647	349.41
	LA 115862	Extramural	0	47.647	0	0	0	0	0	0	285.88
		Pit structure 1	17.896	103.556	0	1.043	0	0	0	37.658	489.8
	LA 115862 Total		10.738	81.192	0	0.626	0	0	0	22.595	408.24
	LA 265	Extramural	35.768	100.581	6.368	0	0	3.99	0	52.093	1874.2
		Extramural:SU1	69.218	266.396	2.957	3.616	0	0	2.411	63.287	1300.6
		Pit structure 1	15.253	157.873	0.316	0.234	5.202	0.949	0	16.14	556.6
		Pit structure 13	0	67.5	7.864	0	0	0	0	0	536.46
		Pit structure 4	0	110.455	0	0	0	0	0	24.545	762.27
	LA 265 Total		32.123	152.501	3.401	0.82	1.734	1.749	0.495	38.321	1191.7

Table 24.13. Continued.

			AP							NAP	
Age	Site	Structure	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	*Prosopis*	Poaceae	Cheno-am
	LA 6169	Pit structure 4	120.501	782.36	0	7.759	0	0	0	34.38	3107.716
		Pit structure 47:circular	12.624	122.7	0	0	0	0	0	20.4	719.992
	LA 6169 Total		48.583	342.587	0	2.586	0	0	0	25.06	1515.9
	LA 6170	Extramural	174.886	242.464	3.682	7.364	0	0	0	32.344	560.079
		Pit structure 2:ovoid	80.56	494.841	5.018	1.765	0	3.529	0	19.135	1641.984
		Pit structure 5	52.238	252.498	0	0	0	7.941	0	41.837	1124.381
		Pit structure 50	31.813	107.487	0.63	0	0	0	0	18.958	716.629
	LA 6170 Total		57.665	197.748	1.317	1.014	0	2.157	0	25.549	892.664
	LA 6171	Extramural	37.957	221.252	9.811	0	0	0	0	97.445	3025.781
		Pit structure 60	24.101	181.295	18.186	0	19.29	0	0	79.082	1240.122
		Structure 18	9.592	165.122	0	0	0	0	0	41.336	818.05
		Structure 2	0	142.105	0	0	0	0	0	56.842	397.895
		Structure 26	0	83.793	0	0	0	0	0	9.31	158.276
		Structure 9	23.143	99.995	0	0	0	0	0	21.069	403.581
	LA 6171 Total		21.135	171.274	6.767	0	4.286	0	0	62.14	1419.054
AD 700-900 Total			35.074	175.017	3.234	0.801	1.683	1.244	0.224	38.794	1153.79
AD 500-650	LA 6171	Extramural	0	206.809	0	0	0	34.468	0	34.468	3205.532
Grand Total			43.725	225.097	6.402	0.901	1.68	2.344	0.363	37.509	1148.321

Table 24.12. Continued.

Age	Site	Structure	NAP				
			Cheno-am af.	Asteraceae hs.	Asteraceae ls	*Artemisia*	*Ephedra*
Unknown	LA 249	Extramural	0	313.816	299.605	42.632	14.211
AD 1200-1325	LA 6169	Pit room 10	0	0	0	0	0
		Pit room 15	0	171.818	0	0	73.636
		Pit room 16	16.457	23.087	74.089	0.756	25.61
		Pit room 70	7.232	0	0	0	0
	LA 6169 Total		10.437	37.738	42.336	0.432	25.154
AD 1100-1325	LA 6169	Extramural	17.609	123.261	70.435	0	0
AD 1100-1200	LA 249	Pit structure 6	0.846	65.196	108.885	21.158	1.692
	LA 6169	Pit structure 76 w/l 47	0	120	150	60	180
	LA 6170	Extramural	0	239.016	239.016	79.672	26.557
		Structure 5A	6.923	30.554	120.649	41.05	30.351
	LA 6170 Total		5.192	82.669	150.241	50.706	29.403
AD 1100-1200 Total			2.5	77.666	129.539	36.861	30.607
AD 700-1200	LA 6171	Extramural	2.443	31.765	142.941	15.882	63.529
AD 700-900	LA 115862	Extramural	0	0	127.059	0	31.765
		Pit structure 1	0	33.373	33.121	0	46.547
	LA 115862 Total		0	20.024	70.696	0	40.634
	LA 265	Extramural	3.688	72.001	242.084	29.054	10.946
		Extramural:SU1	0	94.249	113.683	26.253	22.864
		Pit structure 1	1.86	39.114	53.79	5.798	6.183
		Pit structure 13	13.5	75.364	37.092	0	0
		Pit structure 4	15	60	126.818	24.545	12.273
	LA 265 Total		3.406	65.159	136.557	19.006	11.31
	LA 6169	Pit structure 4	8.438	84.52	303.702	134.176	34.623
		Pit structure 47:circular	0	27	85.8	0	7.5
	LA 6169 Total		2.813	46.173	158.434	44.725	16.541
	LA 6170	Extramural	5.523	45.23	81.256	9.205	25.773
		Pit structure 2:ovoid	5.018	65.507	64.571	12.077	198.604
		Pit structure 5	7.941	22.058	122.64	103.551	0
		Pit structure 50	0	22.015	125.393	23.06	4.604
	LA 6170 Total		2.936	29.436	113.119	38.187	27.488
	LA 6171	Extramural	0	114.3	105.561	15.123	42.237
		Pit structure 60	6.429	76.518	160.688	19.448	32.82
		Structure 18	21.128	68.803	76.822	24.923	26.899
		Structure 2	0	56.842	85.263	0	0
		Structure 26	0	46.552	18.621	0	0
		Structure 9	0	5.786	26.854	0	26.854
	LA 6171 Total		7.298	74.253	95.125	15.446	29.481
AD 700-900 Total			3.882	55.637	120.677	22.965	20.569
AD 500-650	LA 6171	Extramural	0	103.404	172.34	0	34.468
Grand Total			4.185	62.145	119.953	22.665	22.014

Table 24.13. Continued.

Age	Site	Structure	Economic Taxa					
			Onagraceae	Fabaceae	Solanaceae	*Polygonum*	*Eriogonum*	Brassicaceae
Unknown	LA 249	Extramural	0	7.105	7.105	0	7.105	7.105
	LA 6169	Pit room 10	0	0	0	0	0	0
		Pit room 15	0	0	0	0	0	0
		Pit room 16	0.756	0	0	0	4.451	0
		Pit room 70	0	0	0	0	0	0
	LA 6169 Total		0.432	0	0	0	2.543	0
AD 1100-1325	LA 6169	Extramural	0	0	0	0	0	0
	LA 249	Pit structure 6	0	0	0	0	0	0
	LA 6169	Pit structure 76 w/I 47	0	0	0	0	0	0
	LA 6170	Extramural	0	0	0	5.691	26.557	0
		Structure 5A	0	2.308	0	0	7.2	0
	LA 6170 Total		0	1.731	0	1.423	12.039	0
AD 1100-1200 Total			0	0.692	0	0.569	4.816	0
AD 700-1200	LA 6171	Extramural	0	0	0	0	0	0
	LA 115862	Extramural	0	0	0	0	0	0
		Pit structure 1	0	0	0	0	0	0
	LA 115862 Total		0	0	0	0	0	0
	LA 265	Extramural	0	0	0	0	0	0
		Extramural:SU1	0	0	0.804	0	1.092	0
		Pit structure 1	1.404	0	0	0	0	0
		Pit structure 13	0	0	0	0	0	0
		Pit structure 4	4.269	0	0	0	0	0
	LA 265 Total		0.687	0	0.165	0	0.224	0
	LA 6169	Pit structure 4	1.164	0	0	7.322	12.414	0
		Pit structure 47:circular	5.473	0	0	0	0	0
	LA 6169 Total		4.037	0	0	2.441	4.138	0
	LA 6170	Extramural	1.841	0	0	0	3.682	0
		Pit structure 2:ovoid	0	0	0	0	3.253	0
		Pit structure 5	0.67	0	0	0	0	0
		Pit structure 50	0.22	0	7.728	2.942	0	0
	LA 6170 Total		0.476	0	4.293	1.635	0.771	0
	LA 6171	Extramural	0	0	0	0	0	5.311
		Pit structure 60	0	0	0	0.711	0.711	7.105
		Structure 18	0.282	0	7.902	0	0	0
		Structure 2	0	0	0	0	0	0
		Structure 26	0	0	0	0	0	0
		Structure 9	0	0	0	0	0	0
	LA 6171 Total		0.078	0	2.195	0.158	0.158	3.054
AD 700-900 Total			0.709	0	1.433	0.545	0.585	0.639
AD 500-650	LA 6171	Extramural	0	0	0	0	0	0
Grand Total			0.593	0.196	1.273	0.487	1.208	0.641

Table 24.13. Continued.

Age	Site	Structure	Economic Taxa: Cactaceae	Cylindr-opuntia	Platy-opuntia	*Sphaer-alcea*	*Zea mays*
Unknown	LA 249	Extramural	1.875	0	0	0	7.751
AD 1200-1325	LA 6169	Pit room 10	10.836	0	0	0	27.09
		Pit room 15	0	0	0	0	0
		Pit room 16	4.928	6.304	0	0	26.997
		Pit room 70	0	0	0	0	3.338
	LA 6169 Total		4.364	3.602	0	0	19.774
AD 1100-1325	LA 6169	Extramural	0	0	0	0	2.709
AD 1100-1200	LA 249	Pit structure 6	12.69	8.141	0	0	0.977
	LA 6169	Pit structure 76 w/I 47	270	60	0	0	60
	LA 6170	Extramural	5.691	53.115	0	26.557	5.691
		Structure 5A	5.393	8.892	0	3.851	11.2
	LA 6170 Total		5.468	19.948	0	9.527	9.823
AD 1100-1200 Total			35.532	18.049	0	3.811	10.418
AD 700-1200	LA 6171	Extramural	0	0	0	0	0
AD 700-900	LA 115862	Extramural	0	0	0	0	0
		Pit structure 1	9.391	4.696	0	1.043	2.087
	LA 115862 Total		5.635	2.817	0	0.626	1.252
	LA 265	Extramural	35.193	21.372	0	1.773	95.595
		Extramural:SU1	36.874	186.39	0.804	5.398	127.428
		Pit structure 1	34.23	21.601	0	1.755	62.755
		Pit structure 13	0	50.592	13.5	0	10.979
		Pit structure 4	10	38.538	0	0	21.403
	LA 265 Total		32.12	57.676	0.857	2.329	83.034
	LA 6169	Pit structure 4	5.431	19.784	1.164	23.082	61.051
		Pit structure 47:circular	5.4	6.673	0	0	12.9
	LA 6169 Total		5.41	11.043	0.388	7.694	28.95
	LA 6170	Extramural	0	29.711	0	1.841	57.325
		Pit structure 2:ovoid	8.271	45.819	0	0	30.659
		Pit structure 5	5.424	6.328	0	0	17.91
		Pit structure 50	0.345	7.257	0	0	20.409
	LA 6170 Total		2.316	13.83	0	0.205	25.094
	LA 6171	Extramural	4.5	0	0	0	0
		Pit structure 60	6.429	0	0	6.429	22.253
		Structure 18	1.976	6.231	0	3.158	57.878
		Structure 2	0	0	0	0	0
		Structure 26	0	0	0	0	0
		Structure 9	0	0	0	0	15.283
	LA 6171 Total		3.227	1.731	0	2.306	22.72
AD 700-900 Total			16.432	30.347	0.416	2.155	49.755
AD 500-650	LA 6171	Extramural	0	0	0	0	0
Grand Total			16.692	26.07	0.331	2.069	42.035

Table 24.14. Pivot Table 4, Mean Concentration Values of Selected Taxa from Mealing Basin Features

					AP		**NAP**				
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	Poaceae	Cheno-am	Cheno-am af	Asteraceae hs	Asteraceae ls
AD 1200-1325	Basin:mealing	LA 6169	Pit room 16	102	44.38	399.45	44.38	1198.36	0	22.19	22.19
				103	106.81	267.03	35.6	729.89	35.6	17.8	35.6
				104	45.34	622.61	3.02	673.99	30.22	24.18	69.51
			Total		65.51	429.7	27.67	867.41	21.94	21.39	42.44

Table 24.14. Continued.

NAP		Economic									
Artemisia	*Ephedra*	Onagraceae	*Eriogonum*	Cactaceae	Cylindro-puntia	*Zea mays*	Arboreal	NAP	Economic	Noneco-nomic	Total
0	22.19	0	0	5.12	22.19	22.19	443.84	1403.2	49.5	1792.41	1841.92
0	17.8	0	17.8	8.55	0	53.41	373.85	952.06	79.75	1237.61	1317.36
3.02	48.36	3.02	0	6.04	3.02	30.22	670.97	906.72	42.31	1535.37	1577.69
1.01	29.45	1.01	5.93	6.57	8.4	35.27	496.22	1087.33	57.19	1521.8	1578.99

Table 24.15. Pivot Table 5, Mean Concentration Values of Selected Taxa, Bin Features

					AP		NAP			
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	Poaceae	Cheno-am	Aster-aceae hs	Aster-aceae ls
AD1100-1200	Bin:mealing:adobe lined	LA 6170	Structure 5A	6	43.2	259.2	21.6	1144.8	43.2	21.6
AD 700- 900	Bin:storage	LA 6169	Pit structure 47: circular	121	43.2	280.8	21.6	842.4	108	43.2
Bin Total					43.2	270	21.6	993.6	75.6	32.4

					NAP		Economic			
Age	Type	Site	Structure	Feature	*Artemisia*	*Ephedra*	*Eriogonum*	Cactaceae	*Cylindro-puntia*	*Sphaeral-cea*
AD1100-1200	Bin:mealing:adobe lined	LA 6170	Structure 5A	6	43.2	21.6	21.6	9.26	9.26	4.63
AD 700-900	Bin:storage	LA 6169	Pit structure 47:cir	121	0	0	0	21.6	4.8	0
Bin Total					21.6	10.8	10.8	15.43	7.03	2.31

					Economic					
Age	Type	Site	Structure	Feature	*Zea mays*	Arboreal	NAP	Economic	Non-economic	Total
AD 1100-1200	Bin:mealing:adobe-lined	LA 6170	Structure 5A	6	9.26	302.4	1393.2	54	1911.6	1966
AD 700-900	Bin:storage	LA 6169	Pit structure 47:cir	121	21.6	324	1171.2	48	1442.4	1490
Bin Total					15.43	313.2	1282.2	51	1677	1728

Table 24.16. Pivot Table 6, Mean Concentration Values, Selected Taxa, Burial Features

					AP			NAP			
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	*Juniperus*	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.
AD 700-1200	Burial: human	LA 6171	Extramural	85	12.22	31.76	0	15.88	47.65	349.41	2.44
AD 700-900	Burial: turkey	LA 265	Extramural	19 in 15	55.86	279.31	27.93	0	111.72	3519.31	0

					NAP				Economic	
Age	Type	Site	Structure	Feature	Aster-aceae hs.	Aster-aceae ls	*Artemisia*	*Ephedra*	Cactaceae	Cylindro-puntia
AD 700-1200	Burial: human	LA 6171	Extramural	85	31.76	142.94	15.88	63.53	0	0
AD 700-900	Burial: human	LA 265	Extramural	19 in 15	195.5	614.48	27.93	0	12.41	83.79

					Economic						
Age	Type	Site	Structure	Feature	*Sphaer-alcea*	*Zea mays*	Arboreal	NAP	Economic	Non-economic	Total
AD 700-1200	Burial: human	LA 6171	Extramural	85	0	0	43.98	701.27	0	730.59	730.59
AD 700-900	Burial: turkey	LA 265	Extramural	19 in 15	24.83	55.86	363.1	4813.45	176.9	4962.41	5139.31

Table 24.17. Pivot Table 7, Mean Concentration Values, Selected Taxa, Floor Features

Age	Type	Site	Structure	Feature	AP						
					P. pond.	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	*Prosopis*
AD1200-1325	Floor	LA 6169	Pit room 16	16	0	281.74	0	0	0	0	0
			Pit room 70	70	7.23	101.25	0	0	0	0	0
		LA 6169 Total		3.62	191.49	0	0	0	0	0	0
	Floor:contact	LA 6169	Pit room 10	10	0	117.39	0	0	0	0	0
	Pit room	LA 6169	Pit room 15	15	24.55	147.27	0	0	0	0	0
AD1200-1325 Total				7.94	161.91	0	0	0	0	0	0
AD1100-1200	Floor	LA 249	Pit structure 6	0	0	13.06	0	0	0	13.06	0
				6	79.81	350.81	2.11	0	0	6.89	0
			Pit structure 6 Total	63.85	283.26	1.69	0	0	8.12	0	0
		LA 6170	Structure 5A	5A	121.71	231.92	3.46	0	0	0	0
	Floor Total				80.38	268.59	2.2	0	0	5.8	0
	Floor	LA 6169	Pit structure 76 w/i 47	76 in 47	0	1230	0	0	0	0	0
AD1100-1200 Total					70.33	388.77	1.92	0	0	5.08	0
AD 700-900	Floor	LA 265	Pit structure 4	0	0	0	0	0	0	0	0
		LA 6169	Pit structure 4	4	80.69	670.34	0	6.21	0	0	0
		LA 6170	Pit structure 2:ovoid	2	80.56	494.84	5.02	1.76	0	3.53	0
			Pit structure 5		104.48	418.4	0	0	0	15.88	0
			Pit structure 50	50	0	26.13	0	0	0	0	0
		LA 6170 Total			61.68	313.12	1.67	0.59	0	6.47	0
		LA 6171	Pit structure 60	60	25.71	308.57	51.43	0	77.1	0	0
			Structure 18	18	0	0	0	0	0	0	0
			Structure 2	26	0	142.11	0	0	0	0	0
			Structure 9	9	23.14	99.99	0	0	0	0	0
		LA 6171 Total			14.4	130.13	10.29	0	15.4	0	0
	Floor Total				40.21	246.13	4.73	0.75	5.93	2.99	0
	Floor:contact	LA 6169	Pit structure 47: circular	47	0	60	0	0	0	0	0
	Floor:under metate	LA 6171	Pit structure 60	60	56.84	163.42	21.32	0	0	0	0
	Floor:under pallet	LA 6171	Pit structure 60	60	13.85	124.62	0	0	0	0	0
AD 700-900 Total					37.09	221.74	5.17	0.61	4.82	2.43	0

Table 24.17. Continued.

					NAP				
Age	Type	Site	Structure	Feature	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.	Asteraceae hs.
AD1200-1325	Floor	LA 6169	Pit room 16	16	0	56.35	662.09	0	28.17
			Pit room 70	70	0	0	14.46	7.23	0
		LA 6169 Total		0	28.17	338.28	3.62	14.09	
	Floor:contact	LA 6169	Pit room 10	10	0	0	821.74	0	0
	Pit room	LA 6169	Pit room 15	15	0	0	1448.18	0	171.82
AD1200-1325 Total				0	14.09	736.62	1.81	50	
AD1100-1200	Floor	LA 249	Pit structure 6	0	0	0	13.06	0	0
				6	0	17.46	791.52	1.06	81.49
			Pit structure 6 Total	0	13.97	635.83	0.85	65.2	
		LA 6170	Structure 5A	5A	0	46.9	1801.79	10.38	24.23
	Floor Total				0	23.38	968.96	3.57	53.49
	Floor	LA 6169	Pit structure 76 w/I 47	76 in 47	30	60	2760	0	120
AD1100-1200 Total				3.75	27.95	1192.84	3.12	61.81	
AD 700-900	Floor	LA 265	Pit structure 4	0	0	0	690	30	120
		LA 6169	Pit structure 4	4	0	43.45	1557.93	0	93.1
		LA 6170	Pit structure 2:ovoid	2	0	19.14	1641.98	5.02	65.51
			Pit structure 5		0	12.66	1451.99	15.88	28.54
			Pit structure 50	50	0	13.5	198.58	0	0
		LA 6170 Total		0	15.1	1097.52	6.97	31.35	
		LA 6171	Pit structure 60	60	0	180	2185.71	25.71	77.14
			Structure 18	18	0	0	105.88	0	0
			Structure 2	26	0	56.84	397.89	0	56.84
			Structure 9	9	0	21.07	403.58	0	5.79
		LA 6171 Total		0	55.8	699.33	5.14	29.11	
	Floor Total				0	31.77	948.44	7.5	42.06
	Floor:contact	LA 6169	Pit structure 47:circular	47	0	60	1020	0	0
	Floor:under metate	LA 6171	Pit structure 60	60	0	71.05	1257.63	0	56.84
	Floor:under pallet	LA 6171	Pit structure 60	60	0	13.85	360	0	69.23
AD 700-900 Total					0	34.87	935.46	6.09	42.05

Table 24.17. Continued.

Age	Type	Site	Structure	Feature	Asteraceae ls	*Artemisia*	*Ephedra*	Fabaceae	*Poly-gonum*	*Erio-gonum*
AD1200-1325	Floor	LA 6169	Pit room 16	16	169.04	0	14.09	0	0	0
			Pit room 70	70	0	0	0	0	0	0
		LA 6169 Total			84.52	0	7.04	0	0	0
	Floor:contact	LA 6169	Pit room 10	10	0	0	0	0	0	0
	Pit room	LA 6169	Pit room 15	15	0	0	73.64	0	0	0
AD1200-1325 Total					42.26	0	21.93	0	0	0
AD1100-1200	Floor	LA 249	Pit structure 6	0	13.06	0	0	0	0	0
				6	132.84	26.45	2.11	0	0	0
			Pit structure 6 Total		108.88	21.16	1.69	0	0	0
		LA 6170	Structure 5A	5A	170.17	39.98	34.73	3.46	0	0
	Floor Total				126.4	26.53	11.13	0.99	0	0
	Floor	LA 6169	Pit structure 76 w/I 47	76 in 47	150	60	180	0	0	0
AD 1100-1200 Total					129.35	30.72	32.24	0.87	0	0
AD 700-900	Floor	LA 265	Pit structure 4	0	180	0	0	0	0	0
		LA 6169	Pit structure 4	4	328.97	192.41	18.62	0	6.21	24.83
		LA 6170	Pit structure 2:ovoid	2	64.57	12.08	198.6	0	0	3.25
			Pit structure 5		136.24	47.65	0	0	0	0
			Pit structure 50	50	0	0	13.5	0	0	0
		LA 6170 Total			66.94	19.91	70.7	0	0	1.08
		LA 6171	Pit structure 60	60	282.86	0	102.86	0	0	0
			Structure 18	18	84.71	0	0	0	0	0
			Structure 2	26	85.26	0	0	0	0	0
			Structure 9	9	26.85	0	26.85	0	0	0
		LA 6171 Total			101.31	0	31.31	0	0	0
	Floor Total				109.01	23.99	46.11	0	0.48	2.41
	Floor:contact	LA 6169	Pit structure 47:circular	47	90	0	30	0	0	0
	Floor:under metate	LA 6171	Pit structure 60	60	227.37	63.95	28.42	0	2.84	2.84
	Floor:under pallet	LA 6171	Pit structure 60	60	55.38	13.85	0	0	0	0
AD 700-900 Total					111.87	24.35	41.11	0	0.57	2.14

Table 24.17. Continued.

Age	Type	Site	Structure	Feature	Economic Brassic-aceae	Cacta-ceae	Cylindro-puntia	*Sphaer-alcea*	*Zea mays*
AD1200-1325	Floor	LA 6169	Pit room 16	16	0	0	0	0	2.17
			Pit room 70	70	0	0	0	0	3.34
		LA 6169 Total		0	0	0	0	2.75	0
	Floor:contact	LA 6169	Pit room 10	10	0	10.84	0	0	27.09
	Pit room	LA 6169	Pit room 15	15	0	0	0	0	0
AD1200-1325 Total					0	2.71	0	0	8.15
AD1100-1200	Floor	LA 249	Pit structure 6	0	0	0	0	0	0
				6	0	15.86	10.18	0	1.22
			Pit structure 6 Total		0	12.69	8.14	0	0.98
		LA 6170	Structure 5A	5A	0	3.46	8.71	3.46	12.17
	Floor Total				0	10.05	8.3	0.99	4.18
	Floor	LA 6169	Pit structure 76 w/I 47	76 in 47	0	270	60	0	60
AD1100-1200 Total					0	42.55	14.77	0.87	11.15
AD 700- 900	Floor	LA 265	Pit structure 4	0	0	20	60	0	30
		LA 6169	Pit structure 4	4	0	6.21	37.24	12.41	12.41
		LA 6170	Pit structure 2:ovoid	2	0	8.27	45.82	0	30.66
			Pit structure 5		0	10.85	12.66	0	35.82
			Pit structure 50	50	0	0	26.13	0	39.19
		LA 6170 Total			0	6.37	28.2	0	35.22
		LA 6171	Pit structure 60	60	0	25.71	0	0	23.74
			Structure 18	18	0	0	0	0	0
			Structure 2	26	0	0	0	0	0
			Structure 9	9	0	0	0	0	15.28
		LA 6171 Total			0	5.14	0	0	10.86
	Floor Total				0	6.94	20.5	0.95	23.7
	Floor:contact	LA 6169	Pit structure 47:circula	47	0	0	0	0	30
	Floor:contact Total				0	0	0	0	30
	Floor:under me	LA 6171	Pit structure 60	60	28.42	0	0	0	0
	Floor:under pal	LA 6171	Pit structure 60	60	0	0	0	0	13.85
AD 700-900 Total					1.78	5.63	16.65	0.78	21.99

Table 24.17. Continued.

Age	Type	Site	Structure	Feature	Arboreal	NAP	Economic: Economic	Economic: Non-economic	Total
AD1200-1325	Floor	LA 6169	Pit room 16	16	281.74	1002.34	2.17	1279.75	1281.91
			Pit room 70	70	108.48	25.03	3.34	126.84	130.18
		LA 6169 Total			195.11	513.69	2.75	703.29	706.05
	Floor:contact	LA 6169	Pit room 10	10	117.39	906.62	37.93	948.16	986.09
	Pit room	LA 6169	Pit room 15	15	171.82	1742.73	0	1914.55	1914.55
AD1200-1325 Total					169.86	919.18	10.86	1067.32	1078.18
AD1100-1200	Floor	LA 249	Pit structure 6	0	26.13	26.13	0	52.26	52.26
				6	439.62	1143.73	27.26	1553.15	1580.41
			Pit structure 6 Total		356.93	920.21	21.81	1252.97	1274.78
		LA 6170	Structure 5A	5A	357.1	2230.68	31.27	2643.61	2674.88
	Floor Total				356.97	1294.63	24.51	1650.3	1674.81
	Floor	LA 6169	Pit structure 76 w/l 47	76 in 47	1230	3870	390	4710	5100
AD1100-1200 Total					466.1	1616.55	70.2	2032.76	2102.96
AD 700-900	Floor	LA 265	Pit structure 4	0	0	1190	110	1060	1170
		LA 6169	Pit structure 4	4	757.24	2408.28	99.31	3066.21	3165.52
		LA 6170	Pit structure 2:ovoid	2	585.71	2118.22	88	2615.93	2703.93
			Pit structure 5		538.76	1879.09	59.32	2834.74	2894.06
			Pit structure 50	50	26.13	290.9	65.32	277.84	343.16
		LA 6170 Total			383.53	1429.41	70.88	1909.5	1980.39
		LA 6171	Pit structure 60	60	462.86	3238.02	49.45	3627.69	3677.14
			Structure 18	18	0	211.76	0	211.76	211.76
			Structure 2	26	142.11	625.26	0	767.37	767.37
			Structure 9	9	123.14	545.28	15.28	653.13	668.41
		LA 6171 Total			170.25	1033.12	16	1182.62	1198.62
	Floor Total				300.74	1333.87	54.97	1653.56	1708.53
	Floor:contact	LA 6169	Pit structure 47:circular	47	60	1230	30	1260	1290
	Floor:contact Total				60	1230	30	1260	1290
	Floor:under metate	LA 6171	Pit structure 60	60	241.58	1817.53	34.11	2019.32	2053.42
	Floor:under pallet	LA 6171	Pit structure 60	60	138.46	526.15	13.85	650.77	664.62
AD 700-900 Total					271.86	1307.12	49.54	1589.15	1638.69

Table 24.18. Pivot Table 8, Mean Concentration Values, Selected Taxa, Pit Features

Age	Type	Site	Structure	Feature	AP					
					P. pond.	*P. edulis*	*Juniperus*	*Picea*	*Quercus*	*Prosopis*
AD 1100-1325	Pit:storage	LA 6169	Extramural	126	0	211.3	0	0	0	0
AD 700-900	Pit:	LA 6171	Pit structure 60	63	0	128.57	0	0	0	0
	Pit:ash	LA 115862	Pit structure 1	20	0	28.93	0	0	0	0
	Pit:bell shaped	LA 265	Extramural	229	247.12	27.46	0	0	0	0
			Pit structure 13	141	0	0	15.73	0	0	0
		LA 265 Total		123.6	13.73	7.86	0	0	0	0
	Pit:bell shaped:in F 27	LA 265	Extramural:SU1	41	56.77	593.85	4.37	0	0	0
	Pit:bell; Shaped:roasting:3; Subfloor pits	LA 6171	Extramural	56	30	90	0	0	0	0
	Pit:bell shaped:storage	LA 265	Extramural:SU1	127	194.4	518.4	0	0	0	0
	Pit:bell shaped:storage w/ adult burial	LA 265	Extramural:SU1	24	0	50.63	0	0	0	0
	Pit:bell shaped:storage w/ dog burial	LA 265	Extramural:SU1	26	145.07	72.54	0	0	0	0
	Pit:bell shaped:storage w/ infant burial	LA 265	Extramural:SU1	23	144.64	405	0	28.93	0	0
	Pit:cist:wall of F 56	LA 265	Extramural	156	0	26.13	0	0	0	0
	Pit:floor:sealed	LA 265	Pit structure 4	76	0	220.91	0	0	0	0
	Pit:keyhole	LA 265	Extramural:SU1	27	0	62.31	0	0	0	0
	Pit:lg:irregular	LA 265	Extramural	14	19.97	106.2	3.53	0	6.21	0
				15	0	29.45	29.45	0	0	0
	Pit:linear:floor:foot drum	LA 265	Pit structure 1	107	17.61	0	0	0	0	0
	Pit:oval:lg	LA 265	Extramural	17	18	90	0	0	0	0
	Pit:roasting	LA 115862	Extramural	9	0	0	0	0	0	0
				11	0	95.29	0	0	0	0
	Pit:rodent damage	LA 6170	Extramural	92	0	61.52	0	0	0	0
	Pit:small	LA 6171	Extramural	47	0	202.5	22.5	0	0	0
	Pit:storage	LA 6171	Structure 18	24	39.51	39.51	0	0	0	0
				25	0	170.53	0	0	0	0

Table 24.18. Continued.

Age	Type	Site	Structure	Feature	AP					
					P. pond.	*P. edulis*	*Juniperus*	*Picea*	*Quercus*	*Prosopis*
	pit: storage: bell-shaped w/ subfloor pit	LA 6170	Extramural	69	349.77	423.41	7.36	14.73	0	0
	pit:storage: opening plastered over	LA 6170	Pit structure 50	156	0	24.18	0	0	0	0
				166	37.38	112.15	0	0	0	0
				171	141.83	236.38	6.3	0	0	0
				183	29.72	0	0	0	0	0
				184	0	26.27	0	0	0	0
			Pit structure 50 Total		41.79	79.8	1.26	0	0	0
	pit:subfloor	LA 6171	Extramural	59 in 56	132.79	663.93	26.56	0	0	0
	pit:subfloor:cist	LA 6171	Extramural	104 in 83	27	0	0	0	0	0
	pit: unburned: steep	LA 6171	Extramural	53	0	149.83	0	0	0	0
	pit: bell shaped: small	LA 265	Pit structure 1	191	0	193.43	0	0	0	0
AD 700-900 Total					41.96	142.5	3.8	1.02	1.3	0.45
AD 500-650	sub-cist:in bell shaped:burned	LA 6171	Extramural	93 in 92	0	206.81	0	0	34.5	0

Table 24.18. Continued.

					NAP			
Age	Type	Site	Structure	Feature	*Sarcobatus*	Poaceae	Cheno-am	Cheno-am af.
AD 1100-1325	pit:storage	LA 6169	extramural	126	0	0	598.7	17.61
AD 700-900	pit:	LA 6171	pit structure 60	63	0	51.43	1157.14	0
	pit:ash	LA 115862	pit structure 1	20	0	57.86	405	0
	pit:bell shaped	LA 265	extramural	229	0	82.37	2196.61	27.46
			pit structure 13	141	0	0	235.92	0
	pit:bell shaped:in F 27	LA 265	extramural:SU1	41	0	61.13	1021.78	0
	pit:bellshaped:roasting:3 subfloor pits	LA 6171	extramural	56	0	30	1110	0
	pit:bell shaped:storage	LA 265	extramural:SU1	127	0	0	2268	0
	pit:bell shaped:storage w/ adult burial	LA 265	extramural:SU1	24	0	25.31	734.06	0
	pit:bell shaped:storage w/ dog burial	LA 265	extramural:SU1	26	0	48.36	1160.6	0
				60	0	135	925.71	0
	pit:bell shaped:storage w/ infant burial	LA 265	extramural:SU1	23	0	173.57	2719.29	0
	pit:cist:wall of F 56	LA 265	extramural	156	0	26.13	653.23	0
	pit:floor:sealed	LA 265	pit structure 4	76	0	49.09	834.55	0
	pit:keyhole	LA 265	extramural:SU1	27	0	31.15	623.08	0
				33	0	31.76	952.94	0
	pit:lg:irregular	LA 265	extramural	14	0	50.56	1831.24	2.69
				15	0	0	2650.91	0
	pit:linear:floor:foot drum	LA 265	pit structure 1	107	0	0	176.09	0
	pit:oval:lg	LA 265	extramural	17	0	54	738	0
	pit:roasting	LA 115862	extramural	9	0	0	349.41	0
				11	0	0	222.35	0
	pit:rodent damage	LA 6170	extramural	92	0	20.51	512.66	0
	pit:small	LA 6171	extramural	47	0	22.5	2227.5	0
	pit:storage	LA 6171	structure 18	24	0	19.76	138.29	0
				25	0	0	328.87	12.18

Table 24.18. Continued.

Age	Type	Site	Structure	Feature	NAP			
					Sarcobatus	*Poaceae*	Cheno-am	Cheno-am af.
	Pit:storage:bell shaped w/ subfloor pit	LA 6170	extramural	69	0	44.18	607.5	11.05
	Pit:storage: opening plastered over	LA 6170	pit structure 50	156	0	0	96.72	0
				166	0	12.46	37.38	0
				171	3.15	34.67	769.03	0
				183	0	0	252.66	0
				184	0	35.03	122.59	0
			pit structure 50 Total	0.63	16.43	255.68	0	
	Pit:subfloor	LA 6171	extramural	59 in 56	53.11	398.36	11393	0
	Pit:subfloor:cist	LA 6171	extramural	104 in 83	0	27	108	0
	Pit:unburned:steep	LA 6171	extramural	53	0	9.36	290.29	0
	Pit:bell shaped: small	LA 265	pit structure 1	191	0	24.18	1184.8	24.18
AD 700-900 Total					1.31	45.59	1295	2.3
AD 500-650	subcist:in bell shaped:burned	LA 6171	extramural	93 in 92	0	34.47	3205.5	0

Table 24.18. Continued.

Age	Type	Site	Structure	Feature	NAP			
					Asteraceae hs.	Asteraceae ls	*Artemisia*	*Ephedra*
AD 1100-1325	pit:storage	LA 6169	extramural	126	123.26	70.43	0	0
AD 700- 900	pit	LA 6171	pit structure 60	63	102.86	77.14	0	0
	pit:ash	LA 115862	pit structure 1	20	57.86	28.93	0	0
	pit:bell shaped	LA 265	extramural	229	82.37	549.15	0	0
			pit structure 13	141	15.73	47.18	0	0
	pit:bell shaped:in F 27	LA 265	extramural:SU1	41	104.8	139.73	48.03	30.57
	pit:bell shaped:roasting:3 subfloor pits	LA 6171	extramural	56	30	30	0	
	pit:bell shaped:storage	LA 265	extramural:SU1	127	32.4	97.2	0	0
	pit:bell shaped:storage w/ adult burial	LA 265	extramural:SU1	24	25.31	25.31	25.31	
	pit:bell shaped:storage w/ dog burial	LA 265	extramural:SU1	26	24.18	96.72	24.18	
				60	51.43	167.14	25.71	6.43
	pit:bell shaped:storage w/ infant burial	LA 265	extramural:SU1	23	202.5	289.29	86.79	
	pit:cist:wall of f56	LA 265	extramural	156	26.13	52.26	26.13	0
	pit:floor:sealed	LA 265	pit structure 4	76	0	73.64	49.09	24.55
	pit:keyhole	LA 265	extramural:SU1	27	218.08	62.31	0	0
				33	95.29	31.76	0	95.29
	pit:lg:irregular	LA 265	extramural	14	61.13	225.66	29.19	17.03
				15	117.82	88.36	0	0
	pit:linear:floor:foot drum	LA 265	pit structure 1	107	35.22	52.83	17.61	0
	pit:oval:lg	LA 265	extramural	17	36	54	90	0
	pit:roasting	LA 115862	extramural	9	0	254.12	0	31.76
				11	0	0	0	31.76
	pit:rodent damage	LA 6170	extramural	92	20.51	41.01	0	0
	pit:small	LA 6171	extramural	47	22.5	45	22.5	67.5
	pit:storage	LA 6171	structure 18	24	9.88	69.15	0	9.88
	pit:storage:bell shaped w/ subfl pit	LA 6170	extramural	69	69.95	121.5	18.41	
	pit:storage:opening plastered over	LA 6170	pit structure 50	156	24.18	0	24.18	0
				166	0	87.23	0	0
				171	63.04	280.51	31.52	12.61
				183	29.72	237.8	74.31	0
				184	8.76	166.38	17.51	0
	pit:subfloor	LA 6171	extramural	59 in 56	398.36	371.8	53.11	106.23
	pit:subfloor:cist	LA 6171	extramural	104 in 83	27	81	0	0
	pit:unburned:steep	LA 6171	extramural	53	93.64	0	0	37.46
	pit:bell shaped:small	LA 265	pit structure 1	191	120.9	24.18	0	0
AD 700- 900 Total					64.41	134.55	20.86	16.5
AD 500- 650	subcist:in bell shaped:burned	LA 6171	extramural	93 in 92	103.4	172.34	0	
							34.47	

Table 24.18. Continued.

					Economic			
Age	Type	Site	Structure	Feature	Onagraceae	Solanaceae	*Polygonum*	*Eriogonum*
AD1100-1325	pit:storage	LA 6169	extramural	126	0	0	0	0
AD 700-900	pit:	LA 6171	pit structure 60	63	0	0	0	0
	pit:ash	LA 115862	pit structure 1	20	0	0	0	0
	pit:bell shaped	LA 265	extramural	229	0	0	0	0
			pit structure 13	141	0	0	0	0
	pit:bell shaped:in F 27	LA 265	extramural: SU1	41	0	0	0	8.73
	pit:bell shaped: roasting:3, subfloor pits	LA 6171	extramural	56	0	0	0	0
	pit:bell shaped: storage	LA 265	extramural: SU1	127	0	0	0	0
	pit:bell shaped: storage w/ adult burial	LA 265	extramural: SU1	24	0	0	0	0
	pit:bell shaped: storage w/ dog burial	LA 265	extramural: SU1	26	0	0	0	0
				60	0	6.43	0	0
	pit:bell shaped: storage w/ infant burial	LA 265	extramural: SU1	23	0	0	0	0
	pit:cist:wall of F 56	LA 265	extramural	156	0	0	0	0
	pit:floor:sealed	LA 265	pit structure 4	76	8.54	0	0	0
	pit:keyhole	LA 265	extramural: SU1	27	0	0	0	0
				33	0	0	0	0
	pit:lg:irregular	LA 265	extramural	14	0	0	0	0
				15	0	0	0	0
	pit:linear:floor:foot drum	LA 265	pit structure 1	107	0	0	0	0
	pit:oval:lg	LA 265	extramural	17	0	0	0	0
	pit:roasting	LA 115862	extramural	9	0	0	0	0
				11	0	0	0	0
	pit:rodent damage	LA 6170	extramural	92	0	0	0	0
	pit:small	LA 6171	extramural	47	0	0	0	0
	pit:storage	LA 6171	structure 18	24	1.41	39.51	0	0
				25	0	0	0	0
	pit:storage:bell shaped w/ subfloor pit	LA 6170	extramural	69	3.68	0	0	7.36
	pit:storage: opening plastered over	LA 6170	pit structure 50	156	0	0	0	0
				166	0	0	0	0
				171	0	0	3.15	0
				183	2.2	74.31	0	0
				184	0	0	26.27	0
	pit:subfloor	LA 6171	extramural	59 in 56	0	0	0	0
	pit:subfloor:cist	LA 6171	extramural	104 in 83	0	0	0	0
	pit: unburned: steep	LA 6171	extramural	53	0	0	0	0
	pit:bell shaped: small	LA 265	pit structure 1	191	0	0	0	0
AD 700-900 Total					0.37	2.8	0.68	0.37
AD 500-650	subcist:in bell shaped:burned	LA 6171	extramural	93 in 92	0	0	0	0

Table 24.18. Continued.

Age	Type	Site	Structure	Feature	Economic			
					Brassicaceae	Cactaceae	*Cylindropuntia*	*Platyopuntia*
AD1100-1325	pit:storage	LA 6169	extramural	126	0	0	0	0
AD 700-900	pit:	LA 6171	Pit structure 60	63	0	0	0	0
	pit:ash	LA 115862	Pit structure 1	20	0	0	0	0
	pit:bell shaped	LA 265	extramural	229	0	0	0	0
			Pit structure 13	141	0	0	47.18	0
	pit:bell shaped:in F 27	LA 265	extramural:SU1	41	0	4.37	43.67	0
	pit:bell shaped: roasting: 3, subfloor pits	LA 6171	extramural	56	0	0	0	0
	pit:bell shaped: storage	LA 265	extramural:SU1	127	0	129.6	486	0
	pit:bell shaped: storage w/ adult burial	LA 265	extramural:SU1	24	0	0	50.63	0
	pit:bell shaped: storage w/ dog burial	LA 265	extramural:SU1	26	0	24.18	145.07	0
				60	0	45	488.57	6.43
	pit:bell shaped: storage w/ infant burial	LA 265	extramural:SU1	23	0	28.93	57.86	0
	pit:cist:wall of F 56	LA 265	extramural	156	0	0	5.6	0
	pit:floor:sealed	LA 265	Pit structure 4	76	0	0	17.08	0
	pit:keyhole	LA 265	extramural:SU1	27	0	31.15	155.77	0
				33	0	31.76	63.53	0
	pit:lg:irregular	LA 265	extramural	14	0	40.27	23.31	0
				15	0	117.82	0	0
	pit:linear:floor:foot drum	LA 265	Pit structure 1	107	0	0	17.61	0
	pit:oval:lg	LA 265	extramural	17	0	0	0	0
	pit:roasting	LA 115862	extramural	9	0	0	0	0
				11	0	0	0	0
	pit:rodent damage	LA 6170	extramural	92	0	0	41.01	0
	pit:small	LA 6171	extramural	47	0	22.5	0	0
	pit:storage	LA 6171	structure 18	24	0	9.88	0	0
				25	0	0	0	0
	pit: storage: bell shaped w/ subfloor pit	LA 6170	extramural	69	0	0	18.41	0
	pit:storage:opening plastered over	LA 6170	Pit structure 50	156	0	3.45	0	0
				166	0	0	1.92	0
				171	0	0	6.3	0
				183	0	0	0	0
				184	0	0	2.69	0
	pit:subfloor	LA 6171	extramural	59 in 56	26.56	0	0	0
	pit:subfloor:cist	LA 6171	extramural	104 in 83	0	0	0	0
	pit:unburned:steep	LA 6171	extramural	53	0	0	0	0
	pit:bell shaped: small	LA 265	Pit structure 1	191	0	11.16	0	0
AD 700-900 Total					0.62	19.12	43.23	0.15
AD 500-650	subcist: in bell shaped: burned	LA 6171	extramural	93 in 92	0	0	0	0

Table 24.18. Continued.

					Economic			
Age	Type	Site	Structure	Feature	*Sphaeralcea*	*Zea mays*	Arboreal	NAP
AD1100-1325	pit:storage	LA 6169	extramural	126	0	2.71	211.3	812.71
AD 700-900	pit:	LA 6171	pit structure 60	63	25.71	51.43	154.29	1517.14
	pit:ash	LA 115862	pit structure 1	20	0	0	28.93	694.29
	pit:bell shaped	LA 265	extramural	229	0	0	274.58	3212.54
			pit structure 13	141	0	15.73	15.73	377.48
	pit:bell shaped:in F 27	LA 265	extramural:SU1	41	17.47	43.67	654.99	1571.97
	pit:bell shaped: roasting: 3 subfloor pits	LA 6171	extramural	56	0	0	120	1230
	pit:bell shaped:storage	LA 265	extramural:SU1	127	0	259.2	712.8	3304.8
	pit: bell shaped: storage w/ adult burial	LA 265	extramural:SU1	24	0	50.63	50.63	1012.5
	pit: bell shaped: storage w/ dog burial	LA 265	extramural:SU1	26	0	22.32	217.61	1642.32
				60	25.71	630	289.29	2610
	pit: bell shaped: storage w/ infant burial	LA 265	extramural:SU1	23	0	0	578.57	3789.64
	pit:cist:wall of F56	LA 265	extramural	156	0	0	26.13	893.99
	pit:floor:sealed	LA 265	pit structure 4	76	0	12.81	220.91	1192.06
	pit:keyhole	LA 265	extramural:SU1	27	0	0	62.31	1277.31
				33	0	13.61	190.59	1506.55
	pit:lg:irregular	LA 265	extramural	14	0	139.24	135.91	2493.21
				15	0	11.33	58.91	3015.69
	pit:linear:floor:foot drum	LA 265	pit structure 1	107	0	0	17.61	352.17
	pit:oval:lg	LA 265	extramural	17	0	18	108	1026
	pit:roasting	LA 115862	extramural	9	0	0	0	730.59
				11	0	0	95.29	317.65
	pit:rodent damage	LA 6170	extramural	92	0	41.01	61.52	697.22
	pit:small	LA 6171	extramural	47	0	0	225	2452.5
	pit:storage	LA 6171	structure 18	24	1.41	88.9	79.02	498.14
				25	0	1.74	170.53	476.78
	pit:storage:bell shaped w/ subfloor pit	LA 6170	extramural	69	3.68	73.64	795.27	1067.73
	pit: storage: opening plastered over	LA 6170	pit structure 50	156	0	0	24.18	172.71
				166	0	24.92	149.54	163.92
				171	0	3.15	384.51	1235.49
				183	0	0	29.72	819.63
				184	0	17.51	26.27	423.02
	pit:subfloor	LA 6171	extramural	59 in 56	0	0	823.28	13066.2
	pit:subfloor:cyst	LA 6171	extramural	104 in 83	0	0	27	270
	pit:unburned:steep	LA 6171	extramural	53	0	0	149.83	561.85
	pit:bell shaped:small	LA 265	pit structure 1	191	0	0	193.43	1606.98
AD 700-900 Total					1.72	61.23	191.61	1795.95
AD 500-650	subcist:in bell shaped:burned	LA 6171	extramural	93 in 92	0	0	241.28	3619.15

Table 24.18. Continued.

Age	Type	Site	Structure	Feature	Economic	Non-economic	Total
AD1100-1325	pit:storage	LA 6169	extramural	126	2.71	1018.6	1021
AD 700-900	pit:	LA 6171	pit structure 60	63	77.14	1594.29	1671
	pit:ash	LA 115862	pit structure 1	20	0	752.14	752.1
	pit:bell shaped	LA 265	extramural	229	0	3761.69	3762
			pit structure 13	141	62.91	330.29	393.2
	pit:bell shaped:in F 27	LA 265	extramural:SU1	41	117.9	2109.06	2227
	pit: bell shaped:roasting: 3 subfloor pits	LA 6171	extramural	56	0	1350	1350
	pit:bell shaped:storage	LA 265	extramural:SU1	127	874.8	3855.6	4730
	pit:bell shaped:storage w/ adult burial	LA 265	extramural:SU1	24	101.25	961.88	1063
	pit:bell shaped:storage w/ dog burial	LA 265	extramural:SU1	26	191.57	1646.04	1838
				60	1202.14	1941.43	3144
	pit:bell shaped:storage w/ infant burial	LA 265	extramural:SU1	23	86.79	4281.43	4368
	pit:cist:wall of f56	LA 265	extramural	156	5.6	908.92	914.5
	pit:floor:sealed	LA 265	pit structure 4	76	38.42	1336.13	1375
	pit:keyhole	LA 265	extramural:SU1	27	186.92	1152.69	1340
				33	108.91	1574.62	1684
	pit:lg:irregular	LA 265	extramural	14	202.83	2426.29	2629
				15	129.15	2934.13	3063
	pit:linear:floor:foot drum	LA 265	pit structure 1	107	17.61	352.17	369.8
	pit:oval:lg	LA 265	extramural	17	18	1116	1134
	pit:roasting	LA 115862	extramural	9	0	730.59	730.6
				11	0	508.24	508.2
	pit:rodent damage	LA 6170	extramural	92	82.03	676.71	758.7
	pit:small	LA 6171	extramural	47	22.5	2655	2678
	pit:storage	LA 6171	structure 18	24	141.11	431.81	572.9
				25	1.74	643.82	645.6
	pit:storage:bell shaped w/ subfloor pit	LA 6170	extramural	69	106.77	1756.23	1863
	pit:storage:opening plastered over	LA 6170	pit structure 50	156	3.45	214.16	217.6
				166	26.84	284.7	311.5
				171	12.61	1604.24	1617
				183	76.51	770.64	847.2
				184	46.48	400.12	446.6
	pit:subfloor	LA 6171	extramural	59 in 56	26.56	13862.95	13890
	pit:subfloor:cyst	LA 6171	extramural	104 in 83	0	297	297
	pit:unburned:steep	LA 6171	extramural	53	0	711.68	711.7
	pit:bell shaped:small	LA 265	pit structure 1	191	11.16	1778.09	1789
AD 700-900 Total	subcist:in bell				130.29	1886.54	2017
AD 500-650	shaped:burned	LA 6171	extramural	93 in 92	0	3860.43	3860

Table 24.19. Pivot Table 9, Mean Concentration Values, Selected Taxa, Posthole Features

					AP			NAP		
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	*Picea*	Poaceae	Cheno-am	Cheno-am af.
AD 700-900	pit:posthole: remodeled	LA 6171	structure 18	19	0	591.92	0	186.92	3458.08	93.46
	posthole	LA 6170	pit structure 5	14	0	155.77	0	124.62	1401.92	0
	posthole:double	LA 6171	structure 18	31	8.45	23.65	0	0	59.12	0
			structure 26	31	0	83.79	0	9.31	158.28	0
		LA 6171 Total			4.22	53.72	0	4.66	108.7	0
	posthole:main roof support	LA 6170	pit structure 50	160	20.77	41.54	0	0	643.85	0
				173	30.57	305.66	0	61.13	4615.47	0
			pit structure 50 Total		25.67	173.6	0	30.57	2629.66	0
	posthole:main structure NW1/4	LA115862	pit structure 1	17	11.43	0	0	12.86	64.29	0
	posthole:main structure SW1/4	LA 115862	pit structure 1	16	42.26	281.74	3.13	42.26	1000.17	0
	posthole:sealed by floor	LA 6170	pit structure 5	39	0	17.42	0	17.42	191.61	0
AD 700-900 Total					12.61	166.83	0.35	50.5	1288.09	10.38

Table 24.19. Continued.

					NAP			
Age	Type	Site	Structure	Feature	Asteraceae l	Asteraceae l	*Artemisia*	*Ephedra*
AD 700-900	pit:posthole:remodeled	LA 6171	structure 18	19	249.23	218.08	124.62	124.6
	posthole	LA 6170	pit structure 5	14	31.15	218.08	249.23	0
	posthole:double	LA 6171	structure 18	31	11.82	0	0	0
			structure 26	31	46.55	18.62	0	0
		LA 6171 Total			29.19	9.31	0	0
	posthole:main roof support							
	LA 6170	pit structure 50		160	62.31	83.08	83.08	0
				173	0	366.79	0	0
			pit structure 50 Total		31.15	224.93	41.54	0
	posthole:main structure NW1/4	LA 115862	pit structure 1	17	0	0	0	12.86
	posthole:main structure SW1/4	LA 115862	pit structure 1	16	42.26	70.43	0	126.8
	posthole:sealed by floor	LA 6170	pit structure 5	39	0	0	69.68	0
AD 700-900 Total					49.26	108.34	58.51	29.36

Table 24.19. Continued.

Age	Type	Site	Structure	Feature	Economic: Onagraceae	Economic: Cactaceae	Economic: *Cylindropuntia*	Economic: *Sphaeralcea*
AD 700-900	pit:posthole:remodeled	LA 6171	structure 18	19	0	0	31.15	14.38
	posthole	LA 6170	pit structure 5	14	0	0	0	0
	posthole:double	LA 6171	structure 18	31	0	0	0	0
			structure 26	31	0	0	0	0
		LA 6171 Total			0	0	0	0
	posthole:main roof support	LA 6170	pit structure 50	160	0	0	2.97	0
				173	0	0	0	0
			pit structure 50 Total		0	0	1.48	0
	posthole:main structure NW1/4	LA 115862	pit structure 1	17	0	0	0	0
	posthole:main structure SW1/4	LA 115862	pit structure 1	16	0	28.2	14.09	3.13
	posthole:sealed by floor	LA 6170	pit structure 5	39	2.68	0	0	0
AD 700-900 Total					0.3	3.13	5.36	1.95

Table 24.19. Continued.

Age	Type	Site	Structure	Feature	Economic: *Zea mays*	Arboreal	NAP	Economic	Non-economic	Total
A.D. 700-900	pit:posthole:remodeled	LA 6171	structure 18	19	186.92	591.92	4967.84	232.46	5312.93	5545.38
	posthole	LA 6170	pit structure 5	14	0	155.77	2211.92	0	2523.46	2523.46
	posthole:double	LA 6171	structure 18	31	11.82	32.1	94.6	11.82	106.42	118.25
			structure 26	31	0	83.79	270	0	353.79	353.79
		LA 6171 Total			5.91	57.94	182.3	5.91	230.11	236.02
	posthole:main roof support	LA 6170	pit structure 50	160	41.54	62.31	958.35	44.51	1035.49	1080
				173	0	336.23	5043.4	0	5715.85	5715.85
			pit structure 50 Total		20.77	199.27	3000.8	22.25	3375.67	3397.9
	posthole:main structure NW1/4	LA 115862	pit structure 1	17	0	11.43	90	0	90	90
	posthole:main structure SW1/4	LA 115862	pit structure 1	16	6.26	327.13	1404	51.65	1666.96	1718.6
	posthole:sealed by floor	LA 6170	pit structure 5	39	0	17.42	333.65	2.68	363.13	365.81
A.D. 700-900 Total					27.39	179.79	1708.2	38.12	1907.56	1945.68

Table 24.20. Pivot Table 10, Mean Concentration Values, Selected Taxa, Ceremonial Features

					AP						
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	*Prosopis*
AD 700-900	sipapu	LA 6170	pit structure 50	182	57.86	276.43	0	0	0	0	0
unknown	(blank)	LA 249	extramural	0	738.95	3055.26	397.89	28.42	14.21	71.05	14.21
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	135	0	0	0	0	0
	niche:wall	LA 6169	pit structure 4	41	160.31	894.38	0	9.31	0	0	0
			pit structure 47:circular	163	7.3	0	0	0	0	0	0
	niche:wall Total				83.8	447.19	0	4.66	0	0	0
AD 700-900	vent shaft:bell-shaped	LA 265	pit structure 1	125	0	147.27	0	0	0	0	0

Table 24.20. Continued.

					NAP				
Age	Type	Site	Structure	Feature	*Poaceae*	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls
AD 700-900	sipapu	LA 6170	pit structure 50	182	19.29	231.43	0	32.14	32.14
Unknown	(blank)	LA 249	extramural	0	198.95	1364.21	0	582.63	554.21
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	837	27	135	27
	niche:wall	LA 6169	pit structure 4	41	25.31	4657.5	16.88	75.94	278.44
			pit structure 47:circular	163	0	87.57	0	0	0
	niche:wall Total				12.66	2372.53	8.44	37.97	139.22
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	29.45	2474.18	0	88.36	117.82

Table 24.20. Continued.

					NAP		Economic			
Age	Type	Site	Structure	Feature	*Artemisia*	*Ephedra*	Onagraceae	Fabaceae	Solanaceae	*Polygonum*
AD 700-900	sipapu	LA 6170	pit structure 50	182	0	6.43	0	0	2.97	0
Unknown	(blank)	LA 249	extramural	0	85.26	28.42	0	14.21	14.21	0
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	0	0	0	0	0
	niche:wall	LA 6169	pit structure 4	41	75.94	50.63	2.33	0	0	8.44
			pit structure 47:circular	163	0	0	21.89	0	0	0
	niche:wall Total				37.97	25.31	12.11	0	0	4.22
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	0	0	13.59	0	0	0

Table 24.20. Continued.

Age	Type	Site	Structure	Feature	Economic			
					Eriogonum	Brassica-ceae	Cacta-ceae	*Cylindro-puntia*
AD 700-900	sipapu	LA 6170	pit structure 50	182	0	0	0	6.43
Unknown	(blank)	LA 249	extramural	0	14.21	14.21	0	0
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	0	0	54
	niche:wall	LA 6169	pit structure 4	41	0	0	4.66	2.33
			pit structure 47:circular	163	0	0	0	21.89
	niche:wall Total				0	0	2.33	12.11
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	0	0	0	88.36

Table 24.20. Continued.

Age	Type	Site	Structure	Feature	Economic		
					Platyo-puntia	*Sphaer-alcea*	*Zea mays*
AD 700-900	sipapu	LA 6170	pit structure 50	182	0	0	38.57
Unknown	(blank)	LA 249	extramural	0	0	0	15.5
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	27	0	6.23
	niche:wall	LA 6169	pit structure 4	41	2.33	33.75	109.69
			pit structure 47:circular	163	0	0	0
	niche:wall Total				1.16	16.88	54.84
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	0	0	58.91

Table 24.20. Continued.

Age	Type	Site	Structure	Feature	Arboreal	NAP	Economic	Non-economic	Total
AD 700-900	sipapu	LA 6170	pit structure 50	182	334.29	369.4	47.97	652.75	700.71
Unknown	(blank)	LA 249	extramural	0	4334.21	3028.13	72.34	7288.71	7361.1
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	135	1194.23	87.23	1235.77	1323
	niche:wall	LA 6169	pit structure 4	41	1064	5403.2	163.51	6282.74	6446.3
			pit structure 47:circular	163	7.3	131.35	43.78	87.57	131.35
	niche:wall Total				535.65	2767.28	103.65	3185.15	3288.8
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	147.27	2929.59	160.87	2902.41	3063.3

Table 24.21. Pivot Table 11, Mean Concentration Values, Selected Taxa, Miscellaneous Features

					AP				NAP	
Age	Type	Site	Structure	Feature	*P. pond.*	*P. edulis*	*Salix*	*Prosopis*	Poaceae	Cheno-am
AD 700-900	Dump:ash/refuse	LA 6169	Pit structure 47: circular	152	0	150	0	0	0	930
Unknown	Cobble concentration assoc ash stain	LA 249	Extramural	3	67.5	315	22.5	0	22.5	675
AD 1100-1200	Activity area	LA 6170	Extramural	5B	53.11	132.79	0	5.69	26.56	2363.6

Table 24.20. Continued.

					NAP				
Age	Type	Site	Structure	Feature	*Poaceae*	Cheno-am	Cheno-am af.	Asteraceae hs.	Asteraceae ls
AD 700-900	sipapu	LA 6170	pit structure 50	182	19.29	231.43	0	32.14	32.14
Unknown	(blank)	LA 249	extramural	0	198.95	1364.21	0	582.63	554.21
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	837	27	135	27
	niche:wall	LA 6169	pit structure 4	41	25.31	4657.5	16.88	75.94	278.44
			pit structure 47:circular	163	0	87.57	0	0	0
	niche:wall Total				12.66	2372.53	8.44	37.97	139.22
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	29.45	2474.18	0	88.36	117.82

Table 24.20. Continued.

					NAP		Economic			
Age	Type	Site	Structure	Feature	*Artemisia*	*Ephedra*	Onagra-ceae	Faba-ceae	Solana-ceae	*Poly-gonum*
AD 700-900	sipapu	LA 6170	pit structure 50	182	0	6.43	0	0	2.97	0
Unknown	(blank)	LA 249	extramural	0	85.26	28.42	0	14.21	14.21	0
AD 700-900	niche:slab covered	LA 265	pit structure 13	207	0	0	0	0	0	0
	niche:wall	LA 6169	pit structure 4	41	75.94	50.63	2.33	0	0	8.44
			pit structure 47:circular	163	0	0	21.89	0	0	0
	niche:wall Total				37.97	25.31	12.11	0	0	4.22
AD 700-900	vent shaft:bell shaped	LA 265	pit structure 1	125	0	0	13.59	0	0	0

Table 24.21. Continued.

Age	Type	Site	Structure	Feature	Economic	
					Sphaeralcea	*Zea mays*
AD 700-900	dump:ash/refuse	LA 6169	pit structure 47: circular	152	0	0
Unknown	cobble conc assoc ash stain	LA 249	extramural	3	0	0
AD 1100-1200	activity area	LA 6170	extramural	5B	26.56	5.69

Table 24.21. Continued.

Age	Type	Site	Structure	Feature	Arboreal	NAP	Economic	Non-economic	Total
AD 700-900	Dump:ash/refuse	LA 6169	Pit structure 47: circular	152	180	1140	0	1320	1320
Unknown	Cobble concentration assoc ash stain	LA 249	Extramural	3	405	836.25	3.75	1233.75	1237.5
AD 1100-1200	Activity area	LA 6170	Extramural	5B	191.6	3203.96	123.3	3435.39	3558.69

Table 24.22. Pivot Table 12, Column Samples from LA 265, Selected Taxa

				AP						NAP		
Site	Type	Feature	Stratum	*P. pond.*	*P. edulis*	*Juniperus*	*Picea*	*Salix*	*Quercus*	Poaceae	Cheno-am	Cheno-am af.
LA 265	Column	0	1	42.49	376.76	1.37	1.02	10.35	4.11	5.48	360.85	0
			2.1	0	0	0	0	0	0	0	49.09	0
			2.2	0	60	0	0	0	0	30	360	0
			2.3	0	30.86	0	0	0	0	0	216	0
			2.4	27.09	218.08	0	0	0	0	0	467.31	0
			2.5	0	21.6	0	0	0	0	0	432	0
			3	0	94.06	0	0	10.45	0	31.35	167.23	0
			3.1	26.13	156.77	0	0	26.13	0	78.39	627.1	0
	Column Total			18.07	171.16	0.41	0.3	6.76	1.23	15.62	340.13	0
	Pit: lg: irregular	14	1	31.76	31.76	31.76	0	0	0	31.76	1143.53	0
			2	0	132.79	0	0	0	0	0	1115.41	0
			A	55.86	279.31	0	0	0	55.86	55.86	3910.34	0
			3	0	152.83	0	0	0	0	0	1100.38	0
			4	43.78	197.03	0	0	0	0	197.03	6742.7	0
			5	0	16.2	0	0	0	0	0	291.6	0
			6	48.36	48.36	0	0	0	0	24.18	967.16	24.18
			7	0	53.11	0	0	0	0	79.67	610.82	0
			8	0	44.38	0	0	0	0	66.58	599.18	0
		14 Total		19.97	106.2	3.53	0	0	6.21	50.56	1831.24	2.69

Table 24.22. Continued.

				NAP			Economic		
Site	Type	Feature	Stratum	Asteraceae hs	Asteraceae ls	*Artemisia*	Onagraceae	Cactaceae	*Cylindro-puntia*
	Column	0	1	46.12	61.95	4.11	1.02	18.47	4.88
			2.1	0	0	0	0	0	0
			2.2	30	30	30	0	210	30
			2.3	30.86	30.86	15.43	0	30.86	46.29
			2.4	0	62.31	0	0	62.31	62.31
			2.5	64.8	64.8	0	0	64.8	21.6
			3	0	52.26	0	1.61	10.45	0
			3.1	0	78.39	0	0	0	0
	Column Total			26.4	50.44	5.78	0.47	43.38	17.48
	Pit: lg: irregular	14	1	0	95.29	0	0	63.53	0
			2	79.67	0	0	0	79.67	0
			A	0	279.31	0	0	0	0
			3	152.83	91.7	0	0	0	0
			4	87.57	853.78	262.7	0	43.78	43.78
			5	48.6	48.6	0	0	32.4	16.2
			6	48.36	120.9	0	0	120.9	96.72
			7	0	53.11	0	0	0	53.11
			8	133.15	488.22	0	0	22.19	0
		14 Total		61.13	225.66	29.19	0	40.27	23.31

Table 24.22. Continued.

				Economic						
Site	Type	Feature	Stratum	*Sphaeralcea*	*Zea mays*	Total	Arboreal	NAP	Economic	Non-economic
LA 265	Column	0	1	7.61	38.47	1019.96	436.09	619.79	70.44	949.52
			2.1	0	0	49.09	0	49.09	0	49.09
			2.2	0	300	1110	60	1050	540	570
			2.3	0	15.43	432	30.86	401.14	92.57	339.43
			2.4	0	218.08	1121.54	245.17	903.46	342.69	778.85
			2.5	0	108	777.6	21.6	756	194.4	583.2
			3	0	0	407.61	104.52	304.7	12.06	395.55
			3.1	0	0	1045.16	209.03	836.13	0	1045.16
	Column Total			2.28	75.69	800.29	197.94	615.99	139.3	660.98
	Pit: lg: irregular	14	1	0	0	1429.41	95.29	1334.12	63.53	1365.88
			2	0	26.56	1487.21	132.79	1354.43	106.23	1380.98
			A	0	279.31	5139.31	391.03	4748.28	279.31	4860
			3	0	0	1558.87	152.83	1406.4	0	1558.87
			4	0	853.78	9676.22	240.81	9435.41	941.35	8734.86
			5	0	16.2	469.8	16.2	453.6	64.8	405
			6	0	24.18	1595.82	96.72	1499.1	241.79	1354.03
			7	0	53.11	929.51	53.11	876.39	106.23	823.28
			8	0	0	1375.89	44.38	1331.51	22.19	1353.7
		14 Total		0	139.24	2629.12	135.91	2493.21	202.83	2426.29

Table 24.23. Pivot Table 13, Site, Age, Structure and Feature Type by Economic Pollen

Site	Age	Structure	Type	Feature	Onagraceae	Fabaceae	Solanaceae	*Polygonum*	*Eriogonum*
LA 115862	AD 700-900	Extramural	pit:roasting	9	0	0	0	0	0
				11	0	0	0	0	0
		Pit structure 1	pit:ash	20	0	0	0	0	0
		NW	posthole:main structure	17	0	0	0	0	0
		SW	posthole:main structure	16	0	0	0	0	0
LA 249	AD 1100-1200	Pit structure 6	floor	6	0	0	0	0	0
	Unknown	Extramural	cobble concentration assoc ash stain	3	0	0	0	0	0
			(blank)	0	0	14.21	14.21	0	14.21
LA 265	AD 700-900	Extramural	burial:turkey	19 in 15	0	0	0	0	0
			pit:bell shaped	229	0	0	0	0	0
			pit:cist:wall of F 56	156	0	0	0	0	0
			pit:lg:irregular	14	0	0	0	0	0
				15	0	0	0	0	0
			pit:oval:lg	17	0	0	0	0	0
		Extramural:SU	pit:bell shaped:in Feat 27	41	0	0	0	0	8.73
			pit:bell shaped:storage	127	0	0	0	0	0
			pit:bell shaped:storage w/ adult burial	24	0	0	0	0	0
			pit:bell shaped:storage	26	0	0	0	0	0
			w/ dog burial	60	0	0	6.43	0	0
			pit:bell shaped:storage w/ infant burial	23	0	0	0	0	0
			pit:keyhole	27	0	0	0	0	0
			pit:bell shaped:small	191	0	0	0	0	0
			pit: linear: floor: foot drum(?)	107	0	0	0	0	0
			vent shaft:bell shaped	125	13.59	0	0	0	0
		Pit structure 13	niche:slab covered	207	0	0	0	0	0
			pit:bell shaped	141	0	0	0	0	0
		Pit structure 4	floor	0	0	0	0	0	0
			pit:floor:sealed	76	8.54	0	0	0	0

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	Onagraceae	Fabaceae	Solanaceae	*Polygonum*	*Eriogonum*
LA 6169	AD 700-900	Pit structure 4	floor	4	0	0	0	6.21	24.83
			niche:wall	41	2.33	0	0	8.44	0
		Pit structure 47	bin:storage	121	0	0	0	0	0
		Circular	dump:ash/refuse	152	0	0	0	0	0
			floor:contact	47	0	0	0	0	0
			niche:wall	163	21.89	0	0	0	0
	AD 1100-1200	Pit structure 76	floor	76 in 47	0	0	0	0	0
	AD 1100-1325	Extramural	pit:storage	126	0	0	0	0	0
	AD 1200-1325	Pit room 10	floor:contact	10	0	0	0	0	0
		Pit room 15	pit room	15	0	0	0	0	0
		Pit room 16	basin:mealing	102	0	0	0	0	0
				103	0	0	0	0	17.8
				104	3.02	0	0	0	0
			floor	16	0	0	0	0	0
		Pit room 70	floor	70	0	0	0	0	0
LA 6170	AD 700-900	extramural	pit:rodent damage	92	0	0	0	0	0
			pit:storage:bell shaped subfloor	69	3.68	0	0	0	7.36
		Pit structure 2	floor	2	0	0	0	0	3.25
		Pit structure 5	floor	ps 5	0	0	0	0	0
			posthole	14	0	0	0	0	0
			posthole:sealed by floor	39	2.68	0	0	0	0
		Pit structure 50	floor	50	0	0	0	0	0
			pit:storage:opening plastered over	156	0	0	0	0	0
				166	0	0	0	0	0
				171	0	0	0	3.15	0
				183	2.2	0	74.31	0	0
				184	0	0	0	26.27	0
			posthole:main roof support	160	0	0	0	0	0
				173	0	0	0	0	0
			sipapu	182	0	0	2.97	0	0

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	Onagraceae	Fabaceae	Solanaceae	*Polygonum*	*Eriogonum*
	AD 1100-1200	extramural	activity area	5B	0	0	0	5.69	26.6
		Structure 5A	bin:mealing:adobe lined	6	0	0	0	0	21.6
			floor	5A	0	3.46	0	0	0
LA 6171	AD 500-650	extramural	subcist:in bell shaped:burn	93 in 92	0	0	0	0	0
	AD 700-900	extramural	pit:bell shaped:roasting:3	56	0	0	0	0	0
			pit:small	47	0	0	0	0	0
			pit:subfloor	59 in 56	0	0	0	0	0
			pit:subfloor:cist	104 in 83	0	0	0	0	0
			pit:unburned:steep	53	0	0	0	0	0
		Pit structure 60	floor	60	0	0	0	0	0
			floor:under metate	60	0	0	0	2.84	2.84
			floor:under pallet	60	0	0	0	0	0
			pit	63	0	0	0	0	0
		Structure 18	floor	18	0	0	0	0	0
			pit:posthole:remodeled	19	0	0	0	0	0
			pit:storage	24	1.41	0	39.51	0	0
				25	0	0	0	0	0
			posthole:double	31	0	0	0	0	0
		Structure 2	floor	26	0	0	0	0	0
		Structure 26	posthole:double	31	0	0	0	0	0
		Structure 9	floor	9	0	0	0	0	0
	AD 700-1200	extramural	burial:human	85	0	0	0	0	0

Table 24.23. Continued

Site	Age	Structure	Type	Feature	Brassic-aceae	Cactaceae	*Cylindro-puntia*	*Platyo-puntia*
LA 115862	AD 700-900	Extramural	pit:roasting	9	0	0	0	0
				11	0	0	0	0
		Pit structure 1	pit:ash	20	0	0	0	0
		NW	posthole:main structure	17	0	0	0	0
		SW	posthole:main structure	16	0	28.17	14.09	0
LA 249	AD 1100-1200	Pit structure 6	floor	6	0	12.69	8.14	0
	Unknown	Extramural	cobble conc assoc ash stain	3	0	3.75	0	0
			(blank)	0	14.21	0	0	0
LA 265	AD 700-900	Extramural	burial:turkey	19 in 15	0	12.41	83.79	0
			pit:bell shaped	229	0	0	0	0
			pit:cist:wall of f56	156	0	0	5.6	0
			pit:lg:irregular	14	0	40.27	23.31	0
				15	0	117.82	0	0
			pit:oval:lg	17	0	0	0	0
		Extramural:SU	pit:bell shaped:in feat 27	41	0	4.37	43.67	0
			pit:bell shaped:storage	127	0	129.6	486	0
			pit:bell shaped:storage w/ adult burial	24	0	0	50.63	0
			pit:bell shaped:storage w/ dog burial	26	0	24.18	145.07	0
				60	0	45	488.57	6.43
			pit:bell shaped:storage w/ infant burial	23	0	28.93	57.86	0
			pit:keyhole	27	0	31.15	155.77	0
				33	0	31.76	63.53	0
			pit:bell shaped:small	191	0	11.16	0	0
			pit:linear:floor:?foot drum	107	0	0	17.61	0
			vent shaft:bell shaped	125	0	0	88.36	0
		Pit structure 13	niche:slab covered	207	0	0	54	27
			pit:bell shaped	141	0	0	47.18	0
		Pit structure 4	floor	0	0	20	60	0
			pit:floor:sealed	76	0	0	17.08	0

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	Brassic-aceae	Cacta-ceae	*Cylindro-puntia*	*Platy-opuntia*
LA 6169	AD 700-900	Pit structure 4	floor	4	0	6.21	37.24	0
			niche:wall	41	0	4.66	2.33	2.33
		Pit structure 47	bin:storage	121	0	21.6	4.8	0
		circular	dump:ash/refuse	152	0	0	0	0
			floor:contact	47	0	0	0	0
			niche:wall	163	0	0	21.89	0
	AD 1100-1200	Pit structure 76	floor	76 in 47	0	270	60	0
	AD 1100-1325	extramural	pit:storage	126	0	0	0	0
	AD 1200-1325	Pit room 10	floor:contact	10	0	10.84	0	0
		Pit room 15	pit room	15	0	0	0	0
		Pit room 16	basin:mealing	102	0	5.12	22.19	0
				103	0	8.55	0	0
				104	0	6.04	3.02	0
			floor	16	0	0	0	0
		Pit room 70	floor	70	0	0	0	0
LA 6170	AD 700-900	extramural	pit:rodent damage	92	0	0	41.01	0
			pit:storage:bell shaped subfloor	69	0	0	18.41	0
		Pit structure 2	floor	2	0	8.27	45.82	0
		Pit structure 5	floor	p s 5	0	10.85	12.66	0
			posthole	14	0	0	0	0
			posthole:sealed by floor	39	0	0	0	0
		Pit structure 50	floor	50	0	0	26.13	0
			pit:storage:opening plastered over	156	0	3.45	0	0
				166	0	0	1.92	0
				171	0	0	6.3	0
				183	0	0	0	0
				184	0	0	2.69	0
			posthole:main roof support	160	0	0	2.97	0
				173	0	0	0	0
			sipapu	182	0	0	6.43	0

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	Brassic-aceae	Cactaceae	*Cylindo-puntia*	*Platyo-puntia*
	AD 1100-1200	extramural	activity area	5B	0	5.69	53.11	0
		Structure 5A	bin:mealing:adobe lined	6	0	9.26	9.26	0
			floor	5A	0	3.46	8.71	0
LA 6171	AD 500-650	extramural	subcist:in bell shaped:burn	93 in 92	0	0	0	0
	AD 700-900	extramural	pit:bell shaped:roasting:3	56	0	0	0	0
			pit:small	47	0	22.5	0	0
			pit:subfloor	59 in 56	26.56	0	0	0
			pit:subfloor:cyst	104 in 83	0	0	0	0
			pit:unburned:steep	53	0	0	0	0
		Pit structure 60	floor	60	0	25.71	0	0
			floor:under metate	60	28.42	0	0	0
			floor:under pallet	60	0	0	0	0
			pit:	63	0	0	0	0
		Structure 18	floor	18	0	0	0	0
			pit:posthole:remodeled	19	0	0	31.15	0
			pit:storage	24	0	9.88	0	0
				25	0	0	0	0
			posthole:double	31	0	0	0	0
		Structure 2	floor	26	0	0	0	0
		Structure 26	posthole:double	31	0	0	0	0
		Structure 9	floor	9	0	0	0	0
	AD 700-1200	extramural	burial:human	85	0	0	0	0

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	*Sphaeral-cea*	*Zea mays*	Total	Arboreal	NAP	Economic
LA 115862	AD 700-900	Extramural	pit:roasting	9	0.00	0.00	730.59	0.00	730.59	0.00
				11	0.00	0.00	508.24	95.29	317.65	0.00
		Pit structure 1	pit:ash	20	0.00	0.00	752.14	28.93	694.29	0.00
		NW	posthole:main structure	17	0.00	0.00	90.00	11.43	90.00	0.00
		SW	posthole:main structure	16	3.13	6.26	1718.61	327.13	1404.00	51.65
LA 249	AD 1100-1200	Pit structure 6	floor	6	0.00	0.98	1274.78	356.93	920.21	21.81
	Unknown	Extramural	cobble conc assoc ash stain	3	0.00	0.00	1237.50	405.00	836.25	3.75
			(blank)	0	0.00	15.50	7361.05	4334.21	3028.13	72.34
LA 265	AD 700-900	Extramural	burial:turkey	19 in 15	24.83	55.86	5139.31	363.10	4813.45	176.90
			pit:bell shaped	229	0.00	0.00	3761.69	274.58	3212.54	0.00
			pit:cist:wall of f56	156	0.00	0.00	914.52	26.13	893.99	5.60
			pit:lg:irregular	14	0.00	139.24	2629.12	135.91	2493.21	202.83
				15	0.00	11.33	3063.27	58.91	3015.69	129.15
			pit:oval:lg	17	0.00	18.00	1134.00	108.00	1026.00	18.00
		Extramural:SU	pit:bell shaped:in feat 27	41	17.47	43.67	2226.95	654.99	1571.97	117.90
			pit:bell shaped:storage	127	0.00	259.20	4730.40	712.80	3304.80	874.80
			pit:bell shaped:storage w/ adult burial	24	0.00	50.63	1063.13	50.63	1012.50	101.25
			pit:bell shaped:storage w/ dog burial	26	0.00	22.32	1837.61	217.61	1642.32	191.57
				60	25.71	630.00	3143.57	289.29	2610.00	1202.14
			pit:bell shaped:storage w/ infant burial	23	0.00	0.00	4368.21	578.57	3789.64	86.79
			pit:keyhole	27	0.00	0.00	1339.62	62.31	1277.31	186.92
				33	0.00	13.61	1683.53	190.59	1506.55	108.91
			pit:bell shaped:small	191	0.00	0.00	1789.25	193.43	1606.98	11.16
			pit:linear:floor:?foot drum	107	0.00	0.00	369.78	17.61	352.17	17.61
			vent shaft:bell shaped	125	0.00	58.91	3063.27	147.27	2929.59	160.87
		Pit structure 13	niche:slab covered	207	0.00	6.23	1323.00	135.00	1194.23	87.23
			pit:bell shaped	141	0.00	15.73	393.20	15.73	377.48	62.91
		Pit structure 4	floor	0	0.00	30.00	1170.00	0.00	1190.00	110.00
			pit:floor:sealed	76	0.00	12.81	1374.55	220.91	1192.06	38.42

Table 24.23. Continued.

Site	Age	Structure	Type	Feature	*Sphaeralcea*	*Zea mays*	Total	Arboreal	NAP	Economic
	AD 1100-1200	extramural	activity area	5B	26.56	5.69	3558.69	191.59	3203.96	123.3
		Structure 5A	bin:mealing:adobe lined	6	4.63	9.26	1965.6	302.4	1393.2	54
			floor	5A	3.46	12.17	2674.88	357.1	2230.68	31.27
LA 6171	AD 500-650	extramural	subcist: in bell shaped:burn	93 in 92	0	0	3860.43	241.28	3619.15	0
	AD 700-900	extramural	pit: bell shaped:roasting:3	56	0	0	1350	120	1230	0
			pit:small	47	0	0	2677.5	225	2452.5	22.5
			pit:subfloor	59 in 56	0	0	13889.51	823.28	13066.23	26.56
			pit:subfloor:cist	104 in 83	0	0	297	27	270	0
			pit:unburned:steep	53	0	0	711.68	149.83	561.85	0
		Pit structure 60	floor	60	0	23.74	3677.14	462.86	3238.02	49.45
			floor:under metate	60	0	0	2053.42	241.58	1817.53	34.11
			floor:under pallet	60	0	13.85	664.62	138.46	526.15	13.85
			pit:	63	25.71	51.43	1671.43	154.29	1517.14	77.14
		Structure 18	floor	18	0	0	211.76	0	211.76	0
			pit:posthole:remodeled	19	14.38	186.92	5545.38	591.92	4967.84	232.46
			pit:storage	24	1.41	88.9	572.93	79.02	498.14	141.11
				25	0	1.74	645.56	170.53	476.78	1.74
			posthole:double	31	0	11.82	118.25	32.1	94.6	11.82
		Structure 2	floor	26	0	0	767.37	142.11	625.26	0
		Structure 26	posthole:double	31	0	0	353.79	83.79	270	0
		Structure 9	floor	9	0	15.28	668.41	123.14	545.28	15.28
	AD 700-1200	extramural	burial:human	85	0	0	730.59	43.98	701.27	0

Table 24.23. Continued

Site	Age	Structure	Type	Feature	*Sphaer-alcea*	*Zea mays*	Total	Arboreal	NAP	Economic
LA 6169	AD 700-900	Pit structure 4	floor	4	12.41	12.41	3165.5	757.24	2408.28	99.31
			niche:wall	41	33.75	109.69	6446.3	1064	5403.2	163.51
		Pit structure 47	bin:storage	121	0	21.6	1490.4	324	1171.2	48
		circular	dump:ash/refuse	152	0	0	1320	180	1140	0
			floor:contact	47	0	30	1290	60	1230	30
			niche:wall	163	0	0	131.35	7.3	131.35	43.78
	AD 1100-1200	Pit structure 76	floor	76 in 47	0	60	5100	1230	3870	390
	AD 1100-1325	extramural	pit:storage	126	0	2.71	1021.3	211.3	812.71	2.71
	AD 1200-1325	Pit room 10	floor:contact	10	0	27.09	986.09	117.39	906.62	37.93
		Pit room 15	pit room	15	0	0	1914.6	171.82	1742.73	0
		Pit room 16	basin:mealing	102	0	22.19	1841.9	443.84	1403.2	49.5
				103	0	53.41	1317.4	373.85	952.06	79.75
				104	0	30.22	1577.7	670.97	906.72	42.31
			floor	16	0	2.17	1281.9	281.74	1002.34	2.17
		Pit room 70	floor	70	0	3.34	130.18	108.48	25.03	3.34
LA 6170	AD 700-900	extramural	pit:rodent damage	92	0	41.01	758.73	61.52	697.22	82.03
			pit:storage:bell shaped subfloor	69	3.68	73.64	1863	795.27	1067.73	106.77
		Pit structure 2	floor	2	0	30.66	2703.9	585.71	2118.22	88
		Pit structure 5	floor	p s 5	0	35.82	2894.1	538.76	1879.09	59.32
			posthole	14	0	0	2523.5	155.77	2211.92	0
			posthole:sealed by floor	39	0	0	365.81	17.42	333.65	2.68
		Pit structure 50	floor	50	0	39.19	343.16	26.13	290.9	65.32
			pit:storage:opening plastered over	156	0	0	217.61	24.18	172.71	3.45
				166	0	24.92	311.54	149.54	163.92	26.84
				171	0	3.15	1616.9	384.51	1235.49	12.61
				183	0	0	847.16	29.72	819.63	76.51
				184	0	17.51	446.59	26.27	423.02	46.48
			posthole:main roof support	160	0	41.54	1080	62.31	958.35	44.51
				173	0	0	5715.9	336.23	5043.4	0
			sipapu	182	0	38.57	700.71	334.29	369.4	47.97

Table 24.24. Pivot Table 14, Burial Type by Selected Mean Pollen Concentration Values, Peña Blanca Project, Sandoval County, New Mexico

Burial	Site	Feature	*Pinus ponderosa*	*Pinus edulis*	*Picea*	*Abies*	*Juniperus*	Poaceae	Cheno-am	Economic	Non-economic	Cactaceae	*Cylindropuntia*
Adult	LA 265	24	0	5.51	0	0	0	0	24.79	0	33.05	0	0
Child	LA 115862	6	0	0.48	0	0	0	0	2.86	0.48	6.19	0	0
	LA 6169	49	29.86	61.13	0.2	0.11	0.23	1.57	81.44	1.73	192.1	0.34	0.11
Child Total			19.91	40.91	0.13	0.07	0.15	1.05	55.25	1.31	130.13	0.23	0.07
Female	LA 6169	2	0.29	7.54	0.67	0	0	0	0.78	0.68	14.51	0	0
Male	LA 6169	81	2.17	12.49	0	0	0	1.9	17.11	1.43	42.83	0	0
Unknown	LA 115862	7	0.3	4.4	0.24	0	0	1.1	6.59	2.71	23.84	0.2	0
	LA 265	22	1.09	6.87	0	0	0	0.98	25.41	9.6	50.72	0.87	5.56
		24	0	0	0	0	0	0	6.65	1.73	11.58	0.42	0.42
		244	0	0.16	0	0	0	0.02	1.01	0.03	2.05	0.02	0.005
	LA 265 Total		0.27	1.8	0	0	0	0.25	8.52	2.85	16.6	0.33	0.15
Unknown Total			0.29	3.1	0.12	0	0	0.68	7.55	2.78	20.22	0.27	0.75

Table 24.24. Continued.

Burial	Site	Feature	*Platy-opuntia*	*Sphaeralcea*	Cucurbitaceae	*Zea mays*	Solanaceae	Rosaceae	*Polygonum*	*Eriogonum*
Adult	LA 265	24	0	0	0	0	0	0	0	0
Child	LA 115862	6	0	0	0	0.48	0	0	0	0
	LA 6169	49	0	0	0	0.91	0	0.231	0.145	0
Child total		0	0	0	0.77	0	0.154	0.097	0	0
	LA 6169	2	0	0	0	0.13	0	0.558	0	0
	LA 6169	81	0.27	0.27	0	0.81	0	0	0	0.072
	LA 115862	7	0	0.46	0	1.55	0	0	0	0.105
	LA 265	22	0.22	0	0.21	2.61	0	0	0	0.109
		24	0	0	0	0.06	0.83	0	0	0
		244	0	0	0	0.006	0	0	0	0
	LA 265 total		0.05	0	0.05	0.67	0.2	0	0	0.027
Unknown total			0.03	0.23	0.03	1.11	0.1	0	0	0.066

Table 24.25. Pivot Table 15: Vessel Type by Mean Pollen Concentration Values, Selected Economic Taxa

Vessel Type	Age	Site	Feature	*Zea mays*	Cucurbitaceae	*Sphaeralcea*	Cactaceae	*Cylindropuntia*	*Platyopuntia*
Bowl	AD 1100-1200	LA 6169	81	0.81	0	0.27	0	0	0.27
	AD 700-900	LA 115862	7	1.03	0	0	0.32	0	0
		LA 6169	2	0.5	0	0	0	0	0
	AD 700-900 Total			0.77	0	0	0.16	0	0
Bowl total				0.78	0	0.09	0.11	0	0.09
Jar	AD 700-900	LA 115862	7	2.6	0	0	0.24	0	0
		LA 265	244	0.01	0	0	0.04	0	0
		LA 6169	2	0	0	0	0	0	0
			49	1.39	0	0	0.46	0	0
		LA 6169 Total		0.69	0	0	0.23	0	0
	AD 700-900 Total			1.32	0	0	0.2	0	0
Mug	AD 700-900	LA 265	244	0	0	0	0	0.01	0
	AD 700-900	LA 265	22	2.62	0.22	0	0.87	5.56	0.22
		LA 6169	2	0	0	0	0	0	0
	AD 700-900 Total			1.31	0.11	0	0.44	2.78	0.11
Pot	AD 700-900	LA 265	24	0	0	0	0	0	0
	AD 700-900	LA 115862	6	0.48	0	0	0	0	0
			7	0	0	1.82	0	0	0
		LA 115862 Total		0.24	0	0.91	0	0	0
		LA 265	24	0.06	0	0	0.42	0.42	0
	AD 700-900 Total			0.18	0	0.61	0.14	0.14	0
Sherds	AD 700-900	LA 6169	49	0.43	0	0	0.22	0.22	0
Utility	AD 700-900	LA 6169	2	0	0	0	0	0	0

Table 24.25. Continued.

Vessel Type	Age	Site	Feature	*Artemisia*	Solanaceae	Rosaceae	*Polygonum*	*Eriogonum*
Bowl	AD 1100-1200	LA 6169	81	1.9	0	0	0	0.07
	AD 700-900	LA 115862	7	0	0	0	0	0
		LA 6169	2	0	0	0	0	0
	AD 700-900 Total			0	0	0	0	0
Bowl total				0.63	0	0	0	0.02
Jar	AD 700-900	LA 115862	7	0	0	0	0	0.21
		LA 265	244	0	0	0	0	0
		LA 6169	2	0	0	0	0	0
			49	5.08	0	0.46	0.07	0
		LA 6169 Total		2.54	0	0.23	0.04	0
	AD 700-900 Total			1.02	0	0.09	0.01	0.08
Mug	AD 700-900	LA 265	244	0	0	0	0	0
	AD 700-900	LA 265	22	1.75	0	0	0	0.11
		LA 6169	2	0	0	2.23	0	0
	AD 700-900 Total			0.87	0	1.12	0	0.05
Pot	AD 700-900	LA 265	24	0	0	0	0	0
Seed	AD 700-900	LA 115862	6	0	0	0	0	0
			7	0	0	0	0	0
		LA 115862 Total	0	0	0	0	0	0
		LA 265	24	1.66	0.83	0	0	0
	AD 700-900 Total			0.55	0.28	0	0	0
Sherds	AD 700-900	LA 6169	49	2.38	0	0	0.22	0
Utility	AD 700-900	LA 6169	2	0	0	0	0	0

Table 24.26. Pivot Table 16: Age by Mean Pollen Concentration Values, Selected Economic Taxa

Age	Period	Site	Feature	*Zea mays*	Cucurbitaceae	*Sphaeralcea*	Cactaceae	*Cylindro-puntia*
AD 1100-1200	Late Rio Grande Developmental	LA 6169	81	0.81	0	0.27	0	0
AD 700-900	Early Rio Grande Developmental	LA 115862	6	0.48	0	0	0	0
			7	1.55	0	0.46	0.2	0
		LA 115862 Total		1.34	0	0.36	0.16	0
		LA 265	22	2.62	0.22	0	0.87	5.56
			24	0.03	0	0	0.21	0.21
			244	0.01	0	0	0.02	0.01
		LA 265 Total		0.54	0.04	0	0.27	1.2
		LA 6169	2	0.13	0	0	0	0
			49	0.91	0	0	0.34	0.11
		LA 6169 Total		0.39	0	0	0.11	0.04
	Early Rio Grande Developmental Total			0.73	0.01	0.11	0.18	0.39

Table 24.26. Continued.

Age	Period	Site	Feature	*Platyo-puntia*	*Artemisia*	Solanaceae	Rosaceae	*Poly-gonum*	*Eriogo-num*
AD 1100-1200	Late Rio Grande Developmental	LA 6169	81	0.27	1.9	0	0	0	0.07
AD 700-900	Early Rio Grande Developmental	LA 115862	6	0	0	0	0	0	0
			7	0	0	0	0	0	0.1
		LA 115862 Total		0	0	0	0	0	0.08
		LA 265	22	0.22	1.75	0	0	0	0.11
			24	0	0.83	0.42	0	0	0
			244	0	0	0	0	0	0
		LA 265 Total		0.04	0.68	0.17	0	0	0.02
		LA 6169	2	0	0	0	0.56	0	0
			49	0	3.73	0	0.23	0.15	0
		LA 6169 Total		0	1.24	0	0.45	0.05	0
	Early Rio Grande Developmental Total			0.01	0.68	0.05	0.17	0.02	0.03

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