DESCRIPTION

The approximately 4.9-hectare (ha) [12-acre (ac)] Arroyo Hondo Pueblo (LA 12) is a large, well-preserved prehistoric adobe (with some masonry) pueblo located approximately five miles southeast of the City of Santa Fe above the Arroyo Hondo gorge in the northern Rio Grande Valley of north-central New Mexico (refer to Figure 1). The site has been the focus of extensive excavations and analyses, conceived of and undertaken by Douglas Schwartz, then President of the School of American Research (SAR), beginning in 1970.

The settlement saw two distinct periods of occupation, referred to as Components I and II. Component I extended from A.D. 1300 to about 1345 and Component II dates between A.D. 1370 and 1410 or slightly thereafter (refer to Figure 3). The Component I site grew rapidly from a few rooms to approximately 1,200 rooms arranged in 24 terraced one- and two-story roomblocks that enclosed or partially enclosed 13 rectilinear plazas, making it one of the largest sites in the northern Rio Grande region at the time. After a nearly 30-year hiatus, during which time the site may have still seen partial or seasonal occupation, the site was re-occupied by a much smaller group. During this second occupation (Component II), the site was rebuilt with about 200 single-story rooms around three plazas directly over the remains of the earlier, more extensive occupation.

Arroyo Hondo Pueblo was at the forefront of a trend in the northern Rio Grande region toward the aggregation of large numbers of people at single, rapidly constructed settlements, and may have helped stimulate a settlement pattern that characterized the region up until historical times (Creamer 1993). The site was one of, if not the, largest community in the region during the critical transition between the late Coalition and early Classic periods (Wendorf and Reed 1955). This transition was marked by dramatic increases in population size and changes in settlement structure, local and regional social organization, ceremonialism, craft specialization, and economic integration (Cordell 1989, Habicht-Mauche 1986, Wendorf and Reed 1955).

Research at Arroyo Hondo Pueblo has already contributed significant information regarding the area's prehistoric environment, chronology, architecture, settlement organization, regional interaction and social organization, local and regional ceramic production and exchange, subsistence and demography, and the process of population growth and site aggregation in the early 14th century.

Despite previous excavations and limited disturbances at Arroyo Hondo Pueblo, more than two-thirds of the site's total rooms remain intact and in a likely excellent state of preservation. Additionally, the rooms that were completely exposed were subsequently backfilled and still contain valuable information regarding construction technique and architectural style preserved in walls and wall

intersections. Future research at the site can provide substantial additional information relating to a number of important research questions including demography, chronology, regional organization and integration, changing subsistence strategies, local and regional ceramic production and exchange, and site aggregation and abandonment.

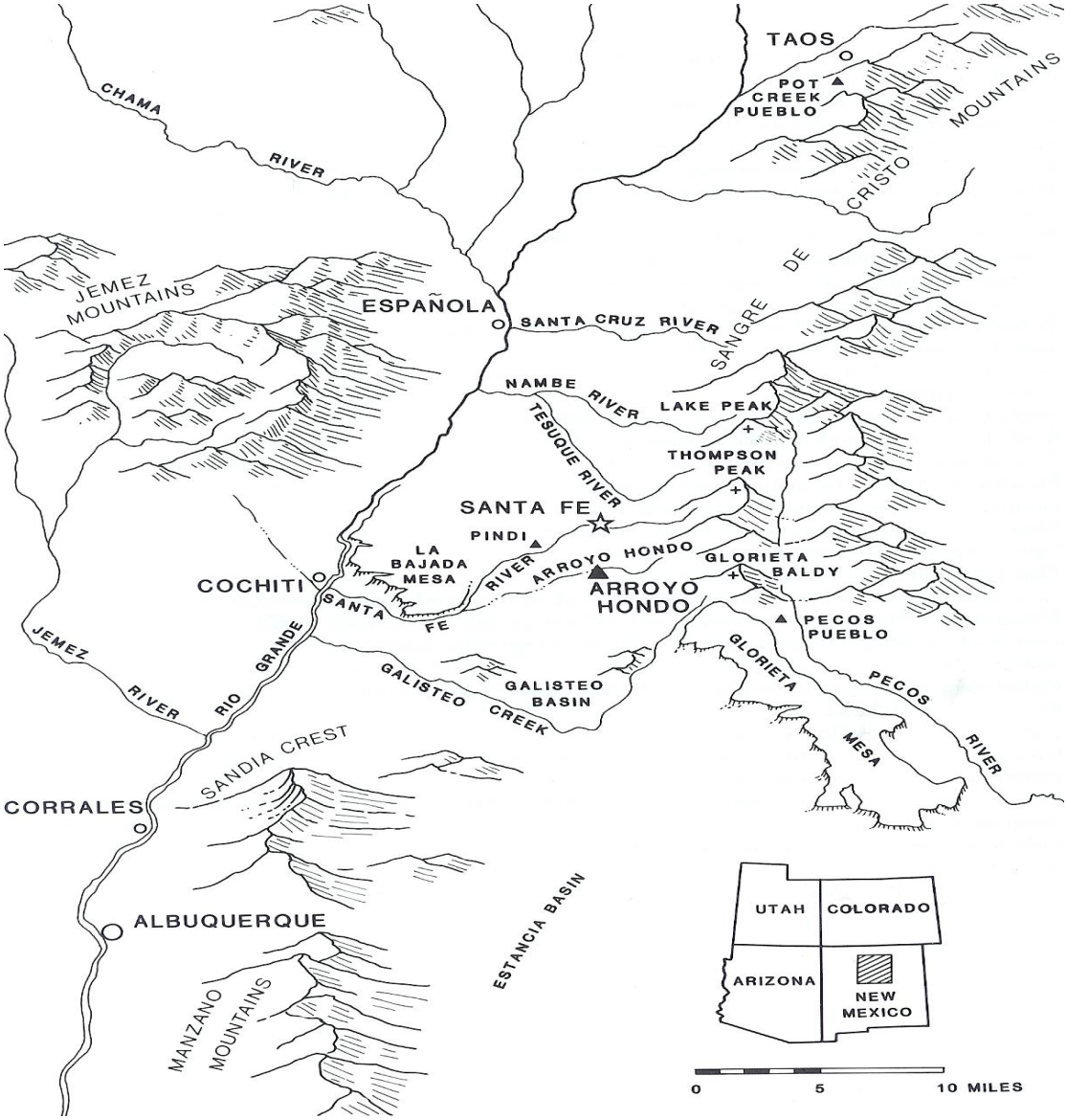

Figure 1. Location of Arroyo Hondo Pueblo in the northern Rio Grande Region.

Physical and Environmental Setting

Arroyo Hondo Pueblo is perched on the edge of the 38-m (125-ft) deep Arroyo Hondo gorge at the foot of the Sangre de Cristo Mountains approximately five miles southeast of the City of Santa Fe in the northern Rio Grande Valley of north-central New Mexico (refer to Figures 1 and 2). The area is on the eastern edge of the Rio Grande trough. To the northeast, the Sangre de Cristo Mountains rise to an altitude of more than 3,962 m (13,000 ft). Approximately 30 miles to the east, the Great Plains province abuts the eastern prong of the Rocky Mountain province and the northeastern edge of the Basin and Range province (Thornbury 1965). West of the low foothills of the Sangre de Cristos, an alluvial plain or piedmont is inclined toward the Rio Grande.

Kelley's 1980 study of the contemporary ecology of Arroyo Hondo Pueblo included a 65-square-km (25-square-mile) study area centered on the pueblo itself. The following discussion regarding the pueblo's physical and environmental setting is primarily based on Kelley's 1980 study. Elevation within the study area ranges from 2,027 m (6,650 ft) on the alluvial plain of the western half (referred to by Kelley as the Piedmont section), to 2,500 m (8,200 ft) in the foothills of the eastern half where a series of north to northwest trending ridges are separated by fault-formed valleys (referred to by Kelley as the Foothills section) (Kelley 1980). Arroyo Hondo Pueblo is at an elevation of 2,161 m (7,090 ft) on a west-facing piedmont area overlooking a group of perennial springs (refer to Figure 2).

Kelley's physiographic divisions of the study area into the Piedmont and the Foothills sections also represent its two main geologic areas. The Foothills section consists of mountain peaks and foothills of Precambrian rock, while the Piedmont section consists of alluvium underlain by Tertiary volcanics, Cenozoic sediments, and Precambrian basement rock. The Precambrian rocks of the Foothills section include pink and gray granite, gneiss, schist, pegmatite and aplite dikes, and amphibolite. The Piedmont section of the study area has a more complex stratigraphic sequence, with Precambrian rock likely underlying the entire area. Rock units visible along the walls of Arroyo Hondo Canyon west of the Precambrian foothills include the Galisteo, Tesuque, and Ancha formations, andesitic lava flow, and alluvia (aeolian deposits, slope wash, and stream and terrace deposits) (Kelley 1980).

The four faults in the study area include the Chamisos, Piedras Negras, Arroyo Hondo, and Seton Village faults. The Arroyo Hondo is a thrust fault, while the other three are the more characteristic normal faults of the area. Associated with the Arroyo Hondo fault is a series of springs that produce the only perennial stream in the area. Within the canyon early inhabitants would have found several large springs that still flow today, as well as an extensive tract of arable land (Kelley 1980).

Figure 2. Overview of Arroyo Hondo Pueblo after excavation showing surrounding environment, facing north, 1974 (SAR).

The Ancha Formation covers the structural features in the western half or Piedmont section of the study area. Together with the Tesuque Formation of the Santa Fe Group, Kelley describes these as the two most significant rock units in the study area because their relative thickness and thinness largely determine the amount and depth of groundwater (Kelley 1980:20).

Basal geology and hydrological conditions determine the distribution of soil types. Kelley identifies six major soil formations for the Arroyo Hondo study area: Terrace Deposits, Foothills Soils I and II, and Piedmont Soils I, II, and III (Kelley 1980:49). Kelley classifies these soil formations on the basis of their prehistoric agricultural potential to determine the areas where agriculture may have been practiced by the pueblo's prehistoric inhabitants. According to Kelley's classification, soils rated 0 have no agricultural potential; soils rated 1 have extremely limited agricultural potential (such as the highly eroded canyon walls of Arroyo Hondo in the Piedmont section); soils rated 2 have limited agricultural potential (such as the shallow Piedmont soils); and soils rated 3 have the highest agricultural potential for the area and are associated with previously or presently cultivated fields. Terrace Deposits occupy 4.2-percent of the study area, consist of Ancho Clay Loam, Five Mile Loam, and Alluvial Land, and have a prehistoric agricultural rating of 3. Foothills Soil I occupies 1.8-percent of the study area, located on the steepest slopes and with the largest percentage of exposed bedrock. Foothills Soil I consists of Rockland and Chimayo soils and Mirabal Stony Loam, and has a rating of 0. Foothills Soil II occupies 39.3-percent of the study area, mostly in the northeast portion, consists of Chimayo Stony Loam, Santa Fe-Rock complex, and Santa Fe-La Fonda association, and also has a rating of 0. Piedmont Soil I occupies 46.4-percent of the study area, consists of Bluewing Gravelly Sandy Loam, Cerrillos Fine Sandy Loam, Pojoaque-Panky association, Silver-Pojoaque association, and Laporte-Rock outcrop complex, and has a rating of 2. Piedmont Soil II occupies 2.5-percent of the study area, consists of Pojoaque-Rough Broken Land complex, and has a rating of 1. Finally, Piedmont Soil III occupies 5.8-percent of the study area, consists of Panky Fine Sandy Loam, and has a prehistoric agricultural rating of 3. Numerous abandoned and presently cultivated fields in the southern portion of the study area are on Panky soils (Kelley 1980). Arroyo Hondo Pueblo itself is situated on a level area of relatively poor quality Piedmont Soil I overlooking the springs and adjacent to arable Piedmont Soil III.

To the east and northeast of Arroyo Hondo Pueblo, the Sangre de Cristo Mountains have a pronounced effect on the climate, forming a barrier to air-mass movement. Orographic lifting caused by the mountains results in nearly all of the area's summer precipitation and much of its winter snow. The mountains additionally protect the area from cold arctic air that moves down the Great Plains to the east during the winter. Occasionally this cold air spills over the mountains, bringing dry, cold weather to the area for a few days. The overall climate is characterized as semiarid, with cool summers, unpredictable monsoon rains, and short, moderate winters. The frost-free period for the Arroyo Hondo area averages about 165 days per year, with the last spring frost typically occurring during the first week of May and the first fall frost occurring in mid-October (U.S. Department of Agriculture 1941). Despite a relatively short

growing season, the area's overall climate generally allows for successful farming for certain crops, but not warm enough for growing corn (Tinsley 1909).

The following discussion of the area's agricultural potential is based on data available 25 years ago and tend to ignore plant biology and the potential presence of tailored crops originated by sophisticated Ancestral Puebloan farmers for the specific Arroyo Hondo area, as well as the possible application of agricultural techniques such as gravel-mulched fields (pebble-mulched fields) such as were found at San Marcos Pueblo in the Galisteo Basin to the southeast. The potential exists for more sophisticated reanalysis of the area's prehistoric agricultural potential in light of advances in all the archaeological sciences, particularly pollen analysis and archaeobotany.

Precipitation in the area is currently summer dominant, with a dry spring season. Kelley (1980) examines the precipitation pattern for the area between 1895 and 1950 when the precipitation average of 36.3 cm (14.3 in) was sufficient to allow dry farming of corn and beans. During this 55-year interval, there were periods of four to six years with below-average precipitation that was not severe enough to eliminate dry farming in the area. Since 1950 however, precipitation and soil moisture have declined and the only crop raised in the area has been wheat (Folks 1968). Kelley summarizes: "Considering the precipitation averages during periods of dry farming and the droughts of the late 1800s and early 1950s, it appears that if annual precipitation is more than 14 inches, dry farming can be successful. However, if annual precipitation drops below 14 inches, dry farming is precarious or impossible. Precipitation of less than 13 inches a year constitutes near-drought or drought conditions, under which complete crop failures would be common" (Kelley 1980:33). The present climate allows crop production only if watered artificially. Dry farming would have been successful during years of above-average precipitation however, failure due to drought could be expected at regular intervals in each century (Kelley 1980:47).

While favorable in its potential for orographic rainfall and access to resources of adjacent higher and lower zones, Arroyo Hondo Pueblo's location in the foothills at the narrowest point of the pinyon-juniper zone of the Santa Fe area resulted in extreme sensitivity to minor fluctuations in temperature and precipitation and therefore a marginal climate for agriculture (Kelley 1980:14). The site's prehistoric inhabitants would have been required to practice agriculture fairly extensively to support the community's peak population. Dry farming of corn and beans has been documented in the Arroyo Hondo area from the 1890s until the drought of the early 1950s. During the 50-year period between 1896 and 1945, Kelley reports precipitation was generally above average, allowing the soil to retain enough moisture to support dry farming during this interval. Kelley emphasizes that similar conditions of above average precipitation would also have been necessary during the pueblo's period of maximum population around A.D. 1330. In order to support the pueblo's peak population, the inhabitants must have practiced fairly extensive agriculture. Lands within Arroyo Hondo Canyon could support irrigation or floodwater farming, while the surrounding higher elevation areas could be dry

farmed during years of above-average precipitation [if annual precipitation was more than 36.3 cm (14 in)]. A prolonged drying trend culminating in drought would have had a devastating effect on the prehistoric farmers as it did in historic times. Similarly, a series of long, cold winters could drastically reduce or even preclude the harvest of cultivated crops (Kelley 1980).

The immediate Arroyo Hondo area is predominantly characterized as pinyon-juniper woodland (*Pinus edulis-Juniperus monosperma*), which occurs in the elevation range from approximately 1,981 to 2,438 m (6,500 to 8,000 ft). In order of descending importance, other vegetation located within the pinyon-juniper woodland includes cholla (*Opuntia imbricata*), wavyleaf oak (*Quercus undulata*), Apache plume (*Fallugia paradoxa*), gray oak (*Quercus grisea*), mountain mahogany (*Cercocarpus montanus*), wolfberry (*Lycium pallidum*), and Gambel oak (*Quercus gambelii*). Understory within the pinyon-juniper woodland area includes (in order of descending importance) blue grama grass (*Bouteloua gracilis*), snakeweed (*Gutierrezia lucida*), ring muhly (*Muhlenbergia torreyi*), Russian thistle (*Salsola kali*), red sage (*Kochia americana*), soapweed yucca (*Yucca glauca*), tansy mustard (*Descurainia pinnata*), prickly pear cactus (*Opuntia sp*.), bitterweed (*Hymenoxys richardsonii*), and claret cup (*Echinocereus triglochidiatus*). In the lower elevations, between 7.2 to 8 km (4.5 to 5 mi) south and southwest of the pueblo, the shortgrass plains-pinyon-juniper ecotone dominates (Kelley 1980).

The dominant vegetation on the relatively fertile terrace deposits of the area's arroyos is rabbit brush, with blue grama grass growing in the open areas between shrubs. Other shrubs in these areas include four-wing saltbush (*Atriplex canescens*), currant (*Robes cereum*), big sagebrush (*Artemesia tridentata*), and wolfberry (*Lycium pallidum*). According to Kelley (1980:67), with a dependable water supply such as regular floods or perrenial streams, these terrace deposits could easily be irrigated.

Ponderosa pine (*Pinus ponderosa*) forest begins 4 km (2.5 mi) northeast of the pueblo at elevations of 2,438 to 2,743 m (8,000 to 9,000 ft). Pinyon and juniper are mixed with ponderosa in these areas, as well as rabbit brush, Gambel oak, and Apache plume; with an understory of blue grama grass, snakeweed, broomweed (*Gutierrezia sarothrae*), and bitterweed (*Hymenoxys richardsonii*). Mixed conifers occur at higher elevations of 2,591 to 3,048 m (8,500 to 10,000 ft) approximately 9.7 to 16.1 km (6 to 10 mi) northeast of the pueblo (Kelley 1980). In the relatively fertile terrace deposits of the arroyos, rabbit brush is the dominant vegetation, with blue grama grass growing in the open areas between shrubs. Other vegetation located in these areas include Apache plume, four-wing saltbush (*Atriplex canescens*), currant (*Ribes cereum*), big sagebrush (*Artemisa tridentata*), and wolfberry (*Lycium pallidum*). In addition to blue grama grass, understory in these terrace areas includes snakeweed, lamb's quarters (*Chenopodium album*), mullein (*Verbascum thapsus*), yellow sweet clover (*Melilotus officinalis*), white sweet clover (*Melilotus albus*), globe mallow (*Sphaeralcea coccinea*), Indian ricegrass (*Oryzopsis hymenoides*), side-oats grama (*Bouteloua curtipendula*), sand dropseed (*Sporobolus cryptandrus*), whitestem stickleaf (*Mentzelia albicaulis*), meadow goatsbeard (*Tragopogon pratensis*), Russian thistle,

tumble mustard (*Sisymbrium altissimum*), common purslane (*Portulaca oleracea*), squirreltail (*Sitanion hystrix*), Japanese brome (*Bromus japonicus*), galleta grass (*Hilaria jamesii*), and Indian tea (*Thelesperma megapotamicum*) (Kelley 1980).

Finally, riparian vegetation characterizes Arroyo Hondo where a perennial stream exists or where the water table is less than 0.9 m (3 ft) below the surface. Vegetation in these areas includes various species of willow (*Salix exigua, S. amygdaloides*, and *S. goodingii*), and lemonade bush (*Rhus trilobata*). Understory includes yellow sweet clover, prickly lettuce (*Lactuca serriola*), spike dropseed (*Sporobolus contractus*), curly dock (*Rumex crispus*), marestail (*Equisetum laevigatum*), horsetail (*Equisetum arvense*), evening primrose (*Oenothera hookeri*), cattail (*Typha latifolia*), bulrush (*Scirpus olneyi*), willoweed (*Epilobium adenocaulon*), silverweed (*Potentilla anserina*), pull-up muhly (*Mulenbergia filiformis*), mint (*Mentha arvenis*), witchgrass (*Panicum capillare*), rush (*Juncus saximontanus*), and yellow nut grass (*Cyperus esculentus*). Domestic use areas currently extend south and southwest of the pueblo and include cleared fields that were dry farmed in the first half of this century but are now either abandoned or used as pasture (Folks 1968). Before domestic use, these areas likely consisted of pinyon-juniper woodland (Kelley 1980).

Edible plants and animals found in the local environment would also have helped sustain the pueblo's inhabitants. A major natural food source in the area would have been supplied by the numerous pinyon pines during years of high nut production. Containing 3,364 calories per pound (Woodin and Lindsey 1954), the pinyon nut crop is the most valuable wild food source in the entire area surrounding the site (Kelley 1980). Additionally, cultivated fields and eroded arroyo sides and bottoms would have provided disturbed soils where native edible plants could grow in prehistoric times.

In the predominantly wooded environment surrounding the pueblo during the early years of the area's habitation, mule deer (*Odocoileus hemionus*) would have been fairly common. Westward into the fringe of the woodland area and the grasslands, the pronghorn antelope (*Antilocapra americana*) was likely found, though now locally extinct. Excavations at Arroyo Hondo Pueblo yielded a collection of 24,589 animal bones representing at least 4,448 individuals of at least 91 different species. Animals that were particularly abundant at the site were the domestic turkey (*Meleagris gallopavo*), the mule deer, cottontail rabbits (*Sylvilagus auduboni*), black-tailed jackrabbit (*Lepus californicus*), rock squirrels (*Spermophilus variegatus*), spotted ground squirrel (*Spermophilus spilosoma*), Gunnison's prairie dog (*Cynomys gunnisoni*), Botta's pocket gopher (*Themomys bottae*), Ord's kangaroo rat (*Dipodomys ordi*), white-footed mice, and wood rats (*Neotoma spp.*). Emphasis on turkey raising increased at Arroyo Hondo with the rapid rise in population and the concomitant economic pressures on resources during Component I (A.D. 1300-1345), but remained important to the pueblo's economy throughout the entire occupation sequence (Lang and Harris 1984).

In addition to supplying supplemental food resources, the area's diverse environment provided prehistoric inhabitants with materials for construction, fuel for heating and cooking, materials for making tools, hunting equipment, clothes and bedding, art and religious objects, and other artifacts. The heavy clay soils available near the site were mixed with water and made into adobe for wall, floor, and roof construction. Additionally, locally available andesite rock was used in the construction of some of the earliest walls at the site, and large cobbles were obtained from the arroyo bottom for use in later wall footings built around A.D. 1370. Granite and gneiss found in the foothills were used for manos and metates and the andesite was used for grinding slabs, choppers, hoes, and other tools. Chert derived from the Ancha formation was used as a raw material in the production of knives, projectile points, scrapers, drills, and other implements. Extensive outcrops of clay were also exposed along the canyon wall east and west of the site, which would have been used for pottery production (Kelley 1980).

Summary of Climate and Environmental Change: Archaeological tree-ring chronologies derived mainly from roofing materials at Arroyo Hondo Pueblo were used by Rose, Dean, and Robinson (1981) to reconstruct climatic variables for Arroyo Hondo Pueblo's period of occupation. Lang and Harris (1984) cite the three major causes of environmental change during the prehistoric occupation of the Arroyo Hondo area as resulting from climate change between A.D. 1300 and 1410, human modification of the environment through tree-cutting and clearing of land for agriculture, and the dynamics of vegetative succession.

The conditions that characterized what is known as the Little Ice Age appeared in the region around A.D. 1250, if not earlier. This climatic period is thought to have been triggered by a series of massive volcanic eruptions in the early and middle 1200s in parts of the world far from the Southwest. These eruptions are believed to have significantly impacted the earth's climate by producing gases that decreased effective solar radiation (Salzer 2000). Perhaps beginning as early as the late A.D. 1100s, winter precipitation gradually decreased, leading to less snowpack and drier soils in the spring. This pattern was soon combined with a trend for monsoonal rains to arrive later in the summer and not last as long as they had in earlier periods. Finally, during the early 13th century, northern cold, dry air pushed farther south into the Southwest during the winter, and the frost-free season in the northern Southwest was radically shortened (Kantner 2004).

Arroyo Hondo Pueblo was initially founded around A.D. 1300 during a time of increased precipitation after nearly 50 years of below-average moisture. This relatively moist climate prevailed until around A.D. 1335. Marsh habitats, stream aggradation, and a relatively high volume of flow in Arroyo Hondo Canyon are projected for this period, during which the pueblo rapidly expanded. The dominant vegetation at this time appears to have been woodland, with fingers of grassland extending from the west and scattered ponderosa pine and Douglas fir located in cool gullies and north-facing slopes (Lang and Harris 1984). After A.D. 1315, accumulated tree cutting and clearing of native

vegetation for agriculture radically altered the immediate woodland environment, creating more grassland and brushland environments. Beginning around A.D. 1335, the pattern of precipitation shifted toward high annual variability, with severe droughts separated by brief wet intervals. The period from A.D. 1335 to 1355 was marked by drought phases and likely by flash floods, erosion, and arroyo cutting. By the 1330s and 1340s, Kelley (1980) sees evidence for some well-developed brushland communities in the area, after which time much of the agricultural area was abandoned, allowing the woodland to begin reestablishing itself. Sometime in the 1370s a second phase of settlement began (referred to as Component II: A.D. 1370-1410), coinciding with a temporary return to high precipitation. Precipitation remained variable into the early 1380s, when renewal of agricultural activity and tree cutting appears to have re-expanded open habitats, though on a smaller scale (due to fewer inhabitants) than seen in Component I (A.D. 1300-1345) times. Component II reached its greatest expansion in the early 1400s, when tree-ring data show a 10-year period of sustained high moisture. However, sometime after A.D. 1410 the area suffered a major drought, with precipitation declining toward the lowest point in the 1,000-year tree-ring record. A major fire occurred around this time, after which the site was permanently abandoned (Rose et al. 1981).

Site Description

Arroyo Hondo Pueblo saw two phases of occupation, referred to as Component I (A.D. 1300-1345) and Component II (A.D. 1370-1410) (refer to Figure 3). The occupation dates of the two components are principally based on tree-ring analysis, as well as ceramic and architectural data.

Component I Occupation (A.D. 1300-1335): Arroyo Hondo Pueblo was initially established just after A.D. 1300, and experienced rapid growth between A.D. 1300 and 1315. At its height of occupation, the site covered approximately 2.4 ha (6 ac) and included more than 1,000 rooms arranged in 24 terraced one- and two-story roomblocks that enclosed or partially enclosed 13 rectilinear plazas. The direction of site growth appears to have been the same during both occupations of the site, with the earliest structures built near the edge of the arroyo close to the spring and expanding from there first west and then south. The roomblocks were laid out along north-south and east-west axes measuring 10 to 50 m (33 to 164 ft) long, one to six rooms wide, and including between four and more than 70 rooms. In some cases, long walls were built first and then shorter cross walls were added to form rooms, a process that Creamer (1993:148) proposes may indicate planned, cooperative construction. Rooms from both Components were relatively consistent in size, ranging from 4 to 9.3 square meters (43 to 100 sq ft) and averaging 6.3 square meters (68 sq ft). Short-axis walls averaged 2 m (6.6 ft) long and long-axis walls averaged slightly more than 3 m (9.8 ft) long. The average size of living and storage rooms was similar in both Components I and II. Only the few ceremonial rooms identified in Component I were significantly larger than other types of rooms (Creamer 1993:130).

Most of the 24 roomblocks that comprise Component I are attached and arranged around plazas, with the first plaza (plaza C) being the largest, and the other plazas of fairly uniform size (refer to Figures 4 and 5). Roomblocks 17 and 21 are offset slightly from the main structure (refer to Figure 3). Roomblocks 1, 2, and 3 surround plaza A, forming a separate unit northwest of the main set of roomblocks. Four of the plazas are completely enclosed by roomblocks, four are enclosed on three sides, and three are defined by the intersection of two roomblocks. Three other plazas (B, H. and J) are only partially defined by roomblocks. The five completely or almost completely enclosed plazas (C, D, F, G, and I) are roughly rectangular, and most range in size from about 550 to 850 sq m (5,920 to 9,150 sq ft). Plaza C, the largest at 1,260 square meters (13,563 sq ft), was the first Component I plaza in use at the site.

In all cases investigated by Schwartz, second-story rooms were set back from the edge of the first-story roof lines, giving the pueblo a terraced appearance. The outer row of rooms in some roomblocks appears to have been single-story, with the central portion of most roomblocks composed of two-story structures. Rooftop areas were highly utilized during Component I, especially for food preparation (Creamer 1993). The arrangement of roomblocks at Arroyo Hondo Pueblo, and likely at other contemporaneous sites in the area, was apparently based on a plaza-oriented model that allowed for population increase by staged construction of roomblocks around an increasing number of plazas, providing a format for a continually expanding structure (Creamer 1993:12-13). Schwartz sees the layout of Arroyo Hondo Pueblo as resulting from the abutment of numerous small single-plaza sized villages as people in the area aggregated at the site (Schwartz, pers. com 2006).

Numerous documented features indicate that plazas served as the location for a variety of domestic activities (refer to Figures 4 and 5). Plazas showed some variability in the types of features they contained. Excavations in both Component I and Component II plazas revealed the presence of mealing bins, basins, hearths, ovens, and other features relating to food processing and preparation. Walls, ramadas, and portales formed protective outdoor work areas that may have been used for pottery making and leather, wood, or stone working (Creamer 1993:57, 87). Domestic turkeys pens were documented in plazas during both components, including several that were located in plaza K (Lang and Harris 1984). Trenches and post holes indicate that turkey pens were built of sticks and branches in or adjacent to roomblock corners, with

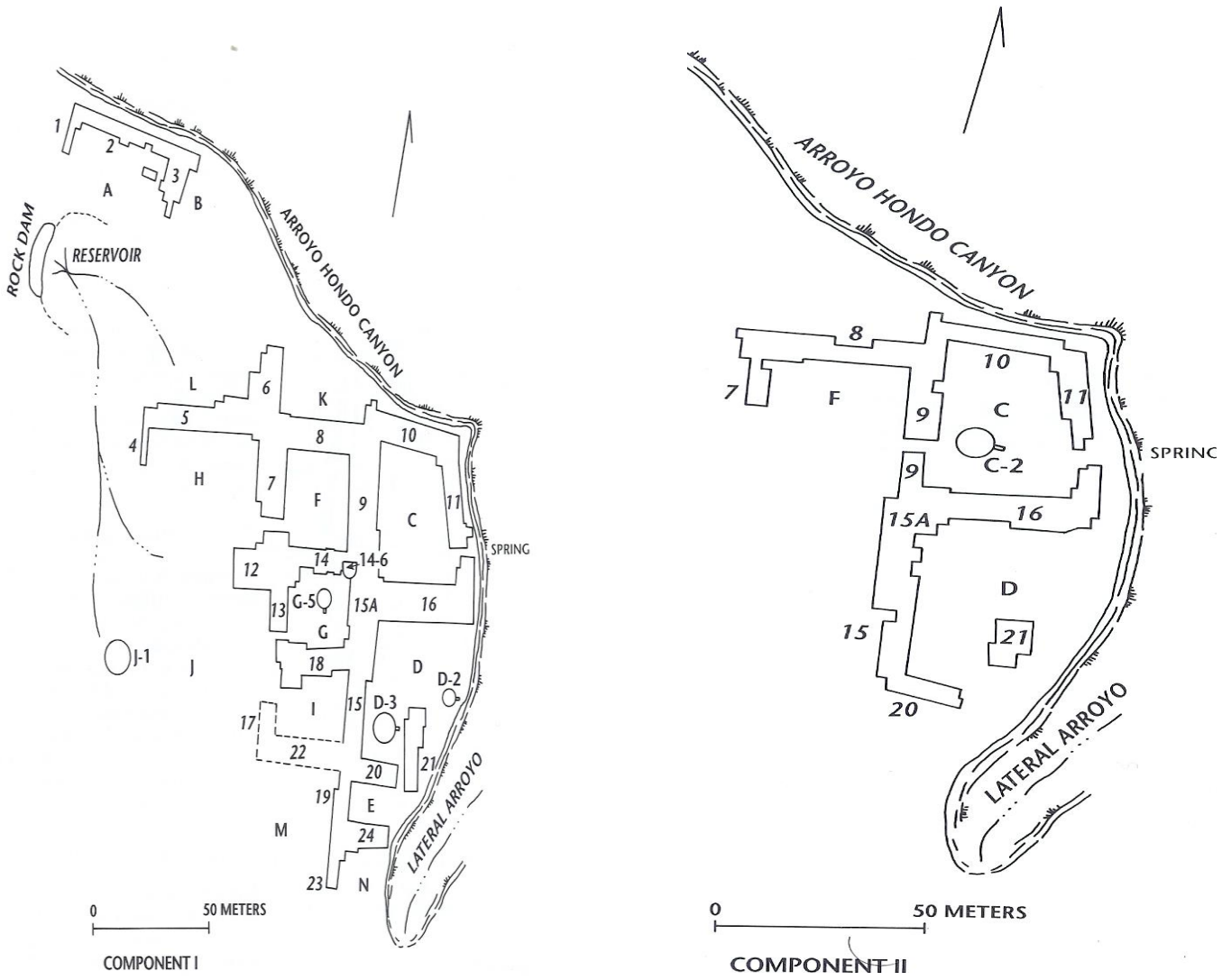

Figure 3. Schematic diagrams of Component I site (left) and Component II site (right) showing roomblock and plaza numbers.

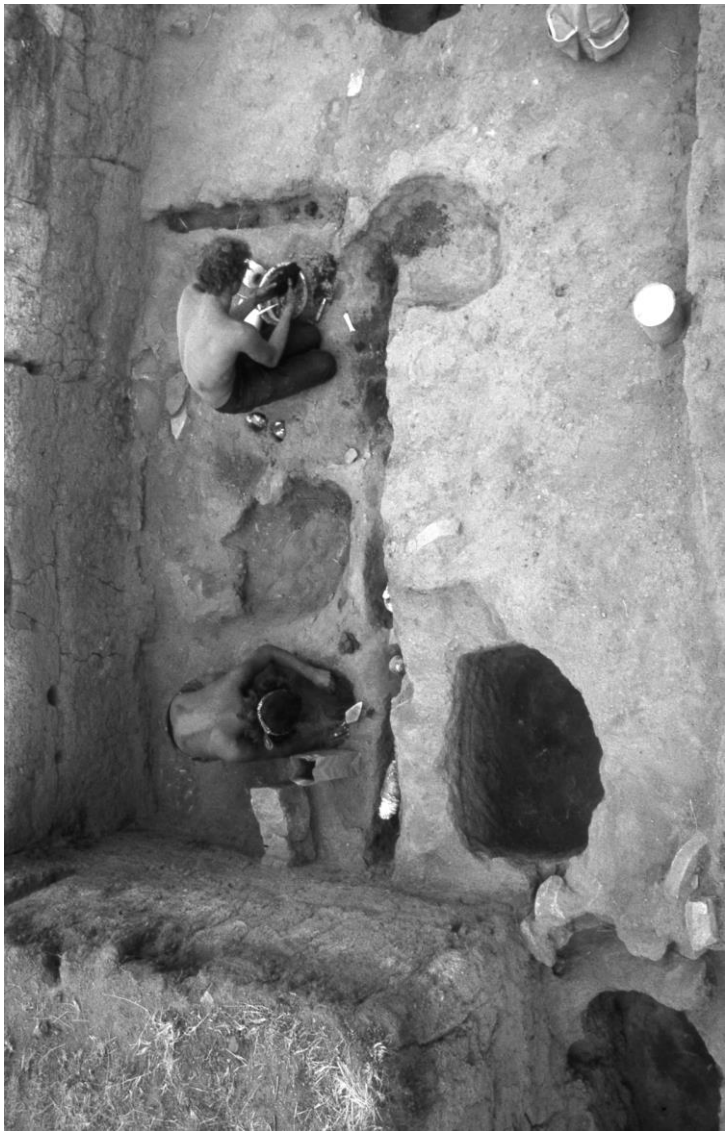

Figure 4. Exposed features in Component I plaza G, including the foundation for a post and brush turkey pen.

Figure 5. Overview of the north side of Component II plaza C looking east showing numerous excavated features.

the roomblock walls forming one or two sides of the pen (refer to Figure 4). Turkey pens contained an abundance of turkey dung, egg shells, roosts, and food and water vessels.

Component I plaza A had a number of large, deep, rock- or trash-filled pits unlike any found at the other plazas, two of which may have served as ovens. Additionally, a two-room stone rubble and adobe structure in the middle of plaza A was also unique. Despite the common occurrence of mealing bins, turkey pens, and wall dividers or portales in all other excavated plazas, none of these features were recorded in plaza A. Component I plazas G and K and Component II plaza C were generally similar. Tree ring dates indicate the primary use of plaza G was during Component I. The use of plazas for religious and sociopolitical activities is inferred from the presence of kivas in three of these open areas (refer to Figure 6). Gateways or entry passages that provided or limited access to plazas, were found in both Component I and II plazas, located near the intersection of roomblocks. Four Component I gateways were investigated by Schwartz, ranging from 2.5 to 4.1 m 8.2 to 13.5 ft) wide and as long as the roomblocks were wide. Two gateways were investigated from Component II, located on opposite sides of plaza C and measuring 6 m (20 ft) and 3 m (10 ft) wide (Creamer 1993:87).

Human interments were encountered beneath plaza areas where they had apparently been placed while the plazas were still in active use and under room floors (Palkovich 1980). From the Component I occupation, 48 human interments, representing nearly half of the total Component I burials recovered by Schwartz, were recovered from plaza areas (Palkovich 1980:10). Eight of the 12 Component II burials were located in plaza C. The remains were found in oval pits averaging 1 m (3.3 ft) long, 70 cm (28 in) wide, and 20 to 140 cm (8 to 55 in) deep (Creamer 1993:76).

Most Arroyo Hondo kivas are round, subterranean, and located in plaza areas surrounded by roomblocks (refer to Figure 6). Component I kivas range from an estimated 4.4 to 10.5 m (14.4 to 34.4 ft) in diameter, and the one Component II kiva measures 7.5 m (24.6 ft) across. Kiva 14-6 was D-shaped and constructed above-ground in the corner of a roomblock adjacent to plaza G (refer to Figure 7). Kiva J, the largest round structure at Arroyo Hondo [diameter 10.5 m (34.4 ft)]) and the only one not located in an enclosed plaza, is located at the far western edge of the site, away from the roomblocks (refer to Figure 8). Kiva J is semi-subterranean and does not include any of the features recorded at the site's other kivas, other than its shape. Creamer (1993:88) speculates that this kiva may have been used for community-wide activities, whereas the smaller kivas may have been used for the activities of specific religious or ceremonial groups. Kiva J falls in the lower range of size for "great kivas" as defined by Vivian and Reiter (1965:84) and from here on is referred to as a "community structure" (Schwartz, pers. com. 2006).

Although only one kiva was found associated with the Component II occupation, the frequency of kivas was similar for both components, wtih one kiva for every 200 rooms. Kivas were located at

different areas within plazas, with no apparent pattern. Kiva features were similar for both components and included elaborate firepits with deflectors, ventilator shafts, wall niches, *sipapus* (small holes in the floor of modern Pueblo kivas that represent the place of emergence from the underworld), loom holes, floor cists, a possible foot drum, and "paho houses" (small diameter, bottle-shaped cavities located on one side of the ventilator shoulder in the kiva wall), similar to kiva features recorded at other contemporaneous sites in the area (Creamer 1993:105). Component I kiva G-5 yielded the remains of eight individuals. Burials were also found in the fill of kivas D-2 and D-3, which appear to have been interred after the kivas were no longer in use (Creamer 1993:95).

Three two-story structures were identified in Component I that may also have served ceremonial purposes. The structures contained kiva-like features in the upper stories, including loom holes, firepit deflectors, painted plaster, and unusual artifacts. The lower stories of each of these rooms were either bare or contained storage facilities, possibly for the storage of ceremonial items. Additionally, a probable shrine is located on a hill southeast of the site and is presumed to have been in use during one or both occupations of the site (Creamer 1993:88). The shrine (LA 10608) consists of a doughnut-shaped mound of stone, a rectangular wall outline that may be recent, and a low-density lithic artifact scatter. The shrine is on private land and is not included within the boundaries of the NRHP.

A large irrigation ditch that stretches an estimated 3.2 km (2 mi) long is located along the south side of Arroyo Hondo and may date back to prehistoric times and the occupation of Arroyo Hondo Pueblo (Schwartz 1971). Schwartz (1971:14) described the ditch as carrying water from the arroyo upstream from the site to the agricultural fields located southwest of the site. He notes that the ditch is visible in a 1915 Nelson photograph of the site and that feeder ditches may also have been in use in prehistoric times. Extensive irrigation was used throughout the Rio Grande valley in prehistoric times, and there is a good possibility that the ditch noted at Arroyo Hondo Pueblo was also in use during this time, although it remains to be demonstrated (Schwartz, pers. com. 2006).

Room features documented during Schwartz's investigations of the site include slab-lined, clay-lined, and pit hearths; wall vents; floor cists and basins; wall niches; pole and plank shelves; wall pegs; ladder impressions; post holes; and occasionally decorative plaster (refer to Figures 10-13). Wall vents may have provided light and outside air, directed smoke, or served as a means of communication between rooms (refer to Figure 13). Floor cists likely had a variety of functions, with smaller cists serving as post rests for water or food storage and larger cists holding other stored goods. Wall niches, shelf holes, post holes, and other features were used for storing household goods. Rooms that lacked hearths and other interior features.

Figure 6. Aerial view of Component I plaza G showing kiva G in the center and D-shaped kiva 14-6 at top left.

Figure 7. Component I kiva 14-6, an above-ground D-shaped kiva built into the corner of roomblock 14. The firepit, ashpit, deflector and ventilator are visible.

Figure 8. Overview of Component I kiva J ("community structure"), Arroyo Hondo Pueblo's largest round structure and the only one not located in an enclosed plaza.

Figure 9. Component I kiva G-5 showing the impressions of posts and planks placed around the edge of the kiva pit, then covered with adobe and plaster to form interior walls.

were most likely used to store food items. Stationary facilities for corn grinding within rooms are rare at Arroyo Hondo. No mealing bins were identified in Component I rooms, and only four Component II rooms had mealing bins built into the floors (Creamer 1993:151).

Certain architectural indicators such as hearth location are used to assign a probable function to rooms at Arroyo Hondo Pueblo. Three categories of rooms were identified at the site: 1) storage rooms, typically located on the first story and lacking hearths or other features; 2) living rooms, often located on the second story (during Component I), with features such as hearths, niches, and vents; and 3) ceremonial rooms, which might have been larger than average room size and contained certain features such as hearth deflectors, painted wall plaster, and loom anchor holes, as well as features typical of living rooms. Rooftop work areas typically contained a hearth, often slab-lined, and groundstone tools. Creamer (1993:130) speculates that these areas were likely used for cooking, grinding, and tool-making, among other activities. Although multifunctionality of rooms and change in room function over time makes it difficult to assign function to rooms with certainty, Creamer estimates that the number of living rooms was slightly greater than the number of storage rooms during both components. Rooms were entered through ceiling hatchways, although during both components, few doors opened from ground-floor rooms to areas outside the roomblocks, restricting access to habitation space (Creamer 1993:150).

Residential units during both Components I and II may have consisted of one or two rooms that included a single living room or a living room and storage room. During Component I the characteristic pattern appears to have been a two-story structure with a living room in the second story and a storage room below. During Component II, a front-to-back orientation achieved a similar pattern, with the living room adjacent to the plaza and the storage room behind it. The size of the average residence unit suggests the nuclear family as the most common domestic group, but Creamer (1993:151) emphasizes that residence units are difficult to define, and this suggestion is tentative. Component I ended shortly after A.D. 1330 during a period of major drought. Schwartz found trash fill in few rooms, suggesting the Component I occupation ended abruptly (Creamer 1993:13).

Component II Occupation (A.D. 1370-1410): After nearly 30 years, Arroyo Hondo Pueblo saw a second occupation, known as Component II, which dates from A.D. 1370 to 1410 or slightly thereafter. Excavators working in the 1970s found as much as one meter (3.3 ft) of wind-blown fill and collapsed adobe walls filling Component I rooms. During this second occupation, the site was rebuilt with about 200 single-story rooms directly over the remains of the earlier, more extensive occupation. Most Component II construction appears to have occurred rapidly in the A.D. 1370s and 1380s. A single room that was securely dated to A.D. 1410 represents the last evidence of construction at the site. Of the 53 Component II rooms excavated by Schwartz and his team, 21 rooms (representing 40-percent of

Figure 10. Clay-lined hearth in Component-I room 11-5 (left) and pit hearth in room 11-9 (right). Scale is 40 cm in 5 cm increments.

Figure 11. Slab-lined hearth and adjacent ash pit in Component II room 8-6.

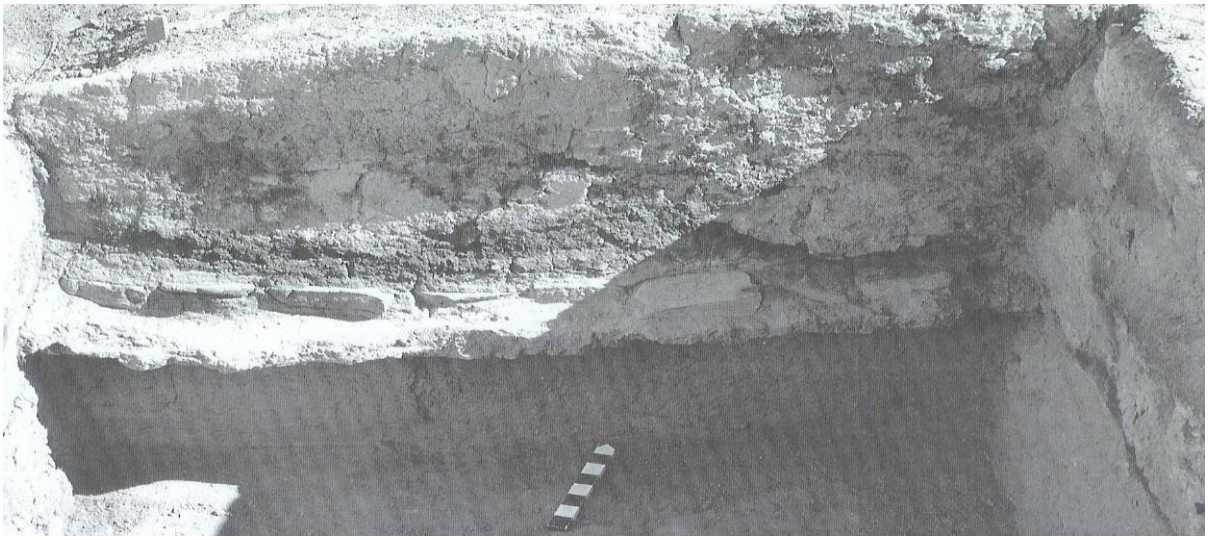

Figure 12. Slab footings beneath the north wall room 9-6 (after removal of the underlying fill). This type of footing was only used during Component II.

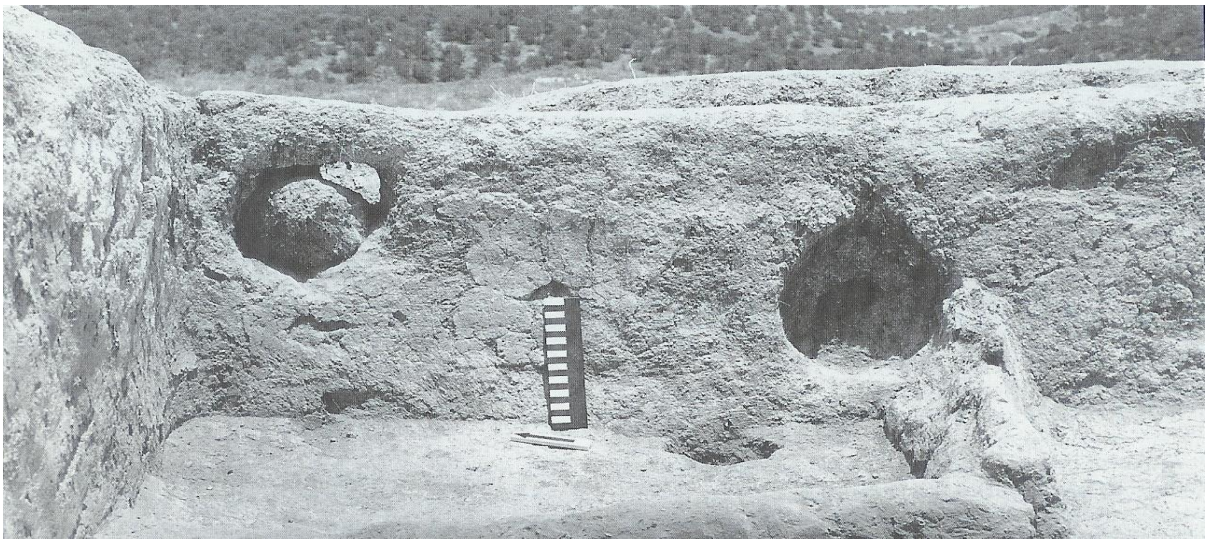

Figure 13. Component II room 9-10 showing mealing bin (defined by raised clay rim) and wall vents (one partially plugged, the other blocked).

the total Component II rooms) had burned, most completely. These rooms often clustered together. This is in contrast to Component I, where only 7 of the 66 excavated ground-floor rooms (representing 10-percent of the total Component I rooms) had burned. Construction methods used during Component II were essentially the same as those reported for the early occupation, with a few exceptions possibly relating to the smaller population size and constraints of building on top of Component I structures and rubble (refer to Figure 12). In the early 15th century, a fire destroyed many Component II rooms, which were never rebuilt. Following soon after, Arroyo Hondo Pueblo was abandoned between 1410 and 1420 (Creamer 1993:40).

Construction Materials and Methods: Excavations at Arroyo Hondo Pueblo provided a wealth of information about construction techniques and architectural features. Site layout, construction materials and methods, and architectural details of the site are similar to other contemporary sites in the northern Rio Grande region. The Component I settlement had at least five times as many rooms as the later Component II occupation, and employed somewhat more complex construction techniques, as required by the construction of two-story rooms. Trees used as beams during Component II were cut at a younger age than those used in Component I, suggesting that Component II residents may not have had access to older, larger trees necessary to construct sturdy roofs to support two-story structures. Component I rooms were frequently built in groups, while this type of aggregate construction was not used during Component II.

While a few masonry rooms (approximately two-percent of the site's total structures) were built of locally available andesite early in the occupation, all subsequent construction was of puddled adobe. Component I rooms were built directly on the ground after minimal leveling and clearing. Rooms built toward the end of the Component I occupation were frequently underlain by culturally deposited fill. Approximately one fourth of the rooms excavated by SAR exhibited this trait (Creamer 1993:13).

No trenches for wall footings were observed for either adobe or masonry walls. Wall segments excavated from Component I structures indicate that low courses of adobe, between 7 and 15 cm (2.8 and 6 in) high, served as footings for adobe walls. Stones were incorporated in the lowest levels of a few of the adobe walls from Component I, but these did not constitute stone foundations. In Component II, stone and slab footings were common, likely because walls were built over unstable Component I room fill and not on the level ground surfaces that were available for Component I walls (refer to Figure 12).

Unshaped, locally obtained andesite chunks were used in the limited masonry construction of roomblock 11. Interlocking courses two stones wide were built up and mortared in place with 2-5 cm (0.8-2 in) of mud. Walls averaged 32 cm (12.6 in) wide, with the smooth side of the stone always facing outward. The maximum recorded stone wall height was only 1.6 m (5.2 ft). Abutments between masonry walls were not interlocking, suggesting to Creamer (1993:14) that the walls were built parallel across the

long axis and later joined by crosswalls. Creamer suggests that the long, continuous walls indicate that masonry rooms were planned in advance and not constructed individually. Spaces between wall junctions were usually filled with adobe, pebbles, and small rocks (Creamer 1993).

Construction at Arroyo Hondo Pueblo soon shifted to a combination of masonry and adobe, with puddled adobe used for the remainder of the site (refer to Figures 14 and 15). Adobe walls were made of clean clay, free of rocks, vegetation, and trash debris. No temper material was added. The clay was obtained from beneath the site, as indicated by borrow pits uncovered during Schwartz's excavations in plaza areas and under room floors. Walls became thinner toward the top, rising from 32 cm (12.6 in) at the base to 24-27 cm (9.5-10.6 in) at the top. Vigas were laid across the top of the long-axis walls of the rooms. Bonding lines between courses of adobe are visible in most walls at Arroyo Hondo (Creamer 1993).

Adobe walls were built either in a series of parallel long walls subdivided by short-axis walls or sequentially around the perimeter of a unit. Examination of the wall abutment construction indicates the long walls were built before the short-axis walls. This suggests groups of rooms were built at the same time, referred to by Creamer (1993:16) as "aggregate construction". This type of construction was documented in each of the roomblocks where extensive excavation of contiguous rooms was conducted, including roomblocks 5, 11, 16, and 18. Not all walls were built at the same time however, as indicated by chinking of some wall abutments with stone, adobe, and pot sherds.

In addition to puddled adobe, another method of adobe construction documented at Arroyo Hondo is the use of adobe rubble, which was occasionally used for wall repair, as observed in room 16-28 and rooms 7 and 32 in roomblock 18 (Creamer 1993:16). Plaster was not a common wall treatment at Arroyo Hondo. Some room fill contained fragments of gray to white plaster that had apparently fallen from second-story rooms, and portions of a few first-story rooms were plastered as well. No evidence was found to indicate that entire rooms were plastered (Creamer 1993:17).

Although no intact roofs were discovered at Arroyo Hondo, impressed adobe, timbers and brush were recovered from stratified deposits. Mortar impressions on vigas indicated they were most often pinyon, had been stripped of bark, and ranged from 9 to 25 cm (3.5 to 9.8 in) in diameter, averaging 16 cm (6.3 in). Vigas dating to the Component II occupation were smaller, likely because they were cut younger, and most often ponderosa pine was used. From three to five beams generally supported a Component I room. In the one room where it could be measured, space between 9-cm (3.5-in) diameter vigas measured 40 cm (15.7 in) though, as Creamer points out, the number and spacing of support vigas would have depended on room length, viga diameter, and the presence of a second-story above the room. *Latillas*, smaller diameter poles or planks, were laid at right angles to the vigas. Adobe impressions revealed three kinds of latillas were in use at Arroyo Hondo: planks, poles, and split poles. Plank latillas

were made exclusively of pinyon and were the favored type. Pole and split-pole latillas were made of ponderosa pine, pinyon, juniper, or Douglas fir. Pole latillas were made from small peeled branches and split-pole latillas were made from larger trees and branches (Creamer 1993:19).

Grass, leaves, brush, pine boughs, juniper bark, corn leaves and stalks, cholla, and reeds were all used to cover the pole and split pole latillas. In most cases, a single layer of dry adobe clay covered the brush directly on top of the plank latillas, although both dry or wet clay caps were documented. Evidence indicates that most second-story rooms were added after ground-floor rooms had been occupied for at least a short period of time, suggesting to Creamer (1993:20) that the second story was a later addition and not part of the original room construction. Many Component II rooms lacked vigas, simply consisting of latillas, brush, and mud. A difference in tree species preference was found in both Components I and II, with ponderosa pine the most common species used in rooms, and pinyon or pinyon and juniper the most common species used in plazas during both components. Pinyon and juniper, which tend to be smaller, would have been more readily available than ponderosa, and may have therefore been chosen for smaller scale construction in plaza areas such as that of turkey pens and ramadas. Additionally, many of the tree-ring samples from plazas derived from trash deposits and may represent firewood (Creamer 1993:138-139).

Both wet and dry clay floors were observed at Arroyo Hondo Pueblo, and occasionally multiple floors occurred. Most first-floor rooms appear to have been entered through roof hatchways as indicated by the remains of hatch coping and ladder impressions. Doorways and ventilation holes were also documented, and would have provided ventilation between rooms and access to outside terraces for second-story rooms. Numerous floor and wall features were documented at the site, paralleling architectural features at other contemporaneous sites in the northern Rio Grande region. Three types of hearths were recorded, including slab, clay, and pit, with slab hearths the most frequent throughout both Components (refer to Figures 10 and 11). These hearth types occurred variably in interior or rooftop locations at Arroyo Hondo. Rooftop hearths are likely present at other sites but few have been reported (Creamer 1993:39). Whereas most Component I hearths were located on rooftops or in second-story rooms, Component II hearths were most common in ground-floor, presumably habitation rooms. Hearths tended to be located in the center of Component I rooms, but shifted to a location along long-axis walls in Component II. Vent holes likely assisted in smoke removal, circulation, and communication between rooms and are relatively uniform in size and shape. Subfloor cists were documented and remain of uncertain function, though Creamer

Figure 14. Adobe and masonry wall abutment in room 11-5, illustrating the shift from masonry to adobe construction.

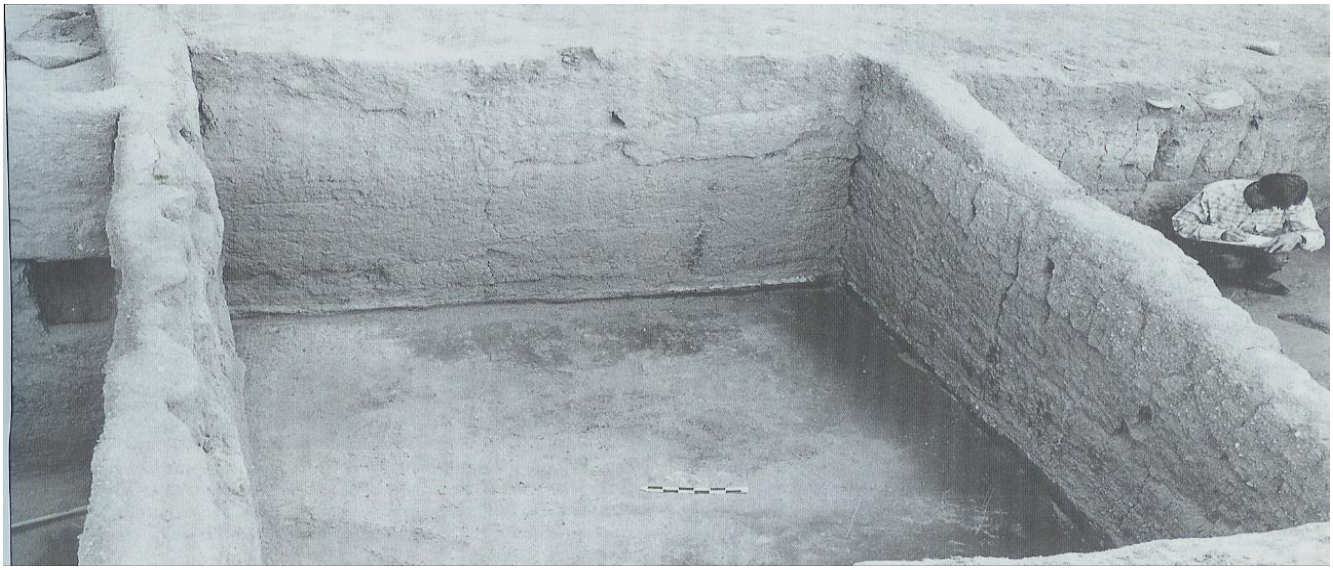

Figure 15. Adobe walls in room 16-33: Striations and changes in texture indicate hand-made courses.

(1993:39) speculates they served a variety of purposes, from pot rests to food storage. Only a few post holes were documented, and may have served as roof or rack supports. Wall niches, pole and plank shelves, and wall pegs were all identified. Room decoration was very limited, consisting of a few fragments of colored plaster found in room fill. Mealing bins were not documented in outside rooms in Component I, whereas several were found in exterior rooms in Component II (refer to Figure 13).

Component I kivas and the one Component II kiva that was rebuilt on the ruins of an earlier Component I kiva were all constructed using similar materials and techniques. Initially a large pit measuring 1 to 2 m (3.3 to 6.7 ft) deep, was excavated and posts and planks were set around it, forming walls. Adobe was then used to cover the structure. This adobe over plank wall construction technique was only identified in kivas at Arroyo Hondo Pueblo (refer to Figure 9). Walls were then plastered with a mixture of white ash or gypsum and water, or with fine micaceous clay. Three of the kivas excavated had painted or colored plaster that divided the upper and lower wall sections. The predominant colors red and yellow (derived from locally-available hematite and limonite), were painted over white or gray plaster. Horizontal designs extended around the wall, occasionally punctuated by dots or figures (Creamer 1993:91). All kiva floors had a layer of dry clay 5-9 cm (2-3.5 in) thick, which was sprinkled with water and trampled down. On top of this, some kivas also had a layer of plaster or fine wet clay like that used on the walls.

Arroyo Hondo Pueblo Chronology & Site Growth: Arroyo Hondo Pueblo was established during the Pueblo IV period (A.D. 1300-1600) of the Pecos classification (Kidder 1927), and can be dated to the transition from the late Coalition period (Galisteo stage, A.D. 1200-1325) to the early part of the Classic period (A.D. 1313-1600) in the northern Rio Grande sequence (Wendorf and Reed 1955). The site saw two phases of occupation, referred to as Component I (A.D. 1300-1345) and Component II (A.D. 1370-1410). More than 300 tree-ring dates obtained from a wide range of proveniences clearly establishes the founding of the site after A.D. 1300, defines periods of construction for Components I and II, and indicates a hiatus in occupation between the two components. Given limited availability, tree-ring dates are less useful for determining the sequence in which rooms were built within each component. For this, architectural indicators such as room orientation, bonding or abutment of walls, and stratigraphic placement are used to establish temporal relationships among structures at the site (Creamer 1993).

Tree-ring dates indicate that the site was first established and major construction began soon after A.D. 1300 (Creamer 1993:137). Most of Component I was built during the next 15 years and fell off sharply after 11315/1320. Four roomblocks located around plaza C were likely among the earliest constructed, including roomblock 11, which incorporates the greatest amount of masonry architecture at the site (refer to Figure 3). These structures are closest to Arroyo Hondo canyon and the spring that was the pueblo's principal source of water. Adobe rooms were later added parallel to the masonry roomblock on both sides of the center core of masonry rooms (Creamer 1993:140).

An absence of cutting dates between A.D. 1330 and the late 1350s indicates a cessation in construction by this time. Tree-ring dates indicate that construction activity and presumably reoccupation took place as early as the late A.D. 1350s or early 1360s. More than 100 cutting dates from the A.D. 1370s and 1380s indicate a great deal of activity at the site during this interval, including the construction of kiva C in A.D. 1386. The 1380s saw the greatest construction activity during Component II. Only ten of the original 24 Component I roomblocks were rebuilt during Component II, located around plazas C, D, and F (refer to Figure 3). Component II kiva C was apparently built in A.D. 1386 (Creamer 1993:147).

After 1390, the number of tree-ring dates declines sharply. A cluster of cutting dates in room 16-17 at 1410 represents the last construction at the site, with no evidence of new construction after 1410. During the Component II occupation, rooms burned in nearly every roomblock, including roomblocks 9, 10, 15, 15a, 16, and kiva C-2. Room 16-17 yielded numerous tree-ring dates at 1410, indicating that the extensive burning may have occurred after this year. Some of the rooms in roomblock 16 seem to have been abandoned or mostly fallen out of use by the time of the fire. While none of the burned rooms appeared to have been restored after the fire, trash was deposited in some of the burned rooms, and beams were extracted from others. Creamer (1993:138) speculates that most of the site could have been abandoned prior to 1410, with only a residual occupation residing in room 16-17.

Population Size & Site Demographics: The best estimate for population size during the two occupations at Arroyo Hondo Pueblo is derived from architecture, although estimates are built upon multiple levels of assumptions (Hassan 1978:56). Creamer postulates that if 90-percent of the 1,000 Component I rooms were occupied when the settlement was at its height, if residences consisted primarily of two rooms, and if family size was between three and six individuals, then population could have ranged between 1,300 and 2,700 people at the settlement's peak. Wetterstrom's 1986 study of food, diet, and population at Arroyo Hondo Pueblo concludes that about 600 people could have been supported by the surrounding environment in good years. Despite this great difference in population estimates, Creamer (1993:152) suggests that the two estimates may not be incompatible, and that maximum population at the site may have overrun carrying capacity and peak levels may not have been long-lived.

Again assuming 90-percent occupancy of the 200 Component II rooms, two rooms per residence units, and three to six individuals per family, Creamer (1993:153) suggests population may have ranged between 250 and 350 individuals during this second occupation at Arroyo Hondo Pueblo.

Palkovich's 1980 study of the skeletal remains recovered from the site identified a variety of pathologies associated with malnutrition that cluster in the under-five age group, including endo-cranial lesions, porotic hyperostosis, cribra orbitalia, and generalized skeletal porosity. These pathologies almost certainly reflect the effects of malnutrition and infectious disease. Porotic hyperostosis is believed to be primarily of dietary origin, and in this case probably stems from a diet rich in maize, which is

known to inhibit iron absorption and is suspected of having caused iron deficiency anemia in other prehistoric societies in the American Southwest (El Najjar et al. 1976, Palkovich 1980). In sum, these analyses led Wetterstron (1986:153) to conclude that the inhabitants of Arroyo Hondo Pueblo had a serious nutrition problem which was probably exacerbated when food was scarce. Analyses of the skeletal remains also indicates a high mortality rate among infants and young children that allowed only about 40-percent of the population to reach the age of 15. Only about 50-percent of children reached age 5, and for those that lived to adulthood, the average age of death was about 34 (Palkovich 1980).

Examining the ways in which drought and other calamities might have affected the Arroyo Hondo population, Wetterstron (1986:154-155) proposes that climatic changes could have had a significant impact on the inhabitants' health and demographic patterns, as supported by the archaeological evidence. In addition to skeletal indicators for dietary stress, plant remains from the site include possible starvation foods, indicating the inhabitants suffered through lean times, and the faunal remains point to food shortages after the A.D. 1330s. During this time, evidence indicates that residents stalked a wider variety of game and traveled farther to obtain it than in earlier periods. During periods of drought, deaths from protein-calorie malnutrition (PCM) were probably at their peak, with likely significant dips in the adult population 20 to 30 years later, which could have had far-reaching consequences for social organization and subsistence patterns. With shortages of adults at certain periods in the pueblo's history, the community needed a flexible sociopolitical system that made it possible to recruit people from a large pool, prompting a possible change in residence patterns. Additionally, these periods may have also stimulated new, more intensive subsistence practices, including the construction of agricultural features such as check dams and ditches to improve water distribution across fields (Wetterstrom 1986:156-159).

Likely Appearance and Use of Arroyo Hondo Pueblo & Surrounding Lands at the Time of Occupation: Arroyo Hondo Pueblo was initially founded around A.D. 1300 during a time of increased precipitation that prevealed until around A.D. 1335. The dominant vegetation at this time appears to have been woodland, with fingers of grassland extending from the west and scattered ponderosa pine and Douglas fir located in cool gullies and north-facing slopes (Lang and Harris 1984). Marsh habitats in Arroyo Hondo Canyon are projected for this period, during which the pueblo rapidly expanded.

Arroyo Hondo Pueblo quickly grew from a single roomblock to a network of interconnecting roomblocks and plazas. Most of Component I was built in 15 years between A.D. 1300 and 1315, during which time there must have been constant construction. Four roomblocks located around plaza C were likely among the earliest constructed, including roomblock 11, which incorporates the greatest amount of masonry architecture at the site. These structures are closest to Arroyo Hondo canyon and the spring that was the pueblo's principal source of water. Adobe rooms were later added parallel to the masonry roomblock on both sides of the center core of masonry rooms (Creamer 1993:140). Masonry construction was quickly replaced with coursed adobe construction for the remainder of the Component I and II occupations.

At the site's peak it contained an estimated 1,200 rooms in 24 terraced one- and two-story roomblocks fully and partially enclosing 13 rectilinear plazas. The layout of the site, with roomblocks arranged around increasing numbers of plazas, allowed for a continually expanding site that could accommodate additional occupants as needed (Creamer 1993). The Component I occupation (A.D. 1300-1330) appears to have been a time of population increase in the northern Rio Grande region, likely a combined result of locally increasing populations and in-coming groups from the north.

Schwartz's excavations at the site revealed numerous features in the plaza areas such as mealing areas, ovens, turkey pens, basins, dividing walls, ramadas or portales, and human burials that indicate a diversity of domestic activities took place in these areas. Walls, ramadas, and portales formed protected work spaces. Roof tops were also the focus of domestic activities, especially food preparation. Subterranean kivas sunk into plaza areas likely were the focus of religious and sociopolitical activities. The community structure (kiva J), located in the southwest portion of the site away from the plazas and roomblocks, likely served the entire Coomponent I community as a gathering place for social, religious, and/or political activities. During Component II, kivaC-2 in plaza C likely served a similar purpose. A little distance southeast of the site, a doughnut-shaped masonry shrine with a low-density lithic artifact scatter may have had socioreligious significance or served as a symbol of community solidarity for the Component I and possibly the Component II occupants of the site.

Arroyo Hondo Pueblo's inhabitants would have been required to practice agriculture fairly extensively to support the community's peak population. Lands within Arroyo Hondo Canyon could support irrigation or floodwater farming, while the surrounding higher elevation areas could be dry farmed during years of above-average precipitation (Kelley 1980). With an estimated population of around 1,000 inhabitants at its peak, Kelley (1980:43) estimates that at least 271 ha (669 ac) of terrace deposits down in Arroyo Hondo and up to 1,125 ha (2,781 ac) of piedmont soils may have been under cultivation at the time of the site's population peak around A.D. 1330. As the site's population grew, it would have been necessary to adopt more intensive subsistence strategies to feed the inhabitants, as evidenced by agricultural features such as check dams. A large irrigation ditch that stretches along the

south side of Arroyo Hondo may have been used during prehistoric times to carry water from the arroyo upstream to the agricultural fields located southwest of the site. Feeder ditches visible in historic photographs of the site may also have been in use in prehistoric times.

Edible plants and animals found in the local environment would also have helped sustain the site's inhabitants. Additionally, cultivated fields and eroded arroyo sides and bottoms would have provided disturbed soils where native edible plants could grow in prehistoric times. From the beginning of the site's occupation, extensive tree cutting and clearing of native vegetation for agriculture radically altered the immediate woodland environment, creating more grassland and brushland environments. Changing environments surrounding the site would have forced later Component I inhabitants to range farther in their search for wild food and animal resources than in earlier times.

In addition to supplying supplemental food resources, the area's diverse environment provided prehistoric inhabitants with materials for construction, fuel for heating and cooking, materials for making tools, hunting equipment, clothes and bedding, art and religious objects, and other artifacts. Clay soils available near the site were mixed with water and made into adobe for construction. Additionally, locally available andesite rock was used in the early construction of some walls and large cobbles were obtained from the arroyo bottom for use in later wall footings built during Component II. Granite and gneiss found in the foothills were used for manos and metates and the andesite was used for grinding slabs, choppers, hoes, and other tools. Chert derived from the Ancha formation was used as a raw material in the production of knives, projectile points, scrapers, drills, and other implements. Extensive outcrops of clay were also exposed along the canyon wall east and west of the site, which would have been used for pottery production (Kelley 1980). Trade goods found at Arroyo Hondo Pueblo, including mollusc shells, artifacts made of turtle shell, scarlet macaws, Tularosa turkeys, and non-local ceramics, indicate the inhabitants had a fair amount of contact, either directly or indirectly, with peoples from more distant regions. The three small domestic Tularosa turkeys (*Meleagris gallopavo tularosa*) identified at the site may have originated in the area south and east of the Manzano Mountains (Lang and Harris 1984:9-10).

Construction of the site fell off quickly after A.D. 1330, by which time Kelley (1980) sees evidence for some well-developed brushland communities in the area. Shortly following this, much of the agricultural area was abandoned, allowing the woodland to begin reestablishing itself. Schwartz and his team found the two occupations at Arroyo Hondo to be separated by a thick layer of sterile windblown soil and fallen room walls, with the second, smaller settlement built directly over the remains of the earlier, more extensive one (Creamer 1993). Component I ended shortly after A.D. 1345 during a period of major drought, and trash fill found in a few rooms suggested that the Component I occupation ended abruptly (Creamer 1993:13).

Sometime in the A.D. 1370s the Component II occupation began, coinciding with a temporary return to high precipitation. Precipitation remained variable into the early 1380s, when renewal of agricultural activity and tree cutting appears to have re-expanded open habitats, though on a smaller scale than seen in Component I times. Most of the Component II construction took place between the A.D. 1370s and 1380s, during which time the site was rebuilt with an estimated 200 single-story rooms directly on top of the larger, early settlement. Component II reached its greatest expansion in the early 1400s, when tree-ring data show a 10-year period of sustained high moisture. However, sometime after A.D. 1410 the area suffered a major drought, with precipitation declining toward the lowest point in the 1,000-year tree-ring record (Rose et al. 1981). In the early 15th century, a fire destroyed many Component II rooms, which were never rebuilt. Following soon after, Arroyo Hondo Pueblo was permanently abandoned between A.D. 1410 and 1420 (Creamer 1993:40).

Previous Research and Documentation at Arroyo Hondo Pueblo

Arroyo Hondo Pueblo was first documented by Adolph Bandelier in 1881, although he may never have actually visited the site (Bandelier 1881:90-91). In 1915, Nels Nelson conducted excavations at the site, sponsored by the American Museum of Natural History. Nelson's work at Arroyo Hondo was one of a series of projects he undertook in the Southwest in order to better understand the area's chronology and the cultural affiliation of the sites. Nelson worked at Arroyo Hondo for two months, during which time he cleared a total of 111 rooms, including the community structure (kiva J) and two refuse deposits. Although Nelson's work at Arroyo Hondo was never published, field notes and a site map are on file at the Laboratory of Anthropology in Santa Fe, New Mexico (Nelson n.d.) and at the American Museum of Natural History. In 1933, W. S. Stallings of the Museum of New Mexico collected one tree-ring sample from the site (Robinson et al. 1973:57). Later the Laboratory of Anthropology assigned Arroyo Hondo Pueblo the designation LA 12.

In 1970, Douglas Schwartz, then president of SAR, conducted a short session of fieldwork at Arroyo Hondo Pueblo in order to test the suitability of the site for the study of population dynamics and culture change (Schwartz 1971). Following the initial tests, Schwartz applied for and received a major research grant from the National Science Foundation (NSF) to pursue his work at Arroyo Hondo, and in 1971 he began intensive fieldwork at the site, which continued each summer through 1974. Schwartz's research at Arroyo Hondo Pueblo had three central objectives: to use modern techniques to expand our understanding of northern Rio Grande Pueblo culture; to explore the growth and dynamics of a large Pueblo IV settlement; and to use Arroyo Hondo Pueblo, along with comparative ethnographic analysis, to examine the cross-cultural implications of rapid population growth and cultural and environmental change (Schwartz 1971). The first field season at the site focused on the comprehensive excavation of roomblock 16 in order to obtain details about the site's architecture. While this was underway, a road grader was used to strip the top 10 to 15 cm (4 to 6 in) of soil from the roomblocks, after which hand tools

were used to identify the tops of rooms, allowing for the creation of a complete map of the site. Monitored mechanical equipment was followed by careful excavation to remove sterile overburden from plaza surfaces and dug test depressions to determine the presence of kivas. In subsequent years, excavations were undertaken in all of the roomblocks, kivas, and plazas, and ecological and archaeological surveys of the area were undertaken (Dickson 1979, Kelley 1980), as well as pollen and other specialized studies (refer to Figure 16). Room and roomblock architecture, site organization and growth, residential configuration, and the makeup of plazas and kivas were the focus of Schwartz's excavations at the site.

Detailed, standardized notes and room measurements were taken, as well as samples for chronometric and paleobotanical analysis, which were obtained from almost every provenience during each field season. Pollen and flotation samples were taken from all rooms, hearths, storage bins, cists, and from almost all other architectural and stratigraphic features (Creamer 1993:10). All wood remains were collected. Archaeomagnetic samples were collected at Arroyo Hondo during the 1972 and 1974 field seasons from hearths in rooms and kivas and from burned walls and floors.

Of the 312 dated tree-ring samples obtained from the site, 106 were recovered from the Component I occupation, 200 were from Component II, and six could not be assigned to a component, but were probably part of the Component I occupation (Creamer 1993:136). Almost half of the Component I dates were recovered from plazas, primarily plaza G, and the remainder were recovered from 18 rooms and two kivas. The larger Component II dated tree-ring sample was obtained from 20 rooms, kiva C, and plaza C.

Excavation was undertaken across the site, including some rooms from every roomblock, as well as within five of 13 plazas, and six kivas (all of the kivas identified at the site), in order to investigate the establishment and growth of Arroyo Hondo Pueblo. Schwartz investigated 150 rooms, including 100 Component I rooms (32 one-story and 34 two-story rooms), representing 10-percent of those constructed; and 50 rooms from Component II, representing 25-percent of the later period rooms that were built. Refer to Figure 16 for areas of the Component I and II sites that were excavated by Schwartz and his team (after Creamer 1993:8-9). Excavation units were chosen in order to examine the organization of social units as well as chronological information for the site to understand its establishment and growth.

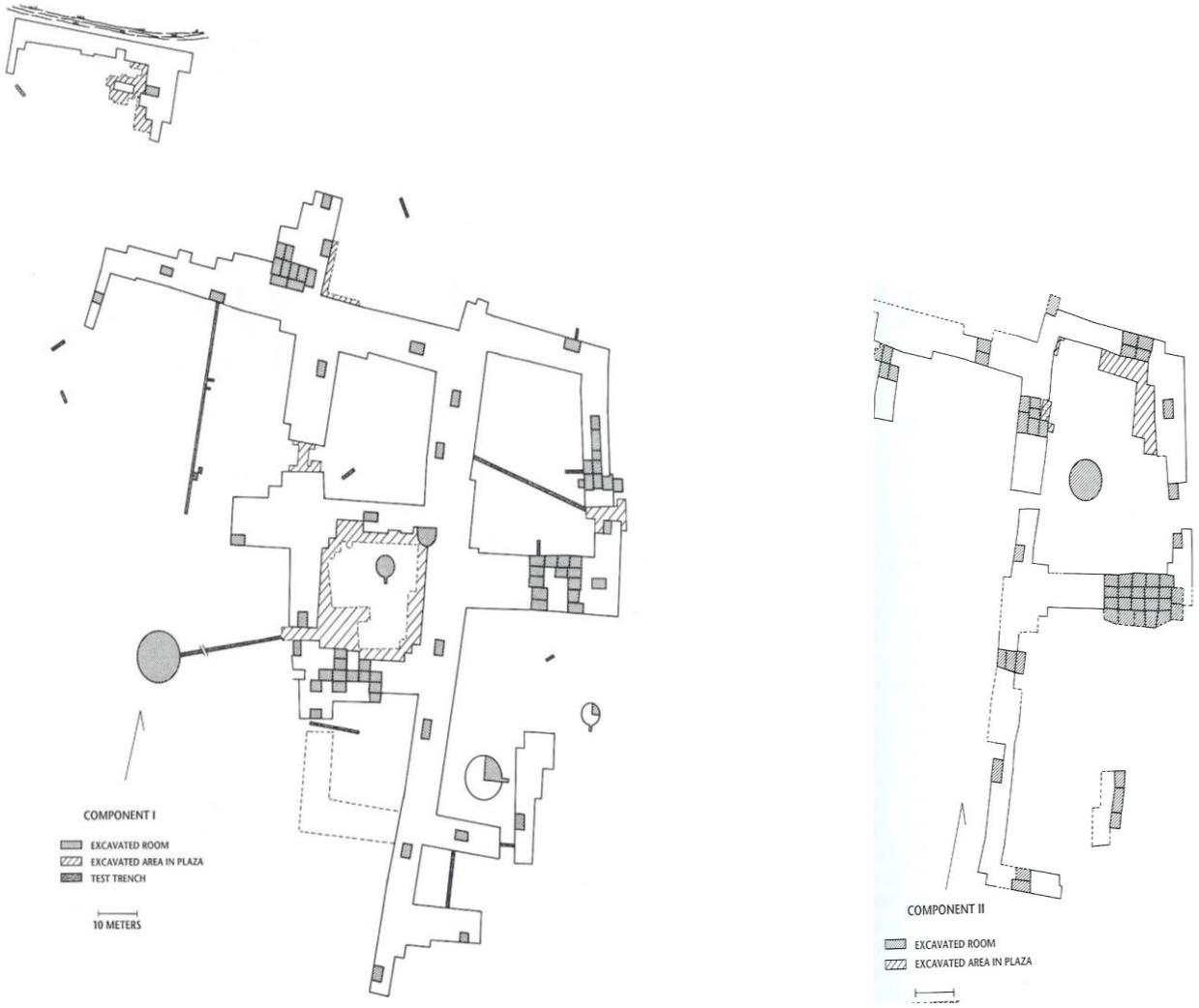

Figure 16. Areas of the Component I (left) and Component II (right) sites excavated by Douglas Schwartz, School of American Research.

Extensive excavations were undertaken in three Component I plazas, including plazas A, G, and K. Plaza C, which was used during both components, was also excavated (refer to Figure 2). Test excavations were conducted in Component I plazas D, E, F, H, and I, primarily to locate kivas and examine plaza gateway areas. Three plaza gateways were tested, as well as units within five plaza areas (Creamer 1993:9). Excavations in plaza G were extensive, covering more than 46-percent of the entire 672 square meter area. Five kivas dating to Component I and one Component II kiva were excavated by SAR. Component I kivas G-5 and 14-6 and Component II kiva C-2 were completely excavated. Kivas D-2 and D-3 were partially excavated, and the site's largest and only kiva not located in an enclosed plaza, kiva J, was originally excavated by Nelson in 1915, and was completely re-excavated by Schwartz and his team (refer to Figure 8). All excavated areas were backfilled following the completion of fieldwork.

Interim results were published in three preliminary reports during the years of excavations (Schwartz 1971, 1972; Schwartz and Lang 1973). All field notes, maps, specimen sheets, photographs, drawings, interim reports, and other documents are on file in the Arroyo Hondo laboratory at SAR. Additionally, all artifacts recovered from the site are located at SAR. After the completion of fieldwork in 1974, Schwartz, in collaboration with the National Geographic Society, produced the film *The Rio Grande's Pueblo Past*. A preliminary synthesis was also published following several years of analysis (Schwartz 1981). Nine volumes regarding every aspect of the site have been published by SAR Press with support from another NSF grant in the 30 years following the Arroyo Hondo excavations (Dickson 1979, Kelley 1980, Palkovich 1980, Rose et al. 1981, Lang 1984, Lang and Harris 1984, Wetterstrom 1986, Creamer 1993, Habicht-Mauche 1993, Shapiro 2006). These volumes focus on particular data sets, covering topics such as the Arroyo Hondo and surrounding environment and paleoenvironment; Arroyo Hondo Pueblo settlement patterns, human remains, faunal remains, subsistence and diet, architecture, ceramic, and lithic artifacts; dendroclimatology; and spatial syntax analysis of the site. Susan Collins used some of the Arroyo Hondo data in her Ph.D. dissertation for the University of Colorado (Collins 1975), and Catherine Cameron of the University of Colorado, Boulder later incorporated data from the investigations at Arroyo Hondo into other studies of prehistoric Puebloan architecture (Cameron 1991, 1999a, 1999b).

Subsequent to the completion of excavations at the site, a National Endowment for the Humanities grant enabled the creation of a storage facility at SAR specifically designated for the Arroyo Hondo Pueblo materials. The facility includes a laboratory where visiting scholars can continue to study the Arroyo Hondo materials.

Current Conditions and Past Impacts: Site Integrity

Arroyo Hondo Pueblo currently consists of mounded adobe roomblocks, scattered architectural stone, and open plaza areas with significant groundcover and surface artifact scatters. The site is stable and in very good condition. The mounded areas now stand between 1 and 2 m (3.3 and 6.6 ft) above the ground surface.

Excavations at Arroyo Hondo Pueblo conducted by Nelson in 1915 (described above) appear to have affected approximately 111 of the site's estimated 1,200 total rooms (Components I and II combined), representing approximately 9-percent of the site's rooms. Schwartz's excavations at the site conducted between 1971 and 1974 (described above) cleared a total of 150 rooms (100 Component I rooms and 50 Component II rooms), representing approximately 13-percent of the site's rooms, some of which had already been tested by Nelson (Creamer 1993). Together, Nelson and Schwartz's excavations have affected an estimated 22-percent of the site. An estimated 78-percent of the deposits associated with the site's occupation, particularly the burned areas, are therefore thought to remain undisturbed and preserved beneath the modern ground surface, possessing the integrity associated with undisturbed prehistoric sites known from throughout the region. Additionally, those rooms that were completely exposed by SAR and Nelson still contain valuable information about construction technique preserved in walls and their intersections. The roof and floor strata may contain abundant cultural materials including reconstructible ceramic vessels, lithic tools and debris, plant and animal remains, and food processing materials.

A stock tank constructed sometime between Nelson's 1915 work at the site and SAR's 1970s excavations there destroyed two Component I roomblocks that form the south and western edges of plaza I (shown on Figure 3 as dashed lines and designated numbers 17 and 22). Aerial photographs of the area indicate that the stock tank was built after the 1940s (Shapiro 2006, pers. com.) Residences built around Arroyo Hondo Pueblo since the 1970s are likely located in areas used by the prehistoric inhabitants of the site for agriculture, although residential construction is not believed to have directly impacted known structures and features associated with the site. Installed sometime after 1970, Brass Horse Road follows the southern and eastern edges of the site. Although the road does not cross any known structures or features, it could have impacted prehistoric trash deposits.

The School of American Research (SAR) acquired Arroyo Hondo Pueblo from private landowners in the 1930s. In the spring of 2003, SAR's Board of Managers donated the site to The Archaeological Conservancy, a national non-profit organization that acquires and preserves significant sites across North America. The site has since been established as a permanent archaeological and educational preserve, with public tours available by request. The preserve is currently partially fenced, posted, and routinely patrolled by local volunteer site stewards. Little or no vandalism has occurred at the

site since site stewards began monitoring it.

Under the terms of the Native American Grave Protection and Repatriation Act (NAGPRA), in the spring of 2006 in consultation with local Pueblos as represented by the Pueblo of Zia, SAR reburied approximately 100 human remains and associated funerary items within the boundaries of the site. The reburial took place in an area devoid of cultural deposits, as determined by a testing program conducted by the Museum of New Mexico's Office of Archaeological Studies (OAS) in 2006. Native American groups involved with the reburial are concerned that this remain private and that the reburial location not be shown on any maps.

Despite some rural residential development and roadway construction in the area, the location and setting of Arroyo Hondo Pueblo is much the same as it would have been at the time of the village's prehistoric occupation and therefore retains high integrity. The village site's original design and layout are still apparent in the highly visible arrangement of roomblocks, plaza areas, and kivas that represent the Component I and Component II settlements. Materials used to construct the site, including local clay used for adobe, local andesite used for limited masonry construction, and river cobbles, all remain intact. The site's workmanship is highly apparent in the distinct style of coursed adobe and limited masonry architecture employed. Additionally, despite previous excavations at the site, the site's original feeling and association remain intact. Overall, despite rural residential development surrounding the site and the evidence of previous excavations, Arroyo Hondo Pueblo possesses a high degree of intact deposits capable of producing an abundance of well-provenienced data that will augment and contextualize existing data sets from the site.

STATEMENT OF SIGNIFICANCE

Arroyo Hondo Pueblo was one of the first large, aggregated, plaza-oriented sites in the northern Rio Grande region, established shortly after A.D. 1300 and rapidly constructed between A.D. 1300 and 1315, during the critical transitional period from the late Coalition to the Classic periods (Pueblo III to early Pueblo IV periods). The site is also the first major pueblo in the northern Rio Grande region to be extensively excavated using modern standards and equipment with a multidisciplinary approach. Arroyo Hondo Pueblo is significant under Criterion D at the state1 level of significance for the tremendous amount information that it contains and has already yielded regarding the prehistoric cultural development of Ancestral Pueblo peoples during the Pueblo III to early Pueblo IV periods (A.D. 1300-1410), when major geographic and ideological reorganization took place as thousands of people left the Four-Corners region and moved south and east during this turbulent time of transition; for the lack of a substantial and lengthy later occupation that might contaminate the earlier deposits; and for the extensive, interdisciplinary, professional excavations and broad supporting research that has been undertaken at the site over the last 30 years. Arroyo Hondo Pueblo was at the forefront of a trend in the northern Rio Grande region toward the aggregation of large numbers of people at single, rapidly constructed settlements, and may have helped stimulate a settlement pattern and sociopolitical organization that characterized the region up until historical times (Creamer 1993). The site provides a dramatic example of the speed and magnitude of population aggregation in the region during the early stages of this trend. Arroyo Hondo Pueblo was one of, if not the, largest communities in the region during the critical transition between the late Coalition and early Classic periods, marked by dramatic increases in population size, settlement structure, local and regional social organization, ceremonialism, craft specialization, and economic integration (Cordell 1989, Habicht-Mauche 1986, Wendorf and Reed 1955). The site is also the southernmost expression of these traits, giving it a unique position and potential for understanding these changes and how they related to developments in other areas of the Southwest at this time. Arroyo Hondo Pueblo is one of the few Coalition to Classic Period sites in New Mexico that had a small, later occupation and, as such, is an uncontaminated example of late Coalition to Classic Period architecture and intra-site design. The relative simplicity of the site's deposits and material culture are key to understanding more complex site histories present in other very large pueblos elsewhere in the Southwest where diverse populations speaking several different languages aggregated during the same time period. The site is ancestral to Puebloan peoples still living in New Mexico today.

Through preliminary testing, archaeological survey, four years of intensive excavations, multidisciplinary studies, and at least 20 years of subsequent analysis and publication, research at Arroyo

1 A national level of significance should be considered after a comparison with other early pueblo sites. Given that it was one of the first large, aggregated, plaza-oriented sites in the northern Rio Grande region, a potential for national level significance is high, if not implied.

Hondo Pueblo has already contributed significant information regarding the area's prehistoric environment, chronology, architecture, settlement organization, regional interaction and social organization, local and regional ceramic production and exchange, subsistence and demography, and the processes of population growth and site aggregation in the early 14th century. The site also contains tremendous potential to contribute to our understanding of the prehistory of the greater Ancestral Pueblo world of New Mexico, Colorado, and Arizona. Despite the vast amount of research that has already been undertaken at the site, researchers continue to return to Arroyo Hondo Pueblo to ask new questions under new theoretical paradigms (for example, Cameron 1999a and 1999b; Shapiro 2005), underscoring the tremendous importance of the site for understanding Puebloan society, architecture, and settlement organization, as well as numerous other research issues. More than two-thirds of the site's total rooms remain intact and in a likely excellent state of preservation. Future research at the site can provide substantial additional information relating to a number of important research issues, including prehistoric community planning and development and regional organization and integration in the northern Rio Grande region during the Pueblo III and early Pueblo IV periods of the 14th and early 15th centuries. Arroyo Hondo Pueblo is included among the 24 sites singled out for protection by the 2004 Galisteo Basin Archaeological Sites Protection Act, further highlighting the site's tremendous significance.

Context Summary

The northern Rio Grande region culture area has been defined as stretching from the Pueblo of Isleta on the south to the Colorado state line on the north; and from the Canadian River on the east to the Rio Puerco and the Rio Chama on the west (refer to Figure 17) (Wendorf 1954:200). Two commonly used temporal classification systems apply to the pueblo period in the northern Rio Grande region, based primarily on changes in pottery types and, to some extent, architecture and settlement patterns. The first system comprises the Basketmaker and Pueblo periods of the Pecos Classification used throughout the Southwest (Kidder 1927). The second system was specifically developed for the central and northern Rio Grande region by Wendorf and Reed (1955) and is essentially a regional expression of the Pecos Classification that also emphasizes patterning in settlement size, location, and organization, and continues to use ceramic types as chronological markers. The northern Rio Grande classification system comprises three major divisions: the Developmental (Basketmaker III-early Pueblo III), Coalition (late Pueblo III), and Classic (Pueblo IV). Specific dates for the subdivisions vary among researchers, but generally fall into: Developmental (A.D. 600-1200), Coalition (A.D. 1150/1200-1325), and Classic (A.D. 1325-1600) (Cordell 1997:197).

During the first half of the Developmental period inhabitants of the northern Rio Grande region developed a mixed horticultural and foraging economy and built simple semi-subterranean pithouses,

frequently in groups of two or three and sometimes associated with above-ground jacal rooms. Sites of this period tend to be located on benches overlooking the Rio Grande Valley and along intermittent tributaries (Cordell 1979, Lintz et al. 1988). The earliest ceramic sites contain both Lino Gray and brown ware cooking vessels, as well as San Marcial Black-on-white decorated wares (Cordell 1997). In later Developmental times (after A.D. 900), villages became larger and more numerous and settlement locations expanded into a greater range of environmental zones. Architecture became more complex, and increased site size presumably reflected increased population in the region and greater reliance on cultigens (Lintz et al. 1988). Ceramics representing the late Developmental period include Kwahe'e Black-on-white (Cordell 1979, Wendorf and Reed 1955). By the end of the late Developmental period (early Pueblo III), surface pueblos that combined surface rooms and storage facilities began to appear (Cordell 1997).

During the subsequent Coalition period (late Pueblo III), although larger surface pueblos were built, pithouse architecture continued and residential settlement shifted to valley bottoms. The beginning of the Coalition period was marked by a technical change in black-on-white pottery in which carbon paint was substituted for mineral paint in most of the northern Rio Grande region, with the new resultant ceramic type termed Santa Fe Black-on-white (Cordell 1997). Additionally, subterranean round kivas continued, and at about this time the large trough metate largely supplanted the deep basin metate (Cordell 1997:225). Around A.D. 1275, a small settlement known as upper Arroyo Hondo Pueblo (LA 76) was established on a gravelly rise east of the Arroyo Hondo fault and near the upper spring. This earlier settlement consisted of approximately 45 to 50 rooms arranged in a U-shaped mound around a central plaza containing a possible kiva depression. Upper Arroyo Hondo Pueblo was likely abandoned around A.D. 1325, with some of the inhabitants possibly joining those that established the larger site of Arroyo Hondo Pueblo downstream (Dickson 1979).

Dickson (1979:75) summarizes the Coalition period in the northern Rio Grande region as a time of environmental stress, particularly drought conditions, which forced the abandonment of the less productive districts of the region by reducing the human carrying capacity. Degraded environmental conditions rendered the extensive agricultural practices that had previously characterized the area possible only in the most productive districts, prompting the aggregation of populations within these areas. Population pressure on critical resources built within these most productive areas, caused by the combined effects of continued environmental stress and population aggregation. This pressure resulted in a slight decline in the population in the middle of the Coalition period in these areas and a transformation of the extensive agricultural practices of earlier Developmental times into intensive ones (through the use of irrigation, check dams, and other techniques) by the end of the Coalition period. Dickson proposes that these new agricultural techniques combined with improved environmental conditions allowed for a rapid increase in the region's population between A.D. 1300 and 1320. Schwartz, however, sees a decline in the region's total population at this time, with aggregation into

larger sites masking this overall decline (Schwartz 2006, pers. com).

By around A.D. 1250, during the late or Galisteo phase Coalition period (Wendorf and Reed 1955), the northern Rio Grande region saw a dramatic increase in the number of inhabitants, with the majority of people beginning to live in aggregated pueblos (those with more than 50 rooms) (Cordell 1989, 1997; Creamer 1993:11). Masonry construction became more common, especially in the Galisteo area, but it never fully replaced puddled adobe at some of the major pueblos in the vicinity of Santa such as Pindi Pueblo (LA 1) (Stubbs and Stallings 1953:25), Arroyo Hondo Pueblo, and others. Above-ground kivas were incorporated into roomblocks at Pindi Pueblo and other sites in the region (Cordell 1997, Wendorf and Reed 1955). Settlement patterns and larger villages suggest an even greater reliance on cultigens during this time. At the same time a new ceramic type referred to as Galisteo Black-on-white appeared, showing great similarity to the Mesa Verde Black-on-white ceramics of the Four Corners region to the north. In addition to this dominant ceramic type, other new wares such as Poge, Pindi, and Wiyo Black-on-white are thought by some researchers to reflect Mesa Verde cultural influence (Dickson 1979, Wetherington 1968).

The earliest excavated levels at Arroyo Hondo Pueblo are dominated by Santa Fe Black-on-white ceramics, considered the diagnostic ceramic of the late Coalition period in the northern Rio Grande (Habicht-Mauche 1993:54). By around A.D. 1320, Galisteo Black-on-white, whose distribution center lies to the south in the Galisteo Basin, becomes the predominant ceramic type, although Santa Fe Black-on-white rises again in popularity at the beginning of the Component II occupation. Wiyo Black-on-white is present in small to moderate amounts throughout Component I deposits at the site. For a brief time between A.D. 1320 and 1350, two black-on-white ceramic types known as Pindi and Rowe gained prominence, possibly reflecting influence from the Espanola-Chama district to the north where potters favored the use of ash and pumice tempers. Ceramic decoration at the site follows trends seen elsewhere in the northern Rio Grande region.

The Rio Grande Classic Period is characterized by the production of red-slipped glaze-decorated ceramics in the central and northern Rio Grande regions. Prehistoric population in the area reached its maximum during this period, and large aggregated communities were present, with an elaboration of material culture (Cordell 1997). Some well-known Classic Period sites in the region include Pindi, Te'ewi, Tsama, Sapawe, Pa'ako, Tijeras Pueblo, Kuaua, Cieneguilla, and Pecos Pueblo (refer to Figure 17).

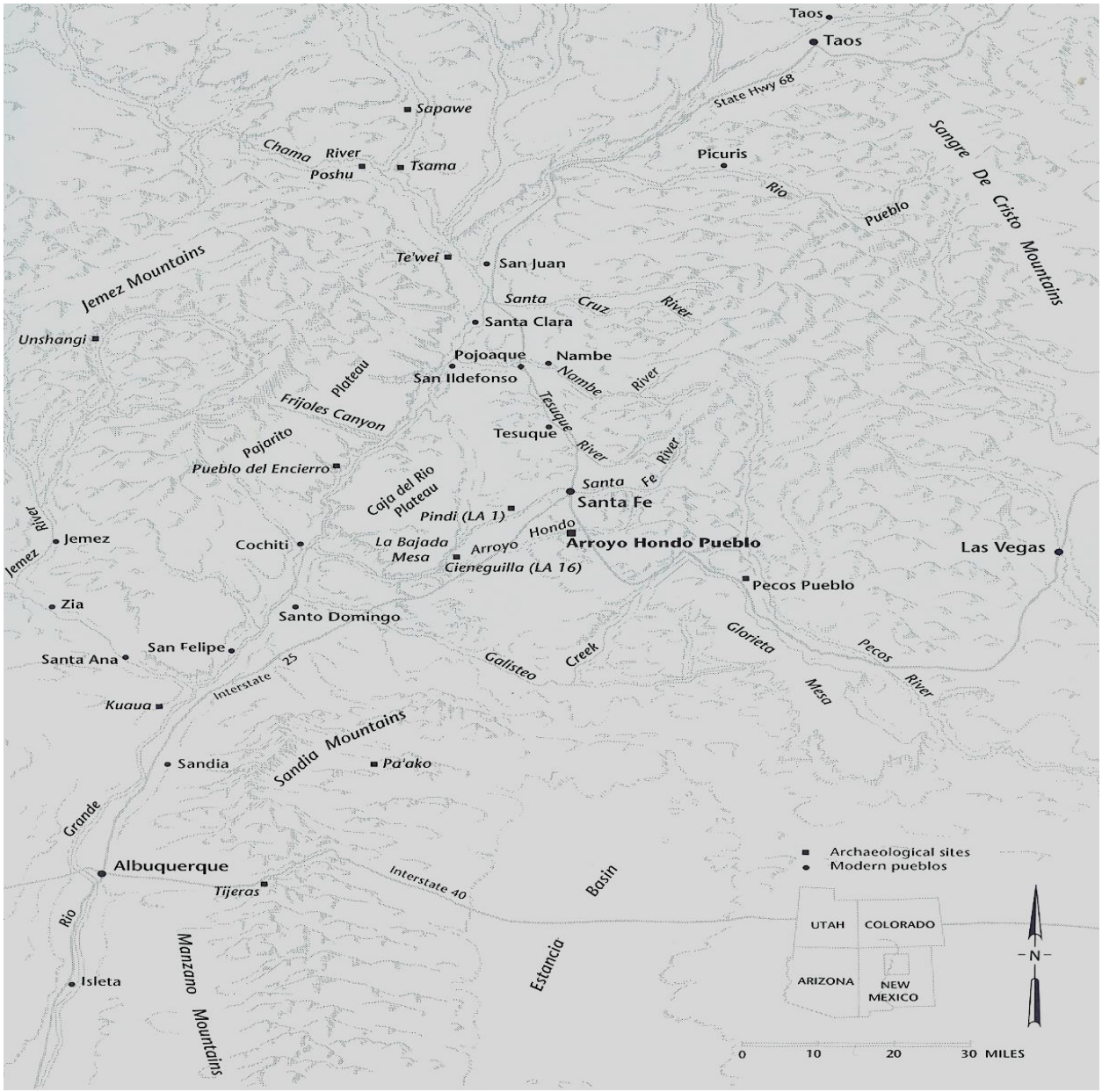

Figure 17. Map of the central and northern Rio Grande region with location of archaeological sites mentioned in the text.

Analysis of ceramics at Arroyo Hondo Pueblo showed that the rapid shift from black-on-white ceramic styles to the glaze-painted ceramics typically used in the northern Rio Grande to mark the beginning of the Classic Period was not as dramatic at Arroyo Hondo Pueblo as it was in areas farther south. Glaze ware ceramics are present at Arroyo Hondo Pueblo in very small amounts prior to A.D. 1350, forming a significant part of the ceramic assemblage only after 1370. By about A.D. 1400 to 1410, Agua Fria Glaze-on-red is the most common decorated ceramic type at the site, although white wares continue to dominate the assemblage throughout both Components I and II (Habicht-Mauche 1993:56).

Population aggregation increased in the A.D. 1300s during a time of higher relative precipitation in the northern Rio Grande region. It was about this time that Arroyo Hondo Pueblo was established just west of the Galisteo Basin at the base of the Sangre de Cristo Mountains above the deeply incised Arroyo Hondo Creek. The rapid population growth and settlement expansion in the region were likely a result of the incorporation of smaller villages in the neighboring region into larger, aggregated settlements (Schwartz 2006, pers. com). Some researchers have suggested the increased population at this time may have been due, in part, to migration from the northern San Juan region, which may also have resulted in the southward retreat of groups from the northwest periphery of the northern Rio Grande into the area (Cordell 1989, Habicht-Mauche 1986, Shapiro 2005).

Beginning around A.D. 1300 or shortly thereafter, a few families built one or two small roomblocks, quickly followed by rapid construction of the site now known as Arroyo Hondo Pueblo. Between A.D. 1300 and 1330, the pueblo grew rapidly from a few residences to at least a thousand rooms in 24 roomblocks around 10 plazas covering nearly six acres and inhabited by an estimated 1,000 to 1,500 estimated people. Arroyo Hondo Pueblo was a massive site in comparison to other contemporaneous settlements in the region -- northern Rio Grande sites typically did not reach the size of Arroyo Hondo until the mid-15th century (Cordell 1997, Creamer 1993). Several large pueblos were established in the nearby Santa Fe River valley during the Late Coalition (A.D. 1300-1325; early Pueblo IV), including La Bajada Pueblo (LA 7), La Cienega Pueblo (LA 149), La Cienega Mesa Pueblo (LA 3), and La Cieneguilla Pueblo (LA 16) (refer to Figure 17).

According to Adams (1991), who has traced the development of the enclosed plaza settlement layout in the American Southwest, plaza-oriented sites appeared in both Chaco Canyon (northwest New Mexico) and the Mimbres area (southwest New Mexico) during the 11th century. By the 13th and 14th centuries, sites with this layout were located throughout the southern Mogollon area (southern New Mexico and northern Mexico) and the Rio Grande region. Adams argues that the katsina cult developed as an institution of social integration, with specific aspects that required larger scale cooperation that cross-cut households and clans (Adams 1991). As in today's modern pueblos, enclosed plazas were likely valued as ceremonial spaces, and Adams (1991:83-84) associates them with the development of the katsina cult, a religious tradition still followed by Pueblo peoples.

Other researchers have suggested that the site aggregation that characterized the late Coalition and early Classic Periods may have been a response to the need for defense (LeBlanc 1999, Wilcox and Haas 1994). Some researchers have suggested that aggregated settlements developed under conditions of increasing population, increased settlement permanence, and decreased residential mobility (Kohler 1989). Despite the obvious disadvantages, aggregated communities had a competitive advantage in situations where there was increased competition and conflict over agricultural and foraging territory and increasingly limited resources. Arroyo Hondo's defensible location and arrangement of plaza areas enclosed by roomblocks with limited access may support this hypothesis. The clear pattern of aggregation during the Pueblo III period (late Coalition/early Classic) in the northern Rio Grande region, with movement from dispersed villages to densely aggregated sites such as Arroyo Hondo Pueblo, may have been a response to increased warfare in the region. Evidence for burning of the site at the end of Component I may indicate increased violence (Creamer 1993), seen at other sites throughout the region between A.D. 1250 and 1300 (Wilcox and Haas 1994).

The occupation of Arroyo Hondo from the early 14th through the early 15th centuries spanned the transition between the late Coalition and early Classic periods in the region (Wendorf and Reed 1955). This transition was marked by dramatic increases in population size, settlement structure, local and regional social organization, ceremonialism, craft specialization, and economic integration (Cordell 1989, Habicht-Mauche 1986, Wendorf and Reed 1955). Arroyo Hondo Pueblo was one of, if not the, largest communities in the region during this critical transition period. The Classic period (Pueblo IV) is named for the large, aggregated communities and multiroom pueblos that characterize this period. The sudden appearance of large pueblos on the Caja del Rio Plateau to the west probably reflects the Late Coalition/Early Classic period expansion of northern Rio Grande Puebloan populations into upland settings (Cordell 1997).

The rapid rise in the area's population would have encouraged the formation of new social and ethnic alliances as these immigrants merged with the inhabitants of the area to form large, aggregated settlements. As discussed above, competition and conflict may also have intensified as increasing numbers of inhabitants sought increasingly limited resources (LeBlanc 1999, Wilcox and Haas 1994). Creamer (1993:153) suggests that economic and political pressures associated with emigration into the area may have contributed to the pattern of highly aggregated settlements that continued into the 14th, 15th, and 16th centuries. Increased local patterning in material remains is seen during this period, as reflected in the diversity of local black-on-white ceramic styles documented at the beginning of the 14th century. Habicht-Mauche (1986:6-7) suggests that this may have been a mechanism for validating cultural identity and ethnic boundaries in an increasingly crowded and competitive social landscape. Arroyo Hondo Pueblo was one of only two very large sites in the Santa Fe district of the northern Rio Grande region that were occupied in the early 14th century, the other being La Cieneguilla (LA 16). Other contemporaneous sites in the region appear to have been much smaller (Creamer 1993:153).

During the middle of the 14th century, Arroyo Hondo Pueblo underwent rapid depopulation and was abandoned during a time of greatly reduced precipitation in the region. After a hiatus of some 30 years, a new occupation began at the site sometime in the A.D. 1370s. The town was partially rebuilt during this second occupation (known as Component II) to consist of nine roomblocks around three plazas. The settlement was occupied until about A.D. 1410, and was permanently abandoned by 1420. By the middle of the Classic Period, between A.D. 1400 and 1542, most of the large pueblos in the Santa Fe River Valley had been abandoned. While La Bajada and La Cieneguilla Pueblos continued to be occupied, their populations dropped sharply. This regional population decline coincides with a general withdrawal from upland settings that appear to correlate with oscillations in tree-ring growth observed in the upper Rio Grande region, indicating a period of reduced and unpredictable precipitation (Anscheutz 1994:22; Fritts 1965:430). Additionally, near the end of the Classic period, it is likely that the spread of newly introduced European diseases in advance of actual contact may also have contributed to the region's population decline.

Data Categories

Research at Arroyo Hondo Pueblo has already provided and has the potential to provide a tremendous amount of information about prehistoric cultural development of Ancestral Pueblo peoples in the northern Rio Grande region of north-central New Mexico during the Pueblo IV to early Pueblo V periods of the 14th and early 15th centuries [Late Coalition to Classic Periods (Wendorf and Reed 1955)]. Specifically, the site has already yielded and still contains information about the prehistoric environment of the northern Rio Grande region; and about prehistoric subsistence practices, architectural and settlement layout details, local ceramic production and regional exchange, artifactual and skeletal remains, faunal and botanical remains, and the processes and chronology of site development and subsequent abandonment at Arroyo Hondo Pueblo. The site has the potential to yield additional information about prehistoric community planning and development and regional organization and integration in the 14th and early 15th centuries during a critical time of demographic and socio-religious transition in the northern Rio Grande region. With an estimated 78-percent of the site remaining intact and preserved beneath the surface, the site holds an abundance of well-preserved remains with the potential to provide additional information about these important research issues.

Prehistoric Archaeology

The prehistoric environmental context of the northern Rio Grande region has been assessed through analyses of perishable materials already recovered from excavations at Arroyo Hondo Pueblo, and additional materials certainly remain preserved in unexcavated contexts at the site (Kelley 1980, Rose et al. 1981). Tree-ring dates from Arroyo Hondo Pueblo have provided important temporal information regarding the two occupations of the site; have provided support for the dating of regional ceramic types (of which the site contains a diversity); have helped bracket the timing of regional site development, aggregation, and subsequent abandonment; and provide a database from which more refined models of local cultural and climatic variation can be constructed. It is highly likely that additional wood samples are preserved at Arroyo Hondo Pueblo, and their potential to contribute substantial additional information about both local and regional cultural chronology as well as environmental and climatic variability is high.

The abundance of tree-ring samples collected at Arroyo Hondo Pueblo supports the detailed chronology of site development, settlement, and abandonment for the two components at the site (Rose et al. 1981). Macrobotanical samples from Arroyo Hondo Pueblo have been used to provide data about subsistence resources and the local environment, giving researchers the most detailed information yet recorded for a site from the northern Rio Grande region (Lang and Harris 1984). Chronological and environmental information about the site has been reconstructed through analyses of recovered wood and botanical fragments (Rose et al. 1981, Kelley 1980). More than 300 wood fragments recovered from a great diversity of locations at the site were dated and analyzed, providing an abundance of information about the past climate and paleoclimatic fluctuations, as well as the chronology of site development, methods of construction, and the chronology of site abandonment during this critical period in the region's prehistory (Creamer 1993). Many of the site's samples derive from burned rooms, especially from the second occupation of the site, and are therefore particularly well preserved.

Numerous burned and preserved corn cobs have been recovered from the site, providing an abundance of information about changing subsistence and storage practices, the environment's carrying capacity, and changing environmental and climatic conditions (Kelley 1980, Rose et al. 1981, Palkovich 1980, Wetterstrom 1986). Corn was certainly a major subsistence crop for the occupants of Arroyo Hondo Pueblo, and is highly likely to still exist in a number of preserved contexts at the site. Additional detailed morphological analyses to determine what strains or hybrids of corn were present and how diverse or uniform the utilized corn strains were. Information such as this can be used to assess susceptibility to risk due to various adverse environmental conditions.

Analyses of pollen samples from Arroyo Hondo Pueblo have been used to evaluate the prehistoric environment and subsistence resources at the site and throughout the surrounding area. Combined with such analyses from other sites in the region, this information allows for a regional reconstruction of the past environment. Comparable analyses from other sites in the region support the notion of various environmental fluctuations over the last centuries. As drought years prevailed, the occupants of Arroyo Hondo Pueblo intensified their agricultural strategies through the construction of check dams, terraces, irrigation ditches, and possible grid gardens (Wetterstrom 1986, Dickson 1979). Research undertaken at Arroyo Hondo Pueblo has provided and has the potential to provide more detailed information about the inhabitants' adaptive changes and their relation to the changing environment. Wood species data has been used to evaluate human impacts to the local environment over time, for example by comparing changes in wood species used as fuel and for construction over time (Creamer 1993). Comparison of the types of fuels used for heating and cooking early and later in the site's occupation has indicated that there was a change in the selection of fuels over the history of the site's two occupations (Lang and Harris 1984). In many contexts, residents deplete the most desirable heating fuels early in the life of a settlement and are increasingly forced to rely on shrubs or less efficient heating fuel. The two occupations of Arroyo Hondo Pueblo provide an ideal context for such a study, especially when linked to a comparable faunal study.

Research at the Arroyo Hondo Pueblo has provided and has the potential to provide more information about changes in prehistoric land use over time and how these changes correlate with detailed information about the changing paleoclimate (Rose et al 1981, Wetterstrom 1986). Abundant floral and faunal remains from the site have been recovered and remain well preserved in the Arroyo Hondo repository at SAR (Lang and Harris 1984, Wetterstrom 1986). Faunal analyses have determined changes in resources that were available and sought throughout the site's occupation, indicating that significant environmental change resulted from hunting pressure and resource collection. Comparison of faunal species diversity from deposits associated with the earlier and later occupations at the site have been used to evaluate the impact of residents' hunting and land use activities on local resources (Lang and Harris 1984). Comparisons of modern and prehistoric botanical samples have also revealed changes that have occurred with the invasion of non-native species introduced by Europeans and changes associated with grazing and rural residential development (Kelley 1980). Pollen recovered from numerous contexts at the site have indicated that the canyon environment was quite lush during the optimal period when the site was first founded and the springs and river flowed at their highest levels in recent history, circa A.D. 1300 (Kelley 1980, Rose et al. 1981). The site contained several marshy areas, and supported numerous species not present in the immediate area today. Thus, macrobotanical and pollen analyses from Arroyo Hondo Pueblo have had and continue to have the potential to document resources utilized by the prehistoric occupants of the region, and to document changes in resource utilization techniques.

Analyses of skeletal remains from Arroyo Hondo Pueblo by Palkovich (1980) have provided and retain the potential to provide additional information about the demographics of the site's population, including overall health, patterns of illness, malnutrition, and death, and how these changed from the earlier to the later occupation of the site.

Detailed analyses of ceramics recovered from Arroyo Hondo Pueblo undertaken by Habicht-Mauche (1993) have contributed and have the potential to contribute more information about local and regional ceramic production, interaction, and exchange in 14th and early 15th century northern Rio Grande region. Habicht-Mauche (1993) found that large quantities of black-on-white pottery were being exchanged between adjacent villages and districts in the northern Rio Grande region during the early years of the 14th century. The ceramic distribution suggests that the region consisted of a number of local political alliances that competed with one another for land and other resources following an influx of population from the north and west (Creamer 1993:154). The widespread introduction of glaze-painted pottery (though found at Arroyo Hondo only after A.D. 1340) suggests to Habicht-Mauche (1993) the emergence of more stable "complex tribes". Studies such as these have the potential to contribute additional information about regional interaction and the early formation of alliances in the northern Rio Grande region during the 14th and early 15th centuries.

Arroyo Hondo Pueblo has provided and retains the potential to provide important information about architectural and settlement layout details, including the chronology of site construction, information about architectural methods and materials, and the evolution of a plaza-oriented settlement layout (Creamer 1993). Construction methods and architectural features from both occupations at Arroyo Hondo Pueblo indicate that the site was part of a local architectural tradition. Certain design and construction techniques suggest that the site was built to accommodate a rapidly growing population, with sequential construction of roomblocks around multiple plazas providing an easy means of expanding the site size while maintaining the plaza-oriented design (Creamer 1993:39). Additionally, the switch from masonry to adobe construction may indicate expediency in selection of construction materials. Relatively standardized structures, such as rooms, and aggregate (multiroom) construction seen during the Component I occupation required coordination and planning among builders and Creamer speculates that this may indicate the immigration of large groups to the site rather than individual families. During the Component II occupation of the site however, rooms were built individually or in pairs, suggesting that construction during this later occupation was organized by individuals or families. Based on this information, important inferences regarding site and regional demographics can be made, providing insights into significant research issues such as the possibility of migration into the northern Rio Grande region in the late 13th and early 14th centuries and the processes of site aggregation that took place at that time.

Most recently, Shapiro (2005) has used the vast amount of data about the site to examine the process of sociopolitical organizational change at Arroyo Hondo Pueblo by analyzing architectural change, known as "space syntax analysis" (Hillier and Hanson 1984). Shapiro (2005:45) proposes that "the physical organization of built space is not random, but embodies both the institutions and social structures of societies." At Arroyo Hondo, Shapiro sees changes in spatial use between Components I and II, with rooftop areas serving as the most integrating spaces in the relatively open, interconnected layout of the Component I settlement, and plazas serving as primary integrating spaces during the Component II occupation. A significant shift toward greater residential privacy is seen in Component II when roomblocks become more segregated, while public plaza areas become more integrated and serve as the location for ceremonial activities. Over time at Arroyo Hondo, Shapiro sees it become increasingly difficult for non-residents to gain access to the deepest portions of particular roomblocks. These changes in organization are paralleled at other contemporaneous sites in the northern New Mexico region, and may mark a shift in Puebloan social organization that may have been related to rapid population growth and immigration (Shapiro 2005). Studies such as these have the potential to contribute additional information about settlement organization and changes in sociopolitical organization that took place at Arroyo Hondo and other sites in the northern Rio Grande region during the 14th and early 15th centuries.

Research Potential

Arroyo Hondo Pueblo is likely to contain valuable information regarding community planning and development and regional organization and integration in the northern Rio Grande region during the 14th and early 15th centuries.

Community Planning and Development
Arroyo Hondo was one of the earliest and largest plaza-oriented settlements established during a time of great demographic and socio-religious transformation in the northern Rio Grande region, and therefore has tremendous potential to inform on the processes of community planning and development during the 14th and early 15th centuries in this region. Prior to about A.D. 1250**,** the region was relatively sparsely populated, followed by a major trend in site aggregation, of which Arroyo Hondo Pueblo was a frontrunner. Further research at the site has the potential to address the processes of community planning and development, site aggregation, and subsequent abandonment at Pueblo III to early Pueblo IV period villages in the region.

A major research question that remains is the nature and extent of the likely migration of peoples from the Four Corners region of southwest Colorado to the northern Rio Grande region during the late 13th and early 14th centuries. Through analyses of settlement layout, architectural features and methods, skeletal remains, and artifacts recovered from Arroyo Hondo Pueblo, which was occupied during this critical transition period, future researchers can address this important research question. Additionally, studies

of the process of abandonment at the site at the end of both components can provide information about the scale of social units within Pueblo III to early Pueblo IV period villages and some indication about their destinations. Similarities with other sites in the region suggest that insights from Arroyo Hondo Pueblo can provide important information about Pueblo III to early Pueblo IV period village organization and can contribute to the study of abandonment behaviors in other Pueblo settings.

Regional Organization & Integration

Arroyo Hondo Pueblo has the capacity to provide data that can be used to evaluate several regionally oriented arguments that have been suggested to account for both local settlement structure and regional patterning in the northern Rio Grande region during the 14th and early 15th centuries. The two classes of regionally oriented arguments specific to the northern Rio Grande region during Pueblo III to Pueblo IV times are the in-migration of inhabitants from the Four Corners region of southwestern Colorado (Cameron 1995, Creamer 1993, Dickson 1979, Lipe 1995, Wendorf and Reed 1955, Shapiro 2005) and the development of the katchina religious cult (Adams 1991, Schaafsma and Schaafsma 1974). The Pueblo III to early Pueblo IV period settlements of the northern Rio Grande region can be used to address the nature of local and regional organization during this era.

Several researchers have identified an important series of developments related to regional integration, ritual development, and interactions linked to Pueblo III and Pueblo IV period settlements in the northern Rio Grande region. The site's plaza-oriented design may be associated with the religious developments occurring throughout portions of the Southwest at this time (Adams 1991:83-84). According to Adams (1991), enclosed plazas were valued as ceremonial space and were associated with the development of the katchina cult. The presence of a great kiva and central plazas during Component I may indicate that Arroyo Hondo Pueblo was in a period of religious transition in the early 14th century (Creamer 1993:149). Additionally, the region's population also appears to increase at this time, which may indicate the consolidation of people that previously lived in widely scattered, smaller settlements and/or the in-migration of peoples from the north. It has been proposed that, in addition to seeking better-watered areas, inhabitants from the north may have been drawn south by the development of the katchina religious cult in the Rio Grande region during this time (Adams 1991, Cordell 1984, Creamer 1993, Lipe 1995). The construction of multiple plaza areas with associated kivas created spaces that could be used for public ceremonies necessary to integrate divergent populations and assimilate the new population into the existing settlement (Creamer 1993). Planned, aggregate, standardized room construction built around separate, open plaza areas supports the notion of migrant clans joining local groups to form large, aggregate settlements.

The consolidation of populations into a large settlement that was defensibly located is also consistent with models suggesting that concerns for defense or worries about security were prevalent and partly responsible for some of the settlement changes seen in the northern Rio Grande region in the early

14th century (LeBlanc 1999, Wilcox and Haas 1994). The size of Arroyo Hondo Pueblo, with 1,200 rooms during Component I, makes it the largest settlement within the northern Rio Grande region at this time and a prime candidate for the seat of a regional alliance (Creamer 1993). The large plazas and community structure (kiva J) could also be seen as consistent with a prominent local and regional settlement that might have hosted ceremonies where goods could be exchanged and political leaders meet. Arroyo Hondo Pueblo's two occupations that spanned the Pueblo III to early Pueblo IV periods during a time of demographic and socio-religious transition in the northern Rio Grande region, provides a unique opportunity to examine these research issues.

Finally, several researchers have made a strong case for the need to recognize a potentially hostile landscape in explanations of patterning in the northern Southwest during this time of increasing population and pressures on resources (Haas 1990, Haas and Creamer 1996, LeBlanc 1999, Snead 1995a, Wilcox and Haas 1994). An increasing number of empirical studies and recent excavations have documented catastrophic events, violent deaths, and hostile relations—conflict or warfare—that constitute an emerging explanation for Pueblo III to early Pueblo IV period social developments. Research at Arroyo Hondo Pueblo, which contains evidence of Pueblo settlement changes that may have been related to concerns for defense, has the potential to contribute to a better understanding of social developments and the relevance of warfare during this period in the region's prehistory.

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GEOGRAPHICAL DATA

Verbal Boundary Description
The site is located in an unplatted portion of projected Section 13, Township 16 North, Range 9 East, in the Sebastian de Vargas land grant, Santa Fe County, New Mexico. The site boundary is indicated on the accompanying 7.5-Minute Series USGS Seton Village, New Mexico Quadrangle (2002).

Boundary Justification
The site boundary was determined through surface observation, aerial photography, and extensive excavations and subsurface testing previously undertaken by the School of American Research (SAR). The boundary includes all of the known architecture associated with Arroyo Hondo Pueblo.

PHOTOGRAPHS

The following information pertains to all photographs unless otherwise noted:

Arroyo Hondo Pueblo
Vicinity of Santa Fe, Santa Fe County, New Mexico
Photographer: John W. Murphey
Date: May 2007
Location of negatives: New Mexico Historic Preservation Division, Santa Fe

Photo 1 of 8

Camera facing

Photo 1 of 8

Camera facing

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All photographs and maps were taken or created by various researchers with the School of American Research (SAR) over the course of SAR's investigations at Arroyo Hondo Pueblo, Santa Fe County, NM. All original negatives are located at the Arroyo Hondo Repository, SAR in Santa Fe, NM.