MUSEUM OF NEW MEXICO

OFFICE OF ARCHAEOLOGICAL STUDIES

AN ARCHAEOLOGICAL DATA RECOVERY PLAN FOR SEVEN SITES ON NM 22 NORTH OF PEÑA BLANCA, SANDOVAL COUNTY, NEW MEXICO

John A. Ware

Submitted by Timothy D. Maxwell
Principal Investigator

ARCHAEOLOGY NOTES 227

SANTA FE 1997 NEW MEXICO

ADMINISTRATIVE SUMMARY

In May and June 1997, the Office of Archaeological Studies, Museum of New Mexico, at the request of the New Mexico State Highway and Transportation Department, examined seven cultural properties along the right-of-way of NM 22 between Peña Blanca and Cochiti Pueblo that will be affected by a highway improvement project. All but one of the sites (LA 115862) are located on lands owned by the Pueblo of Cochiti, and permission to inspect cultural properties on pueblo lands was granted by the Cochiti Pueblo governor's office.

Based on field inspections and a review of previous archaeological research in the area, a data recovery plan was developed for the seven cultural properties and is presented in this report, along with summaries and specific treatment plans for each site in the project area. Although no test excavations were performed on the present project, surface indications suggest that substantial Rio Grande Developmental (A.D. 600-1200) components are present at six of the seven sites in the project area (LA 249, LA 265, LA 6169, LA 6170, LA 115862, and LA 115863), and that substantial Coalition and Classic period (A.D. 1200-1600) components are present on the majority of sites, as well (LA 249, LA 265, LA 6169, LA 6170, LA 6171, and LA 115863). Data recovery efforts at the Peña Blanca Project promise to yield important information on local and regional culture history, the nature and extent of early Puebloan occupations and adaptations in the northern Santo Domingo Basin, and the nature and variability of late prehistoric agricultural strategies in the Cochiti region.

MNM Project 41.6491
NMSHTD Project No. TPM-0022(9)08
CN 2861
JPA D04040

CONTENTS

Figures

Tables

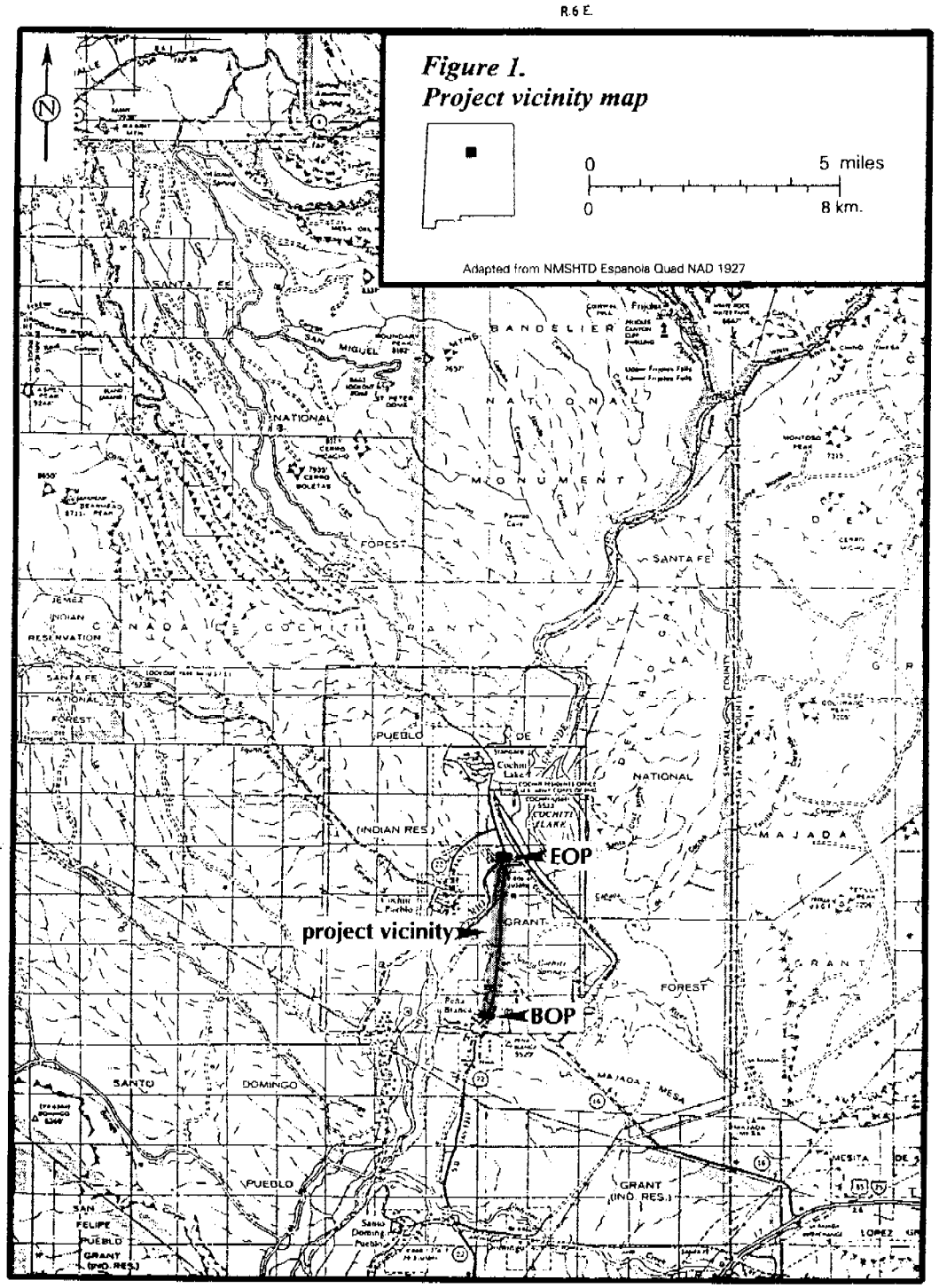
INTRODUCTION

The sites described in this research design and data recovery plan were documented by cultural resource inventory surveys conducted by the New Mexico State Highway and Transportation Department (NMSHTD) along NM 22 in the fall of 1996 and early winter of 1997 (Marshall 1997) (Fig. 1 and Appendix 1). The survey covered a total of 34.196 ha (84.499 acres) and resulted in the discovery and documentation of 8 cultural properties within the limits of the proposed project area. Seven of these cultural properties, including LA 249, LA 265, LA 6169, LA 6170, LA 6171, LA 115862, and LA 115863, are at least partially within the proposed project limits and cannot be avoided. The sites date from the Early Rio Grande Developmental period (ca. A.D. 600-1200) to the Rio Grande Classic (A.D. 1300-1600), and several sites include historic components outside the proposed project limits.

The sites were resurveyed by staff members of the Museum of New Mexico's Office of Archaeological Studies (OAS) in the late spring of 1997, and the following research design and data recovery plan was prepared on the basis of these site visits and background library and archival research. There was no opportunity to conduct test excavations at the sites.

The author would like to thank Nancy Akins, Steven Lentz, James Moore, and Dean Wilson of OAS and Sandra Marshall of NMSHTD for their advice and assistance during preliminary site evaluation visits. The Pueblo of Cochiti granted permission to visit the sites, and their cooperation and assistance is greatly appreciated. The report was edited by Tom Ireland, and Rob Turner did the drawings.

The first portion of this report presents an overview of the project environment, a brief history of archaeological research in the northern Santo Domingo Basin, a summary of local and regional culture history, and a descriptive overview of each site with specific data recovery recommendations. The final sections summarize important research problem domains for cultural resources in the project area and presents a comprehensive plan for excavation and data recovery on the project.


R.6 E.
Figure 1.
Project vicinity map
0
5 miles
0
8 km.
Adapted from NMSHTD Espanola Quad NAD 1927
EOP
BOP
project vicinity
T.16 N.
BANDELIER
NATIONAL
MONUMENT
SANTA FE
FOREST
COCHITI GRANT
CANADA
JEMEZ
INDIAN
RESERVATION
PUEBLO
DE
COCHITI
(INDIAN RES.)
MAJADA
GRANT
SANTO
DOMINGO
PUEBLO
SAN
FELIPE
PUEBLO
GRANT
(IND. RES.)
MESITA
LOPEZ

PROJECT ENVIRONMENT

The Peña Blanca Project study area is near the northern edge of the Middle Rio Grande depression, part of a chain of structural depressions that form the Rio Grande Rift Valley, which extends from southern Colorado to the vicinity of El Paso, Texas. The present project area lies along the northern edge of the Santo Domingo sub-basin, a northern extension of the Albuquerque Basin, one of four principal basins that comprise the Middle Rio Grande. The Albuquerque Basin extends roughly 100 miles north-south by 35 miles east-west and covers approximately 7,925 sq km (Fox et al. 1995:52). Its northern boundary is formed by two major uplifts: the Nacimiento, consisting primarily of Precambrian plutonic and metamorphic rocks overlain by Paleozoic strata; and the Jemez uplift, consisting principally of Cenozoic volcanic rocks. The basin's eastern margin is formed by massive fault blocks forming the Sandia, Manzano, and Los Pinos Mountains, which consist primarily by Precambrian plutonic and metamorphic rocks, with overlying limestones and sandstones of the Paleozoic period (Fox et al. 1995:52).

Fill material within the Albuquerque Basin is composed primarily of sediments from the Miocene to early Pleistocene Santa Fe Group, which date from approximately 15 to 1 million years old. Most of the sediment is from high-elevation uplift areas adjacent to the basin, the Colorado Plateau on the west, and the southern Rocky Mountains on the east and the north. The Santa Fe Group varies from 2,400 to 3,000 ft thick along the basin margins to 14,000 ft in the central basin. In the last million years, basin fill has been subjected to cyclical incision and aggradation. Erosion has predominated since the Rio Grande began cutting its valley during the Pleistocene. For the past 10,000 to 15,000 years the river valley has been gradually aggrading, producing young sediments that are up to 60 m thick (Fox et al. 1995:54).

NM 22 runs along the eastern edge of the Rio Grande floodplain, cutting through Upper Pleistocene gravel terraces equivalent to the Edith gravels (Hoge 1970) in the Albuquerque area. The gravel terraces north of Peña Blanca consist of an upper and lower deposit of axial Rio Grande gravels and a middle fine-grained overbank deposit, with a combined total thickness of 165 ft (Smith 1996:91). The first terrace above the floodplain traversed by NM 22 is capped by eolian and redeposited alluvial sands and silts that vary from a few centimeters to several meters thick. Smith (1997, personal communication) has recently dated these fine-grained sediments to between 15,000 and 30,000 years, but archaeological deposits of much more recent origin (ca. 1000-1500 B.P.) have been observed eroding from these deposits, suggesting significant deposition in the last 2,000 years.

Most of the soils in the Peña Blanca project area are classified as Rough Broken Land-Embudo Association (Maker et al. 1971:13). This association dominates in southeastern Sandoval County in topography characterized by undulating, hilly, and heavily dissected uplands. Most of the soils in this association are forming on unconsolidated old alluviums that are coarse- to medium-textured and have high proportions of gravel. The typical surface layer is a gravelly-sandy loam or a gravelly-loamy fine sand. Gravel and cobbles are common over many of the surfaces and tend to reduce superficial soil erosion.

The climate of the northern Albuquerque Basin is semiarid. The seasonal distribution of precipitation in the basin, as in most of the Southwest, is primarily a function of sea-surface temperature regimes in the eastern Pacific and the seasonal position of polar and subtropical jetstreams (Gottfried et al. 1995:98), as well as local topography, which influences orographic storm patterns (Fox et al. 1995:59). Mean annual precipitation within the Middle Rio Grande Basin

varies from a low of 200 mm to a high of over 400 mm. Typical precipitation patterns are a highly variable frontal precipitation pattern in the winter, a semiarid to arid late spring, and a summer regime linked to convectional storms that are highly variable from site to site (Gottfried et al. 1995:98). Detailed weather and precipitation data was collected by the U.S. Army Corps of Engineers at Cochiti Dam for 26 consecutive years, between 1968 and 1993. During the quarter century that records were kept, the average annual precipitation was 12.56 in (s.d. = 3.40), with a minimum of 6.81 (1976) and maximum of 21.39 in (1985).

The principal vegetation community in the eastern Santo Domingo sub-basin has been classified as Plains-Mesa grassland (Loftin et al. 1995:84). This community dominates on landscapes in the northern Albuquerque Basin between 1,200 and 2,300 m in elevation that receive between 300 and 450 mm of precipitation annually. The dominant shrubs include Bigelow sagebrush, winterfat, rabbitbrush, and broom snakeweed. Grasses include blue grama, sideoats grama, galleta, ring muhly, Indian ricegrass, and sacaton/dropseed.

The desert shrub and grassland of the northern Albuquerque Basin supports many small mammals, some of which are unique to the area. The largest component of the small-mammal assemblage is comprised of various granivorous pocket mice and kangaroo rats. Other grass-eating rodents include antelope squirrels, spotted ground squirrels, pocket gophers, harvest mice, several species of *Peromyscus*, grasshopper mice, cotton rats, and woodrats. Black-tailed prairie dog populations are present but have been drastically reduced as a result of pest-control measures in the recent past. Black-tailed jackrabbit and desert cottontail are also present in varying numbers. Common artiodactyls include mule deer and pronghorn. Carnivores include coyote, kit fox, long tailed weasel, badger, skunk, and bobcat. Reptiles and amphibians are represented by one species of salamander, two species of turtles, and several species of frogs, toads, lizards, and snakes. Several dozen resident and migratory bird species are present within the study area.

ARCHAEOLOGICAL OVERVIEW

History of Research

Archaeological research in the Cochiti area and the Santo Domingo Basin began with the explorations of Adolf Bandelier in 1880-82 (Bandelier 1892; Biella 1979) and continued into the first half of the twentieth century with the extensive site and ceramic surveys by H. P. Mera in the 1920s and 1930s (Mera 1940). The first intensive excavations in the region were conducted at La Bajada Pueblo by Nels Nelson of the American Museum of Natural History in 1915-16, part of his extensive research on late prehistoric Pueblos in the northern Rio Grande and Galisteo Basin (Nelson 1914, 1916). Stubbs and Stallings of the Laboratory of Anthropology conducted extensive excavations throughout the 1930s and 1940s, primarily in search of tree-ring samples for the developing science of dendrochronology (Robinson et al. 1972; Biella 1979). The first archaeological survey that approached a systematic inventory consisted of a survey of 30 sites in the Santa Fe River Valley by R. H. Carter and Paul Reiter in 1932 and 1933 (Carter and Reiter 1933).

Highway salvage excavations within the present project area were conducted by Alfred E. Dittert Jr. and Frank W. Eddy of the Laboratory of Anthropology in 1961, but the results of these studies were never published. Shortly thereafter, intensive salvage work began in conjunction with the construction of Cochiti Dam and its various spillways, conveyance channels, and outlet works (Biella 1979). Work on Cochiti Dam included extensive surveys and intensive excavations and was accomplished primarily between 1962 and 1967, with additional small-scale excavations and surveys between 1969 and 1973. The latter small-scale projects focused primarily on areas adjacent to the dam and reservoir, especially in areas impacted by the town of Cochiti Lake (Snow 1970) and a highway to the Tetilla Peak Recreation Area (Snow 1973).

Survey work for the Cochiti Dam Archaeological Salvage Project was initiated in April 1962, and intensive excavations began at the proposed dam site in mid-June 1963 under the direction of Charles H. Lange (Lange 1968). During their first season of fieldwork excavations were completed at three small to medium-size village sites dating to the Late Developmental through Early Classic Periods: the Red Snake Hill site (LA 6461), the North Bank Site (LA 6462), and the Alfred Herrera Site (LA 6455). The 1964-65 field seasons focused on the excavation of Pueblo de Encierro (LA 70), a large Classic to early historic period pueblo within the conservation pool of Cochiti Reservoir. The work, conducted under the general direction of Charles Lange and A. E. Dittert Jr. succeeded in excavating over 200 surface rooms and over a dozen subterranean kivas and pitrooms at this large site. A final report of the LA 70 excavations was published by the Museum of New Mexico in 1976 (Snow 1976).

In 1967 the National Park Service contracted with the Laboratory of Anthropology to compile an inventory of archaeological sites in areas adjacent to Cochiti Reservoir to identify the resources that would be most vulnerable to vandalism due to increased recreational use of the area, including the eastern portions of Bandelier National Monument. A list of 331 sites was compiled and published with brief summaries of each site (Peckham and Wells 1967).

In 1969, 75 sites were recorded by the Museum of New Mexico in the Town of Cochiti Lake survey. The sites range from late Archaic to late Classic and include campsites, fieldhouses, and agricultural fields. Several of the lithic sites in the Town of Cochiti survey were subsequently intensively mapped, surface collected, and test excavated, and the results were published in a brief

report (Bice and Davis 1972). An extensive rock-art study of the Cochiti area was conducted in 1966 by Polly and Curt Schaafsma (P. Schaafsma 1975). Other projects unrelated to the Cochiti Salvage Project included survey and testing projects on the Cañada de Cochiti Grant between 1958 and 1970 (Flynn and Judge 1973). Most of the this work was accomplished by Southern Illinois University and the University of New Mexico.

The University of New Mexico initiated intensive surveys and excavations in the permanent and flood pools of Cochiti Reservoir in 1975 (Broilo and Biella 1977). Fieldwork was accomplished primarily between 1975 and 1977, resulting in the discovery and study of nearly 300 sites and the publication of a four-volume monograph series (Biella and Chapman 1977, 1979) that remains to this day the most detailed archaeological study in the Cochiti-White Rock Canyon regions of northern New Mexico.

University of New Mexico surveys of Cochiti Reservoir documented 121 nonstructural lithic components at 90 site locations, many of which were probably occupied during the Archaic period (Biella and Chapman 1977:295-316). The investigation of these sites still constitutes one of the most intensive studies of Archaic adaptations in the northern Rio Grande. Like many other areas of the northern Rio Grande, the Cochiti study area had a paucity of Early Developmental deposits and structural remains (A.D. 600-900). Only 17 components from 12 sites contained possible Early Developmental structural depressions, and the majority of components were along the southern terrace margins of the Santa Fe River. There is a slight increase in sites in the Late Developmental Period (A.D. 900-1200), with 34 sites documented on survey. The majority of these sites were discovered in stratified contexts with earlier or later occupations.

The subsequent Coalition or Pueblo III period was the first high-density occupation of the Cochiti study area. Over 363 sites were documented, and the majority (268) contained architectural remains. A total of 233 sites in the Cochiti study area contain Classic or Pueblo IV components, the majority dating to the early Pueblo IV Glaze A and B periods (A.D. 1325-1450). The number and size of Pueblo IV components suggests a significant decline in occupation during the late prehistoric period in the Middle Rio Grande. The final historic period is represented by 37 documented sites, a slight majority of them components of earlier occupations.

Prior to the University of New Mexico's Cochiti Reservoir project in the late 1970s, archaeological research in the Middle Rio Grande had focused on the largest and most spectacular Anasazi sites--most dating to the Coalition or Classic periods. Early lithic sites, smaller Anasazi occupation and special-use sites, and historic period sites were typically underrecorded or simply neglected by early researchers. The University of New Mexico's research in Cochiti Reservoir in the late 1970s went a long way in correcting this historic imbalance. Not only were UNM's surveys the first truly systematic inventories of cultural resources in the Cochiti area, but this first modern salvage project also sponsored the first multidisciplinary environmental and economic studies in the Cochiti area, and many of the problems addressed were tied to large-scale adaptive issues that were being addressed at the same time on the Colorado Plateau and the San Juan Basin, to the west of the Rio Grande Valley.

Few modern studies have approached the scope and scale of the Cochiti Reservoir Project. Large-scale surveys were conducted in the Arroyo Hondo and eastern Galisteo Basin during the 1970s, to the east of the Cochiti study area (Dickson 197?; Lang 1977), and intensive surveys and limited excavations have been conducted over the past 20 years within Bandelier National Monument, immediately north of the Cochiti study area (Hill and Trierweiler 1986; Kohler 1989, 1990).

OVERVIEW OF CULTURE HISTORY

The spatial-temporal systematics of the northern Rio Grande have been the subject of discussion and debate since the pioneering work of Nelson (1914) and Kidder (1917). H. P. Mera's (1935) regional surveys and ceramic studies helped to define geographic boundaries for the region and postulated a temporal framework based on the distribution of prehistoric ceramic types. In 1955, Wendorf and Reed published a major synthesis of northern Rio Grande prehistory. Arguing that the northern Rio Grande did not reflect the sequence of early cultural developments on the Colorado plateaus to the west, they proposed a modification of the Pecos classification comprising five chronological periods: Preceramic, Developmental, Coalition, Classic, and Historic (Table 1). Subsequent syntheses by McNutt (1969), Wetherington (1968), Lang (1977), and Dickson (1979) have revised or elaborated on Wendorf and Reed's developmental scheme.

Table 1. Northern Rio Grande cultural sequence

Rio Grande Chronology	Dates (A.D.)	Pecos Classification
Preceramic	Pre-600	Paleoindian-Basketmaker III
Developmental	600-1200	Basketmaker III-Pueblo II
Coalition	1200-1325	Pueblo III-Pueblo IV
Classic	1325-1540	Pueblo IV
Historic	1540-present	Pueblo V

The following regional overview draws heavily on previously published syntheses of the northern Rio Grande (Cordell 1978; Dickson 1979; Wendorf and Reed 1955; McNutt 1969; Wetherington 1968). Emphasis will be placed on cultural dynamics within the Santo Domingo Basin and White Rock Canyon, and only secondarily on the larger Santa Fe district, whose boundaries Cordell (1978) defined as follows: Pecos on the east, the confluence of the Chama and Rio Grande on the north, White Rock Canyon and Cochiti Reservoir on the west, and the Rio Jemez on the south.

Early Hunters and Gatherers

Only a few scattered Paleoindian and Early-Middle Archaic localities have been recorded in the Santa Fe District (Stuart and Gather 1981:46), but a substantial number of Late Archaic sites have been recorded in recent years, primarily from White Rock Canyon (Biella and Chapman 1977), the Galisteo Basin (Honea 1969; Lang 1977), the Santa Fe River Valley (Post 1996), and high-elevation areas of the Sangre de Cristos (Wendorf and Miller 1959). The paucity of early hunter-gatherer sites may simply be a function of visibility, since land surfaces of the appropriate antiquity may not be exposed in many areas of the northern Rio Grande (Cordell 1979:1-2). Whatever the case, in the late Archaic, between approximately 1500 B.C. to A.D. 500, evidence of hunter-gatherer occupation and use of the northern Rio Grande increases dramatically.

Prior to the Cochiti Reservoir Project, practically nothing was known about Archaic chronologies in the northern Rio Grande Valley. Unfortunately, although a number of late Archaic

components were recorded in Cochiti Reservoir, the virtual absence of datable charcoal from the sites precluded major refinements of the Oshara chronology developed in the Puerco Valley to the west (Chapman and Biella 1979). Despite the lack of time control, however, Archaic site studies in Cochiti Reservoir contributed substantially to our knowledge of Late Archaic settlement patterns and economic adaptations in the northern Rio Grande. University of New Mexico scholars documented, among other things, a significant degree of intersite redundancy in food processing, consumption, and lithic raw material and reduction activities within the Cochiti study area. These studies concluded that the majority of Archaic occupations of Cochiti and White Rock Canyon were seasonal in nature, and that the abundance and relatively uniform distribution of lithic raw materials within the study area resulted in a widespread use of expedient lithic reduction technologies:

> Taken in conjunction with other lines of investigation concerning the character of Archaic occupation of the Cochiti Reservoir locale, the strategies of lithic resource tool manufacture and usage seem to indicate a strictly short term period of occupancy governed by foreknowledge that the majority of lithic tools necessitated during the term of occupancy could be expediently manufactured at any site locale (Chapman and Biella 1979:392).

Chapman (1979) went on to compare Late Archaic adaptations at Cochiti Reservoir with intensively studied Archaic expressions in the San Juan Basin to the west, and found two principal differences between the two areas: First, Cochiti Archaic expressions are predominantly Late Archaic in age, whereas the San Juan Archaic is dominated by Middle Archaic San Jose assemblages. Second, unlike the San Juan Basin, Chapman found no evidence of a strong correlation between Archaic sites in the Cochiti area and areas of high vegetative diversity (Stuart and Gather 1981:46-47). Chapman concludes that in an area like the northern Rio Grande, local plant diversity may not be an important variable in conditioning hunter-gatherer settlement distributions.

In recent years, studies of Archaic settlements and adaptations in the Santa Fe River Valley (e.g., Post 1994) have considerably expanded our knowledge of regional Archaic adaptations in the northern Rio Grande, with important implications for the Cochiti and White Rock Canyon study areas. Over 64 late Archaic components have been reported in the Santa Fe area (New Mexico Cultural Resource Information System files), and several residential base camps have been excavated. Usually near permanent water sources, base camps typically contain shallow pit structures with interior hearths, suggesting cold weather occupation. Post (1994) hypothesizes an annual round for Late Archaic hunter-gatherers that involved movement from riparian zones, such as the Santa Fe River and Rio Grande, up to piedmont and lower montane environments in response to plant flowering and fruiting schedules and seasonal movements of large game animals. Presumably, winter base camps were in piedmont and montane zones, where wood was abundant and large game animals could be more easily exploited.

The Rio Grande Developmental

The earliest dates for corn in the Santa Fe area are from Ojala Cave in lower Alamo Canyon, north of Cochiti Reservoir (Traylor et al. 1977), where two radiocarbon dates, 650 $\pm$145 B.C. and 590 $\pm$ 75 B.C., were recovered from late Archaic artifact-producing strata (Cordell 1979:2). Despite these early dates, there is very little evidence of early agricultural commitments in the northern Rio Grande--especially when compared with the Colorado Plateau to the west. Post (1994)

suggests that short and unpredictable growing seasons north of La Bajada Hill may have limited early experiments with corn horticulture. Lang (1977:354) suggests that the low frequency of Late Archaic (Basketmaker II) farming sites may be the result of sampling bias, but he also suggests the possibility of a long-winter climate regime for A.D. 300 to 775, resulting in shorter growing seasons and a tenuous horticulture adaptation. Cordell (1979) argued that the northern Rio Grande is so optimal for broad spectrum foraging that there would have been few incentives to invest heavily in corn horticulture until demographic pressure forced the issue.

Consistent with the overall paucity of Basketmaker II expressions in the northern Rio Grande, sites of the succeeding Early Developmental period (Basketmaker III-early Pueblo I, A.D. 600-900) are extremely rare as well (Wendorf and Reed 1955:138). In an extensive survey of Basketmaker III and Pueblo I sites in the Rio Grande, McNutt (1969) concluded that Early Developmental sites are virtually absent in the Rio Grande Valley north of White Rock Canyon and La Bajada Hill: "With but two possible exceptions (LA 171, 195), both very tentative, there is virtually no specific information that contradicts the hypothesis that Puebloan groups were not in the Rio Grande Valley north of White Rock Canyon and La Bajada Hill before 800 A.D." (1969:70).

Recent intensive archaeological surveys in the Santa Fe area have largely confirmed McNutt's impressions. Dickson's (1979:10) survey of the Arroyo Hondo drainage south of Santa Fe recorded only one Early Developmental site. Only four Basketmaker III-Pueblo I sites were identified on the San Cristobal survey in the eastern Galisteo Basin (Lang 1977:355), and most of these were tenuously identified on the basis of projectile point styles. Significantly, the entire survey of the San Cristobal drainage produced only one sherd of Lino Gray pottery. Finally, Stuart and Gather's survey of archaeological site documents for the northern Rio Grande, which examined over 1,100 site components within a 600 sq mi region, found only 15 (1.5 percent) components dating to the Early Developmental period (1981:47).

There is a similar paucity of Early Developmental sites in the Cochiti study area. Biella and Chapman (1977) recorded only seven Basketmaker III sites in their survey of the Cochiti Reservoir flood pool, and all of these are south of the mouth of White Rock Canyon and along the lower courses of the Santa Fe River. Early Developmental sites in the Cochiti area typically consist of isolated structural depressions, and in some but not all cases the depressions are associated with surface architecture. Significantly, several of the Cochiti sites that were initially identified as Early Developmental were subsequently excavated by Hunter-Anderson, who found no evidence of formal pit structures and recovered a pottery assemblage dominated by Pueblo IV ceramic types (Stuart and Gather 1981:47). Consequently, the sample of Early Developmental sites in the Cochiti area is even smaller than original counts suggested. Biella and Chapman concluded that the Developmental occupation of the Cochiti area was ephemeral and possibly seasonal, and that extensive year-round occupation of the area did not begin until the early thirteenth century Rio Grande Coalition, probably precipitated by significant immigration into the region.

The only Early Developmental period site excavated to date in the Cochiti area is LA 272, an early ceramic period site excavated during the Cochiti Dam project (Snow 1971). The site, which consisted of three pit structures, at least two slab-lined surface units (possibly jacal or puddled adobe), and an extramural storage pit and diversion wall, is on the north side of the Santa Fe River approximately four miles from its confluence with the Rio Grande. The pit structures were circular in outline and ranged from 4 to 5 m in diameter and 1.3 to 1.9 m deep. All had tunnel ventilators and central fire pits. The ceramic assemblage from LA 272 included Red Mesa Black-on-white, Piedra Black-on-white, and plain gray neck-banded utility wares. Based on the low frequency of

material remains and the lack of human burials at the site, Snow (1971:21) argued that occupation was short term and probably occurred between A.D. 850 and 950.

The Late Developmental period (A.D. 900-1200) saw a gradual growth of population in the northern Rio Grande. According to Wendorf and Reed (1955:140), "A significant increase in the number of pueblos occurred shortly after A.D. 900, and, at the same time, the area of occupation was extended to the Canadian on the east and to beyond Taos on the north." The earliest sites from this time period are typically associated with Red Mesa Black-on-white. At the Tesuque Bypass site north of Santa Fe, McNutt (1969) described a Red Mesa component consisting of a small adobe roomblock partly enclosing a semisubterranean kiva. In addition to Red Mesa Black-on-white, the material assemblage included contained neck-banded gray wares, trough metates open at one end, and both oval and rectangular manos (McNutt 1969:58).

Seven miles north of Tesuque Bypass at LA 835, Stubbs and Stallings (1953) described a large cluster of 12 to 15 residence units, each consisting of from 10 to 20 adobe surface rooms and one or more kivas. Stubbs also recorded a Great Kiva at LA 835--one of only two or three great kivas known for the Rio Grande during the Developmental period. Tree-ring dates recovered from the Great Kiva suggest a construction date in the early tenth century A.D. and use well into the eleventh century (Peckham 1984:276).

Comparatively few Red Mesa phase sites have been recorded outside of the Santa Fe and Tesuque Valleys. No Red Mesa sites were found in the survey of the permanent pool at Cochiti Reservoir (Biella and Chapman 1977), and Stuart and Gather's study of the area around Cochiti Reservoir documented only 34 Pueblo II components, the majority associated with either earlier or later occupations. Likewise, surveys in the Galisteo have produced very little evidence of Red Mesa activity in the Basin. Only two sites of possible Red Mesa affiliation were recorded on Dick Lang's San Cristobal survey. According to Lang (1977:382), "The rarity of Pueblo II material in the survey area is in accord with the data for this period over the remainder of the Basin, and fortifies the belief . . .that Pueblo II activity outside the Cerrillos mining area was transitory in the Galisteo Basin, and associated with quantitatively limited excursions into the heart of the drainage."

The second half of the Late Developmental period (Pueblo II-Pueblo III, ca. A.D. 1000-1200) saw an increase in the number and size of sites in the northern Rio Grande. According to Wendorf and Reed (1955:140-41), Late Developmental sites range from small 10 to 12 room coursed-adobe pueblos to communities of over 100 rooms and multiple kivas. McNutt (1969) notes a significant elaboration of architectural forms during the Late Developmental, with both jacal and adobe surface architecture, and a wide variety of kiva forms. The predominant decorated ceramic of the Late Developmental is Kwahe'e Black-on-white, which dates from roughly the mid-eleventh century to 1200 A.D. According to McNutt (1969:10), the distribution of Kwahe'e Black-on-white extends from the confluence of the Rio Chama and the Rio Grande in the north to just north of Albuquerque in the south, with the greatest concentration east of the Rio Grande between the Rio Chama and Galisteo Creek. Published reports on Late Developmental sites include the Kwahe'e complex at the Tesuque Bypass site (McNutt 1969), a pre-Pindi jacal structure at Pindi Pueblo (Stubbs and Stallings 1953), and a pithouse site (LA 6462) near Cochiti Pueblo (Lange 1968).

Lang (1977:383) reports a slight increase in activity in the eastern Galisteo Basin during the Late Developmental period. The survey of the San Cristobal watershed produced two sites and two isolated occurrences of Kwahe'e Black-on-white. The sites include a small two-room adobe and masonry structure on the north rim of San Cristobal Canyon and a small sherd scatter of mixed Kwahe'e and Santa Fe Black-on-white pottery on a low, heavily dissected ridge several hundred

meters west of U.S. 285. Despite the slight increase in activity at the end of the Developmental period, Pueblo II sites are rare in the Galisteo Basin, and Lang suggests that occupation may have been limited to seasonal hunting, procurement of lithic resources, and as a corridor for trade traffic (1977:22).

There is a slight increase in frequency of Late Developmental sites in the Cochiti study area, but again, all these sites are south of White Rock Canyon, and the majority are early components of subsequent Pueblo III occupations, making it difficult to evaluate the precise character of Late Developmental components on the surface (Chapman and Biella 1979:393). Fortunately, several sites with substantial Late Developmental components were excavated on the Cochiti Dam Project in 1963-64 (Lange 1968).

LA 6461, the Red Snake Hill site, was situated on a low terrace on the west bank of the Rio Grande, just north of Cochiti Pueblo. Pre-excavation indications included two concentrations of river cobbles that were presumed to be the remains of adobe surface structures, but test excavations failed to locate any evidence of foundation walls (it is possible that these features were cobble-bordered grid gardens that were mistaken for adobe roomblocks; see discussion in the Problem Domain section, below). Instead, four pit structures were discovered at LA 6461, two of which were excavated, and all of which contained evidence of Late Developmental occupation in the form of Kwahe'e Black-on-white ceramics. The two excavated structures ranged from 3.6 to 4.6 m in diameter and 2.4 m in depth, and each had a standard suite of floor features that included an adobe and pole deflector in line with an ash pits, a circular adobe-rimmed fire pit, and in Pithouse 2, a sipapu. Both structures had tunnel ventilator shafts (Lange 1968:5-11).

LA 6462, the North Bank site, was 1.5 miles north of Cochiti Pueblo on the west bank of the Rio Grande. The site consisted of eight dispersed architectural units, seven of which were excavated or tested in 1963 (Lange 1968:13-72). Four units consisted of rectangular adobe house blocks with integral storage and living rooms and associated kiva dating to the Pueblo III Coalition period (ca. A.D. 1200-1325). Significantly, each of these Coalition period units also contained an earlier Kwahe'e period component in the form of a nearby pit structure. The pit structures were virtually identical to those excavated at LA 6461, ranging from 3.4 to 4.5 m in diameter and from 0.5 to 2.3 m deep, with tunnel ventilator shafts and the standard assemblage of floor features (adobe and pole deflector, ash pit, adobe rimmed fire hearth, and in most cases, a sipapu). Two additional units at LA 6462 contained only Kwahe'e (Pueblo II) period pit structures and no evidence of associated surface architecture (Unit V was apparently associated with three large storage pits, two of which were slightly bell-shaped, and all containing Kwahe'e Black-on-white ceramics).

What is perhaps most striking about LA 6462 is the relationship between Pueblo II (Kwahe'e) and Pueblo III (Santa Fe) components. Over half of the units excavated at LA 6463 consist of a Pueblo III roomblock and kiva complex and a nearby Pueblo II pit structure. One likely explanation is that small family groups moved into the Cochiti area on a seasonal basis during the eleventh and twelfth century, and that the descendants of these families began occupying the area year-round at the end of the twelfth century A.D. The close proximity of the Kwahe'e pit structures and the subsequent Santa Fe adobe roomblocks suggests that successive site unit occupants may have been lineally related. Consequently, although Chapman and Biella (1979) may be right when they argue for a migration of population into the region during the early Coalition, ancestors of the migrants may have been occupying the Cochiti area on a seasonal basis for a number of generations before the region became the locus of year-round occupation and use.

Scholars who have embraced migration models to explain the growth and development of Anasazi population in the northern Rio Grande point to the Late Developmental period (A.D. 900-1200) as the most likely time of initial colonization of the area from the San Juan Basin to the west. According to McNutt (1969:100), "It is most probable that the earliest Puebloans in the northern Rio Grande Valley were immigrants from somewhere within the area south of Mesa Verde, west of east Puerco, north of the Datil Mountains, and east of the Chuska-Lukachukai-Carrizo Mountains." The evidence for migration that is most often cited is the growth of population during the Late Developmental without any tangible Basketmaker-Pueblo I base, and the appearance in the northern Rio Grande around A.D. 900 of ceramic types that are almost indistinguishable from pottery types of the northern San Juan Basin: "Early ceramic developments in the Chaco-San Juan present striking parallels to the Red Mesa Black-on-white and Kwahe'e Black-on-white pottery sequence of the northern Rio Grande Valley, with regard to vessel form, finishing techniques, paint type, and decorative motifs" (McNutt 1969:100).

The Rio Grande Coalition

Beginning around A.D. 1200, three major changes took place in the northern Rio Grande: (1) There was a significant increase in the size and number of sites, suggesting a substantial increase in regional population; (2) Pithouses, which were the dominant domiciles of the preceding period, were largely replaced by rectangular surface roomblocks; and (3) Organic painted black-on-white pottery, known as Santa Fe Black-on-white, became the dominant ceramic type in the northern Rio Grande (Cordell 19793). The increase in the number of Santa Fe Black-on-white sites in the northern Rio Grande was fairly spectacular. McNutt's (1969:79) survey of Laboratory of Anthropology site survey files in the late 1960s found that Santa Fe Black-on-white sites outnumbered Kwahe'e Black-on-white sites by a ratio of roughly three to one. There is also significant variability in site size during the thirteenth century, with individual sites ranging anywhere from one or two rooms to over 200 rooms, and most sites falling between the range of 15 to 30 rooms (Stuart and Gather 1981:51).

Wendorf and Reed (1955) felt that these changes were sufficiently important to designate a new period in the northern Rio Grande cultural sequence: the Rio Grande Coalition. The Rio Grande Coalition traditionally begins around A.D. 1200 with the appearance of carbon-painted Santa Fe Black-on-white and ends about A.D. 1325 with the beginning of the glaze ware sequence in the northern Rio Grande. Wendorf and Reed divided the Coalition period into two phases: Pindi (A.D. 1200-1300) and Galisteo (A.D. 1300-1325). The beginning of the Galisteo phase was marked by new architectural and ceramic forms, another important spike in regional population growth, and regional differentiation suggesting a variety of new influences from regions north and west of the Rio Grande Valley. Important Coalition period sites in the northern Rio Grande include: Pindi Pueblo (LA 1), the School House or Agua Fria ruin (LA 2), Pueblo Alamo (LA 8), Chamisa Locita (LA 4), Lamy (LA 10), Arroyo Hondo (LA 12), Cieneguilla (LA 16), Las Madres (LA 25), Upper Arroyo Hondo (LA 76), Rowe Pueblo (LA 108), Pina Negra (LA 235), the Arrowhead Ruin (LA 251), the oldest sections of Pecos (LA 625), Manzanares (LA 1104), and in the Galisteo Basin, Piedra Lumbre Pueblo (LA 309), the Waldo site (LA 9147), and the oldest sections of Pueblo Largo (LA 183) and San Cristobal (LA 80).

The type site for the Pindi phase is Pindi Pueblo (LA 1), on the Santa Fe River a few miles south of Santa Fe. There were two major building periods at Pindi Pueblo. The earliest Pindi phase construction episode consisted of a small adobe walled pueblo of 30 to 40 rooms, three kivas, and tree-ring dates from the first half of the thirteenth century (Stubbs and Stallings 1953). Surface

rooms were small, rectangular, with central fire hearths; kivas were round, semi-subterranean, with east-oriented ventilator shafts and central clay-lined fire hearths and ashpits (Wendorf and Reed 1955:144).

The Tesuque Bypass site (McNutt 1969) also had a Pindi phase component consisting of a surface roomblock with adobe floors and slab-based walls, an exterior storage pit, and several circular to elliptical floor areas (1969:56). The associated material assemblage was dominated by Santa Fe Black-on-white, a variety of smeared indented gray ware, small corner notched projectile points, and a variety of flaked and ground stone tools.

In the Arroyo Hondo drainage south of Santa Fe, Dickson (1979) noted a significant increase in sites during the first half of the thirteenth century followed by a slight decline in the second half of the century. Dickson also notes some evidence of population aggregation at Arroyo Hondo and Pueblo Alamo toward the end of the Coalition, with the simultaneous abandonment of many smaller sites in the Arroyo Hondo sustaining area.

A similar pattern of population growth and community aggregation has been reported for the Galisteo Basin, with a major population spike appearing around A.D. 1250. Although no substantial Pindi phase sites were recorded on the San Cristobal survey (Lang 1977:388-89), two major centers of population were founded in the eastern Basin during the second half of the thirteenth century. Piedra Lumbre Pueblo (LA 309), on a gravel ridge several kilometers north of San Cristobal Pueblo, consists of a rectangular block of surface masonry rooms and an "L" shaped group of rooms to the west enclosing a small plaza. Lang estimates the total number of ground floor rooms at Piedra Lumbre at around 150 (1977:391). Excavations at Piedra Lumbre by W. S. Stallings in the 1930s produced tree-ring dates ranging from A.D. 1251 to 1333 (Robinson et al. 1973). Nelson (1916) also documented a substantial Pindi phase component at Pueblo Largo (LA 183), which subsequently yielded tree-ring dates in the late A.D. 1200s with a good cluster of cutting dates centered in the 1290s. Lang notes that Pindi phase sites of the late thirteenth century are associated with extensive agricultural fields with grid borders on flood plains (1977:23).

The Galisteo phase in the eastern Galisteo Basin (A.D. 1300 to 1350-65) saw continued growth of several large Pueblo III villages and evidence of population dislocation around A.D. 1345, followed by the establishment of new population centers in well-watered localities (Lang 1977:24). A total of ten sites with Galisteo Black-on-white were found on the San Cristobal survey, and at six of these sites, Galisteo Black-on-white was the only pottery type present (1977:394).

In the survey of Cochiti Reservoir, Biella and Chapman (1977) documented an eight- to tenfold increase in Coalition period sites over the preceding Developmental period, with a similar increase in room counts per period. On the basis of these ratios, Stuart and Gather (1981:51) suggested that some areas in the northern Rio Grande experienced a tenfold population increase between A.D. 1150 and 1250. Some areas, notably the Pajarito Plateau and White Rock Canyon, were occupied intensively for the first time during the early Coalition period (Peckham 1984:279; Stuart and Gather 1981:51). Biella (1979) notes that Coalition period sites are fairly ubiquitous from the confluence of the Rio Grande and Santa Fe River all the way to Los Alamos Canyon (the Caja del Rio is the only part of the northern canyon that has few Pueblo III sites).

Based on UNM's surveys within the maximum pool zone of Cochiti Reservoir, Biella (1979) was able to identify three basic kinds of Coalition period residential units: (1) single isolated rooms, usually consisting of either a surface room or semi-subterranean "pit room," most containing a simple interior hearth; (2) small roomblocks of up to eight rooms with a single kiva,

the most common architectural configuration consisting of a linear row two rooms deep with habitation rooms in front, storage rooms in back, and a single kiva in front or to the side of the roomblock; and (3) large roomblocks with 15-20 rooms and one or more kivas that typically consist of simple multiples of the basic 7-8 room habitation unit. Biella (1979:121) found no definitive evidence from architecture, artifacts, or floral and faunal remains to indicate that the different Pueblo III site categories represent different seasonal or geographic occupation strategies. Instead, Biella argues that the differences reflect simple variation in the size of coresident social group: the smallest site class representing a single isolated commensal unit, perhaps a nuclear family; the medium site class representing three to five coresident commensal groups and comprising, at the same time, the most common Pueblo III social unit; and the largest sites consisting of two or more basic units in contiguous or near contiguous proximity. At the end of the Coalition period there is an apparent shift to a bimodal settlement pattern consisting of small one to three room sites and villages of 50 or more rooms. This settlement shift coincides with the appearance of glaze and biscuit ware pottery in the northern Rio Grande, an event that ushers in the Rio Grande Classic period.

In summary, the Coalition period in the northern Rio Grande saw the growth and expansion of Pueblo population and a significant increase of diversity in the size, location, and material culture of Pueblo III sites (Cordell 1978:57). There has been a great deal of disagreement among scholars over the causes of these processes. Many recent scholars have argued that the Pueblo Coalition is the result of growth, expansion, and diversification of a local population responding to extensive and influential contacts with Anasazi populations to the west. Other scholars attribute change during the Pueblo Coalition to large-scale immigration into the Rio Grande Valley from the west. A great deal of research and debate has been directed toward identifying the cultural affiliation of the migrants. Some people argue for an influx of people from Mesa Verde, Chaco, and west-central New Mexico (Stuart and Gather 1981:51). There seems to be general agreement that migrations of people into the northern Rio Grande played an important role in the cultural dynamics of the region, especially at the end of the Coalition period

The Rio Grande Classic

The Pueblo IV, or Rio Grande Classic period (Wendorf and Reed 1955), begins around A.D. 1325 with the appearance of a highly distinctive red-slipped glazed ceramic, and ends at the close of the sixteenth century with the arrival of European colonists. The period was one of cultural expansion and fluorescence, notable primarily for its large aggregated communities and a variety of highly distinctive cultural materials including a variety of new vessel forms, carved bone tools, elaborately decorated pipes, carved stone axes and effigy forms, mural paintings, and a distinctive Rio Grande art style featuring masked figures (Wendorf and Reed 1955:153; Cordell 1978:58).

Rio Grande glaze wares, which may initially have been attempts to imitate western trade wares such as St. John's Polychrome, were manufactured throughout the Pueblo IV period and traded widely (Cordell 1978; Nelson 1914; Kidder and Shepard 1936; Mera 1935; Shepard 1942). Rio Grande glazes were manufactured locally throughout the Rio Grande Valley south of La Bajada Hill. North of La Bajada, Santa Fe Black-on-white continued to evolve into the matte-painted biscuit ware series (Wendorf and Reed 1955:151).

The hallmark of the Pueblo IV period in the Rio Grande was population aggregation, typically accompanied by the construction and maintenance of large-scale agricultural and water-control features including dams, reservoirs, terrace grid gardens, and systems of dispersed fieldhouses.

As mentioned above, sites of the period show a distinctive bimodal distribution, with the most common sites ranging from one to three rooms and more than 50 rooms (Stuart and Gather 1981:53). Significantly, the average Coalition site of 8 to 30 rooms is nearly absent in the Rio Grande Classic (Stuart and Gather 1981:53). Masonry architecture, established as the principal construction medium at the end of the Pueblo Coalition, continued as the dominant form throughout the Classic period; however, above-ground kivas gave way to subterranean kivas in plazas, and great kivas appeared at a number of Classic sites in the northern Rio Grande (Wendorf and Reed 1955:151).

There are two excavated Pueblo IV sites in the Santa Fe River Valley: the Classic component at Pindi Pueblo (Stubbs and Stallings 1953); and Cieneguilla Pueblo (LA 16), excavated by Nels Nelson in 1915. Recent surveys of the Santa Fe River Valley have recorded an additional nine sites with Pueblo IV components (Cordell 1978:59). Surveys of the Arroyo Hondo drainage south of Santa Fe indicate a slight increase in site numbers during early Pueblo IV, with many small fieldhouses and an increase in overall site size, suggesting an increase in population density during the period. Much of the Arroyo Hondo sustaining area (Dickson 1979) was depopulated in the first part of the fifteenth century, and population shifted to Tetilla Canyon and the west face of La Bajada Mesa (Schwartz and Lang 1972). Dickson (1979) postulated a sequential abandonment of resource zones within the Arroyo Hondo drainage. The poorest areas were abandoned first, and the lower, better-watered areas were abandoned last.

Surveys of the eastern Galisteo Basin (Lang 1977) suggest a significant population disruption and village abandonment during the first half of the fourteenth century, and the consolidation of population at a number of large pueblos between 1350 and 1475. During this period the number of sites increased dramatically in the San Cristobal survey area, with over 100 Pueblo IV loci recorded. According to Lang (1977:409): "The great increase in site numbers in the mid-to-late Pueblo IV horizon unquestionably constitutes a reflection of the increased density of population associated with the development of three major pueblos in the area: LA 183 on Canada Estacada, and LA 80 and SC-40 on San Cristobal Arroyo." Beginning around 1425, small sites and evidence of dispersed field agriculture disappeared in the eastern basin, and there was a shift toward large-scale community water control and agricultural systems. This pattern persisted throughout the sixteenth and seventeenth centuries, until the abandonment of the Galisteo Basin in the wake of the Pueblo Revolt of 1680 (Lang 1977:27).

A total of 322 Pueblo IV sites have been recorded in the Cochiti–White Rock Canyon area. The majority of sites date to between 1325 and 1450 (Glaze A and B). Despite some reduction in the total number of Pueblo IV occupation sites from the preceding Coalition period, the increase in average room counts per site resulted in a much less drastic drop in inferred population (Stuart and Gather 1981:53). Although Pueblo IV sites continued to be occupied into the sixteenth century in the Cochiti study area, there was a marked decline in the number of sites from 1500 onward (Biella 1979:122).

Biella describes three types of residential sites in the Cochiti area during the Pueblo IV period: open camp sites, small one- to three-room architectural sites, and large villages. The first category of nonstructural sites have comparatively high artifact densities, and they typically include open hearths associated with quantities of fire-cracked rock. The function of the fire-cracked rock on ceramic period sites is problematic (Biella 1979:124), although the features described in the Cochiti area resemble features recently identified as pottery firing kilns in the Santa Fe area (Post and Lakatos 1996). A total of 15 one-room and 16 two-or-three room sites were excavated on the Cochiti Project (Biella 1979:124-25). Most of these isolated structures are constructed of unshaped,

dry-laid masonry, and many incorporate large boulders as building elements. About half have internal hearth areas, although formal hearths are rare. At multiroom small sites, one room is often larger than the others and exhibits somewhat greater labor investment in construction.

In the large-site category are villages consisting of 50 or more rooms and one or more kivas (Biella 1979:128). Village sites display significant variation in size and internal configuration of architectural elements. Smaller sites often consist of a single linear or L-shaped roomblock with one or at most two kivas, and larger sites consist of multiple roomblocks enclosing rectangular plazas and multiple kivas. Three large Pueblo IV village sites were at least partly excavated on the Cochiti Project (LA 6455, LA 9154, and LA 70). Excavation invariably revealed complex occupation histories, with evidence of accretional growth, differential abandonments, reoccupations, room and roomblock remodelings, etc. These attributes combine to suggest a high level of population mobility and settlement instability during the late prehistoric period despite population aggregation in a few prime localities.

Comparative studies of architecture and floral and faunal assemblages from Pueblo IV sites in the Cochiti area suggest that, unlike Pueblo III occupations, there is considerable seasonality of occupation during the Rio Grande Classic. The bulk of the evidence suggests that small sites were occupied during the warm season (presumably as fieldhouses or other special activity loci) and that village sites were the principal focus of winter occupation. According to Biella (1979:141), "With few exceptions small Pueblo IV sites serve as warm weather seasonally inhabited residences by one or two commensal groups whose primary winter residences are at large sites within the region."

Historic Period

According to Cochiti oral tradition, recorded by Bandelier in the late nineteenth century, before the ancestors of Cochiti moved to the west bank of the Rio Grande below the mouth of White Rock Canyon they inhabited the Pajarito Plateau from Frijoles Canyon south to Kuapa on Cañada de Cochiti. At that time Cochiti and San Felipe were one tribe, but conflicts with the northern Tewa forced the Keres off the plateau, and they divided to form the historic communities of Cochiti in the north and San Felipe in the south (Benavides 1965:224-25). Although the Coronado chronicles mention eight Keresan pueblos, Cochiti is not described or named. The first surviving Spanish description of Cochiti comes forty years later, in the fall of 1591, when the Rodríguez-Chamuscado expedition described a village of 230 houses, from two to three stories high, which they called "Medina de la Torre" (Lange 1959:9). The Pueblo was visited a year later by Espejo who referred to the village as "Cachiti," apparently a corruption of the Keresan "Ko-tyi-ti." Oñate found Cochiti at its present location in 1598.

The mission church of San Buenaventura, established as a *visita* of Santo Domingo in the early seventeenth century, was administered by a resident friar from 1637 on (Lange 1959:10). The Cochitis were active participants in the Pueblo Revolt of 1680. When word was received of Otermín's march to reconquest in 1681, the Cochitis, along with refugees from San Felipe, Santo Domingo, San Marcos, and apparently a few northern Tiwa, moved to a fortified site on Portrero Viejo, a high mesa on the flanks of the Jemez Mountains that had long served as a refuge for the Rio Grande Keres. When the refugees refused to return to their homes on the Rio Grande in 1693, Vargas attacked and burned the fortified village, capturing 342 women and children and killing 21 Cochiti warriors (Benavides 1965:225). Despite this route, many Cochiti elected to participate in the unsuccessful revolt of 1696 (Lange 1959:10).

The population of Cochiti waxed and waned through the eighteenth and nineteenth centuries. At the time of the Pueblo Revolt the population stood at around 300. A 1706 census described Cochiti as a mission with 520 residents. In 1744, the village contained approximately 80 families. In 1776, Fray Domínguez reported 116 families and a total population of 486 (Lange 1959:11). This is the first time that Cochiti was reported to have a smaller population than that of its neighbor, Santo Domingo. In 1821, the year of Mexico's independence, the population of Cochiti had dropped to 339 (Simmons 1979a:185). From a low of 172 in 1860-61, the Cochiti population had rebounded to nearly 800 individuals in 1970 (Simmons 1979b:221).

Since the early seventeenth century, people of European descent have resided in or near Cochiti Pueblo. In fact, of 83 historic sites recorded on Cochiti Reservoir Project surveys, the majority appear to be of Hispanic cultural affiliation (Snow 1979). With the exception of missionaries and mission personnel, there are few references to Spaniards living in the Cochiti area prior to 1650. However, archaeological surveys of the Cochiti Reservoir Project recorded six historic sites that probably date to the second half of the seventeenth century, and three of these (LA 34, LA 591, and LA 50134) were at least partly excavated. The sites vary in size from one to more than 12 rooms, and the majority are on the east bank of the Rio Grande, opposite the pueblo of Cochiti. Two of the sites (LA 34 and LA 591) represent substantial habitations that include a variety of outbuildings, most associated with animal husbandry activities, and both sites were apparently abandoned shortly before the Pueblo Revolt of 1680 (Snow 1979:217).

According to Snow (1979), European occupation of the northern Keres area presented several adaptive challenges, not the least of which was limited access to irrigable land. Since the Pueblos owned and used all of the floodplain farmland, Spanish residents would have had to rent plots on the floodplain, for which there is some evidence, or resort to dry farming, for which there is little or no evidence. Because of the paucity of good farmland, Spanish colonists apparently turned to stock raising as an economic alternative, recruiting Pueblo residents as shepherds and herders, first under the *encomienda* system of tribute labor, and later, in the seventeenth century, under the *partido* system of labor peonage (Snow 1979:220). Significantly, there is substantial evidence of livestock raising at both LA 34 and LA 591. Abandonment of the large seventeenth century sites in the Cochiti area just prior to the Pueblo Revolt may have been precipitated by a combination of drought and an increase in the intensity of Apache raiding, so that the Pueblo Revolt was simply the culmination of a series of adaptive failures in the northern Rio Grande.

There were many more Spanish colonists in northern New Mexico after the Reconquest than before the revolt, and this led inevitably to disputes over valuable farm land with resident Pueblos. Nevertheless, the eighteenth century saw little change in Spanish economic activities in the Cochiti area (Snow 1979:224). Livestock raising remained the principal economic activity, but with the shift to the *partido* system of land tenure, in which wealthy stock owners would loan out portions of their herds and flocks to individual herders in a peonage system similar to sharecropping, the principal residences of the area became small insubstantial dwellings for herders and shepherds. A total of 18 eighteenth century sites were recorded during the various Cochiti Project surveys, and predictably, the sites are smaller than their seventeenth century counterparts, architectural clusters have fewer components, units are more dispersed over the landscape, and the inventory of portable artifacts tends to be less varied compared with seventeenth century habitation sites. According to Snow (1979:226): "Taken as a whole . . . the 18th century sites in the Cochiti Reservoir District reflect the successful redevelopment and stabilization of the Spanish frontier and its eventual extension via herding activities, into areas not known to have been utilized by the Spanish during the previous century."

A total of 17 nineteenth century sites were recorded on the Cochiti Reservoir surveys. The majority were small, dispersed dwellings with nearby livestock enclosures and an occasional outbuilding, reflecting the continuation of a livestock based economy that had dominated eighteenth century Hispanic adaptations in the Cochiti area. The nineteenth century eventually witnessed the disruption of this pattern, but change was fairly gradual. The opening of the Santa Fe Trail and the availability of American manufactured goods such as cotton textiles would eventually cause the decline and collapse of the wool industry in northern New Mexico. Of more immediate consequence to Hispanic settlers in the Cochiti area were changes in land ownership and use in the wake of the Mexican War and the Treaty of Guadalupe Hidalgo. As thousands of acres of private and public grazing land was taken up by the territorial government, centuries-old traditions of livestock production came to an end in the Middle Rio Grande Basin (Snow 1979:228).

LA 249 (Tashkatze Pueblo)

LA 249, or Tashkatze Pueblo, was recorded for the first time by H. P. Mera in the 1930s. Tashkatze is apparently a Keresan word meaning "place of the potsherds" (Lange 1968:318). Mera's map of Tashkatze depicts two rectangular plazas surrounded by low adobe and cobble roomblocks. The site is on a high, heavily dissected gravel terrace on the east side of the Rio Grande just south of its confluence with the Cañada de Cochiti at an elevation of 1,616 m (5,330 ft). Although the major architectural features at LA 249 are well outside the current project area, shallow midden deposits extend into the project area, and there is a strong likelihood of buried cultural features within the project limits.

The site environment is characterized as plains-mesa grassland, with scattered junipers and an understory of grasses, perennial shrubs such as snakeweed, and cacti. In the spring of 1997, the adobe mounds that comprise the major architectural features at the site were covered with dense stands of sticky seed forget-me-not. The general area of the site is heavily overgrazed, there is extensive local erosion, and surface visibility is generally excellent.

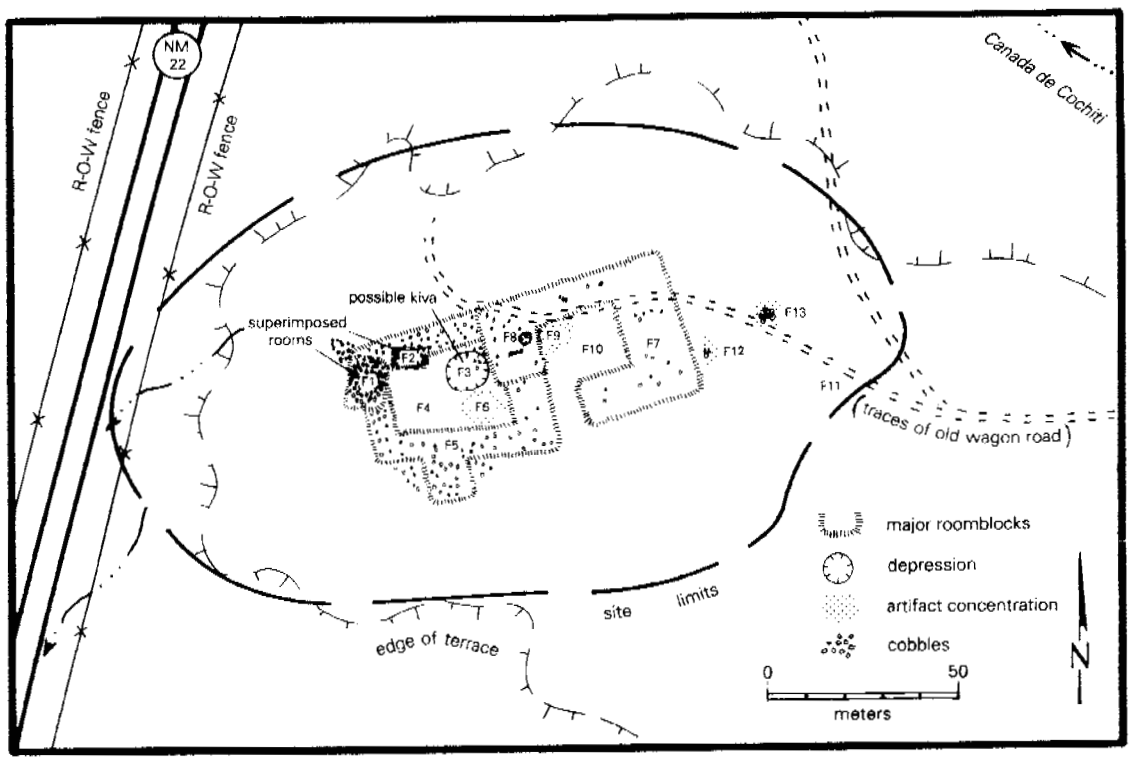


Figure 2. Map of LA 249 (Tashkatze), after Marshall (1996) and Mera.

The main site area consists of a cluster of low adobe mounds encompassing two rectangular plazas, covering an area approximately 140 m east-west by 70 m north-south (Fig. 2). Shallow midden deposits and surface artifact scatters extend beyond the roomblocks to encompass an area roughly 200 m by 150 m, or approximately 30,000 sq m. Based on nearby roadcut and arroyo exposures, the terrace that supports the site is covered by anywhere from 1 to 3 m of eolian sand.

Consequently, the probability of additional buried cultural features is high.

The principal architectural remains at LA 249 consist of two semirectangular adobe and cobble roomblocks. The easternmost roomblock is visible today as a low rectilinear mound averaging 6 m wide and surrounding a plaza measuring approximately 50 m east-west by 30-40 m north-south. The enclosing house mounds project an average of 25 to 30 cm above the surrounding terrace surface and most likely represent the remains of a single-story adobe structure. The second house mound (Roomblock 2) is approximately equivalent in size and area, but portions of its north and east roomblocks appear to overlie the western mound of Roomblock 1, suggesting that the second roomblock is stratigraphically later than the first. The second roomblock is open in the southwest corner and encloses a rectangular plaza that measures roughly 35 m east-west by 30 m north-south. House mounds of the western roomblock project roughly 50 cm above the surrounding terrace surface, a fact consistent with their superior stratigraphic position and more recent abandonment.

The most recent architectural features at LA 249 consist of two discrete rectilinear cobble concentrations that are superimposed on portions of Roomblock 1. The largest of the two concentrations measures approximately 20 m north-south by 12 m east-west and straddles the northwest corner of the earlier adobe structure. There are few obvious cobble alignments within the concentration, but there appears to be a sufficient number of cobbles to construct an adobe and cobble wall of at least 1 or 2 m high. A second and somewhat smaller cobble feature lies 5 m east of the first and partially overlies several rooms in the northern portion of Roomblock 1. The feature consists of a rectangular alignment of large water-worn cobbles, two or more courses in width, enclosing a cobble-free area roughly 10 m east-west by 4 m north-south. There are many fewer cobbles associated with this feature, and it is likely that the alignments represent the base course of a structure with upper walls consisting of perishable adobe or wood. Although the functions of these adjacent features are indeterminate, they appear to be approximately contemporaneous, and their close proximity suggests that they had some sort of complementary function (i.e., a farmhouse and nearby livestock enclosure).

In addition to the surface architectural features, there is a possible structural depression in the northeast corner of Roomblock 1. The depression measures approximately 6 m in diameter but is extremely faint, and it may not be architectural. To the east of Roomblock 2 are at least two small concentrations of cobbles and artifacts whose functions are indeterminate. It is possible that these cobble features are elements of the ubiquitous agricultural features scattered over many of the fluvial terraces on the east side of the Rio Grande floodplain. Finally, an old road or wagon track divides about 60 m east of Roomblock 2, and a spur track winds up over Roomblock 2, fading out in the vicinity of Structures 1 and 2. It is presumed that this trace is associated with the occupation and use of Structures 1 and 2. There is no obvious formal trash mound associated with LA 249. Instead, cultural material is diffusely scattered within a halo around the site, and these deposits extend into the current project area.

Ceramic, chipped stone, and ground stone artifacts are present in large quantities on the surface of LA 249. Although the site is just beyond the edge of NM 22--a busy modern highway--access to the site is posted, and Cochiti Pueblo actively enforces the posting. Consequently, the site is in excellent condition, and there is no obvious evidence of vandalism or intensive surface collection.

Although no recent ceramic inventories have been conducted at LA 249, Charles Lange collected 305 sherds from the surface of the pueblo in 1964, and the sample was subsequently analyzed by Kenneth Honea of the Laboratory of Anthropology. There were no field notes

accompanying Lange's ceramic collection, so there is no way to know how representative the sample is of the total site population. Nevertheless, Lange's ceramic frequencies coincide well with preliminary observations of the site assemblage made in the spring of 1997. Just less than half (49 percent) of the sherds in Lange's sample consisted of Glaze A types, with less than 2 percent consisting of later glaze wares, placing the occupation of Roomblocks 1 and 2 firmly within the fourteenth century, or Early Classic period. In addition, there were measurable frequencies (ca. 5 percent) of earlier Black-on-white wares, including Kwahe'e, Santa Fe, and Galisteo, suggesting a Late Developmental-Coalition component at LA 249. Finally, ceramics of the Tewa Polychrome series account for just over 3 percent of the total assemblage, so there is probably a historic component at the site that probably correlates with the construction and occupation of Structures 1 and 2.

The chipped stone assemblage at LA 249 consists of a wide variety of raw material types and reduction stages. Basalts, cherts, chalcedonies, and obsidian comprise the major flaked stone material categories. Ground stone artifacts are also present on the surface of the site, including mano and metate fragments of fine-grained sandstone and vesicular basalt.

Although no excavations have been conducted at LA 249, ceramic cross-dating suggests that the major occupation component occurred during the early Pueblo Classic, or fourteenth century, with smaller scale occupations in the twelfth and thirteenth centuries, and in the eighteenth and nineteenth centuries. None of these principal occupation horizons appear to be centered within the highway project area, and so highway construction should have a negligible effect on culture historical information at the site. However, surface surveys within the project area suggest a comparatively high frequency of Late Developmental and Coalition period ceramics, which may indicate a buried cultural component. It is essential, therefore, that we conduct extensive excavations within the area of surface refuse that extends into the project area. Eolian deposits in the area immediately east of the present highway slope cut may mask significant buried cultural deposits and features.

The recommendation is to excavate a series of 1 by 1 m test pits within the project area to determine the depth of cultural deposits and the presence or absence of cultural features. If features or substantial deposits are found, excavation blocks will be extended by hand to delineate the buried cultural components. If hand excavations fail to recover significant buried resources, it is recommended that a backhoe be used to extend the range of exploration to rule out important buried cultural resources within the project limits.

LA 265

Presumably, LA 265 was first discovered and recorded in the 1930s by H. P. Mera during his surveys along the Rio Grande near Cochiti. However, no map was completed at the time of discovery, and early Laboratory of Anthropology records contain only a legal description of the site and a check list of ceramic types. In 1961, Ed Dittert and Frank Eddy of the Museum of New Mexico assigned two new LA numbers (LA 6172 and LA 6173) to the site during their highway salvage surveys of NM 22 between Peña Blanca and Cochiti Pueblo. They described LA 6172 as a cluster of pithouse depressions and associated cobble surface units, and LA 6173 as a concentration of river cobbles, fire-cracked rock, and an associated sherd and lithic scatter. The locations of both of these sites overlap with the location of LA 265.

To further complicate matters, in 1972 David Snow of the Laboratory of Anthropology

recorded three possible pit structure depressions on the east side of NM 22 but on the same terrace that supports LA 265. At that time Snow pointed out the overlap that existed between LA 6172 and LA 265, and suggested that "LA 6172" should be applied only to the east side of the terrace (east of NM 22) to avoid confusion over site designations. When LA 265 was rerecorded for the present highway project by Sandra Marshall in October 1996, she determined that distinctions between the three sites was arbitrary, and the site update form that she filed at the Laboratory of Anthropology collapsed all three site numbers back into LA 265--a decision that seems justified given the extensive nature of archaeological remains at LA 265.

LA 265 is a multicomponent site occupying a low gravel terrace immediately south of the confluence of the Rio Grande and the Santa Fe River at an elevation of 1,616 m (5,300 ft) (Fig. 3). Based on ceramic associations the site was at least intermittently occupied for over 1,000 years, from the early Rio Grande Developmental period (Basketmaker III) to the late historic period (eighteenth-nineteenth century). The current highway project will affect the central portion of the terrace, an area of heavy eolian deposits that contain and overlie substantial prehistoric occupation debris. The potential for significant buried cultural resources is considered extremely high.

The environment at LA 265 is typical of plains-mesa grassland, with scattered junipers along the rocky soil of the terrace margins and an understory of grasses, perennial shrubs, and cacti. Most of the terrace is covered with dunal deposits that vary from 1 to 4 m deep. Due in part to the dune cover, surface erosion appears to be minimal on the site despite evidence of livestock overgrazing. Archaeological remains consist of a widely dispersed lithic and ceramic scatter, at least a dozen small cobble features, including rock piles and one-course alignments, several possible structural depressions and burned rock concentrations, and evidence of recent historical use in the form of a terrace edge pit excavation and nearby historic lumber debris. Remains of an eighteenth century fieldhouse noted by David Snow in 1972 have not been relocated.

Cultural remains are distributed over most of the terrace surface, covering an area approximately 530 m north-south by 360 m east-west, an oval expanse of somewhat over 150,000 sq m. The earliest temporal component at the site appears to cover the most space on the terrace. Around the margins of the terrace, where eolian deposits have been thinned by sheet erosion, and in localized deflated and disturbed areas in the interior of the terrace, Lino Gray pottery from an extensive Early Developmental occupation is found in mixed assemblages with chert, obsidian, and basalt debitage. Prior surveys of LA 265 have described numerous structural depressions at the site. Dittert and Eddy (1961) described a cluster of pithouse depressions associated with several cobble surface units, David Snow (1972) described three possible pithouse depressions near the eastern edge of the terrace, and Marshall (1996) described a possible structural depression in the vicinity of Snow's cluster during NMSHTD surveys. Although structural depressions were not apparent during cursory site inspections during the spring of 1997, recognition may have been affected by time of day and adverse vegetation patterns. It is apparent from the distribution of early ceramics at the site that significant eolian deposition has occurred on the terrace since the early ceramic occupation component, and so there is a strong possibility of substantial buried cultural remains at LA 265.

Because of visibility and ceramic mixing problems, it is difficult to assign a precise date to the early ceramic component at LA 265. Marshall noted a few fragments of black-on-white ceramics on the surface of the site, but specific types are not reported (presumably because sherds were too small to classify), and Dave Snow mentions only Lino Gray types in his 1972 surveys. It may be significant in this regard that recent field inventories at LA 265 have documented large frequencies of coarse-tempered gray wares but no evidence of neck-banding. The earliest ceramic site

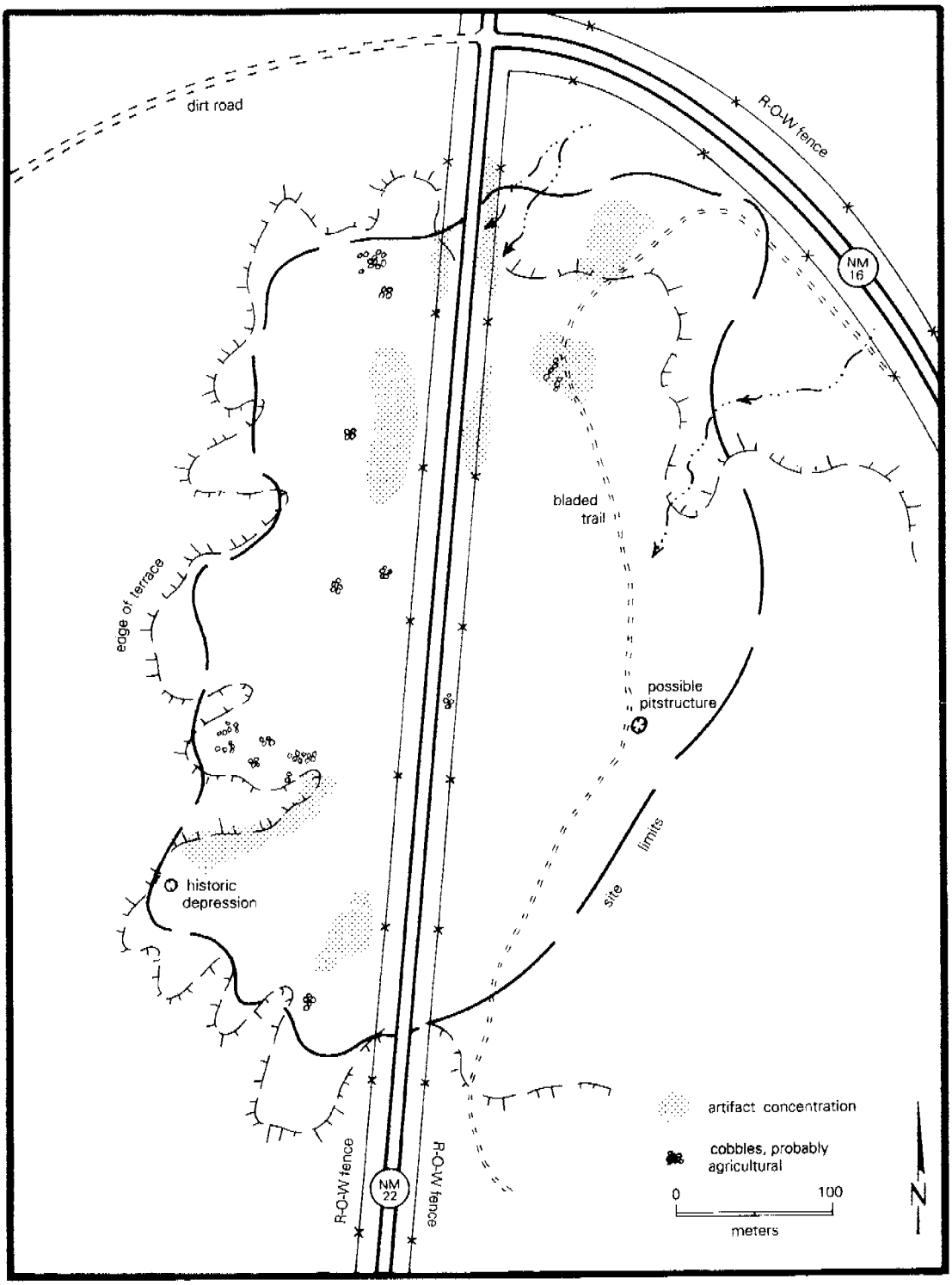


Figure 3. Map of LA 265 (LA 6172 and LA 6173), after Marshall (1996).

excavated on the Cochiti Dam project is LA 272, a Pueblo I pithouse and surface roomblock on a basalt-capped mesa just two miles east of LA 265. The LA 272 assemblage was dominated by plain gray utility wares (88.3 percent) described as Lino (10.5 percent) or La Bajada Gray (88 percent) (Honea 1971:10-13). The principal decorated types at LA 272 were Red Mesa and Piedra Black-on-white, which, combined, accounted for just over 10 percent of the total ceramic assemblage. The paucity of black-on-white ceramics at LA 265, and the apparent absence of neck-banded gray wares, suggests that LA 265 may be even older than LA 272. Honea (1971) places the occupation of LA 272 at A.D. 850-950. Based on ceramic evidence collected to date, the occupation of LA 265 may extend back into the eighth century A.D.

In addition to an Early Developmental (Basketmaker III) component at LA 265, several sherds of Glaze A (and possibly White Mountain Red Ware) have been recorded at the site, suggesting an early Classic period occupation. In scattered locations across the terrace surface are concentrations and partial alignments of large river cobbles that are either resting on or within the eolian surface mantle. Stratigraphically, these cobble features appear to be the best candidates for structural remains associated with the late prehistoric component at LA 265. Although the precise function of these cobble features is uncertain, the paucity of late prehistoric material culture at LA 265 argues against a substantial residential occupation during the Rio Grande Classic. It is more likely that the cobble alignments and concentrations are the remains of agricultural features constructed on the terrace surface after the principal eolian deposits were laid down. Similar features have been observed on other terraces in the project area (LA 6169, LA 6170, LA 6171, and LA 115863), and one of the main objectives of investigations on the Peña Blanca project will be to assess the character of these dispersed cobble features.

Marshall's survey in October 1996 documented 12 cobble concentrations and alignments, the majority on the west side of NM 22, between the right-of-way fence and the western terrace edge. At least two of these features appear to be within the current project area, and so we will have an opportunity at LA 265 to investigate at least a sample of these ubiquitous features. The geological environment of LA 265 prevents the unambiguous identification of artifactual assemblages associated with these cobble features, in part because of the likelihood of mixing with cultural material from underlying strata. If the cobble features prove to be remnants of agricultural grids, then the expedient quartzite cobble tools that are fairly common on the site may be associated with the features. Also, in one or two observed instances, fragmentary ground stone artifacts were found in association with cobble features, and at least one instance, incorporated into a cobble alignments. Aside from these obvious associations, the multicomponent character of LA 265 makes it difficult to discriminate between Early Developmental and late prehistoric artifact assemblages at the site.

The most recent occupation component at LA 265 was described as an eighteenth century fieldhouse by David H. Snow in 1972. It is unclear, however, where this feature is on the terrace. Marshall's 1996 survey states that the only indications of historic use of the terrace are a shallow excavation near the west terrace edge, a possible roadbed near the south edge of the terrace, a twentieth century enamel ware jar discarded on the surface of the site, and a recently bladed pedestrian trail that traverses the eastern half of LA 265, roughly parallel with NM 22. None of these features is within the current project limits, and so if there are historic components at LA 265, they may not be affected by the proposed undertaking.

During highway salvage excavations along NM 22 in 1961, Dittert and Eddy claimed that cultural remains associated with LA 265 were too far outside the highway right-of-way to warrant excavations or further investigations, and there is no evidence from the extant survey records that

highway construction was monitored for buried cultural features and deposits. Significantly, however, a 200 m long bar ditch that parallels NM 22 on its west side has Early Developmental and later occupation refuse strewn along its entire length. The bar ditch is only 5 m west of the right-of-way fence. Considering the quantity of refuse in close proximity to the highway easement, it is probable that buried cultural features were impacted during construction activities in 1961.

Because of the high likelihood of buried cultural remains within the project area at LA 265, data recovery efforts will be conducted in at least four discrete stages. The first stage will focus on the production of a detailed map of exposed features and artifact concentrations on the terrace surface. Through mapping and in-field recording an attempt will be made to delineate the overlapping spatial coordinates for the various temporal components at LA 265. Through intensive surface recording and mapping we will also attempt to identify the historic component at the site. The second stage will involve extensive test excavations within the project limits with the objective of determining the depth of the eolian surface mantle, identifying submantle occupation surfaces and cultural features, and delineating and excavating cultural features that occur on or within the eolian depositional component. The nature and scope of stage three will be conditioned by the preliminary results from stage two test excavations. Cultural features and occupation surfaces delineated during test excavations will be expanded and exposed by means of controlled block excavations during stage three. If dune deposits turn out to be culturally sterile and overlying and obscuring substantial cultural deposits, then mechanical equipment will be used to remove eolian overburden within the project limits. The final stage of excavation will involve hand excavation of all cultural features of all cultural features and occupation surfaces delineated by blading and trenching operations within the project limits.

LA 6169

LA 6169 was first recorded in 1961 by Ed Dittert and Frank Eddy as part of a highway salvage project along NM 22 north of Peña Blanca. When it was recorded in December of 1961 there was a light snow cover on the ground. The site survey form and accompanying sketch map describes a U-shaped roomblock partially enclosing a kiva or pithouse depression to the east. The roomblock contained one or two surface rooms that were indicated on the surface by concentrations of river cobbles, but the remaining roomblock was described as a low adobe mound that projected very slightly above the surrounding bench surface. The site survey form also describes a rectangular cobble room northwest of the adobe roomblock near the edge of the gravel terrace. Dittert and Eddy speculated that this was probably the footing for a "modern" Cochiti farmhouse. The site form concluded with a recommendation for excavation of the adobe roomblock and mapping of the historic structure.

When Dittert and Eddy returned to the site two weeks later to begin excavation, highway construction crews were already excavating along the eastern edge of the adobe roomblock. Dittert and his crew examined the bulldozer cuts for evidence of subsurface architecture but, according to Dittert's field notes, "nothing turned up." Where Dittert had thought a line of adobe rooms was located, "only a thin layer of trash" was identified in the bulldozer cuts, and they could find no evidence of a pithouse or kiva. He concluded that the surface structures were actually much smaller than originally suspected, and that the majority of surface rooms and associated pit structures were probably outside and to the west of the highway construction area. Since the historic farmhouse foundation was well outside the 1961 project area and would not be affected by highway construction, Dittert and his crew curtailed further work at LA 6169 and moved on to the next site.

LA 6169 was revisited during the Cochiti dam project in the mid-1960s (Peckham and Wells 1967), when the site was described as being "almost completely destroyed by highway construction" but still containing a 15-20 room U-shaped roomblock, a kiva depression, and a possible historic Cochiti farmhouse. The site update form filed by Sandra Marshall in November 1996 describes a site that "does not particularly resemble the site found in the location as described for LA 6169." Marshall's notes and accompanying sketch map describes two well defined cobble mounds, one of which is the feature Dittert identified as a farmhouse foundation (Feature 1 in Fig. 4); two possible structural depressions, a dispersed sherd and lithic scatter on the west side of the NM 22 right-of-way; and a dispersed artifact scatter and random cobble concentration on the east side of the highway. Subsequent site visits by staff of OAS documented what appears to be a deeply stratified site with multiple buried components from the Early Developmental period through the Rio Grande Coalition and possibly the Rio Grande Classic, and at least circumstantial evidence for a substantial early historic component as well.

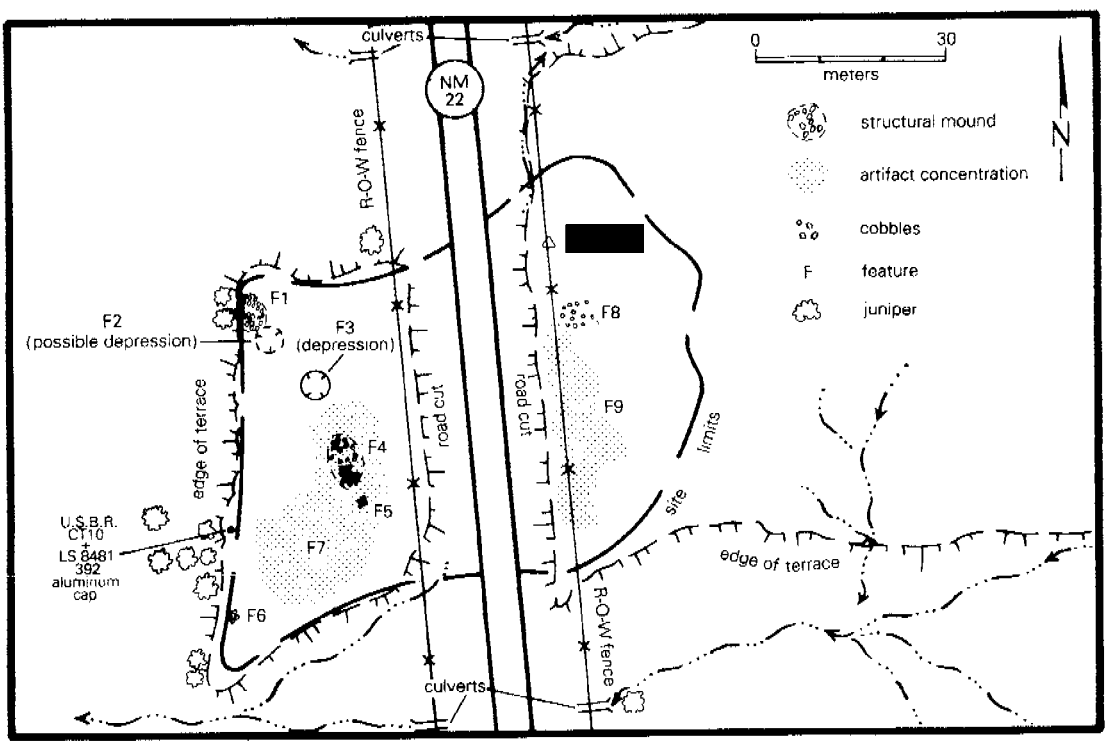


Figure 4. Map of LA 6169, after Marshall (1996).

As with all of the sites in the current project area, LA 6169 occupies a low gravel terrace that rises above the eastern edge of the Rio Grande floodplain, approximately one-half mile northeast of the confluence of the Rio Grande and the Santa Fe River, at an elevation of 1,609 m (5,275 ft). The site environment is characterized by plains-mesa grassland, with scattered junipers on the rocky slopes above the terrace to the east and an understory consisting of a variety of local perennial and annual plants, including grama grass, Russian thistle, broom snakeweed, and several species of cacti. The top of the terrace is covered in eolian sand to a depth of up to 2 m. Artifacts and cobble concentrations are dispersed over most of the terrace surface, and the highest densities of archaeological material occur along the edge of the terrace where the dune deposit has been thinned by sheet erosion and in wind-formed blowouts in the interior of the dune. The site measures roughly 90 m (north-south) by 90 m (east-west), forming an ellipse of nearly 6,400 sq m.

In previous archaeological recording efforts at LA 6169, there is no indication that the ceramic assemblage was ever adequately described or evaluated. Dittert and Eddy identified the site as a Pueblo II habitation, presumably based on the presence of Kwahe'e Black-on-white, but there is no indication that they ever accomplished a systematic inventory of the assemblage. Based on OAS examinations in 1997, although Kwahe'e is present at LA 6169, it appears to be a minor component of a ceramic assemblage dominated by Lino Gray Ware and Santa Fe Black-on-white. In addition there are at least a few sherds of neck-banded gray ware, some mineral-painted white wares reminiscent of Socorro Black-on-white, and some corrugated utility wares. The total ceramic picture at LA 6169 is that of a multicomponent occupation with individual components dating to the Early and Late Developmental and the Rio Grande Coalition periods.

An even more significant discrepancy between early and recent field observations at LA 6169 is the paucity of occupation debris associated with Dittert and Eddy's adobe roomblock. Dittert and Eddy describe a collapsed U-shaped adobe roomblock that measures some 150 by 75 feet--by Pueblo II standards, at least, a very large habitation site for the northern Rio Grande province. A few years later, Peckham and Wells observed that although most of the site had been obliterated by highway construction, anywhere from 15 to 20 rooms had been preserved outside the highway right-of-way. A habitation of this scale would have produced a large quantity of habitation debris and occupation refuse even if the site were occupied for a short period of time, and yet, the artifact scatter to the east and south of the presumed roomblock consists only of a very light surface artifact scatter. As Dittert himself pointed out in 1961, bulldozers excavating into the adobe roomblock in 1961 exposed only a "thin layer of trash."

Based on present surface indications, it seems much more likely that Dittert's adobe roomblock is actually a series of cobble-bordered grid gardens. Although there is a light scatter of river cobbles over much of the area designated Feature 7 on Marshall's map (Fig. 4), the cobble concentration designated Feature 4 preserves the best evidence of grid gardens at LA 6169. Within the Feature 4 cobble concentration, which measures approximately 8 m north-south by 6 m east-west, are six to eight parallel cobble alignments, apparently one course high and averaging just over 20 cm separating the alignments. Similar to several other sites in the project area (LA 6170, LA 6171, and LA 115863), the single-course cobble alignments rest on top of an eolian sand deposit that forms a mantle over the terrace surface. Because the cobble features have stabilized local areas of the dune and there is often generalized deflation of the dune around the margins of the cobble concentrations, the general impression is that of a mound projecting 30-50 cm above the average terrace surface, surrounded by deflated areas that mimic structural depressions.

There is, in fact, a long historical precedent in the northern Rio Grande for mistaking agricultural fields for pueblo structural footings (see discussion in the Problem Domain chapter), and one of the clearest indications of agricultural function is the absence of significant occupation refuse. On the other hand, although extensive agricultural features, including grid gardens, cobble alignments, and rock concentrations have been recorded on La Bajada Mesa west of the present project area, we know of no prior documentation of such features in the Cochiti area. Moreover, if the cobble features in the present project area are, in fact, agricultural, then they are very different from the terrace-top fields that are so common throughout the Tewa Basin, lower Chama Valley, and the Galisteo Basin, just 10 miles east of the present project area. Without an extensive testing program on the Peña Blanca Project, the best we can do is present the hypothesis of agricultural function and build appropriate tests of the hypothesis into the data recovery plan, keeping an open mind to alternative interpretations of these ubiquitous features.

If our agricultural hypothesis is correct, LA 6169 may have a very similar culture depositional

history to LA 265: an Early Developmental through Coalition occupation on the terrace surface, followed by an episode of dune deposition, followed by grid garden construction and use on the dune surface during the late prehistoric period. Aside from recent trash along the NM 22 road side, the most recent use of the LA 6169 terrace appears to be associated with Feature 1 (Fig. 4), identified as a historic Cochiti farmhouse by Dittert and Eddy in 1961 and labeled a house rubble mound by Sandra Marshall of the NMSHTD in her survey of the project area in the fall of 1996. The feature consists of a large oval to subrectangular ring of poorly sorted river cobbles, open in the center, with an entryway or opening in the north wall of the ring. The cobble ring measures approximately 9 m long north-south and 7 m in width east-west and is raised roughly 30-40 cm above the surrounding terrace surface. Although Dittert and Eddy described the feature as the footings for a "modern" Cochiti house, there is no evidence of an adobe or wooden superstructure, and in fact, there is no evidence of historic artifacts in the immediate vicinity of the feature.

With the absence of associated material culture, the age and function of Feature 1 remains problematic. The structure may be very old, perhaps dating to the late prehistoric or early historic period, which may help to account for the absence of historic refuse. The superstructure may have been dismantled and moved off the site, leaving behind only the cobble footings. The location of the feature, within 1 or 2 m of the western edge of the terrace, may also help to account for the lack of material deposition. At this point, however, we cannot rule out an alternative interpretation that the feature represents a Pueblo shrine, since the form and size of the feature is vaguely reminiscent of hilltop shrines in the northern Rio Grande. Whatever the case, the feature is well outside the current project area, and consequently, any additional information gleaned from the feature must necessarily come from surface survey or ethnohistorical consultation.

Construction activities at LA 6169 will affect several surface cobble concentrations, including Feature 5, Feature 8, portions of Feature 4, and two dispersed artifact concentrations designated Features 7 and 9. Because of the high probability of buried cultural features and deposits at LA 6169, data recovery efforts will be conducted in discrete stages in a fashion similar to those proposed for LA 265.

The first stage of field investigations will consist of a detailed survey, inventory, and mapping of all surface artifact concentrations and cultural features on the LA 6169 terrace. In the second stage we will conduct extensive controlled test excavations within the project limits to determine the depth of the eolian surface mantle, identify submantle occupation surfaces and cultural features, and delineate and excavate features that occur within the dune component. A major objective of the second stage of data recovery will be to determine the nature of the ubiquitous cobble concentrations at LA 6169. Controlled excavations within Features 5, 8, and portions of Feature 4 will, we hope, determine whether these are architectural or agricultural remnants--information that will be critical in guiding future data recovery efforts. Stage three investigations will consist of block excavations in areas where cultural features have been delineated during stage two. Depending on preliminary returns from the test excavations, mechanical equipment may be brought in at the end of stage three to remove sterile sand overburden within the project limits. The final stage of data recovery will involve hand excavation of all cultural features and occupation surfaces delineated as a result of mechanical trenching and overburden removal.

LA 6170

LA 6170 was first recorded in 1961 as part of a NM 22 highway salvage project under the direction of Ed Dittert and Frank Eddy of the Museum of New Mexico (Fig. 5). Dittert and Eddy

described the site as an "L-shaped" row of surface rooms with one and possibly two associated kiva depressions. According to their field notes, at one end of the "L" was a well-preserved rectangular room consisting of several lines of river cobbles plainly visible on the surface. The remainder of the roomblock was described as an adobe mound forming an elongate rise on the terrace surface. At the south end of the surface roomblock were the partial remains of a modern farmhouse foundation and associated litter of tin cans and other historic debris.

The majority of the adobe roomblock and associated structural depressions was outside of the 1961 project area and so were unaffected by highway construction. One large rectangular room, designated Feature 1, extended partly into the right-of-way, and the eastern half of this room was excavated over the course of two days by Dittert and Eddy. No report of the 1961 excavations was published, and so the following architectural descriptions are taken directly from Eddy and Dittert's field notes.

Eddy and Dittert described Feature 1 as a "well preserved rectangular room" at the north end of the surface roomblock and protruding partly into the highway right-of-way. Their excavation strategy consisted of hand excavation of a 5 ft wide trench around the north, east, and south sides of the room wall, exposing the exterior of the wall footings, and simultaneously clearing a large block from the room interior. By the end of the first day of excavation most of the eastern half of the room footings was exposed, and construction details were recorded. All that remained of the wall was one course of water-worn river cobbles that presumably served as a footing for an upper wall of adobe or some other perishable material. The footing wall consisted of two parallel lines of upright cobbles, approximately 1.5 ft apart and 0.6 ft high, the space between filled with adobe melt and occasional large cobbles (Fig. 6). Since few stray cobbles were recovered from the wall trenches, Dittert and Eddy concluded that the footing was not carried up higher than a single course. They speculated that the wall superstructure was composed of adobe bricks or some other perishable material, of which no material record has survived.

After the footing was exposed, the interior fill was removed from the room in two, apparently arbitrary layers, the first layer from ground surface to 0.4 ft below surface, and the next layer from 0.4 to 0.7 ft below ground surface, a depth at which a floor surface was apparently encountered. Structure fill consisted of a tan, silty sand with occasional flecks of charcoal but very few ceramics and only an occasional lithic flake. The floor was defined as the contact between a tan-colored sand overlying a whitish pink clay. There was no evidence of plaster or intentional packing of the floor surface, and the floor was recessed only slightly below the bottom of the foundation wall. The only floor feature consisted of a shallow, circular, subfloor pit measuring 2.4 ft in diameter, 0.8 ft deep, and 1.1 ft from the north wall of the structure. A sketch map of the pit shows a flat floor and walls sloping slightly inward (Eddy's notes describe a shallow pit with straight walls). There are no notes on the interior fill of the pit, details of its construction, or any artifactual associations. Dittert's field notes indicate that the structure floor was not well defined and that there was no tangible evidence of upper wall or roof components. He concluded that the structure may never have been completed.

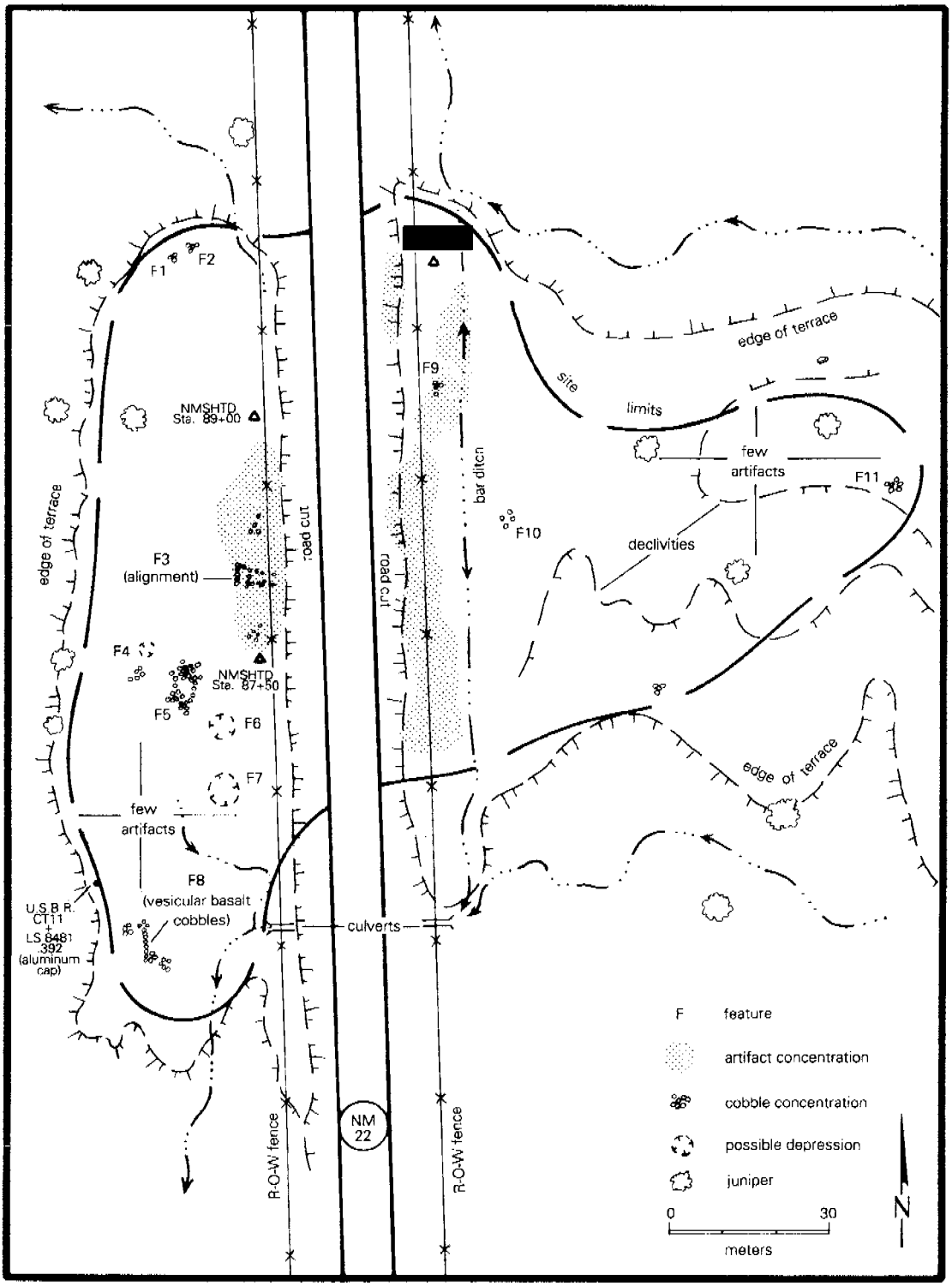


Figure 5. Map of LA 6170, after Marshall (1996).

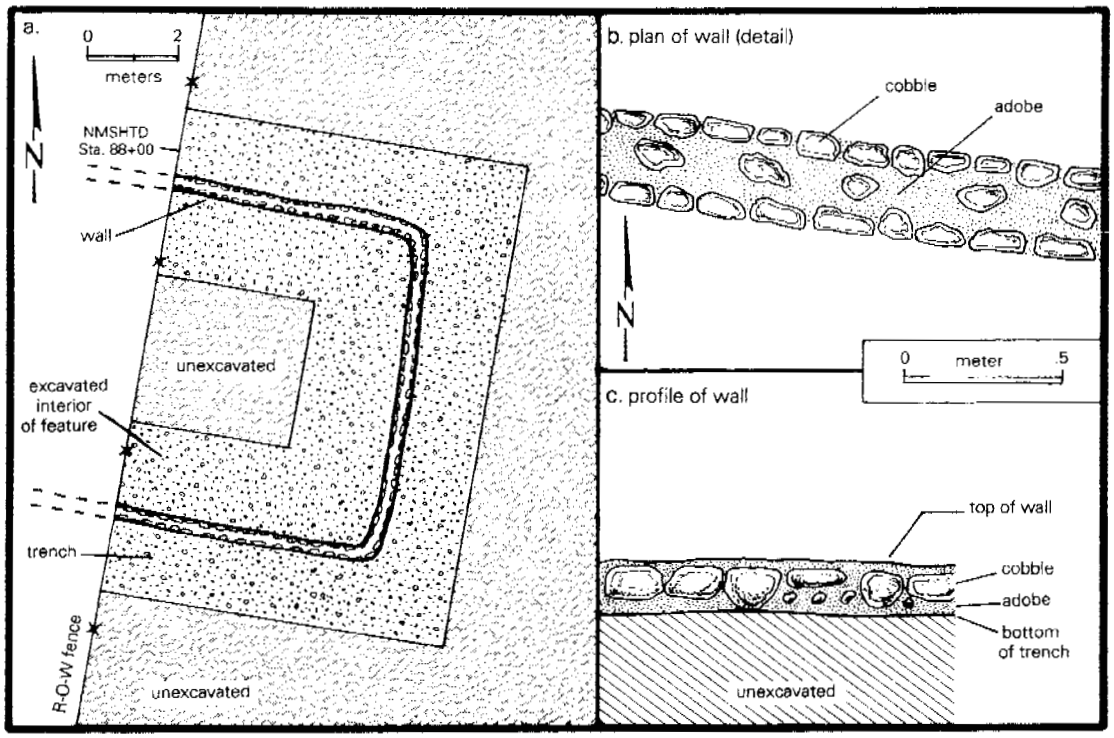


Figure 6. Plans and profile of LA 6170, after Marshall (1996).

Based primarily on the large size of the room (over 31 ft long and over 18 ft wide) and the presence of Tewa Polychrome on the surface of LA 6170, Dittert and Eddy speculated that Feature 1 may be the remains of an historic Cochiti house. They reasoned that the apparent absence of modern glass, crockery, pottery, and metal objects in clear association with Feature 1 suggested that the house was at least 100 years old and probably older. They noted that many pieces of Kwahe'e Black-on-white were found in the lower level of the room fill, but they argued that these sherds were probably derived from the borrow area, where clay was obtained for adobe wall construction, and that subsequent melting of the adobe redeposited the early sherds in the interior fill of the structure. One of the Cochiti laborers on the crew pointed out that the wall foundation of Feature 1 was much narrower than was traditionally constructed at Cochiti Pueblo, and that modern houses also have much deeper recessed floors (up to 1.5 ft in depth). Eddy offers this observation as additional evidence for an early construction date for Feature 1. Another Cochiti laborer, whom Eddy describes as the lieutenant governor of Cochiti, claimed that the terraces along the eastern side of the Rio Grande floodplain supported a number of fieldhouses occupied by Cochiti families during the growing season. According to the informant, these houses fell into disuse with the advent of motor transportation and the shift to a wage labor economy, so that very few seasonal fieldhouses were in use in 1961.

Eddy and Dittert's interpretations of LA 6170 notwithstanding, the site looks remarkably like other terrace-top sites on the Peña Blanca project. LA 6170 is on the edge of the first Pleistocene terrace above the Rio Grande floodplain. There is a single large mound with associated cobble features on the west side of the NM 22 right-of-way that looks like similar features at LA 6169 and LA 6171, with numerous large river cobbles atop a stabilized and pedestaled dune deposit. Marshall's 1996 survey recorded at least seven such cobble concentrations at the site, two of which contain definite cobble alignments, and one of which, Feature 5, is associated with significant

mounding. Marshall also noted three possible structural depressions; two to the south of Feature 5 and a third immediately northwest. Significantly, Marshall found no evidence of a historic farmhouse at the site, and she reduces Dittert and Eddy's "L-shaped" pueblo to two small surface cobble concentrations (see Fig. 5).

The geological setting and natural environment of LA 6170 is essentially identical to other terrace-top sites in the project area, with a Pleistocene gravel terrace topped by a mantle of eolian and redeposited alluvial sands and silts supporting a mixed Great Basin desert shrub vegetation assemblage. Artifacts are very lightly scattered over the surface of the terrace on both sides of the highway right-of-way. The lithic assemblage consists of a variety of local materials, including several varieties of quartzite, a variety of local chalcedonies, basalt, and Jemez obsidian. Much of the debitage on the site is the product of primary core reduction, and there are several tested cobbles in the assemblage. Most of the raw material that was reduced appears to be derived from local terrace gravels. Several artifacts of ground stone were noted during field inspections during the spring of 1997.

Ceramics, although not abundant at LA 6170, nevertheless span a relatively long time period, suggesting multicomponent occupation of the terrace top. The presence of coarse-tempered gray wares in the Lino Gray tradition suggests an Early Developmental component at LA 6170. A substantial Pueblo II-III occupation is also indicated by the presence of Kwahc'e and Santa Fe Black-on-white and corrugated utility wares. Marshall also noted Classic period biscuit wares on the surface of LA 6170, and both Dittert and Eddy and recent Museum of New Mexico surveys of the site have documented the presence of Tewa Polychrome. From the available ceramic evidence, it appears likely that the terrace locality that supports LA 6170 was occupied, at least intermittently, between A.D. 600-700 and the historic period.

Unfortunately, eolian and secondary alluvial deposits on the terrace surface make it impossible to accurately assess the depth and extent of the various temporal components. The possibility of significant buried features and cultural deposits at LA 6170 is extremely high. In fact, Dittert and Eddy noted that during construction of NM 22 in 1961, heavy equipment uncovered at least two buried cultural features within the highway right-of-way that were not indicated by any obvious surface manifestations. One feature apparently consisted of burned construction clay and charcoal, and was less than a foot below the 1961 ground surface. Another buried feature consisted of a layer of cobbles mixed with charcoal, what Dittert described as a probably cobble-floored surface unit. Dittert and Eddy also noted additional charcoal stains that were exposed but not investigated during road construction.

Based on all available evidence, there is very little to distinguish LA 6170 from other terrace-top sites in the project area. The site contains a number of the cobble features that are found throughout the project. As discussed above, these features may be architectural remnants, but we consider it more likely that they are the remains of agricultural grid gardens that have stabilized sections of an unstable dune surface, creating a mounded topography that mimics surface architecture. In 1961, Dittert and Eddy described an "L-shaped" roomblock measuring 140 by 75 feet, and in the late 1960s, Peckham and Wells (1967) revisited the site and described an "L-shaped" roomblock consisting of 10-12 rooms, 1-2 kivas, and a modern farmhouse. Only a small portion of the site has been affected by highway construction. Only additional excavation at LA 6170 will resolve these conflicting interpretations. It should be pointed out, however, that a pueblo occupation the size of what Dittert, Eddy, Peckham, and Wells describe would have produced a large quantity of occupational refuse, and that refuse is not apparent today on or near the site.

Proposed construction activities at LA 6170 will affect surface artifact scatters and cobble concentrations on both sides of the highway right-of-way, as well as two possible structural depressions recorded by S. Marshall on the west side of the right-of-way (Features 6 and 7). As with other sites on the Peña Blanca Project, the high probability of buried cultural features and deposits at LA 6170 will necessitate a staged data recovery effort, similar to the plans for LA 265 and LA 6169. Very briefly, the first stage will consist of detailed survey, inventory, and mapping of surface features and distributions, followed by a second stage in which controlled test excavations will be conducted within the project limits. Cultural features delineated during stage two test excavations will be exposed by controlled block excavations during stage three of the data recovery effort, and depending on the results of the test excavations, mechanical equipment may be used to remove sterile overburden at the site in order to expose additional buried cultural components. The final stage of data recovery at LA 6170 will involve hand excavation of all features and components identified during trenching and overburden removal operations.

LA 6171

LA 6171 is on the first Pleistocene terrace immediately south and east of the confluence of the Rio Grande and the Santa Fe River, on the north bank of the Santa Fe River, at an elevation of 1,610 m (5,280 ft) (Fig. 7). The site was first recorded by Ed Dittert and Frank Eddy in December 1961 as part of a highway salvage project on what is now NM 22, north of Peña Blanca. According to Dittert and Eddy the site consists of two Pueblo III house blocks with two or three associated kiva or pithouse depressions. The house blocks were described as low mounds covered with river terrace cobbles, and the subsurface structures were marked by depressions in which water collected, resulting in a denser than average vegetation cover. Dittert and Eddy described prehistoric refuse in the form of sherds and flakes eroding from the base of drift sand adjacent to the house blocks. The principal ceramic type noted was Santa Fe Black-on-white. Dittert and Eddy completed a site survey form on LA 6171, but since the principal cultural features were outside the highway right-of-way, no excavations were conducted at the site in 1961.

Peckham and Wells (1967) re-visited LA 6171 in the mid-1960s and recorded two roomblocks totaling 20-30 rooms, two to three kivas, and a ceramic assemblage dating to the Rio Grande Coalition (ca. 1175 to 1300). Peckham and Wells's brief description is essentially compatible with the early descriptions of the site by Dittert and Eddy. The next recorded visit to LA 6171 occurred in the fall of 1996 during preliminary surveys by Sandra Marshall for the present project. Marshall noted the two prominent cobble mounds at the site and added at least three additional structural depressions to the site assemblage (Fig. 7). Marshall's map shows the two cobble mounds (Features 1 and 2), each flanked by two possible structural depressions, and two additional depressions north of Feature 1 and within the current project area. In addition, Marshall noted several small cobble concentrations to the south and west of Feature 1 that had apparently escaped the notice of previous investigators. Marshall's observations in 1976 also expand the ceramic inventory for LA 6171. In addition to Santa Fe Black-on-white, Marshall notes a small number of Glaze A and corrugated utility wares at the site, and two Cochiti Polychrome sherds that appear to be from the same vessel and that Marshall concludes were probably deposited in recent years.

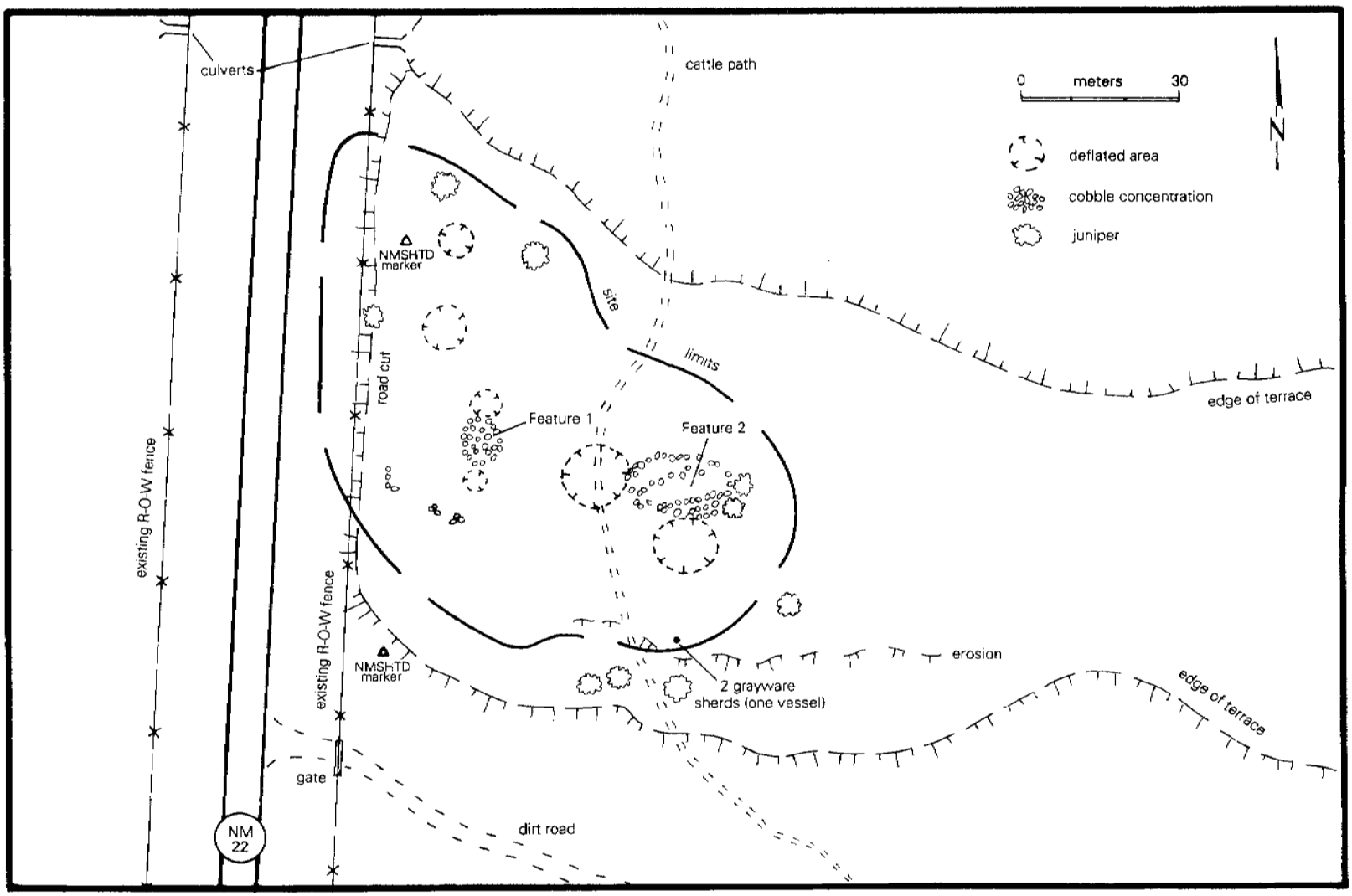


Figure 7. Map of LA 6171, after Marshall (1996).

The geological setting and natural environment of LA 6171 is essentially identical to that of other terrace-top localities in the project area. The terrace is fluvial in origin and Pleistocene in age, with a mantle of eolian sands and fine silts to depths varying from 1 m to over 3 m. Features 1 and 2 are prominent mounds that project 1 m or more above the average terrace surface and are capped by what appear to be a single course of large river cobbles in the 10-30 cm size range. Feature 1, which is just outside of the present project area, measures roughly 8 m north-south by 4 m east-west, and Feature 2, which is several hundred feet to the east, is approximately three to four times as large but composed of the same single-course cobble deposits. Internal cobble alignments are apparent in both features, but especially in the larger interior of Feature 2, where a number of parallel cobble alignments are apparent. The cobbles comprising both features appear to be resting directly on eolian sand deposits with no obvious evidence of adobe wall remnants. The adjacent depressions that are depicted as discrete, round holes on Sandra Marshall's map are, in reality, rather amorphous deflated areas of the dune. Whether or not these are true structural depressions cannot be ascertained without subsurface testing or, alternatively, some form of remote sensing.

In summary, the features described as architectural mounds and structural depressions at LA 6171 are virtually identical to cobble features at other sites in the project area, which poses the same question at this site as elsewhere: are these cobble features habitation mounds, agricultural remnants, or some other feature whose function is, as yet, unknown and unanticipated? If, as Peckham and Wells (1967) suggest in their 1967 survey, LA 6171 contains 20-30 pueblo rooms, we are at a loss to explain where the occupation refuse from these habitations is deposited. There is, in fact, very little material culture in the vicinity of either cobble features, (although Feature 1 has somewhat more material associations than the larger Feature 2), and what there is appears to be dominated by primary lithic debitage. Since cobble testing and primary core reduction are common "embedded activities" on cobble grid gardens in other areas of the northern Rio Grande (Ware and Mensel 1992), the relative abundance of primary debitage at LA 6171 provides at least tentative support for the agricultural hypothesis. Nevertheless, without extensive testing at LA 6171 it is impossible to rule out the possibility of buried occupation refuse at this and other ambiguous sites in the project area.

The proposed construction project on NM 22 will extend approximately 50 ft beyond the current right-of-way fence and directly affect two possible structural depressions and several small cobble concentrations southwest of Feature 1. Unless project design plans change, Features 1 and 2 will be outside the project limits and, therefore, will not be directly affected. Although there is no direct evidence of a Developmental period occupation at LA 6171, the depth of the dune mantle at the site is such that the likelihood of buried cultural features and deposits is good.

As with other terrace-top sites in the project area, the dune deposits at LA 6171 will necessitate a staged data collection strategy. The first stage will consist of detailed mapping and recording of surface features and artifact distributions, and the second stage will entail extensive test excavations to determine the depth of cultural materials, the presence of buried deposits, and the nature and extent of visible surface features. Test excavations will be restricted to the project limits and will focus especially on the small cobble concentrations southwest of Feature 1 and the two possible structural depressions to the north. Depending on data returns from stage two test excavations, mechanical equipment may be used in stage three to remove sterile overburden at the site and expose buried cultural features and deposits. Stage four of the data recovery plan will involve the controlled hand excavation of all features and deposits recovered during stripping operations at the site.

LA 115862

LA 115862 is a small sherd and lithic scatter with associated cobble features recorded for the first time by Sandra Marshall of the NMSHTD in October 1996 during preliminary surveys for the current highway project. The site is within the right-of-way of NM 22 and extends into private land west of the right-of-way that is owned by the Peña Blanca Grant (Fig. 8).

The site is situated on a narrow gravel terrace just south of LA 265 and approximately 100 m east of the Rio Grande floodplain at an elevation of 1,610.4 m (5,280 ft). The site consists of a small sherd and lithic scatter measuring approximately 30 m east-west by 20 m north-south and covering roughly 470 sq m. The artifact scatter is dominated by primary reduction lithic debitage of locally occurring basalts and chalcedonies, with small frequencies of Jemez obsidian. A single basal-notched obsidian projectile point was the only formal artifact recorded during preliminary surveys at the site. Within the primary lithic scatter Marshall recorded two sherds of Lino Gray, and during site visits by OAS staff during the spring of 1997, a third sherd of undecorated white ware was observed.

Along the western edge of the artifact scatter are two small concentrations of river cobbles. The first concentration (Feature 1) is near the northern edge of the narrow terrace and consists of a very small rectilinear concentration of river cobbles measuring less than 1 m on a side. The second cobble concentration (Feature 2) is approximately 10 m south of Feature 1, near the southern terrace edge and is also very small, just over 1 m on a side. Neither concentration contains any obvious internal alignments or other distinguishing features. In the vicinity of the two main cobble concentrations are several smaller concentrations that may be the remains of disarticulated features. However, the entire surface of the terrace is covered with cobbles of various sizes, and it is difficult to distinguish cultural from natural configurations.

What little artifactual evidence was recovered from LA 115862, two sherds of Lino Gray and a basal-notched arrow point, suggest an Early Developmental period occupation of the terrace, making LA 115862 roughly contemporaneous with a major buried component at nearby LA 265. If the cobble concentrations are the remains of agricultural features, then it is likely that they date to the late prehistoric period and are contemporaneous with the majority of cobble grid gardens in the northern Rio Grande. However, there are no material remains at the site to support this hypothesis, and the size and configuration of cobble features at LA 115862 are not particularly diagnostic.

Compared with other sites in the Peña Blanca Project, the data recovery plan for LA 115862 will be relatively straightforward. Unlike most terrace surfaces on the current project, the terrace that supports LA 115862 is essentially devoid of eolian deposits, so that the artifact scatter and cobble features rest directly on the fluvial terrace surface. A detailed surface inspection of the terrace suggests that there is very little soil that might contain subsurface features or cultural deposits, and there is no other indication that the terrace surface was modified in any obvious way. There is, in other words, no evidence and very little likelihood of substantial buried features or deposits at LA 115862.

The first step in data recovery will be to excavate a series of 1 by 1 m test pits across the top of the terrace within the current project limits. If these tests uncover a buried component at the site, excavation will proceed by hand until the component and its associated features are fully delineated. If the initial tests are negative, a backhoe will be used to trench the length of the terrace

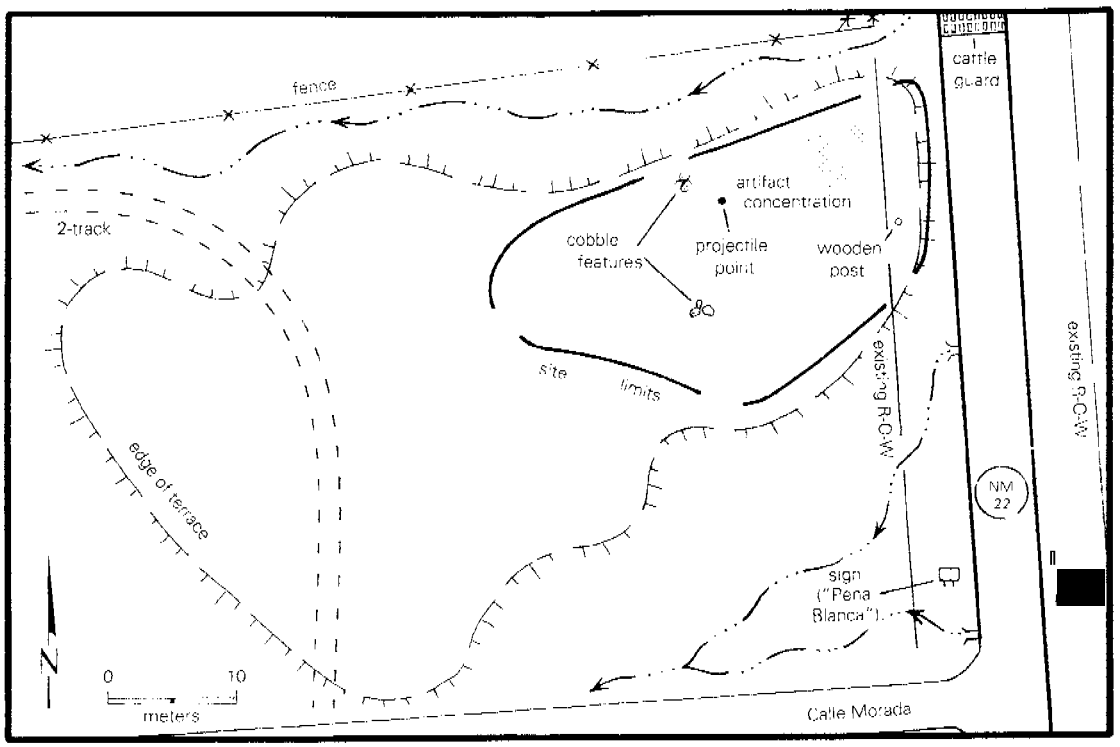


Figure 8. Map of LA 115862, after Marshall (1996).

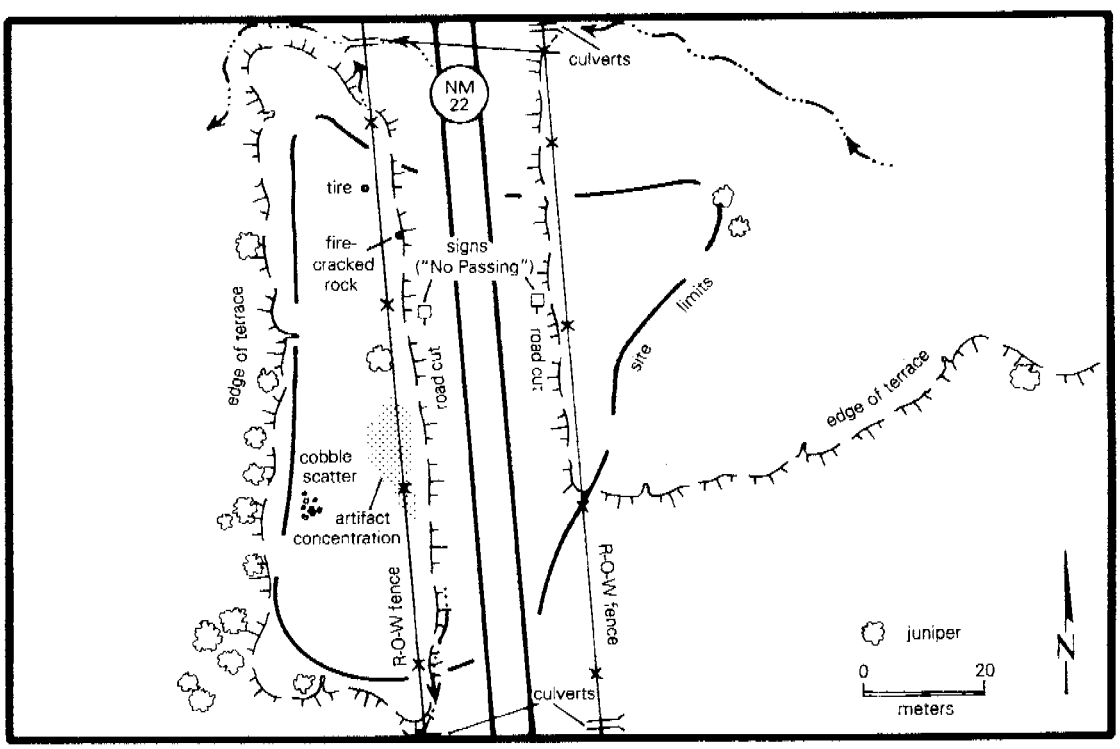


Figure 9. Map of LA 115863, after Marshall (1996).

to rule out the possibility of deeply buried cultural deposits. The two cobble surface features at LA 115862 are approximately 10 m outside of the current project area and will, therefore, not be affected by the current undertaking.

LA 115863

LA 115863 was recorded by Sandra Marshall of the NMSHTD in November 1996 during field reconnaissance along the right-of-way of NM 22 north of Peña Blanca. The site is on a Pleistocene gravel terrace overlooking the east bank of the Rio Grande floodplain approximately 100 m north of LA 6169 at an elevation of 1,607.4 m (5,270 ft) (Fig. 9). LA 115863 consists of a light lithic and ceramic scatter eroding from the base of a low dune deposit that covers most of the terrace surface with eolian and redeposited alluvial sand and silt to a depth of 1 to 3 m. Unlike other terrace-top sites in the project area, there are no obvious cobble alignments at LA 115863, although there are occasional stray cobbles dispersed across the surface of the dune that may be the disarticulated remains of cobble features. The density of artifacts is considerably lower than at nearby terrace sites (LA 6169, LA 6170, and LA 6171), which may explain why LA 115863 escaped the attention of intensive archaeological studies associated with the construction of Cochiti Dam and NM 22 in the 1960s. Unlike LA 115862, however, this site has a high potential for buried cultural features, deposits, and architectural remains. Fire-cracked rock, in particular, is relatively abundant at the site, and a fire-cracked rock feature is currently eroding from the NM 22 roadcut in the northern portion of the site.

The local environment at LA 115863 is typical of Great Basin desert shrub, with scattered junipers on the terrace slopes immediately west and east of the site and an understory of grama grass, snakeweed, Russian thistle, and several species of *Opuntia* on the terrace surface itself. Surface visibility is extremely poor due to deep eolian deposits that cover most of the terrace surface. This fact alone may account for the apparent absence of cultural features at LA 115863. With the exception of the fire-cracked rock feature mentioned above, the only possible cultural feature is a scatter of river cobbles near the western terrace edge. Although the scatter may be the remains of a surface structure (Marshall 1997) or field surface, there are, significantly, no obvious internal alignments and no evidence of mounding associated with the scatter.

The artifactual assemblage at LA 115863 consists primarily of lithic debitage, and the high frequency of cortical flakes and large angular debris indicates that primary core reduction was an important on-site activity. The majority of lithic raw materials are locally abundant and could easily have been obtained from local terrace gravels. The most common raw material is basalt, followed by several varieties of quartzite and white chalcedony. No formal tools or diagnostic flaked stone artifacts were noted during initial recording efforts or subsequent field inspections at the site. Several ground stone artifacts were noted on survey, including a few cobble mano fragments, at least two slab metate fragments, and several pieces of miscellaneous ground stone. Very few ceramics were recovered during initial surveys at the site, and these were composed entirely of coarse-tempered gray wares--probably Lino Gray--and a single sherd of unidentified red ware. Subsequent surveys by OAS recovered a single sherd of Santa Fe Black-on-white on the dune surface, but no other sherds were noted.

With so few temporally diagnostic artifacts recorded during the survey of LA 115863, it is difficult to determine the temporality of deposits at the site. The presence of coarse-tempered gray ware suggests a buried Developmental period component, and the presence of Santa Fe Black-on-white suggests occupation or use during the Coalition or early Classic periods (although a single

sherd is hardly conclusive evidence of occupation). Nor can we say anything with any confidence about the depth and extent of buried components at LA 115863, due to the extent and depth of eolian deposits on the terrace. We can only say that the visible surface indications suggest a less intensive prehistoric occupation of LA 115863 than is found on the adjacent terrace to the south that supports LA 6169. Nevertheless, the only prudent approach to data recovery LA 115863 is to conduct a staged series of excavations similar to the strategy that is proposed at LA 6169 and other dune-covered sites in the project.

The first stage will consist of extensive surface survey and testing using standard 1 by 1 m excavation units, which will be expanded in stage two to delineate any proximate features or deposits that are discovered during test excavations. Stage three will consist of extensive trenching and surface stripping with the aid of mechanical equipment to discover additional buried features and components, followed by stage 4, intensive excavations of all features and deposits discovered during stripping and trenching operations at the site.

RESEARCH ORIENTATIONS

Archaeological research in the northern Santo Domingo Basin and White Rock Canyon over the past 50 years has documented a pattern of seasonal use by early hunters and gatherers beginning in the late Archaic period (ca. 3500 B.P.), sporadic and possibly seasonal use by early farming populations during the Rio Grande Developmental (ca. 600-1200 A.D.), intense occupation and use by late prehistoric Anasazi groups in the thirteenth through fifteenth centuries A.D., and extensive occupation and use during the historic period by Spanish and Pueblo farmers, herders, and ranchers. Archaeological resources discovered along NM 22 appear to date from the Early Developmental period (A.D. 600-900) through the late historic period (nineteenth century) and, as such, the remains conform generally to expectations derived from prior research in the northern portion of the Middle Rio Grande Valley. Although the broad outlines of this occupation history are generally known, intensive excavation of sites in the present study area will allow us to address several important issues of local and regional importance.

The periods of time represented in the study sample saw important changes in the occupation and use of the Cochiti area. In the Early Developmental period, domesticated plants were being added to a diverse assemblage of wild plant and animal foods, and prehistoric settlement patterns, population distributions, technologies, and architecture were changing in response to these important changes in the subsistence economy. In the late prehistoric period, large aggregated populations of Anasazi farmers, who had, several centuries before, made substantial commitments to food production and settled village life, were adopting new technologies and experimenting with new organizations following the structural collapse of Anasazi systems on the Colorado plateaus to the west. In the early historic period, Pueblo people experienced the affects associated with European contact, which would alter centuries-old trajectories of culture change in the northern Southwest.

The fact that there was no test excavation phase on the present project will have an important effect on the structure of the following data recovery plan. With the exception of LA 115862, all of the sites in the current project are on alluvial terraces capped by a mantle of recent eolian and redeposited alluvial sand and silt, and surface indications suggest that the majority of these terrace-top sites have substantial buried components. Without an extensive test excavation phase, it is impossible to know before data recovery begins the nature and actual extent of buried components, or whether present surface indications provide a representative sample of subsurface cultural deposits. Consequently, it is important that the design of research for the Peña Blanca Project be structured in such a way as to accommodate unanticipated discoveries. For example, although no evidence of Archaic occupations were noted on surveys for the present project, if Archaic components exist they would necessarily be buried under recent eolian deposits. It is only prudent, therefore, to anticipate the possible discovery of buried Archaic material by incorporating general questions about the period into the suite of anticipated research problem domains. Because of the size of the sample and the nature of the assemblages under investigation, the following research design breaks the archaeological record of the project area into four discrete temporal units and presents specific research questions and data recovery strategies for each period.

Archaic Occupations

The Archaic is traditionally defined as the cultural stage immediately preceding the evolution of formative farming societies in which human adaptive strategies were centered on diversified

hunting and collecting. In the northern Southwest, the Archaic period dates from approximately 5500 B.C. to A.D. 400-600 (Irwin-Williams 1973). Although no obvious Archaic manifestations were noted on the survey of NM 22, a total of 75 possible Archaic components were recorded on the nearby Cochiti Reservoir Project (Biella and Chapman 1976), and the possibility of buried Archaic materials on the Peña Blanca Project cannot be ruled out. Consequently, this section will present a brief discussion of important Archaic research issues and problem domains for the northern Middle Rio Grande. Major research questions of the Archaic period are rapidly evolving, and syntheses of the period become just as rapidly obsolete. However, much of the research of the last decade has focused on a few general problem domains that will help guide Archaic research on the Peña Blanca Project. Two of the most significant problem domains include the refinement of Archaic chronologies and studies of Archaic period settlement and subsistence systems:

Research Issue 1: Dating and Chronology Refinement

The problems of dating and chronology refinement are, and will no doubt continue to be, important issues in Archaic research, primarily because only the last few centuries of the six-millennia Archaic time continuum overlap with the master tree-ring chronology for the northern Southwest. As a result, archaeologists must rely on C-14 and other less accurate dating techniques for dating Archaic assemblages, and most of the known Archaic sites are dated only on the basis of artifact associations, if they are dated at all. Developing ways to more accurately date Archaic sites and assemblages and refining local and regional chronologies are critical in Archaic research, primarily because so many other research problems are difficult to address without fine-grained temporal control.

The problem of dating and chronology refinement are especially critical in the Cochiti study area, where absolute dates from Archaic components are essentially lacking. According to Chapman and Biella (1979:386):

> Archaic campsites within the project area were abysmally lacking in charcoal due to their generally deflated state of preservation; and although several samples of hearth contents were analyzed for radiocarbon dating purposes, none contained enough organic matter to result in usable dates.

Although the Cochiti Project was able to date some of their Archaic components with the aid of temporally diagnostic projectile points and obsidian hydration, the fine-grained refinements of Irwin-William's Oshara Archaic Tradition for the northern Rio Grande that they had hoped to achieve were not possible without a calibrated C-14 chronology. Consequently, a major objective of Archaic research on the Peña Blanca Project, if sites of the appropriate age are discovered, will be to recover chronometric samples that will allow us to more accurately date Archaic occupation of the study area. Excavation strategies will emphasize the recovery of carbon samples for C-14 dating, buried obsidian flakes for hydration dating, and fired clay samples for archaeomagnetic dating. Dating Archaic horizons will be especially important on multicomponent sites to separate different occupation assemblages. Fine-grained spatial and stratigraphic data recovery and analysis techniques will be necessary to identify and segregate discrete occupations. It may also be necessary to characterize single-component sites of various time periods in the study area to develop temporal/functional signatures and aid in identifying discrete occupations at multicomponent sites.

Research Issue 2: Subsistence and Settlement Systems

Another perennial problem in Archaic research in the northern Southwest is the nature of Archaic subsistence-settlement systems. How, before the advent of horticulture, did Archaic hunters and gatherers subsist? How did they organize the food quest? How did they adapt to changes in their environment? What resources did they obtain during what times of the year? What kinds of family and settlement organizations existed, and how did these organizations vary in time and space?

Most of the recent research on Archaic settlement-subsistence systems has taken place in the San Juan Basin of northwestern New Mexico. Toll and Cully (1983) examined the distribution of key plant food resources in the greater San Juan Basin and concluded that most of the resources in the central basin are abundant between the early spring and fall but may have been in critically short supply from late fall through early spring. From these observations they constructed a hypothetical seasonal round for the San Juan Archaic that postulated a late fall and winter occupation of upland forested regions on the northern and eastern periphery of the basin. Following Toll and Cully's arguments, Vierra (1988) proposed that basin-centered Archaic groups used a residentially mobile forager strategy from the spring through early fall in the central San Juan Basin and moved to the peripheral uplands in the late fall, where they implemented a base camp–centered logistical or collector strategy (Binford 1980).

Chapman (1979) explicitly compared the structure of Archaic sites in the Cochiti study area with what was then known about Late Archaic adaptations in the San Juan Basin and found no evidence of a relationship between Cochiti site locations and the kinds of high vegetative diversity localities that attracted Archaic gatherers in the San Juan Basin. The evidence does suggest, however, that Archaic adaptations in the Cochiti Reservoir study area were seasonal and technologically redundant, and, therefore, probably part of an annual round that incorporated a much larger geographic area. Recent research in the Santa Fe River Valley has documented a number of Late Archaic winter base camps in the piedmont and lower montane slopes of the Sangre de Cristo Mountains, and Post (1994) has suggested that low elevation riparian zones of the Santa Fe River and Rio Grande may have been the summer component of an annual round that involved seasonal movement from high elevation winter base camps to lower elevation summer foraging localities.

Post's hypothesis appears to be consistent with the overall small size and high degree of intersite structural and artifactual redundancy that is found in late Archaic sites and components throughout the Cochiti area (Chapman 1979). An essential part of the test of this hypothesis will be to demonstrate that Archaic components in low elevation areas were occupied primarily during the summer or, at least, nonwinter months. Unfortunately, data relevant to this test (principally floral and faunal remains) were rare or nonexistent on the Cochiti Reservoir excavations because of the shallow depth of cultural deposits at most Archaic localities. With the possibility of deeply buried and hence well-preserved material on the present project, if Archaic deposits are encountered along NM 22 there is a good possibility that seasonally relevant data will be recovered.

Addressing questions such as those outlined above will require detailed information on subsistence resources and resource extraction strategies, which will require, in turn, detailed recovery and analysis of ethnobiological and technological data. Analysis of ethnobiological data will permit inferences regarding the kinds and varieties of resources that were procured, processed, and consumed by Archaic populations in the study area, and how the relative proportions of these

resources changed through time. Analysis of economic faunal remains may shed light on patterns of seasonal occupation and use of the study area. Analysis of subsistence extraction, processing, consumption, and storage technologies will provide information that will complement the ethnobiological data base, contributing to a general understanding of Archaic subsistence-settlement patterns in the Peña Blanca study area.

Early Pueblo Occupations

No evidence has been found of Basketmaker II occupations in the Cochiti-White Rock Canyon area, and there is only scant evidence of an extensive Developmental occupation of the Cochiti Reservoir area. Surveys by Peckham and Wells (1967) of the Pajarito Plateau, White Rock Canyon, and Santo Domingo basin in the 1960s documented only six sites with Early Developmental ceramic assemblages (two of the sites, LA 249 and LA 265, are impacted by the present project). Only 43 Developmental sites and components were documented in UNM's survey of Cochiti Reservoir, and 30 of those components date to the Late Developmental Pueblo II-III period (ca. 1050-1200 A.D.) (Biella 1979:104). Moreover, nearly all of the sites classified as possible Early Developmental occupations turned out, upon excavation, to date to the Pueblo IV period. In retrospect, it appears likely that Pueblo IV agricultural features and associated "borrow pits" on the south terrace of the Santa Fe River were mistaken for Basketmaker III-Pueblo I roomblocks and associated pithouse depressions (Hunter-Anderson 1979:208-216).

The only Early Developmental site excavated to date in the Cochiti area is LA 272, a small surface roomblock with three associated pit structures that appears to date to the Pueblo I-II transition (ca. A.D. 850-950), based on a mixed assemblage of Piedra and Red Mesa Black-on-white ceramics (Snow 1971). Based on the paucity of material remains at LA 272, Snow speculated that the site was a short-term occupation (1971:21), and Biella suggested the possibility of seasonal reoccupation over a series of years (Biella 1979:105). Two Late Developmental sites, LA 6461, the Red Snake Hill site, and LA 6462, the North Bank site, were excavated during the original Cochiti Dam salvage project in 1963-64 (Lange 1968). Both sites consist of dispersed, presumably single-household pit house residences, and both sites were associated with Kwahe'e Black-on-white ceramics, suggesting occupation during the twelfth century A.D.

Considering the paucity of documented Developmental period sites and excavations in the northern Santo Domingo Basin, it is significant that no less than six of the seven sites documented during the Peña Blanca Project have evidence of Early Developmental components (LA 249, LA 265, LA 6169, LA 6170, LA 115862, and LA 115863), and three of these sites (LA 249, LA 6169, and LA 6170) also appear to have buried Kwahe'e period (Pueblo II) components. The Developmental components at LA 265 and LA 6160 appear to be especially early (Basketmaker III - Pueblo I), and the quantity of early occupational refuse suggests significant buried architectural remains. Consequently, the Peña Blanca project promises to yield important information on early Pueblo culture history and adaptations in the northern Middle Rio Grande. Proposed research on early Pueblo occupations in the Peña Blanca Project will focus on three principal problem domains: culture history and the dynamics of culture change, settlement and subsistence patterns, and community patterns and social organization.

Research Issue 1: Culture History and Culture Change

Data from the Peña Blanca Project may shed significant light on a rather poorly understood period of prehistoric occupation of the Rio Grande Valley, namely the Late Basketmaker-Early

Pueblo period (A.D. 600-1200), which Wendorf and Reed (1955) labeled the Rio Grande Developmental. Several characteristics of the period, especially relating to settlement size and population distribution, serve to distinguish the Rio Grande Developmental from contemporaneous Anasazi cultural expressions on the Colorado plateaus to the west. Perhaps most significantly, many parts of the northern Rio Grande appear to have been unoccupied by farming populations throughout most of the first millennium A.D. This is true especially of regions north of the La Bajada uplift (e.g., Pajarito Plateau, Chama Valley, Taos Plateau), where a diversified Archaic-style hunting and collecting adaptation appears to have persisted well into the twelfth century A.D.

Even in areas where there were substantial resident Developmental period farming populations such as the central Tewa Basin, portions of the Santa Fe River Valley, the lower Jemez River Valley, and the Middle Rio Grande, archaeological expressions are often very different from contemporary expressions on the plateau. Until comparatively recently, these differences were expressed in the literature in terms of progressive, unilinear notions of culture change. The Rio Grande was said to have "lagged behind" the more precocious developments in the San Juan Basin to the north. The pithouse to pueblo transition was "delayed" in the Rio Grande Valley for three to four hundred years. Plain gray utility wares in the Lino and Kana'a traditions persisted in the Rio Grande until the late Pueblo II period, long after they had been "superceded" by indented corrugated ceramics on the plateau (Wendorf and Reed 1955; McNutt 1969:77).

Early explanations of these Rio Grande cultural lags were strongly conditioned not only by unilinear notions of culture change but also by a pervasive "Plateau-centric" perspective of the Rio Grande. Early conceptions of the Rio Grande Valley were that it was a marginal "backwater" of the Pueblo world (a notion that persists among some authors even to the present day, e.g., Riley 1994). According to this view, the lag in adoption of major technological and architectural traits in the Rio Grande reflected the time it took for technologies and behaviors to diffuse from the core of cultural development in the San Juan Basin to its eastern periphery. When synchroneity occurred in the appearance of Anasazi material traits, as in the relatively sudden and widespread appearance of Red Mesa Black-on-white throughout much of the Middle and northern Rio Grande Valley in the A.D. 900s, authors typically resorted to population immigration from the plateau to explain the rapid dispersal of cultural traits (McNutt 1969:105).

Although theories of diffusion and migration are not necessarily wrong--in fact, both mechanisms probably figured prominently in the contingent history of the Rio Grande--when we resort to such mechanisms to explain anything of any consequence in a historical sequence, a definite tendency in past Rio Grande explanations, we run a considerable risk of submerging other important causes and processes. It is true, for example, that pithouse architecture persisted in the Rio Grande long after surface architecture began to predominate on the plateau, but domiciliary pithouses persisted long after the appearance and elaboration of surface masonry architecture on the plateau (e.g., Anderson 1980), and there are examples of substantial surface architecture at a number of Developmental sites in the Rio Grande (e.g., LA 835; Stubbs and Stallings 1953; Stubbs 1954). In other words, a progressive unilinear scheme fails to explain important architectural changes in both areas!

What is needed to resolve basic issues of culture history and patterns of culture change in the Rio Grande Valley are fewer unicausal theories of complex sociocultural processes and more basic research on patterns of change and continuity in the middle and northern Rio Grande. Data collected from the Peña Blanca Project promises to enhance a very small existing data base on Early Developmental occupations and adaptations in the northern Santo Domingo Basin, (e.g., Snow 1972), which will contribute to a growing body of data on early Puebloan occupations in the

northern Middle Rio Grande. In addition to providing data that will help us characterize Early Developmental community patterns, architecture, and material assemblages, the Peña Blanca data may also help explicate a number of specific culture historical problems of the period and the region.

Developmental sites in the Lower Jemez Valley (e.g., Hammack et al. 1983) and the Albuquerque area (e.g., Vivian and Clendensen 1965; Frisbie 1967; Peckham 1954, 1957) typically have mixed ceramic assemblages composed of both Anasazi white and gray wares and Mogollon brown and red wares, and some authors have suggested that the Middle Rio Grande was a frontier or "buffer zone" between the Anasazi and Mogollon culture areas (Hammack et al. 1983:4). In several site visits to LA 265, LA 6169, and LA 6170--sites with the largest Developmental components in the present project--no Mogollon ceramic types were observed. If the Middle Rio Grande Valley was truly a cultural frontier, does the apparent absence of Mogollon ceramics in the Cochiti area mean that the northern Santo Domingo Basin lies north of the frontier boundary? A great deal of research has been conducted in recent years on the dynamics of cultural boundaries, frontiers, and zones of interaction (e.g., Lewis 1967; Casagrande et al. 1964), and data from the Peña Blanca project, especially data from Early Developmental components, promise to contribute to this evolving theoretical domain.

Another question of cultural historical significance in the northern Middle Rio Grande is an apparent hiatus in occupation of the region during the early Pueblo II period (ca. A.D. 900-950 to 1050-1100). Early Pueblo II sites with the diagnostic Anasazi white ware of the period, Red Mesa Black-on-white, are rare to nonexistent in the Middle Rio Grande, and some authors have suggested that all or portions of the Middle Rio Grande may have been depopulated during the tenth and early eleventh century, when the Chacoan polity was on the rise in the central San Juan Basin to the west (Hammack et al. 1983:5). Others have argued that the presence or absence of Red Mesa ceramics may have little to do with regional demographics; that, instead, ceramic assemblages in the Middle Rio Grande persisted, essentially unchanged, from the Early Developmental into the tenth and eleventh centuries (Brown 1997; Hogan and Gerow 1990). There does indeed appear to be a paucity of Red Mesa Black-on-white in Developmental components of the Peña Blanca Project, although Red Mesa Black-on-white has been recorded in at least one excavated site in the Cochiti area (LA 272). The possibility of buried early Pueblo II components at Peña Blanca, and the differential distribution of early Pueblo II occupations in the Cochiti area, may provide an opportunity to address this important issue of the Late Developmental period.

Research Issue 2: Settlement and Subsistence Systems

Published characterizations of settlement and subsistence patterns during the Rio Grande Developmental have been profoundly affected by unilinear progressive assumptions about culture change in the Middle Rio Grande. As noted above, a number of authors have pointed out the obvious time lag in the pithouse to pueblo transition in the Middle Rio Grande Valley, as well as the persistence of subsurface storage pits, delays in the appearance of true kivas, lags in Middle Rio Grande ceramic technology and stylistic developments, and so on, and many investigators haveattributed these time lags to the "marginal" character of Rio Grande adaptations. Why did the Rio Grande lag behind the plateau in these presumably important areas of cultural development? According to progressive unilinear theories, the Rio Grande was a "backwater" of culture change--a marginal area that was always two or three step behind the more precocious cultural developments of the plateau. It should be clear, however, that attributing culture change to "marginal adaptations" without any reference to the nature of the adaptations themselves does not

qualify as an explanation of anything. Certainly the Rio Grande Valley was not marginal to the San Juan Basin and Colorado Plateau in terms of the abundance of exploitable resources, or the potential for food production, or the length of the growing season, or the availability of perennial water, or the variety of ecological settings, or the density of human populations it could (and eventually did) support, or a host of other important adaptive characteristics!

Cordell (1978) was one of the first to address the nature of Rio Grande adaptations from a non-"Plateau-centric" perspective when she argued that the adoption of agriculture and the attendant consequences of food production were delayed in the Rio Grande Valley because the area was such an optimal region for hunting and gathering. According to Cordell, the foraging potential of the Rio Grande was so great that there would have been few incentives to adopt labor-intensive food-production methods. Those incentives would eventually be supplied by a rapidly growing population resulting from large-scale immigration into the Rio Grande during the thirteenth and fourteenth centuries, but during the early Pueblo period, when population densities were low, farming may have been no more than a minor component of a subsistence economy that was focused primarily on seasonally available wild foods.

Cordell's hunter-gatherer refugium hypothesis is consistent with a number of archaeological manifestations in the Middle Rio Grande. The persistence of pithouses and subsurface storage facilities may be indicative of a high degree of residential mobility. Gilman (1987) has argued that pit structures in the northern Southwest are associated with cold-season occupations, at least a biseasonal, mobile settlement pattern, and reliance on stored foods while the pit structures were in use (1987:541). Wills (Wills et al. 1994:309-310) has argued that large subsurface storage pits are indicative of high group mobility and the caching of food for future site reoccupation and consumption, as opposed to the storage of food in facilities that were regularly accessed by a long-term, sedentary population. In other words, delays in the pithouse to pueblo transition in the Rio Grande Valley may be entirely consistent with high group mobility, seasonal settlement patterns, and an emphasis on wild plant and animal resources.

Unfortunately, it is difficult to evaluate Cordell's hypothesis with currently available data on the Rio Grande Developmental. Much of the published research on early Pueblo sites in the Rio Grande Valley does not provide adequate documentation of subsistence behavior and technology, seasonality of occupation, and settlement size and configuration. In 1978, Cordell bemoaned the lack of environmental and economic data from excavated sites in the Rio Grande: "The lack of a synthetic view is apparent in nearly all recent field reports in that descriptions of ceramic types and architecture make up the bulk of the report; critical data such as reports of faunal and botanical remains, paleoenvironmental reconstructions and reports of skeletal material are often relegated to appendices" (1978:64). Unfortunately, Cordell's concerns are still valid for the region as a whole. Despite recent comprehensive studies of Rio Grande cultural adaptations (e.g., Cochiti Reservoir, Arroyo Hondo), the majority of published reports still focus on issues of culture history and cultural diffusion that can never resolve a host of processual problems having to do with culture change and human adaptation.

One of the most important goals of our research in the Middle Rio Grande will be to collect basic data on human adaptation and interaction that will allow us to characterize patterns of change and continuity in the region, and to test hypotheses about human settlement and subsistence systems such as those proposed by Cordell. An important objective of the present project will be to collect basic economic and ecologic data to more accurately characterize Developmental period settlement strategies and subsistence systems.

Research Issue 3: Community Patterns and Social Organization

Very little research has been suggested or accomplished on the social organization of early Pueblo populations in the Middle Rio Grande. The apparent absence of kivas suggests a less complex social-ceremonial life for the Rio Grande Anasazi, compared with their contemporaries on the Colorado Plateau. However, since it is far from certain what the function of early kivas was, the significance of their absence is problematic. I have argued elsewhere (Ware 1983) that kivas may have evolved to integrate dispersed male members of localized matrilineages--that kivas were an architectural setting for avunculate-based sodalities. If this hypothesis is true, then the absence of kivas may be indicative of different residence and descent patterns for the Developmental period Rio Grande Anasazi. It is interesting to note in this regard that the Rio Grande Tiwa, the most likely early residents of the Middle Rio Grande Valley (Ford et al. 1972), are thoroughly bilateral without a trace of unilateral descent institutions.

One of the most intriguing aspects of Developmental period community patterns in the northern Santo Domingo Basin is the prevalence of isolated pit structures, suggesting single-family occupations (Biella 1979:109). Biella argued that Early Developmental occupations in the Cochiti area were characterized by pithouse communities with more than one commensal unit represented, while Late Developmental occupations consisted of isolated single-household residences. Apparently, however, Biella based her characterization of Early Developmental community patterns on an excavation sample of a single site, LA 272. Clearly, there is no way to know how representative LA 272 is of Early Developmental occupations in the Cochiti area. Nevertheless, the single-household pattern of the Late Developmental Kwahe'e period has been fairly well established by multiple excavations (e.g., Lange 1969; Biella and Chapman 1979).

One of the principal objectives of excavations on the Peña Blanca Project will be to enlarge the sample of Developmental period sites to test the validity of the single-household pattern. If such a pattern is indeed ubiquitous in the northern Santo Domingo Basin, then there will be important implications for regional settlement systems and organizations.

Late Pueblo Occupations

All of the late Pueblo occupations in the Peña Blanca project appear to be associated with the cobble concentrations that are found on a majority of sites in the study area (LA 265, LA 6169, LA 6170, LA 6171, and LA 115863). Prior investigations by Dittert and Eddy (1961), who described the features as adobe roomblocks, described instead parallel concentrations of one-course cobble alignments, no evidence of adobe melt, ambiguous floor surfaces and features, and perhaps most significantly, no evidence of occupational debris. In the judgment of the present author, the features described by Dittert and Eddy in the early 1960s are cobble-bordered grid gardens dating to the late Pueblo period. Clearly, one of the principal objectives of data recovery efforts on thePeña Blanca Project will be to evaluate the true identity of these features. However, the following discussion of problem domains and research objectives proceeds on the assumption that the features in question are, in fact, agricultural facilities (we explicitly do not rule out the possibility of fieldhouses in the various amorphous cobble concentrations).

Prehistoric grid gardens have been reported and recorded throughout much of the eastern Anasazi region: from the Gallina area (Dick 1976), near Mount Taylor (Lange and Riley 1966), the hill slopes northwest of Zia (Stephenson 1984), on Guadalupe Mesa north of Jemez (Dougherty 1980), throughout the Zuni area (Wiseman 1973; Maxwell 1996), at dozens of localities in the

lower Chama and Ojo Caliente Valleys (Fiero 1978; Tjaden 1979; Lang 1980; Bugé 1984; Anschuetz et al. 1985; Maxwell and Anschuetz 1992; Ware and Mensel 1992), in the western Galisteo Basin (Lightfoot 1990, 1993a, 1993b), and on La Bajada Mesa (Harlan 1984), less than ten miles from the Peña Blanca study area. Moreover, there is a long and distinguished history of archaeologists mistaking grid garden alignments for architectural footings, beginning when Edgar L. Hewett of the School of American Research mistakenly identified extensive grid gardens on Abiquiu Mesa as the footings of a 200-room pueblo (Hewett 1906)!

Past research on prehistoric grid gardens in the Rio Grande Valley have delineated several important problem domains and research issues relating to prehistoric dry farming in the eastern Anasazi region. Investigators have been concerned with when fields were constructed, used, and abandoned; how fields were constructed, how they functioned, and how variation in field form and structure relates to variation in field function; what crops were grown and the productive capacity of dry land grid gardens; the geographical extent of grid fields and the environmental parameters that encouraged their construction and use; and finally, a variety of questions addressing important causal relationships within late prehistoric Pueblo food-production systems. Were, for example, dryland grid fields part of a diversified agricultural strategy designed to reduce subsistence risk in marginal agricultural environments? Were they a response to a particular kind of environmental perturbation, such as drought? Were grid gardens valued because they conserved moisture, channeled runoff, reduced wind effects or the risk of frost damage to crops, or for other reasons?

Because of the nature of the field sample available for study on the Peña Blanca Project, many of these issues, though important, cannot be realistically addressed. The proposed research will focus, instead, on three specific research issues and problem domains: dating and chronometrics, crop mix, and characterization of field structure.

Research Issue 1: Dating and Chronometrics

Although there is some evidence of late Coalition (late 1200s-early 1300s) and early Historic period (late 1500s) use of terrace-top grid fields in the lower Chama Valley (Anscheutz and Maxwell 1987:22), there is general agreement that most cobble-bordered grid fields in the Rio Grande Valley were constructed and used during the Pueblo IV or Classic Pueblo period (ca. A.D. 1325-1598). Beyond a general assignment of fields to the Classic period, however, there is little if any agreement on more precise dating of fields and field systems, and all too often, field construction and use dates have been postulated based on the timing of various external events (e.g., droughts, populations shifts), rather than on independent dating criteria.

Lightfoot's study of the San Marcos field system is a case in point. Lightfoot argued, on the basis of ceramic associations, that most of the San Marcos fields were constructed in the early decades of the 1400s, a period that coincided with a severe regional drought and rapid population growth at San Marcos Pueblo. Significantly, Lightfoot admits that he found very few ceramics in direct association with the grid fields in his study area--the sample was so small, in fact, that he felt compelled to increase the sample by examining sherds from local private collections (a dubious approach considering the lack of provenience control in most private collections). Unfortunately, Lightfoot's assertion of a causal relationship between grid fields and population-resource imbalance in the Galisteo Basin is impossible to evaluate because he fails to publish any of his ceramic data--he even fails to distinguish between ceramics found in the field and ceramics examined in private collections.

Lightfoot (1990:181-182) argued that the paucity of potsherds on San Marcos fields was the result of recent surface collecting. This may be true, but investigations of field systems in other parts of the Rio Grande Valley have also documented extremely low frequencies of surface ceramics, and it may simply be that activities associated with the construction, use, and maintenance of grid fields did not result in the breakage of large numbers of pottery vessels. Nevertheless, a major objective of the Peña Blanca Project will be to maximize the recovery of temporally diagnostic artifacts and to explore other methods for dating prehistoric agricultural fields.

We propose to intensify and extend survey coverage of agricultural fields in the project area to maximize the recovery of temporally diagnostic artifacts. Our approach will be two-fold: (1) intensify pedestrian coverage of the field surface by slowing the pace and shortening the transect interval; (2) extend survey coverage beyond agricultural surfaces to include field margins and the slopes of the gravel terraces that support the fields.

Few if any chronometric dating techniques appear to be applicable to agricultural fields. The new and highly controversial rock varnish dating technique (Dorn 1983) may be applicable and should be explored. Flaked stone artifacts and debitage have been noted at all of the fields in the project area, with the highest concentrations occurring around the field margins. Depending on the surface frequency of obsidian flakes in these assemblages, it may be worthwhile to conduct sample excavations of field edges to recover subsurface obsidian flake samples for hydration dating.

Although no definitive evidence of prehistoric architecture or other cultural features have been noted in the vicinity of the fields, it is possible that the Peña Blanca fields were associated with seasonally occupied structures or fieldhouses. If fieldhouses or other cultural features are recovered during excavation, an important objective of excavation will be to recover chronometric samples from the features (radiocarbon, tree-ring, archaeomagnetic).

In summary, uncertainty about the age of agricultural fields and features in the Rio Grande Valley frustrates a variety of processual studies. Hypotheses regarding issues such as field use-life, field system expansion through time, and correlations between grid field technology and various environmental perturbations such as drought (Lightfoot 1990) and the onset of the Little Ice Age (Anscheutz and Maxwell 1987) cannot be tested and refined without more precise dating of field construction, use, and abandonment events. The present project will not resolve these problems, but it is our objective to test a variety of methodologies that we hope will bring us closer to an understanding of when field systems were constructed and used.

Research Issue 2: Crop Mix

Perhaps the greatest problem associated with the analysis of cultivar pollen from field sediments is that the pollen of southwestern cultivars is extremely rare, even in sediment samples from active agricultural fields (Martin and Byers 1965). As a result, many attempts to recover domestic pollen from presumed farming features have yielded either negative results or such small frequencies of domesticates that interpretation of the results is difficult (Moore n.d.:30). To date, both corn and cotton pollen have been recovered from grid fields in the lower Chama Valley, but the frequencies are extremely low and difficult to interpret.

Dean (1991) has proposed a new method called "intensive systematic microscopy" (ISM) designed to identify rare pollen types. We propose to use ISM on all pollen studies on the present

project. The technique goes beyond the standard 200-grain pollen count and was used successfully to identify corn and cotton pollen from prehistoric fields in the final stages of the Medanales Project and subsequent test excavations northwest of Abiquiu (Moore n.d.). Dean describes the method as follows (1991:9):

> Pollen grains from plants grown in prehistoric agricultural features are usually rare in sediment samples from those features, and finding a rare pollen type in a sample requires a different approach than the standard 200-grain count. . . . Recently I developed a regimen of intensive systematic microscopy to search for rare pollen types at 200X magnification. As a result, very low concentrations of cotton and corn pollen grains were detected in pollen samples from high-altitude prehistoric field features in northern New Mexico (Dean 1991). . . . According to the refined method, the number of spike grains present on each entire microscope slide determines how many slides must be completely examined in order for a rare grain occurring in a given abundance to be seen.

In addition to using ISM to identify rare cultivar pollens, we propose to collect pollen samples from on and off agricultural fields to evaluate the significance of on-site pollen frequencies.

Research Issue 3: Characterization of Field Dynamics

Questions about prehistoric field dynamics, how grid gardens may have functioned, their potential productivity, their life expectancy, and other characteristics are important issues that have not been adequately addressed. Critical unanswered questions fall under the general categories of understanding the energy, nutrient, and hydrologic budgets of the features, and how the techniques employed differed under different situations. Such questions include: Site selection criteria: were only certain substrates, soils, and locations used? If sites differed, were slightly different techniques used at different sites? What are the energy budgets of these sites, and how did the energy budgets differ with different sites and different field types? What are the nutrient cycling characteristics of these fields? Were the sites sustainable, or were extra nutrients required? What was the hydrology of the fields? How much water was conserved by the grids? Were different grid configurations used for different crops?

We believe that the best way to address issues regarding field function and field dynamics is by experimental studies that simulate, as realistically as possible, field structures, soil types, and the climate and radiation regime of late prehistoric grid fields in the Rio Grande Valley. Experimental studies were proposed and initiated by Maxwell and Anschuetz in 1987, but funds were not available for adequate design and completion of the experiments. Experimental studies of several varieties of grid fields are currently being conducted by the University of New Mexico's Department of Biology at their Los Lunas agricultural experimental station (C. White, personal communication), and the results of these studies will be incorporated into the research that is proposed here. In order to design a simulation experiment, we need detailed data on field structure such as soil character and depth, cobble size and grid density, and other detailed field characteristics. An important objective of the current project will be to collect sufficient data to accurately characterize field form and structure so that experimental studies can be designed to investigate a variety of questions about field dynamics.

Historic Occupations

Although historic components were noted at more than half of the sites on the Peña Blanca Project (LA 249, LA 265, LA 6169, LA 6170, and LA 6171), no historic features or artifact concentrations have been noted within the project limits. Moreover, the likelihood of buried historic features and deposits is considered very small due to the depositional environment of the terraces (there has been generalized deflation around most of the late prehistoric features on the project, suggesting that any subsequent features or deposits would be either obliterated or visually obvious).

Historic features outside the project limits will be described on survey update forms, in-field analyses will be performed of associated cultural materials, detailed photographic documentation will be made, and informant responses will be elicited from residents of Cochiti Pueblo through the Pueblo Planning Office.

FIELD AND ANALYTIC METHODS

Data recovery and analysis methods on the Peña Blanca Project will be designed to ensure the collection and analysis of data relevant to the problems and research issues outlined above. The following section outlines proposed methods of recovery and analysis on the project.

Excavation

The two very different kinds of archaeological manifestations on the Peña Blanca Project will require somewhat different excavation and data recovery strategies. The most obvious archaeological features consist of concentrations of fluvial cobbles and gravels--what appear to be the remains of agricultural grid gardens--that rest on the tops of shallow dune deposits. These features appear to have stabilized local sections of the dunes on which they reside, since the features are typically surrounded by areas of general deflation. In addition to these surficial agricultural features, terrace-top dunes appear to overlie archaeological deposits dating from the Rio Grande Developmental and Coalition periods. At several sites, notably LA 265, LA 6169, LA 6170, and LA 6171, the amount of early Puebloan material culture eroding from the base of the terrace dunes suggests substantial buried components, with a strong likelihood of pit structures and other architectural features.

Due to the nature of the resource and the specific questions that have been posed, agricultural field investigations and data recovery strategies will be quite different from those employed on buried cultural deposits. Differences in excavation and data recovery strategies and techniques are detailed below.

Agricultural Sites

Data recovery strategies at agricultural sites (LA 265, LA 6169, LA 6170, LA 6171, LA 115863) will be designed to collect data relevant to three principal problem domains: dating and chronometrics, crop mix, and field structure. Following is a brief summary of methods and approaches:

Dating and Chronometrics. Very few dating techniques are applicable to agricultural fields. Attempts will be made to recover buried obsidian samples for hydration dating, and if any evidence of buried cultural features (such as fieldhouses) is noted during data recovery, a high priority will be placed on the recovery of chronometric samples (C-14, tree-ring, archaeomagnetic). The primary focus of data recovery efforts will be to intensify and extend survey coverage of field and off-field surfaces to maximize the recovery of temporally diagnostic artifacts. Recognizing that artifact visibility is extremely low on field surfaces, we will intensify pedestrian coverage of fields by slowing the pace of survey and shortening the transect interval. Artifacts will be flagged and "piece-plotted," and areas of field surface that have higher than average artifact densities will be gridded and subjected to detailed examination. Optionally, a selected sample of grids will be stripped of surface sand deposits and screened to maximize artifact recovery. Intensive surveys also will be conducted of field margins and terrace slopes. Depending on artifact density, off-field areas and terrace slopes may be mapped, gridded, and sample excavated.

Crop Mix. The problem of what crops were grown on agricultural fields in the project area will be addressed by intensive pollen sampling from both on- and off-field surfaces. In areas where fields are gridded or compartmentalized in another fashion, pollen samples will be collected from

a representative sample of compartments and from different locations within each compartment. Pollen samples will be taken from off-field surfaces so that pollen spectra from different on- and off-field locations can be systematically compared. In addition, we will collect pollen samples from modern agricultural fields to enlarge our comparative data on pollen production in fields (Dean 1992). All pollen samples will be analyzed using the intensive systematic microscopy technique (ISM), designed by Dean (1991) to maximize the recovery and identification of rare cultivar pollen grains.

Field Dynamics. We have proposed that questions regarding prehistoric field dynamics, field function, field productivity, and field life expectancy can be adequately addressed only by controlled experimental studies that simulate, as realistically as possible, key parameters of late prehistoric grid fields in the Middle Rio Grande Basin. A primary goal of the proposed research is to collect sufficient data on how dryland grid fields were prepared, constructed, and used so that realistic experimental studies can be designed. During excavation, particular attention will be paid to the alignment and orientation of cobbles on the surface, pollens at particular locations within the fields, soil textural differences within the soil profile, and general stratigraphy of the area. Data collection strategies will be designed to characterize both spatial and stratigraphic variation in field structure.

Field stratigraphic structure will be examined by multiple linear test trenches. A backhoe will be used to excavate test trenches through field segments, and detailed profiles will be recorded, measuring such parameters as soil depth and constituency, characteristics of soil chemistry and morphology, and soil moisture and temperature parameters. Trenches will bisect field edges and extend beyond field margins so that off-field soil and other profile characteristics can be measured to form a baseline for estimating cultural modifications to the soil within the fields. Collection of profile data and measurement of field structure and soil variables will be carried out by a multidisciplinary team of an archaeologist, a field ecologist, and a soil scientist.

Besides the specific data recovery approaches outlined above, fieldwork at agricultural sites in the project area will include most of the standard data recovery and recording procedures outlined below for buried cultural components. Preexcavation recording and preparation will include photographic documentation, establishment of mapping datums, construction of a 1 by 1 m surface control grid system over the entire site, and completion of a topographic map. Nonartifactual samples (soil, flotation, pollen, macrobotanical, faunal, C-14, tree-ring) will be collected from all stratigraphic sections and any cultural features that might be encountered in association with the agricultural fields. Samples of undisturbed cultural fill will be screened through 1/4 inch mesh hardware cloth, and all artifacts and nonartifactual materials will be collected, bagged, and labeled by unit, stratigraphic level, date, excavator's name, and other appropriate provenience information. A site map will be prepared of the agricultural field with the aid of an optical transit and metric tape (or stadia rod) and will include plans and profiles of all excavation units and cultural features. Standard recording forms (feature, stratigraphic record, field specimen record) will be completed for each excavation unit, and all cultural features will be photographed before, during, and after excavation. Excavators will maintain narrative records of excavation activities that will be cross-referenced with recording forms and provenience collections upon completion of the field phase of the project.

Buried Cultural Components

A general objective of the excavation strategy at all sites with substantial buried cultural components will be to distinguish among the various temporal components present, which will

require strict spatial and stratigraphic controls over all excavations. Several categories of data are relevant across all temporal components:

Excavation strategies will be designed to maximize the recovery of chronometric samples such as radiocarbon, tree-ring samples, archaeomagnetic samples, obsidian samples for hydration dating, and temporally diagnostic artifacts for cross-dating. Dating and chronology refinement are important objectives for all buried temporal components on the Peña Blanca Project.

Special emphasis will be placed on the recovery of macrobotanical and other perishable food remains. Soil and pollen samples will be collected from all cultural features, occupation surfaces, and stratigraphic profiles. Standard water flotation techniques will be used to separate organic components from soil samples, and macroplant remains will be analyzed for species diversity and processing and consumption patterns. Faunal remains will be collected from all archaeological contexts and analyzed for species diversity, butchering and processing methods, and other attributes that will aid in the reconstruction of faunal procurement patterns at the sites. These data will have an important bearing on questions regarding subsistence and settlement systems, mobility patterns, and the structure of economic organizations from the Archaic through the Rio Grande Classic.

Artifact recovery and analysis strategies will attempt to maximize information related to resource procurement and processing, patterns of trade and exchange, and the spatial and temporal distribution of economic activities at the sites. Studies of lithic and ceramic technology will contribute to our understanding of hunter-gatherer settlement subsistence systems and mobility patterns, resource exploitation strategies, and changes in local and regional external relationships through time.

Since the nature and extent of buried cultural components cannot be ascertained prior to the commencement of excavation, data recovery efforts will follow a staged excavation strategy:

1. *Preexcavation recording and preparation* will include photographic documentation of the site and the immediate surroundings, establishment of a mapping datum and subdatums, construction of a 1 by 1 m surface control grid system over the entire site, and completion of a topographic map of the site area.

2. *Surface collection and exploratory excavation* will begin with an intensive inventory and collection of surface artifacts by grid provenience. A sample of 1 by 1 m test pits will then be excavated by hand in controlled levels to document site stratigraphy and obtain representative samples of artifacts from across the site. Test grids will be placed in areas of high surface artifact density; additional randomly placed test pits also will be excavated. Following completion of the controlled tests, a backhoe may be used to excavate exploratory test trenches in areas of the site judged likely to yield buried cultural features and deposits. At the completion of the trenching operations, test trenches will be cleaned, profiled, and recorded.

3. *Intensive excavation* will include hand excavation of cultural features and occupation surfaces discovered during exploratory testing. Excavation of features will be in natural stratigraphic units or arbitrary 10-20 cm levels, depending on stratigraphic definition. 1 by 1 m horizontal controls will be maintained during the excavation of cultural fill; artifacts resting on or near cultural occupation surfaces will be point-plotted in three-dimensional space.

Nonartifactual samples (soil, flotation, pollen, macrobotanical, faunal, C-14, tree-ring) will

be collected from all stratigraphic sections and cultural features. All undisturbed cultural fill will be screened through 1/4 inch mesh hardware cloth and all artifacts and nonartifactual materials will be collected, bagged, and labeled by unit, stratigraphic level, date, excavator's name, and other appropriate provenience information.

At the completion of excavation of the cultural features, unexcavated areas between features will be stripped to culturally sterile soil to locate additional features and define occupation surfaces next to cultural features. In areas of high feature density, surface stripping will be conducted by hand, and horizontal/vertical controls will be strictly maintained. In low feature density areas, overburden will be mechanically removed, and final excavation and feature definition will be done by hand using standard horizontal (1 by 1 m) and vertical (natural strata or 10-20 cm) controls.

A site map will be prepared with the aid of an optical transit and metric tape (or stadia rod) and will include plans and profiles of cultural features and excavation units. Standard recording forms (feature, stratigraphic record, field specimen record) will be completed for each excavation unit, and all cultural features will be photographed before, during, and after excavation. Excavators will maintain narrative records of excavation activities that will be cross-referenced with recording forms and provenience collections upon completion of the field phase of the project.

If buried architectural features are exposed on the Peña Blanca Project, there is a strong likelihood that human remains will be encountered. Should human remains be discovered during excavation, local law enforcement officials, Pueblo of Cochiti officials, and the state historic preservation officer will be notified and consultations completed before the remains are excavated. Treatment of human remains and other sensitive cultural materials will be governed by Museum of New Mexico policy as defined in *Collection and Display of Sensitive Material* (SRC Rule 11) and *Policy on Collection, Display and Repatriation of Culturally Sensitive Materials* (MNM Rule No. 11, January 1991; Appendix *). If such materials are discovered, members of the public will not be allowed to handle or photograph the remains, and no photographs of sensitive materials will be released to the media or general public.

Standard archaeological excavation techniques will be employed to remove any human remains discovered during the project. The burial pit will be defined, hand tools will be used to expose the skeletal parts, the skeleton and grave goods will be mapped, recorded, and photographed, and pollen, flotation, and relevant chronometric samples will be collected.

If unanticipated discoveries at any of the sites on the Ojo Caliente project warrant significant alteration of the scope and intent of this plan, the New Mexico State Highway and Transportation Department and the state historic preservation officer will be consulted prior to implementing any substantive changes.

In addition to excavation, relevant historical and ethnohistorical data will be collected and interpreted for relevant historic components on the project (LA 249, LA 265, LA 6169, LA 6170, and LA 6171). Historical research will be conducted by a trained southwestern historian or ethnohistorian. Historic documents, land grant records, parish records, and any relevant secondary sources will be consulted at the New Mexico State Records Center and Archives and other repositories. Historical research will focus on reconstructing the social and economic history of the northern Santo Domingo Basin and its relationship to historic Pueblo and Spanish communities in the Albuquerque Basin to the south and the Santa Fe River Valley to the north.

Analysis

Before analysis, all recovered materials will be cleaned, and materials requiring conservation will be treated. Nonartifactual samples will be inventoried and prepared for shipment to appropriate analysis laboratories. The artifact assemblage will be analyzed by general artifact categories: lithic artifacts, ceramics, wood, and bone. Artifact attributes will be coded for computerized cataloging and statistical analysis. Samples of representative artifacts will be photographed and/or drawn for inclusion in the final analysis report. At the conclusion of the analysis, all artifacts, nonartifactual samples, and site documentation will be curated at the Museum of New Mexico. Descriptions of analytical procedures for the major categories of artifactual and nonartifactual data follow.

Lithic Artifacts

Lithic artifacts will be classified according to tool form, function, and material type. Formal artifacts will segregated into formal and/or functional categories and subjected to detailed attribute analyses. Attributes to be monitored will include characteristics of the parent material (material type, flake form, platform treatment, etc.), reduction techniques, retouch and edge angles, evidence of use-wear, and material alterations such as thermal treatment. Functional analyses of formal tool use will be conducted in an attempt to correlate tool forms and technologies with resource procurement strategies. Cores and debitage will be analyzed to characterize lithic reduction trajectories, expedient tool use, and raw material source localities. Special emphasis will be placed on identifying nonindigenous lithic materials for determining prehistoric and early historic trade and interaction networks.

Analyses of lithic artifacts relate directly to several specific research problems and issues identified in this report. Dating and chronology refinement are important objectives for all temporal components on the project, and an important objective of lithic analytical design will be to recover obsidian flakes for obsidian hydration dating. This will be especially important for nonceramic sites and components that are not associated with charcoal and other datable organics, such as agricultural fields. Functional attributes of site and component lithic assemblages will be correlated with other economic data (macrobotanical specimens, pollen, faunal remains) to arrive at a more comprehensive understanding of economic adaptations and changes in economic strategies in the study area. Analysis of lithic raw material types will provide important insights into regional trade and interaction, and settlement and mobility patterns. Questions regarding hunter-gatherer mobility will be addressed primarily through the analysis of lithic assemblages, especially with regard to differential biface use (Kelly 1988) and cortical frequencies. Analysis of lithic tools and debitage from agricultural sites will attempt to reconstruct the role of lithic tools in field construction and crop maintenance activities, as well as various imbedded lithic procurement activities.

Ceramic Artifacts

Ceramic artifacts will be classified by ware, type, and vessel form. Other attributes to be monitored will include sherd weight, paste and slip color, temper type, surface treatment, design style and paint type, rim form, secondary alterations such as reuse and mending, and function. A variable power binocular microscope will be used to measure all microscopic attributes. To isolate local versus nonlocal ceramic materials and technologies, representative samples of sherds will be subjected to trace element analyses (X-ray diffraction, microprobe) as an aid in determining the origin of their constituent parts. In addition, data will be collected from material sourcing and

refiring experiments to identify potential clay, slip, and temper sources and local firing technologies.

These analyses will be supplemented by comparative studies of ceramic types and frequencies from contemporaneous sites in the northern Santo Domingo Basin to test hypotheses regarding regional trade and interaction. Special emphasis will be placed on identifying and determining the frequency and origin of various trade wares.

Intrasite seriation studies will be conducted and correlated with chronometric and stratigraphic dates as an aid in determining construction and abandonment sequences at each site. Seriation studies of specific ceramic types will help to identify trends in ceramic production, which can be compared to existing seriation studies to test hypotheses concerning relative dates of production and trade patterns outside the study area.

Ceramic functional studies will attempt to discriminate between storage and nonstorage vessels for estimating changes in ceramic storage volumes through time, and as an aid in determining site structure and function, length of occupation, and the nature of technology and resource procurement patterns at each site.

Floral and Faunal Remains

Analyses of floral and faunal materials will be undertaken by specialists under contract to the Laboratory of Anthropology. Faunal studies will focus on species identification and diversity, age and minimum numbers of individuals, butchering and processing methods, and other attributes that will aid in reconstructing faunal procurement and consumption patterns at the sites. Macrofloral specimens recovered using water flotation methods will be analyzed for species mix, collecting and processing methods, and seasonality. Special emphasis will be placed on determining species diversity and changes in species diversity through time. On- and off-site pollen samples will be examined and compared to provide a clearer picture of plant use and availability during the site occupations.

Research Results

A final report on the excavation and analysis of all sites will be published in the Museum of New Mexico's Archaeology Notes series. The report will present a detailed summary of important excavation, analysis, and interpretive results. Included will be a narrative description of work performed, site and artifact photographs, maps, and data summaries in the form of tables, charts, and graphs. All field notes, analysis notes, maps, and photographs will be deposited with the Archaeological Records Management System of the New Mexico State Historic Preservation Division, in the Laboratory of Anthropology in Santa Fe. Artifacts will be curated at the Archaeological Research Collection, Laboratory of Anthropology, in Santa Fe.

REFERENCES CITED

Anderson, Keith M.
1980 *Highway Salvage on Arizona State Highway 98: Kayenta Anasazi Sites between Kaibito and the Klethla Valley*. Arizona State Museum Archaeological Series No. 140. University of Arizona, Tucson.

Anschuetz, Kurt F., T. D. Maxwell, and J. A. Ware
1985 *Testing Report and Research Design for the Medanales North Project, Rio Arriba County, New Mexico*. Laboratory of Anthropology Notes No. 347. Museum of New Mexico, Santa Fe.

Bandelier, Adolph F.
1892 *Final Report of Investigations among the Indians of the Southwestern United States, Carried on Mainly in the Years from 1880-1885*. Papers of the Archaeological Institute of America, American Series 4, Part 2. Peabody Museum of American Archaeology and Ethnology, Harvard University, Cambridge.

Benavides, Fray Alonso de
1965 *The Memorial of Fray Alonso de Benavides, 1630*. Translated by Mrs. E. E. Ayer. Horn and Wallace, Albuquerque, New Mexico.

Bice, Richard A., and Phyllis Davis
1972 *Cochiti Lithic Sites, Project AS-4 of the Albuquerque Archaeological Society on the Sponsorship of the Museum of New Mexico*. Laboratory of Anthropology Notes 80D. Museum of New Mexico, Santa Fe.

Biella, Jan V.
1979 Chapter 6: Change Residential Patterns among the Anasazi, A.D. 750-1525. In *Archeological Investigations in Cochiti Reservoir, New Mexico*. Vol. 4, *Adaptive Change in the Northern Rio Grande Valley*, edited by J. Biella and R. Chapman. Office of Contract Archeology, University of New Mexico, Albuquerque.

Biella, Jan V., and Richard Chapman
1977 *Archaeological Investigations in Cochiti Reservoir, New Mexico*. Vol. 1, *A Survey of Regional Variability*. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Binford, Lewis R.
1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):4-20.

Broilo, Frank, and J. V. Biella
1977 The Cochiti Reservoir Archeological Project. In *Archaeological Investigations in Cochiti Reservoir, New Mexico*. Vol. 1, *A Survey of Regional Variability*. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Brown, Kenneth L.
1997 *Research Design and Data Recovery Plan for Sites LA 9190, LA 9193, LA 32698, LA 116082, and LA 116083, NM 44 Improvement Project, Sandoval County, New Mexico.* Office of Contract Archaeology, University of New Mexico, Albuquerque.

Bugé, David E.
1984 Prehistoric Subsistence Strategies in the Ojo Caliente Valley, New Mexico. In *Prehistoric Agricultural Strategies in the Southwest*, edited by S. K. Fish and P. R. Fish, pp. 27-34. Arizona State University Anthropological Research Paper No. 33. Arizona State University, Tempe.

Carter, R. H., and Paul Reiter
1933 A Report of an Archaeological Survey of the Santa Fe River Drainage. Manuscript on file, Laboratory of Anthropology, Museum of New Mexico, Santa Fe.

Casagrande, Joseph B., S. I. Thompson, and P. D. Young
1964 Colonization as a Research Frontier: The Ecuadorian Case. In *Process and Pattern in Culture: Essays in Honor of Julian Steward*, edited by R. A. Manners. Aldine, Chicago.

Chapman, Richard C.
1979 Chapter 4: The Archaic Occupation of White Rock Canyon. In *Archeological Investigations in Cochiti Reservoir, New Mexico.* Vol. 4, *Adaptive Change in the Northern Rio Grande Valley*, edited by J. Biella and R. Chapman. Office of Contract Archeology, University of New Mexico, Albuquerque.

Chapman, Richard C., and J. V. Biella
1979 Chapter 21: A Review of Research Results. In *Archeological Investigations in Cochiti Reservoir, New Mexico.* Vol. 4, *Adaptive Change in the Northern Rio Grande Valley*, edited by J. Biella and R. Chapman. Office of Contract Archeology, University of New Mexico, Albuquerque.

Cordell, Linda S.
1978 *A Cultural Resources Overview of the Middle Rio Grande Valley, New Mexico.* U.S. Government Printing Office, Washington, D.C.

1979 *The Prehistory of Santa Fe Country.* New Mexico Geological Society Special Publication No. 8:1-5.

Dean, Glenna
1991 *Pollen Analysis of Archaeological Samples from Basketmaker and Anasazi Agricultural Features at LA 75287 and LA 75288, Abiquiu West Project, Rio Chama Valley, New Mexico.* Technical Series Report 302. Castetter Laboratory for Ethnobotanical Studies, University of New Mexico, Albuquerque.

Dick, Herbert W.
1976 *Archeological Investigations in the Llaves Area, Santa Fe National Forest, Northwest New Mexico, 1972-1974.* Part 1, *Architecture.* Archaeological Report No. 13. USDA Forest Service, Southwestern Region. Albuquerque, New Mexico.

Dickson, D. Bruce, Jr.
1979 *Prehistoric Pueblo Settlement Patterns: The Arroyo Hondo, New Mexico, Site Survey.* Arroyo Hondo Archaeological Series, Vol. 2. School of American Research, Santa Fe.

Dorn, R.I.
1983 Cation-Ratio Dating: A New Rock Varnish Age-Determination Technique. *Quaternary Research* 20:49-73.

Fiero, Kathleen
1978 *Prehistoric Garden Plots along the Lower Rio Chama Valley: Archaeological Investigations at Sites LA 11830, LA 11831, and LA 11832, Rio Arriba County, New Mexico. Museum of New Mexico, Laboratory of Anthropology Notes* 111e.

Flynn, Leo L., and W. James Judge
1973 *An Archaeological Assessment of the Cañada de Cochiti Grant.* Submitted to the USDI National Park Service, Southwest Regional Office, Santa Fe. University of New Mexico, Albuquerque.

Ford, Richard I., Albert H. Schroeder, and Stewart L. Peckham
1972 Three Perspectives on Puebloan Prehistory. In *New Perspectives on the Pueblos*, edited by A. Ortiz, pp. 19-40. University of New Mexico Press, Albuquerque.

Fox, D. G., R. Jemison, D. U. Potter, H. M. Valett, and R. Watts
1995 Geology, Climate, Land, and Water. In *Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin*, edited by D. M. Finch and J. A. Tainter. USDA Forest Service General Technical Report RM-GTR-268. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Frisbie, Theodore R.
1967 The Excavation and Interpretation of the Artificial Leg Basketmaker III–Pueblo I Sites near Corrales, New Mexico. M.A. thesis, University of New Mexico, Albuquerque.

Gilman, Patricia A.
1987 Architecture as Artifact: Pit Structures and Pueblos in the American Southwest. *American Antiquity* 52(3):538-564.

Gottfried, G. J., T. W. Swetnam, C. D. Allen, J. L. Betancourt, and A. L. Chung-MacCoubrey
1995 Pinyon-Juniper Woodlands. In *Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin*, edited by D. M. Finch and J. A. Tainter. USDA Forest Service General Technical Report RM-GTR-268. USDA Forest Service Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Hammack, Nancy S., A. Ferg, and B. Bradley
1983 Excavations at Three Developmental Period Sites near Zia and Santa Ana Pueblos, New Mexico. CASA Papers No. 2. Complete Archaeological Service Associates, Cortez, Colorado.

Harlan, Mark E. (editor)
1984 Archeological Investigations at Two Sites on the Public Service Company of New Mexico's BA to Norton 345 Kv Transmission Line. Public Service Company of New

Mexico.

Hewett, Edgar L.
1906 Antiquities of the Jemez Plateau, New Mexico. Bureau of American Ethnology Bulletin 2. Smithsonian Institution, Washington, D.C.

Hill, James N., and W. Nicholas Trierweiler
1986 Prehistoric Responses to Food Stress on the Pajarito Plateau, New Mexico: Technical Report and Results of the Pajarito Archaeological Research Project, 1977-1985. Final report to the National Science Foundation. Ms. on file, Department of Anthropology, UCLA.

Hogan, P. F. and P. A. Gerow
1990 Prehistory of the Middle Rio Grande Valley. In *Los Lunas Land Exchange Cultural Resources Survey*. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Hoge, Harry P.
1970 Neocene Stratigraphy of the Santa Ana Area, Sandoval County, New Mexico. Ph.D. dissertation. Department of Geology, University of New Mexico, Albuquerque.

Honea, Kenneth H.
1969 The Rio Grande Complex and the North Plains. *Plains Anthropologist* 14:57-70.

1971 Material Culture from LA 272. In *Excavations at Cochiti Dam, New Mexico, 1964-1966 Seasons*. Vol. 1, *LA 272, LA 9154, LA 34*, edited by David H. Snow. Laboratory of Anthropology Notes 79. Museum of New Mexico, Santa Fe.

Irwin-Williams, Cynthia
1973 *The Oshara Tradition: Origins of Anasazi Culture*. Eastern New Mexico University Contributions in Anthropology 5(1). Portales, New Mexico.

Kelly, Robert L.
1988 The Three Sides of a Biface. American Antiquity 53(4):717-734.

Kidder, Alfred V.
1917 *The Old North Pueblo of Pecos*. Papers of the School of American Research No. 38. Santa Fe.

Kidder, Alfred V., and Anna O. Shepard
1936 *The Pottery of Pecos*. Vol. 2, *The Glaze-Paint, Culinary, and Other Wares*. Papers of the Phillips Academy Southwestern Expedition, No. 7. New Haven: Yale University Press.

Kohler, Timothy A. (editor)
1989 *Bandelier Archaeological Excavation Project: Research Design and Summer 1988 Sampling*. Reports of Investigations No. 62. Department of Anthropology, Washington State University, Pullman.

1990 *Bandelier Archaeological Excavation Project: Summer 1989 Excavations at Burnt Mesa Pueblo*. Report of Investigations No. 62. Department of Anthropology, Washington State

University, Pullman.

Lang, Richard W.
1977 *Archaeological Survey of the Upper San Cristobal Arroyo Drainage, Galisteo Basin, Santa Fe County, New Mexico.* School of American Research, Santa Fe.

Lange, Charles H., and Carroll L. Riley
1966 *The Southwestern Journals of Adolph F. Bandelier, 1880-1882.* University of New Mexico Press and School of American Research Press, Albuquerque and Santa Fe.

Lange, Charles H.
1959 *Cochiti: A New Mexico Pueblo, Past and Present.* University of Texas Press, Austin.

Lange, Charles H.
1968 *The Cochiti Dam Archaeological Salvage Project.* Part 1, *Report on the 1963 Season.* Museum of New Mexico Research Records, No. 6. Museum of New Mexico, Santa Fe.

Lewis, Kenneth E.
1977 Sampling the Archaeological Frontier: Regional Models and Component Analysis. In *Research Strategies in Historical Archaeology*, edited by S. South. Academic Press, New York.

Lightfoot, Dale R.
1990 the Prehistoric Pebble-Mulched Fields of the Galisteo Anasazi: Agricultural Innovation and Adaptation to Environment. Ph.D. dissertation, Department of Geography, University of Colorado, Boulder.

1993 The Landscape Context of Anasazi Pebble-Mulch Fields in the Galisteo Basin, North New Mexico. *Geoarchaeology* 8(5):349-370.

1994 Morphology and Ecology of Lithic-Mulch Agriculture. *Geographical Review* 84(2):172-185.

Loftin, S., R. Aguilar, A. L. Chung-MacCoubrey, and W. A. Robbie
1995 Desert Grassland and Shrubland Ecosystems. In *Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin*, edited by D. M. Finch and J. A. Tainter. USDA Forest Service General Technical Report RM-GTR-268. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Maker, H. J., et al.
1971 *Soil Associations and Land Classification for Irrigation, Sandoval and Los Alamos Counties.* New Mexico State University Agricultural Experiment Research Report 188. Las Cruces.

Marshall, Sandra L.
1997 *A Cultural Resource Inventory along NM 22 on Lands of Pueblo de Cochiti and in the Village of Peña Blanca, Sandoval County, New Mexico.* Environmental Section, Preliminary Design Bureau, New Mexico State Highway and Transportation Department, Santa Fe.

Martin, Paul S., and William Byers
1965 Pollen and Archaeology at Wetherill Mesa. In *Contributions of the Wetherill Mesa Archaeological Project*, assembled by D. Osbourne, pp. 122-135. Memoirs of the Society for American Archaeolgy 19. Salt Lake City.

Maxwell, Timothy D.
1991 A Comparative Analysis of Prehistoric Agricultural Technologies in the Southwest. Dissertation prospectus, Department of Anthropology, University of New Mexico, Albuquerque.

Maxwell, Timothy D., and Kurt F. Anschuetz
1987 Variability in Garden Plot Locations and Structure in the Lower Rio Chama Valley, New Mexico. Paper presented at the 52nd Annual Meeting of the Society for American Archaeology, symposium on the gardens of prehistory: *A Look at Cultivation from the Perspective of the Archaeologist*, Toronto.

1992 The Southwestern Ethnographic Record and Prehistoric Agricultural Diversity. In *Gardens of Prehistory: The Archaeology of Settlement Agriculture in Greater Mesoamerica*, edited by T. W. Killion. University of Alabama Press, Tuscaloosa and London.

McNutt, Charles H.
1969 *Early Puebloan Occupations at Tesuque Bypass and the in the Upper Rio Grande Valley.* Anthropological Papers, Museum of Anthropology, University of Michigan, No. 40. Ann Arbor.

Mera, Harry P.
1935 *Ceramic Clues to the Prehistory of North Central New Mexico.* Laboratory of Anthropology Technical Series, Bulletin 8. Santa Fe.

1940 *Population Changes in the Rio Grande Glaze Paint Area.* Technical Series Bulletin, No. 8. Laboratory of Anthropology, Santa Fe.

Moore, James L., J. L. Boyer, and D. F. Levine
n.d. Adaptations on the Anasazi and Spanish Frontiers: Excavations at Five Sites near Abiquiu, Rio Arriba County, New Mexico. Manuscript on file, Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Nelson, Nels C.
1914 *Pueblo Ruins of the Galisteo Basin, New Mexico.* Anthropological Papers of the American Museum of Natural History, Vol. 15, Pt. 1. New York: American Museum of Natural History.

1916 Chronology of the Tano Ruins, New Mexico. *American Anthropologist* 18(2):159-180.

Peckham, Stewart
1954 A Pueblo I Site near San Felipe Pueblo, New Mexico. *Highway Salvage Archaeology* 3:41-51. Laboratory of Anthropology, Santa Fe.

1957 Three Pithouse Sites near Albuquerque, New Mexico. *Highway Salvage Archaeology* 3:39-70. Laboratory of Anthropology, Santa Fe.

1984 *The Anasazi Culture of the Northern Rio Grande Rift*. New Mexico Geological Society Guidebook, 35th Field Conference.

Peckham, Stewart L., and Susan L. Wells
1967 *An Inventory of Archaeological Sites at and in the Vicinities of Bandelier National Monument and the Cochiti Dam and Reservoir, New Mexico*. Laboratory of Anthropology Notes 80F. Museum of New Mexico, Santa Fe.

Post, Stephen S.
1994 *Archaeological Testing and Treatment Plan for a Late Archaic Period Site and Three Coalition-Early Classic Period Sites, Estates V, and Other Areas, Las Campanas de Santa Fe, Santa Fe County, New Mexico*. Archaeology Notes 140. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Riley, Carroll L.
1994 *Rio del Norte: People of the Upper Rio Grande From Earliest Times to the Pueblo Revolt*. University of Utah Press, Salt Lake City.

Robinson, William J., B. G. Harrill, and R. L. Warren
1973 *Tree-Ring Dates from New Mexico J-K, P, V, Santa Fe--Pecos--Lincoln Areas*. Laboratory of Tree-Ring Research, University of Arizona, Tucson.

Hunter-Anderson, Rosalind
1979 Chapter 13: LA 13326, LA 13329, LA 13331, LA 13332, and LA 13333. In *Archeological Investigations in Cochiti Reservoir, New Mexico*. Vol. 3, *1976-1977 Field Seasons,* edited by J. Biella and R. Chapman. Office of Contract Archeology, University of New Mexico, Albuquerque.

Schaafsma, Polly
1975 *Rock Art in the Cochiti Reservoir District*. Laboratory of Anthropology Notes 77. Museum of New Mexico, Santa Fe.

Schwartz, Douglas W., and R. W. Lang
1972 *Archaeological Investigations at the Arroyo Hondo Site*. Third field report. School of American Research, Santa Fe, New Mexico.

Shepard, Anna O.
1942 Rio Grande Glaze Paint Ware. *Contributions to American Anthropology and History* 39. Carnegie Institute of Washington, Publication 528. Washington, D.C.

Simmons, Marc
1979a History of Pueblo-Spanish Relations to 1821. In *Handbook of North American Indians*. Vol. 9, *Southwest*, edited by Alfonso Ortiz. Smithsonian Institution, Washington, D.C.

1979b History of the Pueblos Since 1821. In *Handbook of North American Indians*. Vol. 9, *Southwest*, edited by Alfonso Ortiz. Smithsonian Institution, Washington, D.C.

Smith, Gary A.
1996 The Geology of Tent Rocks. In *New Mexico Geological Society Guidebook, 47th Field Conference, Jemez Mountains Region*.

Snow, Cordelia T.
1979 Chapter 11: The Evolution of a Frontier: An Historical Interpretation of Archeological Sites. In *Archeological Investigations in Cochiti Reservoir, New Mexico*. Vol. 4, *Adaptive Change in the Northern Rio Grande Valley*, edited by J. Biella and R. Chapman. Office of Contract Archeology, University of New Mexico, Albuquerque.

Snow, David H.
1970 *An Inventory of Archaeological Sites on Land Leased by the California City Development Company, Cochiti Pueblo Grant, Sandoval County, New Mexico. Laboratory of Anthropology Notes* 80C. Museum of New Mexico, Santa Fe.

1971 *Excavations at Cochiti Dam, New Mexico, 1964-1966 Seasons*. Vol. 1, *LA 272, LA 9154, LA 34*. Laboratory of Anthropology Notes 79. Museum of New Mexico, Santa Fe.

1973 *Cochiti Dam Salvage Project: Archeological Excavation of the Las Majadas Site, LA 591, Cochiti Dam, New Mexico*. Laboratory of Anthropology Notes 75. Museum of New Mexico, Santa Fe.

Snow, David H.
1976 Archaeological Excavations at Pueblo del Encierro, LA 70. *Laboratory of Anthropology Notes* 78. Museum of New Mexico, Santa Fe.

Stephenson, Matilda C.
1894 *The Sia*. Eleventh Annual Report of the Bureau of American Ethnology, 1889-1890. Washington, D.C.

Stuart, David E., and Rory P. Gauthier
1981 *Prehistoric New Mexico: Background for Survey*. Historic Preservation Division, Santa Fe.

Stubbs, Stanley A., and W.S. Stallings, Jr.
1953 *The Excavation of Pindi Pueblo, New Mexico*. Monographs of the School of American Research 18. School of American Research, Santa Fe.

Toll, Mollie S., and A. C. Cully
1983 Archaic Subsistence in the Four Corners Area: Evidence for a Hypothetical Seasonal Round. In *Economy and Interaction along the Lower Chaco River*, edited by P. Hogan and J. Winter, pp. 385-392. Office of Contract Archaeology, University of New Mexico, Albuquerque.

Traylor, Diane and Lindi Hubbell (editors)
1977 Bandelier: Excavations in the Flood Pool of Cochiti Lake, New Mexico. Manuscript on file at the Southwest Cultural Resource Center, National Park Service, Santa Fe.

Vierra, Bradley J.
1988 Archaic Hunter-Gatherer Archaeology in Northwestern New Mexico. Paper presented at the first Southwest Symposium, Tempe.

Vivian, R. Gwinn, and N. W. Clendenen
1965 The Denison Sites: Four Pithouses near Isleta, New Mexico. *El Palacio* 72(2):5-26.

Ware, John A.
1983 A Boundary-Oriented Model of Culture Change. Ph.D. dissertation, Department of Anthropology, University of Colorado, Boulder.

Ware, John A., and Macy Mensel
1992 The Ojo Caliente Project: Archaeological Test Excavations and a Data Recovery Plan for Cultural Resources along U.S. 285, Rio Arriba County, New Mexico. Archaeology Notes 99. Office of Archaeological Studies, Museum of New Mexico, Santa Fe.

Wendorf, Fred, and John P. Miller
1959 Artifacts from High Mountain Sites in the Sangre de Cristo Range, New Mexico. *El Palacio* 66:37-52.

Wendorf, Fred, and Erik Reed
1955 An Alternative Reconstruction of Northern Rio Grande Prehistory. *El Palacio* 62(5, 6):131-173.

Wetherington, Ronald K.
1968 *Excavations at Pot Creek Pueblo*. Fort Burgwin Research Center Report No. 6. Fort Burgwin Research Center, Taos.

Wills, W. H., P. L. Crown, J. S. Dean, and C. G. Langton
1994 Complex Adaptive Systems and Southwestern Prehistory. In *Understanding Complexity in the Prehistoric Southwest*, edited by G. Gumerman and M. Gell-Mann. Santa Fe Institute Studies in the Sciences of Complexity Proceedings 16. Addison Wesley, New York.