CULTURAL RESOURCES OVERVIEW OF SOCORRO, NEW MEXICO

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For
Cibola National Forest
Gila National Forest
Socorro District Bureau of Land Management

1979

USDA Forest Service
Southwestern Region
Albuquerque, New Mexico

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico

S/N 001-001-00511-8
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PREFACE

This volume is the second in a continuing series and further illustrates the value of our cooperation in the administration of cultural resources. This study of Socorro and Catron counties joins Dr. Cordell's overview of the Middle Rio Grande Valley in bringing together what is known about New Mexico's heritage.

Conceived as a baseline document for use by land managers in Bureau of Land Management and National Forest planning, Ms. Berman's Overview will also appeal to both cultural resource specialists and the interested public. The decision to jointly produce Cultural Resource Overviews for New Mexico is already paying dividends in facilitating management decisions as well as in fostering research. Ms. Berman can take satisfaction from the knowledge that her extensive research has drawn together from disparate sources a picture of the past which will be an invaluable aid to her colleagues.

It is our desire that, through these efforts, the public will learn of the long record of human land use in New Mexico. Readers of this volume may anticipate additional publications in the next few years which, in sum, will clearly summarize current knowledge of the whole state's cultural resources.

We take pleasure in making this second volume of the Overview series available to the public and to the professional community.

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ACKNOWLEDGMENTS

The preparation of a report such as this is the result of the cooperation of many individuals. We would like to acknowledge their fine work. Joanna Wilson drew the illustrations, Jeff Naebert did the drafting, and Donna Calkins, Patty Atkinson, and Jo-Carol Ropp typed the manuscript and made editorial suggestions. Barbara Daniels-Swannack edited the manuscript.

While it is always impossible to include everyone who has contributed to the creation of a report, a number of people were extremely helpful and gave freely of their time and resources. The author would especially like to thank the following: Dr. Jack Wilson; Stewart Peckham, Assistant Director, Laboratory of Anthropology; Laura Holt, Librarian, Laboratory of Anthropology; Marsha Jackson, Curator of Collections, Laboratory of Anthropology; Dr. Robert Weber, Socorro Institute of Mining and Technology; David Brugge, National Park Service; Douglas Dinwiddie, Curator, Western New Mexico University Museum; Patrick Beckett, Acting Director, Cultural Resources Management Program, New Mexico State University; Rosemary Talley, Research Associate, Laboratory of Anthropology; Reggie Wiseman, Staff Archaeologist, Laboratory of Anthropology; Dr. Fred Plog, Arizona State University; Dr. Linda Cordell, University of New Mexico; Kit Sargeant; Margaret Hoyt; Cheryl Wilson, Assistant Director, New Mexico State University Library; Dr. Paul Vassalo, Director of the Library, University of New Mexico; Dr. Stanley Bussey, New Mexico State University; Phyllis Rabineau, Custodian of Collections, Field Museum of Natural History; Joseph Janes, Gila Forest Archeologist; Joseph Tainter, Cibola Forest Archeologist; Maxwell Museum and Cassandra Richard, Socorro District BLM Archeologist. The author wishes to extend a special acknowledgment to Patricia G. Miles who, as a Forest Volunteer, helped in countless ways. I would especially like to thank David "A" Gillio who prepared the section on History. To all others who were not mentioned, your cooperation is appreciated.
INTRODUCTION

OBJECTIVES

The objectives of the following archeological overview are three: 1) the provision of data which will facilitate the interpretation of archeological resources from a spatial, temporal, cultural, and behavioral perspective; 2) the development of a framework which will assist in the recognition of the significance of particular archeological sites or localities; and 3) the compilation of background information necessary for the preparation of cultural resource sections of Land Management Plans and Environmental Statements.

The overview has been divided into seven sections. Each section, with the exception of History, is devoted to a discussion of the archeological background of a particular time period. Beginning with the earliest remains in the study area, the overview examines the cultural development of succeeding occupations. Thus, the archeological remains of the Paleo-Indian, Archaic, Pueblo I, Pueblo II, Pueblo III, and Pueblo IV occupations are summarized.

Each chapter, with the exception of History, has been subdivided for easy reference. The subjects of each section include a discussion of the following: The history of work in the study area, site location, demographic trends, architecture, paleoenvironment, subsistence patterns, and the material culture of each occupation. At the conclusion of each section there is a summary of the significant aspects of the time period under discussion and an assessment of additional research concerns.

Appendices follow the text. Appendix I summarizes the results of the author's museum records and collections search, the purpose of which was to locate prehistoric and historic collections from the study area and evaluate their utility in meeting future research needs. Examples of the questionnaires used are included. Appendix II is a list of the wild plant resources found at Tularosa and Cordova Caves (Martin et al. 1952; Kaplan 1963). It provides both the popular and generic names of plants found, and those expected to be found, in the archeological remains from the study area. A bibliography listing the references cited in the overview follows the Appendices.

THF STUDY AREA

The study area (Map 1) contains lands administered by the Gila and Cibola National Forests and those of the Socorro District of the Bureau of Land Management which lie in Socorro and Catron Counties. Within the Gila Forest, the archeology of the Reserve, Luna, and Quevado Districts is discussed. Within the Cibola Forest, the overview is concerned with the Magdalena District, which consists of four fragmented units, each corresponding to a particular mountain range (Bear, Datil, Magdalena, and San Mateo). The Bureau of Land Management lands discussed herein include the Quevado, Ladron, Malpais, Driveway, and Stallion Planning Units lying west of the Rio Grande in Catron and Socorro Counties (Map 2).

MODERN-DAY ENVIRONMENT

Before discussing the archeology of the study area, I will describe its environmental background. A description of the modern-day environment of the study area is important for several reasons. First, certain factors of the present environment enable us to reconstruct the prehistoric environment and understand how it affected or was manipulated by the prehistoric occupants of the area. Certain types of vegetation in association with particular topographic settings may indicate whether the disturbance of the landscape has occurred as a consequence of aboriginal occupation (Tierney 1972, 1973). Secondly, a description of the modern environment provides insight into the productive potential of the area, as it might have been during the prehistoric period. A study of the relationships among temperature variability, soils, hydrology, and topography might explain, for example, why the occupants of the study area selected and practiced particular resource procurement strategies. Identification of the present-day flora and fauna may indicate what subsistence and economic resources were available during aboriginal settlement and aid in the reconstruction of prehistoric subsistence practices. The presence and location of quarries and clay deposits bear significantly on the range of resources available to the prehistoric occupants (see Warren
1972). Thirdly, the examination of the present environment helps to answer the question, "why did the prehistoric occupants of the study area settle where they did?" The description of the environment, therefore, assists the land resource manager in determining the areas of probable site location. The environmental summary provided below discusses briefly the general physiographic, climatic, floral, and faunal aspects of the study area.

Physiography

The study area lies at the transition of the Basin and Range and Colorado Plateau physiographic provinces. The eastern portion, or that area encompassing the Ladron Mountains, overlaps slightly the Rio Grande Trough (Fenneman 1931; Fitzsimmons 1959). The latter has been assigned by some workers to the Basin and Range Province, while others believe it to be a part of the southern Rocky Mountains, or a distinctive zone lying at the juncture of the Colorado Plateau and bordering provinces (Fitzsimmons 1959: 112).

Some scholars have placed the boundary of the Colorado Plateau and the Basin and Range Province on the 33° 40' latitude at the New Mexico/Arizona border, and thus at the base of the San Francisco, Dillon, Apache, Mangas, and Horse Mountains (Fenneman 1931:274-276; Martin et al. 1956). The study area lies in the Datil Province of the Colorado Plateau.

The Datil Province is traditionally discussed in terms of structural units which are delineated on the basis of shared geological attributes and histories. Within the study area, there are four such units; the three major ones are discussed here. Most of the study area lies in the Mogollon Slope. The Ladron Planning Unit lies in a small part of the Lucero Uplift, the Rio Grande Trough, and the Lemitar-Socorro-Magdalena Zones. The Stallion Planning Unit lies completely in the Lemitar-Socorro-Magdalena Trough and the Rio Grande Trough.

The Mogollon Slope is "a rather nondescript structural unit" (Fitzsimmons 1959:114). It is an area of individual mountain ranges dissected by the streams which drain them. These mountains are flanked by alluvial fans, many of which drain into the Plains of San Augustin.

The major mountain ranges in the Mogollon Slope are the San Francisco, Tularosa, Mangas, Gallinas, Bear, Datil, Magdalena, and San Mateo.

The Mogollon Slope consists mainly of Tertiary formations (Foster 1964; Herrick 1900; Willard 1957; Weber and Willard 1959; Warren 1972; Willard and Weber 1958). The rocks are of volcanic origin or are sedimentary ones derived from volcanic deposits. Throughout the area both Tertiary and Quaternary formations are basically horizontal, although there is a regional dip toward the south (Warren 1972; Fitzsimmons 1959). Where sedimentary rocks predominate, as in the northwestern portion of the study area (the Quemado Planning Unit), the landscape is characterized by mesas and buttes. In the mountainous portions of the study area, the Tertiary deposits are termed the Datil and Baca Formations. They consist of andesite, basaltic andesite, and volcanic sediment such as sandstone, mudstone, siltstone, and shale (Warren 1972, Whiteaker 1976). In the mountains of the Gila Forest, the Tertiary/Quaternary formations are composed of poorly-consolidated beds of volcanic debris and sedimentary rocks such as sandstone, mudstone, siltstone, and tuff (Weber and Willard 1959; Warren 1972). This is termed the Gila Conglomerate. Capping the Gila Conglomerate are Quaternary basalt flows and above those are alluvium-derived materials.

Lying approximately in the center of the Mogollon Slope is a large alluvium-filled, enclosed basin known as the Plains of San Augustin (Bryan 1926; Powers 1939, 1941; Stearns 1956). Wave-cut cliffs and gravel beaches attest to the fact that the basin was once the site of an ancient lake (Powers 1939; Clisby and Sears 1956).

The geomorphological structure of the basin is an unresolved issue. Some investigators consider it to be a fault basin, similar to those found in the Basin and Range Province. Other geologists believe it was caused accidentally as a result of the deposition of volcanic materials in a circular barrier (Fitzsimmons 1959:115). Finally, others think it might be a great caldera, "principally because the bordering
volcanics are notably acidic and because this type of rock is thought to be associated often with the last gasp of volcanic activity in or bordering calderas" (ibid.).

The Lemitar-Socorro-Magdalena Zone consists of two units which share enough features in common to allow their being discussed as a unit (ibid.: 114). The Lemitar-Socorro segment extends south from the Ladron Mountains which lie between this unit and the Lucero Uplift to the north. The Magdalena Uplift lies south of the Lemitar-Socorro Uplift. Between the two units are found the La Jancia Basin and the Snake Ranch Trough. These formations are the northern representatives of a series of uplifts and troughs bordering the western side of the Rio Grande Depression.

Both the Magdalena and Lemitar-Socorro Uplifts are fault-block structures, formed in the late Tertiary and Quaternary periods (ibid.; Denny 1940; Weber 1963a). Characterized by extensive volcanic deposits, the Magdalena Uplift is higher than the Socorro-Lemitar Zone. Shallow intrusions, igneous flows, and pyroclastic debris occur in the former.

Lying in the extreme northeastern and eastern portions of the study area, the Rio Grande Trough consists of an integrated system of linked basins. Although the basins vary in depth, all are filled with sand, silt, and mud deposited from the neighboring uplands. The basin-filling sediments are classed as the Santa Fe Formation or Santa Fe group (Fitzsimmons 1959:114).

The western side of the Rio Grande Trough is bordered by isolated volcanic centers and terraces. The latter are dissected by numerous tributaries. Small basalt-capped mesas and buttes dot the landscape where the water from these drainages has eroded the softer materials. The isolated volcanic cones have been less affected by such fluvial activity.

Climate

New Mexico is characterized by three types of climate, all of which occur in the study area: arid, semiarid, and subhumid/humid (Tuan, Everard, and Widdison 1969:186). Within this area, the Gila and Cibola Forests are characterized by semihumid/humid climes, the Quemado, Malpais, and Ladron Planning Units by semiarid features, and the Stallion planning Unit by an arid climate (ibid.:187, Fig. 78). The differences and similarities in climate vary from place to place, but the boundaries of the climes are seldom distinct as one grades into another (Hardy 1941).

In the portion of the study area characterized by an arid climate, precipitation is lowest, frost-free days are most numerous, and the mean annual temperature the highest of the three types. In the semiarid climates, temperatures are somewhat lower and annual precipitation is higher. (We were unable to obtain any climatic data for the semiarid regions of the study area.) Subhumid and humid climates are confined to the mountains. As Tuan, Everard, and Widdison point out, however, "this is not to say that all mountainous and forested areas in New Mexico have moist climates" (1969:194). Further, there are large tracts of hilly and elevated pinyon-juniper woodland that exhibit only slightly more humid conditions than the contiguous grasslands, which lie in the semiarid clime. The aridity of certain portions of the mountains is frequently the result of edaphic conditions. Loose coarse soils, for example, allow the rapid loss of moisture through evaporation.

Precipitation in the mountains is year-round, although summer rain predominates over winter precipitation (Von Eschen 1960). Summer rains are the result of local orographic and convective storm patterns, while winter snow is the result of cyclonic storms (Tuan, Everard, and Widdison 1969:194). "Though total rainfall in the mountains is greater than at the lower elevations, any one summer rain-shower is not apt to be so heavy as are those over the plains" (ibid.:195).

The mean annual temperatures of the mountainous areas are lower than those of areas lying at lower elevations (USDA 1963; USDC 1965). As Table 1 indicates, the number of frost-free days is substantially fewer in the subhumid/humid climates.

Flora

Five vertical life zones are represented in the study area: the Lower Sonoran,
Table 1. Climatic data for selected portions of the study area.

<table>
<thead>
<tr>
<th>Location</th>
<th>Elevation (in feet)</th>
<th>Mean Temperature (°F)</th>
<th>Precipitation (in inches)</th>
<th>Frost-Free Days (Average days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean Maximum</td>
<td>Mean Minimum</td>
<td>Mean Years of Record</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alma</td>
<td>4800</td>
<td>74</td>
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<tr>
<td>Aragon</td>
<td>6687</td>
<td>66</td>
<td>29</td>
<td>17</td>
</tr>
<tr>
<td>Datil</td>
<td>7100</td>
<td>65</td>
<td>29</td>
<td>23</td>
</tr>
<tr>
<td>Jewett Ranger Station</td>
<td>7400</td>
<td>66</td>
<td>28</td>
<td>12</td>
</tr>
<tr>
<td>Luna Ranger Station</td>
<td>7050</td>
<td>65</td>
<td>26</td>
<td>46</td>
</tr>
<tr>
<td>Quemado</td>
<td>6879</td>
<td>66</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>Reserve Ranger Station</td>
<td>5832</td>
<td>72</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>Salt Lake (4 miles NF)</td>
<td>6575</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Horse Springs</td>
<td>7000</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a</td>
</tr>
<tr>
<td>Socorro</td>
<td>4617</td>
<td>74</td>
<td>41</td>
<td>63</td>
</tr>
<tr>
<td>Magdalena</td>
<td>6556</td>
<td>67</td>
<td>37</td>
<td>43</td>
</tr>
<tr>
<td>Mount Withington</td>
<td>10290</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a</td>
</tr>
</tbody>
</table>

n.a. = not available.

Data for Catron County (Maker, Neher, and Anderson 1972:7)
Data for Socorro County (Maker, Downs, and Anderson 1972:9)

Upper Sonoran, Transitional, Canadian, and Hudsonian (Bailey 1913; Fimbre 1976). The juncture of two zones is referred to as an ecotone; the vegetation of an ecotone is composed of species from the upper and lower limits of the two ecozones.

While each zone is characterized by certain flora, the species within each zone vary as do the boundaries between them. Edaphic conditions, slope, latitude, the presence of mountains, temperature inversions, and the Merriam effect cause variability within and between zones.

The Lower Sonoran Zone, ranging in elevation from approximately 2500 to 4500 feet, occupies the margin of land along the Rio Grande known as the Stallion Planning Unit. The vegetation consists primarily of creosote (Larrea tridentata), yucca (Yucca sp.), mesquite (Prosopis juliflora), tarbush (Flourensia cernua), broom snake weed (Gutierrezia sarothrae), and various
species of grasses (Gardner 1951).

The next life zone is the Upper Sonoran, lying at approximately 4500-6500 feet (Bailey 1913; Elmore 1976). The dominant vegetation consists of pinyon (Pinus edulis) and juniper (Juniperus sp.). In certain areas they grow in equal numbers, while in others, one species is more common than the other. Juniper is usually more abundant at lower elevations; pinyon is more numerous at the upper limits of the zone. In the Quemado and Driveway Units, for example, juniper is more common. Other vegetation in this zone includes various species of cacti (Opuntia sp.), yucca (Yucca sp.), oak (Quercus sp.), and grasses. Where the soil tends to be alkaline, shadscale saltbush (Atriplex sp.), and greasewood (Purshia tridentata) grow among the pinyon and juniper. The Plains of San Augustin are characterized by various species of grasses thriving in the well-drained soils. Where there are heavier soils, as in the lower lying areas of the basin, alkali sacaton dominates. Juniper (J. monosperma) occurs at the outer perimeter of the Plains (Potter 1957; Potter and Rowley 1960). For a complete list of the many plant species which are found in this and the following zones, Elmore (1976) should be consulted.

Crosscutting the Upper Sonoran Zone are riparian communities. The vegetation common to these communities grows along drainages and other water sources. It includes cottonwood (Populus fremontii and sargentii), walnut (Juglans major), sycamore (Platanus wrightii), willow (Salix amygdaloides) and box elder (Acer negundo), among others.

Lying above the pinyon-juniper belt is the Transitional Zone, dominated by Ponderosa pine (Pinus ponderosa) and Gambel oak (Quercus gambeli). Many shrubs characteristic of the Upper Sonoran Zone were found here where they reach the upper limits of their distribution. These include: rabbitbrush (Chrysothamnus nauseosus), broom snakeweed (Gutierrezia sarothrae), box elder (Acer negundo), and birchleaf mountain mahogany (Cercocarpus betuloides). Where streams and other water sources flow through the Transitional Zone, narrowleaf and lanceleaf cottonwoods (Populus angustifolia and Populus acuminata), thinleaf alder (Alnus tenuifolia), water birch (Betula occidentalis), chokecherry (Prunus virginiana), and other flora are found.

At the upper limits of this zone are found kinnikinnick or bearberry (Arctostaphylos uva-ursi), thimbleberry (Rubus parviflorus), and Apache (Pinus engelmannii) and Chihuahuan pines (Pinus leiophylla) (Elmore 1976:110-156). Stands of Ponderosa tend to be denser on cool north slopes. On the drier, lower slopes they co-occur with oaks and other pines, while toward the upper range, they intermix with aspen. Because it is difficult to draw exact boundaries between the pinyon-juniper belt and the higher fir-aspen belt, many investigators arbitrarily designate 6500 to 8000 feet as the range of the Transitional Zone.

At approximately 8000 to 9500 feet lies the Canadian Zone or fir-aspen belt. The dominant vegetation here is Douglas fir (Pseudotsuga menziesii); as one moves higher in the belt, aspen (Populus tremuloides) become more prevalent. At the lower limits of this zone, several species common to the Transitional Zone are found; for example, on the south-facing slopes, Ponderosa pine and Douglas fir co-occur (Elmore 1976:157). At the upper edges of this zone, species from the spruce-fir forest above grow.

Ranging from approximately 9500 to 11,500 feet in elevation, the Hudsonian Zone is the highest, coldest, wettest, and windiest of all zones in which full-size trees can grow (ibid.:173). Only small portions of the forests in the study area lie in this belt. Engelmann spruce (Picea engelmannii) and Sub-alpine fir (Abies lasiocarpa) are the key species of this zone. Several species from the Canadian Zone are also present.

Fauna

For a discussion of the types of fauna and their natural ranges present in the study area, Bailey (1971) should be consulted. Bailey also provides accounts of the ranges of these animals during the historic period.
THE PALEO-INDIAN OCCUPATION

INTRODUCTION

The date of the earliest human occupation in North America is, in the absence of reliable data, still unknown. By 9500 B.C., the accepted date for the Clovis occupation, man occupied extensive portions of the Southwest and Plains (Irwin-Williams 1973; Irwin-Williams and Haynes 1970). Beginning at this time and continuing to approximately 6000 B.C., these areas were occupied with varying intensity by cultural groups who are identified on the basis of their distinctive bifacially-worked lanceolate projectile points. The cultures which existed during this time are known as Paleo-Indian.

A great number of Paleo-Indian "cultural complexes" are represented in the archaeological record from both surface and sub-surface remains. In the study area, the presence of the following cultures has been inferred from their surface remains: Sandia, Clovis, Folsom, Hell Gap, Plainview, Midland, Belen, and Cody. The Agate Basin, Alberta, and Frederick complexes, which are found elsewhere in the Southwest and the Plains, are absent in the study area; they occur primarily in regions east of the Rio Grande Valley (Irwin-Williams and Haynes 1970). Artifacts resembling Angostura points have been noted in the study area, but Weber doubts their true affiliation with this complex (personal communication-1978).

Following the Folsom occupation of the Southwest and Plains, the chronological order of subsequent cultures is unclear. Evidence for the sequential occurrence of various complexes differs from site to site and conflicting data exist as to the appearance and duration of many of them. The works of Haynes (1968) and Irwin-Williams (1973) should be consulted for a recent interpretation of the data pertaining to issues of chronology.

HISTORY OF WORK IN THE STUDY AREA

In contrast to the areas north and east of it, very little investigation of the Paleo-Indian remains has taken place in the study area. Formal investigation has been limited to the work of Hurt and McKnight (1949), whose preliminary report of the archeology of the Plains of San Augustin was not followed by a final document. Judge and Dawson's survey of the central Rio Grande Valley (Judge and Dawson 1972; Judge 1973) covered a small part of the northeast portion of the Ladron Planning Unit. Weber and Haynes have each surveyed extensively in the Plains of San Augustin. In addition, Weber has explored much of the area in the Ladron and Stallion Planning Units (Weber 1963b, personal communication-1978). (The constant inclusion of his observations throughout this chapter reflects his intimate knowledge of the Paleo-Indian remains of Socorro County and his generosity in sharing those observations with the author.) Pat Beckett (Cultural Resources Management Division, New Mexico State University) also possesses a sound background in the Paleo-Indian prehistory of the portion of the study area lying on Bureau of Land Management lands.

While most of the surveys of the study area have been done by volunteers, several contract-related surveys have also located sites from the Paleo-Indian period. Bussey and Beckett's survey of portions of the Plains of San Augustin revealed an extensive site containing substantial numbers of Paleo-Indian and Archaic artifacts (a few sherds of Alma-like pottery were noted too) (Bussey and Beckett 1974a). The site, named the AKE site after the owner of the land, is on the State and National Register of Historic Places. Excavated in the spring of 1978, the report of this undertaking should be completed sometime in 1979 (P. Beckett, personal communication-1978). It is the only known excavation of a Paleo-Indian component in the study area. In a much earlier survey, a large late Paleo early Archaic site (LA 8066) was found in the Quemado district (Honea and Benham 1963; Honea 1969). Finally, many of the Paleo-Indian remains from the Plains of San Augustin have been removed by collectors, (R. Weber, personal communication-1978).

Haynes (personal communication-1978) reports that at the time of his investigations in the area, H. Ross, L. Garner,
and Mr. Henry, all of Socorro, New Mexico, possessed large collections. In addition, Weber knows of persons owning extensive collections in the central Rio Grande area. Finally, Douglas Fischer knows of Paleo-Indian sites on, and possesses a collection of Paleo-Indian artifacts from, his ranch located near Quemado, New Mexico (personal communication—1978).

SITE LOCATION

Paleo-Indian remains have been found only in the Bureau of Land Management's Drive­way, Stallion, Quemado, and Ladron Planning Units. The highest intensity of Paleo-Indian remains occurs on the Plains of San Augustin, located in the Driveway Unit. The next highest frequency occurs in the Quemado Planning Unit (Marshall 1976). Neither sites nor isolated artifacts have been recorded for any lands administered by the USDA Forest Service. This is hardly surprising, for the occurrence of Paleo-Indian remains (especially those of the earliest complexes) in montane areas is rare; however, some sites dating to Paleo-Indian occupations have been noted north of the study area in the Sangre de Cristo Mountains. It is felt that during the terminal Pleistocene period the environment of the mountainous areas was too hostile for human occupation.

Sites located on the Plains of San Augustin are situated in deflated and eroded portions of sand dunes. The dunes are commonly found at the margins of playas. The only Paleo-Indian site noted for the Quemado Planning Unit (LA 8066) is located on a mesa overlooking the Agua Fria drainage (Honea and Benham 1963; Honea 1969). Paleo-Indian remains from other parts of Socorro County are located on open plains and foothills of mountainous tracts and on features close to marshes, ponds, and stream deposits (Weber 1963b).

It has been suggested that the location of sites throughout the span of Paleo-Indian occupation in the central Rio Grande, reflects the economic dependence of the inhabitants on various species of extinct megafauna. The critical criterion in the selection of sites was water (Judge and Dawson 1972; Judge 1973), and as they note, "site locations were selected which would take fullest advantage of the mega-

faunal dependence on water" (1972:1216). The presence of sites near playas and, in the Quemado district, in close proximity to a drainage, suggest, that the same pattern exists in the study area. Other criteria, such as the presence of overview and hunting areas, affected site-selection in the central Rio Grande area (ibid.). These features exist in the study area, but the role they played in site location is unknown. While specific combinations of locational attributes exist in the central Rio Grande for each observed cultural complex, it is believed that the study area lacks similar associations and that the remains reflect the action of different constraints on the population (R. Weber, personal communication-1978).

Processing and armament sites have been identified for the study area (R. Weber, personal communication-1978). Hearths are often present at such sites. Maintenance tasks took place at processing sites while tools were manufactured at armament sites. Weber feels that base camps, loci where a number of activities were performed repeatedly over a period of time, are absent from the study area. Site LA 8006 might be a base camp, however. While no major kill sites have been noted, a possible one was exposed in a blow-out on the Plains of San Augustin in 1953 (C. V. Haynes, personal communication-1978). Individual projectile points are common in deflated areas and have been found on lands administered by the Bureau of Land Management.

PALEOENVIRONMENT

It is generally agreed that the full-glacial period (27,000 to 13,000 B.P.) was characterized by moist, cool conditions. Although most researchers concur, the exact nature of the climatic regime is not well understood. Several investigators have argued that the climate consisted of increased rainfall and lower summer temperatures (Leopold 1951; Weber 1967). A recent study by Brackenridge suggests, however, that during full-glacial times, precipitation was not significantly greater than it is today (1978).

The existence of a moist, cool climate has been demonstrated for parts of the study area through the study of pollen cores from the sediments of the Plains of
San Augustin. These investigations indicate that the Plains were covered by a sub-alpine forest (Clisby and Sears 1956; Martin and Mehringer 1965: Fig. 4), and that periods of low temperature accompanied glaciation. The 5 to 70-foot core segment revealed an abundance of spruce pollen which suggested to Clisby and Sears a prolonged period of low temperature. Marked interruptions in this pattern occur at 12 and 52 feet. The former break and corresponding increase in scrub/grass pollens have led Antevs to argue for a warm and dry interval at this time (1959). He calls this the Datil Interval or Datil Drought and, in the absence of chronometrically-derived dates, places it at 12,500 to 10,800 B.P. (ibid.:33). Weber (personal communication-1978a) says this may be approximately equivalent to the Scharbauer interval of the Llano Estacado. Unfortunately, Antevs' paleoclimatic reconstruction is based on his reading of Clisby and Sears' (1956) pollen graph and the interpolation of events which took place elsewhere in the Plains and Southwest at approximately the same time. Due to the imprecision of his interpretation, Antevs' view warrants further investigation.

Finally, geological evidence indicates that during the late Pleistocene pluvial, Lake San Augustin occupied a maximum area of 255 square miles at the west end of the plains (Stearns 1956; Powers 1939).

Using palynological data from various Southwestern regions, Martin and Mehringer (1965: Fig. 4) have reconstructed the vegetation of this area as it appeared 17,000 to 23,000 years P.P. Their results indicate that spruce, fir, and pine forests occupied the Plains of San Augustin, while parkland-yellow pine proliferated in the San Mateos. The Gila Forest was apparently characterized by a number of plant communities consisting of parkland-yellow pine, woodland (pinyon-juniper), and desert vegetation. Parkland-yellow pine grew in the areas bordering the Rio Grande and encompassing the Stallion Planning Unit, while the Pear, Patil, and Callina Mountains were covered by spruce, fir, and pine forests.

The post-glacial period is dated at approximately 12,000 B.P. (Martin and Mehringer 1965). Data are still vague and in some cases ambiguous regarding the climate during this time. Most paleoclimatic reconstruction for the post-Pleistocene has been based on palynological evidence, although geological features have been studied (Powers 1939). While differences between flora of the glacial period and that of today are quite evident, there is little agreement among investigators as to whether or not the differences are significant. Martin and Mehringer feel that the change was drastic (1965:439) and cite the pollen records from Tule Springs (Nevada), Potato Lake (Arizona) and Crane Lake (Texas) to support their argument. Leopold, referring to the Southwest in general, suggests that the difference between late Wisconsin and present climates is minor and relative to summer, not winter, temperatures (1951). A reading of the pollen core of Clisby and Sears indicates a dramatic change from spruce-pine to tree-shrub pollen in the Plains of San Augustin (1956: Fig. 4).

The paleoenvironment of the later Paleo-Indian periods is not well known for the study area and indeed, conflicting views exist for the whole Southwest. In their discussion of the post-Pleistocene, Irwin-Williams and Haynes (1970) note alternating periods of increasing and decreasing effective moisture. From about 9500 to 9000 B.C. the pollen evidence indicates a somewhat mesic environment which was characterized by more effective moisture than at present. During the period of 8500 to 8000 B.C., the climate was cooler or more moist; however, from 8000 to 6500 B.C., there was a period of relatively less effective moisture with a brief return to more effective moisture conditions at approximately 6500 to 6000 B.C. Data from southeastern Arizona are not in agreement with the above trends. For example, Martin's (1963) studies indicate the environment of Arizona was warm and arid from approximately 9000 to 6000 B.C.

The following is a description of each of the various Paleo-Indian cultures found in the study area. Measurements of the illustrated points are in centimeters.

SANDIA

The Sandia culture is cited as the earliest dated Paleo-Indian culture in the Southwest. Sandia artifacts are known from surface collections from throughout the West (Wormington 1957), but only two excavated sites have yielded Sandia materials. One of these sites, Sandia
Cave, is located approximately 15 miles northeast of Albuquerque, New Mexico; the other, the Lucy site, is located approximately 55 miles east of Sandia Cave. The Sandia occupation ranges from 35,000 to 17,000 B.C. at Sandia Cave (Hibben 1955), but considerable doubt exists as to the validity of these dates. The dating issue is in no way clarified at the Lucy site, as the stratigraphy is mixed as a consequence of aeolian deflation. In Socorro County, Sandia points have been noted east of the Rio Grande (R. Weber, personal communication-1978). A few Sandia points have been found on the Plains of San Augustin (Hurt and McKnight 1949; C. V. Haynes, personal communication-1978). In their survey of the central Rio Grande Valley just north of the study area, Judge and Dawson (1972) noted that Sandia artifacts were absent and suggested that the Rio Grande may have been a significant barrier at this time.

Two types of Sandia points are diagnostic; ranging in length from 2 to 4 inches, both are characterized by a single shoulder. Type 1 (Fig. 1a) has a rounded outline with a rounded base; type 2 (Fig 1b) has parallel sides and a straight or slightly-concave base. Wormington (1957:90) notes that many unfinished forms of more recent projectile points resemble Sandia points and it is therefore easy to confuse them. It is possible, therefore, that points identified as belonging to the Sandia complex may be examples of later points. In addition, it has been suggested that Sandia points may be Clovis knives (Judge 1973:13; Cordell 1978).

The remains of mammoth, mastodon, and extinct species of horse, bison, and camel are associated with the Sandia level at Sandia Cave (Hibben 1955).

CLOVIS

The Clovis culture is the earliest well documented assemblage in the Southwest, dating to between 9500 and 9000 P.C. (Irwin-Williams and Haynes 1970). While Clovis points are widespread throughout the Southwest, camps are rare (Judge 1973). For example, Judge and Dawson (1972) report a single Clovis campsite and one Clovis locality in the central Rio Grande Valley. Weber (1963b) notes the presence of Clovis remains (isolated artifacts and campsites) in association with diatom-bearing marsh, pond, and stream deposits in Socorro County. He feels that these, and the later Paleo-Indian remains in the study area, represent no more than transitory one-day stop-overs for these nomadic people. It is interesting to note the presence of Clovis camp and kill sites southwest of the study area in the San Pedro drainage (Arizona) and to the east in the Jornada del Muerto. Sites in the former area are the Lehner (Haury, Sayles, and Wesley 1959), Maco, and Murray Springs sites (Haury, Antevs, and Lance 1953; Haynes and Hemmings 1968), while an example in the latter area is the Mockingbird Cap site.

The Clovis point, lanceolate in shape, bifacially flaked, with parallel or slightly convex sides and concave bases, ranges in size from 2 to 4 inches (Wormington 1957:263). The most distinctive attribute of the Clovis point is its flute, which may extend from the base halfway to the tip, or the full length of the point (Fig. 2).
percussion flaking was employed in the manufacture of points while pressure flaking might have been used in thinning the lateral edges. The flute was probably produced by indirect percussion (Honea 1976). Other components of the Clovis lithic assemblages include side scrapers, transverse end scrapers, spokeshave scrapers, knives, and gravers (Bussey and Beckett n.d.). These artifacts are both unifacially and bifacially flaked and exhibit little retouch.

Clovis assemblages are associated with the bones of several species of extinct Pleistocene fauna: mammoth, bison, horse, camel, wolf, tapir, jack rabbit, sloth, peccary, deer, and antelope (Haury 1950; Haynes and Hemmings 1968). Mammoth remains have been exposed in a blowout on the Plains of San Augustin. While artifactual material was present on the surface of the blowout, its association with the mammoth is questionable (C. V. Haynes, personal communication-1978). Although the Clovis people practiced a seemingly specialized hunting economy, the exploitation of floral resources should not be discounted.

FOLSOM

Chronologically, the Folsom culture dates approximately 8800 to 8300 B.C. (Irwin-Williams and Haynes 1970). It is considered to be a more evolved form of the preceding Clovis culture i.e., the result of new adaptations to the post-Pleistocene environment (Wormington 1957; Irwin-Williams and Haynes 1970). Nevertheless, limited data from Arizona indicate the two cultures overlapped temporally (Martin and Plog 1973).

Folsom remains occur in a variety of situations in the study area, ranging from open plains to the foothills of mountainous areas (Weber 1963b). Folsom campsites and isolated points are especially abundant in the Plains of San Augustin (Hurt and McKnight 1949) and a Folsom hearth has been excavated at the AKE site (radio-carbon dates not yet available) (P. Beckett, personal communication-1978).

In the central Rio Grande, Judge and Dawson (1972) and Judge (1973) found that Folsom occupations followed a pattern which Weber does not believe existed in the study area (personal communication-1978). In the central Rio Grande, the pattern involves the co-occurrence of a playa, ridge, and nearby drainage, and sites tend to be located along the northeast edge of playas, at loci overlooking broad, open areas which were probably hunting areas. While Folsom sites and isolated points are often located above playas in the study area, Weber reports the location of sites to be highly variable and dissimilar to the central Rio Grande pattern. This is due, in part, to the absence of external drainages in the Plains of San Augustin and to its slight topographic relief (personal communication-1978). Weber suggests that the placement of sites is due to wind conditions. The author suggests that time of day and temperature gradients may relate to the positioning of sites vis-a-vis various topographic features on the Plains of San Augustin.

Folsom points are lanceolate and have concave bases which are bordered by ear-like projections (Fig. 3). Ranging in length from 3/4 of an inch to 3 inches, these points are fluted, like the preceding Clovis points from which it is thought they are derived. The flute extends over most of the body of the point. Fluting generally occurs on both the dorsal and ventral surfaces, though frequently only one face is fluted. The fine facial and marginal retouch on both faces is due to pressure flaking. The basal end normally appears to have been ground. Overall, the workmanship of the Folsom point is considered superior to that of the Clovis point (Wormington 1957).
Other components of the Folsom lithic assemblage are end scrapers, thumbnail scrapers, turtleback scrapers, and spoke-shaves (Bussey and Beckett n.d.).

Evidence from the kill sites known from this period indicates that the Folsom culture subsistence system emphasized a now extinct species of bison, Bison antiquus, the mammoth of earlier times having become extinct. A tooth, tentatively identified as that of Bison antiquus, was found in the Folsom hearth at the AKE site (P. Beckett, personal communication-1978). While bison probably dominated the diet, other faunal remains have been noted in Folsom occupations. At the Lindenmeier site located in northern Colorado, the faunal assemblage included bison, antelope, rabbit, canids, and camel. Except for the presence of Bison antiquus, no direct association with extinct Pleistocene fauna is known from the study area for the Folsom period. Weber notes that horse remains have been identified in "what appears to be a correlative stratigraphic level" from a location in Socorro County (1963b).

HELL GAP

In Socorro County, the Hell Gap occupation is confined to the Jornada del Muerto and does not occur in the study area (R. Weber, personal communication-1978). The presence of Hell Gap points in the latter would be singular, since they have not been noted in western New Mexico (Irwin-Williams and Haynes 1970) and even their appearance in the eastern part of the state is unusual. Hell Gap points have been confused with Lake Mohave or Jay points (see The Archaic). The specimens from the Jornada del Muerto have been identified as Hell Gap points by Agogino, although their resemblance to later point types is notable (R. Weber, personal communication-1978).

Due to their occurrence in neighboring areas, Hell Gap points are described here in case they are found in the study area. They are lanceolate-shaped and the base is rounded or straight. The broadest section of the point occurs at the middle section where it then tapers to form the base. Percussion flaking was employed for facial retouch. Marginal retouch is seen occasionally. Hell Gap points vary in length from 1 3/4 inches to 3 1/2 inches (Honea 1976).

Figure 4 - Plainview Point

(Plainview 1957:265). Both parallel and multi-directional flaking characterize the ventral and dorsal surfaces. The distal end is sometimes parallel-flaked; the base frequently shows signs of having been thinned. Basal edges are almost always ground (Wormington 1957; Honea 1976).

Plainview remains have been found in association with bison.

MIDLAND

Midland points have been observed from surface remains on the Plains of San Augustin (C. V. Haynes, personal communication-1978) and elsewhere in Socorro County (Weber 1963b). The chronological range of the Midland point is unclear, but based on the association of the point with human remains at the
Scharbauer site, located near Midland, Texas, it corresponds to that of the Folsom complex (Wormington 1957; Honea 1976).

The Midland point was originally referred to as the "unfluted Folsom" because of its resemblance to that point type (Fig. 5). Because they are thinner, flatter, and narrower than the Folsom, it has been suggested that fluting would have been impractical (Wormington 1957:42).

Figure 5 - Midland Point

Belen points have been noted from the Plains of San Augustin and the lower tracts bordering the eastern side of the Ladrons (R. Weber, personal communication-1978). Judge (1973) found several Belen localities a few miles south of Belen, New Mexico. Their chronological range is unknown, but Judge (1973) suggests that they fall somewhere between the Folsom and Cody complexes. Weber feels that they are part of the Cody complex, (personal communication-1978). In the central Rio Grande, Belen sites are found very close to overviews, but somewhat further from playas than Folsom sites (Judge 1973; Judge and Dawson 1972). No such patterning has been observed for the study area.

Belen points are lanceolate in outline, unfluted, and commonly have a concave base, as a consequence of basal thinning.

CODY COMPLEX

Temporally, the Cody complex is placed between 7000 and 6000 B.C. and is the latest Paleo-Indian manifestation in the study area. Judge suggests that the date of 6640 B.C. from Hell Gap can be considered representative of the Cody occupation of the Plains (1973:74), while Irwin-Williams and Haynes infer that western New Mexico was occupied by these peoples at around 6700 B.C. (1970:64).

Remains of the Cody complex are found on the Plains of San Augustin (C. V. Haynes, personal communication-1978). Honea and Benham (1963) report the presence of late Paleo-Indian remains at LA 8066 located on the east bank of Agua Fria Creek (Quemado Planning Unit), but they do not identify the artifacts as belonging to this cultural complex.

In their study of the Central Rio Grande, Judge and Dawson (1972) found that sites belonging to the Cody complex were located in areas of greater topographic relief than those of earlier Paleo-Indian occupations. In addition, such remains tended to be located closer to streams than playas, and situated further from hunted areas than Folsom or Belen sites. No such patterning has been observed in the study area, although where these features of the physical landscape are present, it is possible that the same relationship existed. The positioning of LA 8006 on a mesa overlooking Agua Fria Creek suggests that such a pattern obtained during late Paleo-Indian times.

The Cody complex is characterized by four diagnostic artifacts. These include two types of Scottsbluff points, the Eden point, and the Cody knife. The Scottsbluff point, type 1 (Fig. 6a), is triangular or lanceolate in shape. The lateral edges are parallel, the stem is broad and the basal end is faintly shouldered. Ranging in length from 2 to 5 inches, most examples are between 3 and 4 inches long and about 1 inch wide (Wormington 1957:267). Transverse parallel flaking is usual, although irregular flaking occurs on some specimens. Marginal retouch is frequently present.

The Scottsbluff point, type 2 (Fig. 6b), though morphologically similar to type 1, is more triangular in shape and has more distinctly defined shoulders.
The Eden point (Fig. 7) somewhat resembles the Scottsbluff point, although it is narrower and its shoulders are less well defined. Wormington suggests that the stem may be the result of pronounced basal grinding (1957:267). Flaking patterns are typically collateral, although Weber reports that oblique flaking is common in the study area and elsewhere in Socorro County, (personal communication-1978). Examples from the study area resemble those reported from the Rio San José and Rio Grande drainages by Judge (1973) (R. Weber, personal communication-1978). Serration of the lateral sides and the presence of basal concavities characterize these specimens.

While little has been published on the Cody knife (Wormington 1957:267), enough specimens exist so that the basic morphological features are known and can be represented in the illustration (Fig. 8). Cody knives are characterized by a transverse blade and a distinctive shoulder. It has been suggested that they are manufactured from Scottsbluff points by removing the shoulder of one of the lateral edges.

Other artifacts in the Cody complex include various types of scrapers, knives, perforators, choppers, pounders, rubbing stones, and engraving tools. No detailed description of these artifacts has been published (Wormington 1957:128). It is possible that due to the presence of choppers, pounders, and rubbing stones, Cody sites lacking any diagnostics have been mistakenly identified as Archaic sites.

**ASSESSMENT**

In conclusion, the investigation of Paleo-Indian remains is poorly developed in the study area. While there are probably many reasons for this, the major one pertains to the nature of the extant remains. The absence of stratified sites and the ephemeral nature of the surface sites have probably inhibited the broadening of research interests beyond questions relating to the identification of particular...
cultural complexes. Judge and Dawson's survey of the central Rio Grande proves, however, that research related to processual concerns can be conducted in areas where the remains are similar to those of the study area (Judge and Dawson 1972; Judge 1973). While details relating to the chronology of Paleo-Indian remains may not be clarified in this manner (and may be best done through the study of stratified sites), other important questions can be examined in the study area, e.g., the study of site structure and function, locational patterning, and the consideration of demographic trends and population dynamics. It is unfortunate that such questions have been ignored, even though Pleistocene and post-Pleistocene environmental and geological data are relatively well known in this part of New Mexico (Clisby and Sears 1956; Foreman 1956; Stearns 1956; Bryan 1926; Powers 1939).

While many facets of Paleo-Indian lifeways and adaptations can be studied through the investigation of the remains in the study area, other problems are more difficult to solve. One of these is the identification and explanation of projectile point variability. In the absence of large populations of artifacts at any locus in the study area, the representativeness of these remains is limited. It is apparent, from the previous discussions of the various cultural complexes, that the stylistic and morphological attributes of projectile points are highly variable here and elsewhere in the Southwest and Plains. Chronological and functional questions are easier to answer if one has a large body of data, and thus far large populations of artifacts from the study area have not been examined. The findings of the AKE site may provide some of the data required in the explanation of artifact diversity.

In addition to questions pertaining to behavioral concerns, inquiries related to technical aspects of archeology can be posed using the Paleo-Indian remains of the study area. Portions of the area, especially the Plains of San Augustin and the Ladrón Planning Unit, provide a natural laboratory in which new techniques related to site definition can be tested (Klinger 1976). As we have indicated, site recognition is very difficult here and new techniques may have to be developed to increase our ability to identify Paleo-Indian (and other later ephemeral) sites. In the survey of the central Rio Grande, Judge employed a technique called "site pattern recognition" which with some modifications might prove useful in the study area. This technique consisted of approximating "as closely as possible the topographic criteria utilized by the early hunters in their site selection" (1973:48). While playas, ridges, and sand dunes seem to be the topographic features most associated with Paleo-Indian remains in the study area, it is possible - and probable - that investigators have overlooked other variables related to site selection. For example, the location of hunting areas and the proximity of sites to drainages, two major locational criteria in Judge's model, have not been mentioned in reports of Paleo-Indian remains in the study area (Judge 1973; Judge and Dawson 1972). These might have played an important role in the site selection process. It is recommended that, for purposes of management and research, trial surveys be performed in which the primary goal is to identify the prominent features of each site. This will involve the creation of a set of attributes with the greatest probability of being related to site location, and the examination of any associations which might exist between these features and Paleo-Indian remains. Future surveys in which the primary goal is site location, can employ the criteria identified in the previous undertaking.

Finally, questions pertaining to the effects of deposition, deflation, alluviation, and other geomorphological processes on the internal structure of sites and artifact placement can be studied using the Paleo-Indian remains in the study area. These relationships will be discussed more fully in the next section.
THE ARCHAIC

HISTORY OF WORK IN THE STUDY AREA

The Archaic is one of the least studied periods in the area, although more is known about it than the preceding Paleo-Indian period. The reasons for this neglect are similar to those for the previous period, i.e., a bias among investigators toward finding and excavating sites with architecture and obvious features, the low population of Archaic sites, and the low visibility of these sites.

Although surveys have been conducted in which Archaic sites have been encountered, none of these has been systematic, nor has the primary emphasis been on locating Archaic remains. Most of these surveys have been performed under the auspices of cultural resource management programs (Bussey and Beckett 1974; Honea and Benham 1963; Gila National Forest Site Survey Files; Wilson 1972; Kayser and Dart 1977). Some non-contract related reconnaissance surveys (in which Archaic sites have been noted) have been conducted on the Plains of San Augustin (Hurt and McKnight 1949; C. V. Haynes, personal communication-1978; Dick 1965; R. Weber, personal communication-1978a) in the Pine Lawn Valley (Martin, Rinaldo, and Antevs 1949), and in the San Lorenzo drainage (Anzalone 1973; R. Weber, personal communication-1978). Except for Hurt and McKnight's work, these surveys have been conducted in conjunction with the excavation of a particular site or sites in these areas.

Excavations where Archaic occupations have been recorded have been conducted primarily in caves and rockshelters. These include: Tularosa Cave (Martin et al. 1952); O Block Cave (Martin, Rinaldo, and Bluhm 1954); Lemitar Rockshelter and Hackberry Shelter (Anzalone 1973; Weber, personal communication-1978) and Bat Cave (Dick 1965). The best known of these sites are Tularosa, Cordova, and Bat Caves, the last having received attention because the oldest corn in the Southwest found to date was recovered there.

Only a few open-air sites have been excavated and, unfortunately, little data are available on them. The Wet Leggett pithouse (Martin and Rinaldo 1950b) is the only Archaic pithouse known from the study area. The AKF site, an open-air base camp located on the Plains of San Augustin, is being studied; site report will be completed sometime in 1979. In addition, sites along the Harris Creek and the Agua Fria drainages have been excavated by the Museum of New Mexico (Kayser 1972a, 1973c).

To the north of the study area, in the Middle Rio Grande area, many surface Archaic sites have been recorded (Agogino and Hester 1953, 1956, 1958; Beckett 1973; Bryan and McCann 1943; Bryan and Toulois 1943; Campbell and Ellis 1952; Dittert and Ruppé 1952). Excavation of several Archaic sites has been conducted in the Arroyo Cuervo area, an area of about 200 square miles situated between the Rio Puerco and Jemez Rivers (Irwin-Williams 1973). Reinhart (1968) and Cordell (1978) should be consulted for a review of the Archaic in the middle Rio Grande area. To the west of the study area, in east-central Arizona, Archaic sites have been recorded (Longacre 1962; Wendorf and Thomas 1951).

Two cultural traditions are reported for the study area: the Cochise, the forerunner of the Mogollon culture, and the Oshara, ancestral to the Anasazi culture. The boundaries of the two traditions are ambiguous. Irwin-Williams (1967) shows the geographical distribution of each tradition. Elements of each tradition overlap north of Route 60 (R. Weber, personal communication-1978a). Sites containing Chiricahua, San Pedro, Jay, Bajada, San Jose, and En Medio assemblages have been observed throughout a wide range of elevational zones in this area (ibid.).

Cochise

Three stages constitute the Cochise tradition (Sayles and Antevs 1941): the Sulphur Springs (7500 to 3500 B.C.); the Chiricahua (3500 to 1500 B.C.); and the San Pedro (1500 B.C. to between 300 to 200 B.C.). Sites lying in the study area yielded radiocarbon dates within the time ranges of the Chiricahua and San Pedro stages. Dates obtained were 2556 B.C. from the Wet Leggett site (Martin, Rinaldo,
and Antevs 1949; Johnson 1951) and 2108 B.C. from the Chiricahua component at Bat Cave (Dick 1965:105). Corn from a San Pedro level at Tularosa Cave yielded two dates: 350 P.C. and 273 B.C. (Martin et al. 1952:500). No Sulphur Springs stage sites have been recorded for the study area, however, open-air, cave sites, and rockshelters of the Chiricahua and San Pedro stages have been found. These will be discussed later.

Oshara

The following six stages have been identified as belonging to the Oshara tradition: Jay Complex (5500 P.C. to 4800 B.C.); Pajaña Complex (4800 P.C. to 3200 P.C.); San Jose Complex (3000 P.C. to 1800 P.C.); Armijo Complex (1800 P.C. to 800 P.C.); Fn Medio Complex (800 P.C. to A.D. 400); and the Trujillo Complex (A.D. 400 to A.D. 600) (Irwin-Williams 1973). Since there are no published accounts, nor excavated Oshara sites in the study area, we have no comparative materials with which to substantiate any dates.

SITF LOCATION AND DFMOGRAPHIC TRENDS

The following eight types of remains have been reported in the study area: rockshelters and caves; chipped stone scatters (with and without diagnostic projectile points); chipped stone scatters with ground stone; fire-cracked rock; chipped stone scatters with fire-cracked rock; chipped-stone scatters, ground stone and fire-cracked rock; isolated diagnostic artifacts; and one pithouse. Isolated artifacts include projectile points and pieces of groundstone. The single subsurface site is the Cochise dwelling which was discovered in the course of the excavation of Wet Leggett Pueblo (Martin and Rinaldo 1950b).

The highest density of Archaic sites occurs above the margins of former lake terraces or playas. These areas are frequently eroded and the sites occur in blow-outs, where deflation and other processes have exposed ancient living surfaces. Unfortunately, loci such as these have been heavily collected in the area of the Plains of San Augustin (Marshall 1976). The greatest number of Archaic sites have been recorded for the Plains of San Augustin (Driveway Planning Unit) and for the Ouehado Planning Unit where such features are common.

At this point we should discuss site densities and the validity of using certain indicators in site definition. Sites are often identified as Archaic in site reports and on site forms using the following criteria: an absence of ceramics, the presence of fire-cracked rock, and the occurrence of chipped stone scatters similar to those found associated with diagnostic materials at other loci. When criteria such as these are employed in the determination of Archaic site densities, the figures relating to site occurrence may be inflated. In the absence of diagnostic artifacts and chronometrically derived dates, we cannot be sure that these sites are Archaic.

Archaic sites are also frequently found adjacent to springs and along arroyo banks, especially in the montane areas. Many sites exhibiting the features we have just discussed (and which are termed Archaic) have been reported from the Wet Leggett Arroyo (Martin, Rinaldo, and Antevs 1949); the Largo Creek Valley (Kayser and Dart 1977); the Harris Creek Valley, Agua Fria Creek (Kayser 1972a; 1973c); and elsewhere in the Gila National Forest (Gila National Forest Survey Files). Lithic scatters and an occasional point have been recorded from the Cibola National Forest (Museum of New Mexico Site Survey Records).

A problem in site definition in both the montane areas and in the areas characterized by active sand dune formation is the establishment of site size and boundaries. In many areas lithic debris may extend for miles along a ridge or an arroyo bank, interrupted every so often by decreasing artifact densities. The question, especially when one is dealing with land modification projects, is whether the whole area should be considered a site, and, if so, what are its boundaries? From another perspective, questions must be asked pertaining to the significance of the internal organization of such sites and whether the various artifacts present at the site clusters represent different activities or temporal occupations, or both.

The Archaic sites thus far noted represent
open-air use. Several caves and rock-shelters which were inhabited and in which various activities were conducted have been found in the study area and there may be more. These sites (Bat Cave in the Driveway Planning Unit; Tularosa, Cordova and O Block Caves in the Gila National Forest; and the Lemitar and Hackberry Rockshelters in the Stallion Planning Unit) share at least two attributes. The significance of these attributes is that they relate to subsistence and season of occupation. First, these sites occur in transitional ecotones or in areas where access to the other environmental zones is easy. Bat Cave, for example, lies within 30 miles of the natural range of all the resources recovered in its botanical and faunal assemblages (Dick 1965). Lemitar and Hackberry Rockshelters lie at the juncture of the Upper and Lower Sonoran Zones and the caves in the Gila National Forest lie in Upper Sonoran/Transitional ecotones. Second, these are located at or near permanent and semi-permanent water sources. San Lorenzo Arroyo contains water during the summer months and may flow year-round (Anzalone 1973). The Tularosa and San Francisco Rivers flow year-round and palynological data suggest that many basins near Bat Cave were full of water during the summer months when the cave was occupied (Irwin-Williams and Haynes 1970). The proximity of water attracted both humans and animals as it does today.

While no models pertaining to subsistence-settlement patterns have been formulated and tested in the study area, it has been suggested that cave sites were inhabited in the winter and the lower elevational dune sites in the spring, summer, and fall (Bussey and Beckett n.d., 1974; Beckett 1973). Such observations are based on two factors: (1) water was present in areas such as the Plains of San Augustin during the summer months, and (2) the fruition of many of the floral resources present in these areas today takes place during the late summer and early fall. The data are confusing and somewhat ambiguous on this matter; for example, while caves and rockshelters probably offered protection and insulation during the winter months, the presence at Tularosa Cave of three young, (two months or less) artiodactyl specimens indicates a possible late summer-early fall occupancy (Heller 1976:56, Table 17). Nevertheless, only Tularosa Cave possessed storage pits, an indication that food might have been stored there during periods when it was unavailable elsewhere.

Davis (1963) has proposed the opposite view of interelevational settlement for the Mono Lake Paiute. In her model, winter occupation took place at the lower elevations. To take advantage of more comfortable climates, Davis believes the Paiute went to the mountains for the summer. It is possible that the Archaic peoples of the study area practiced a similar pattern, but one which involved the return to lower elevations during the late summer and early fall to harvest wild resources and cultivated plants.

**Additional Observations**

Subsequent to the completion of this section, Weber (1978b) informed the author of the presence of Archaic remains in the San Mateo Mountains. I quote from his letter dated October 18, 1978:

> In the upper part of Nogal Canyon, below Springtime campground, terraces and interfluve ridges bear lithic clusters with bifacial knives, thick flake side scrapers, and medium to large corner-notched and side-notched dart points that suggest late Archaic complexes of a generalized San Pedro Cochise-Hueco phase affiliation. . . .small lithic scatters were seen along terraces and interfluves in the foothills at the north end of the San Mateos, but no diagnostic types were recognized.

It is evident (from Weber's notes) that these remains resemble those of the other montane portions of the study area and that their significance in an upland-downland subsistence pattern awaits clarification.

**PALEOENVIRONMENT**

Some knowledge of the paleoenvironment is essential for understanding the economic adaptations and population dynamics of this period which begins around 8000 B.C. It is termed the Neothermal (Antevs 1955).
While there is general agreement that an increase in temperature—from the preceding glacial periods—took place during this time, disagreement exists as to whether certain periods were warmer and drier, or warmer and wetter than others. Either geological or floral evidence is employed to support each opinion.

The more established and earlier view was developed by Antevs (1952, 1955, 1962), based on geological evidence. He identified three climatic stages: the Anathermal (8000 to 5500 B.C.); the Altithermal (5500 to 2000 B.C.), and the Medithermal (2000 B.C.). The Anathermal was characterized by a moist cool climate which became drier and warmer through time. The Altithermal was warmer and drier than today. The Medithermal supported a moderately warm and somewhat arid climate—one that was hardly distinguishable from that of today.

Antevs based his argument on the correlation of certain geological phenomena with floral and faunal data. He attributed the following changes (climatic markers) to periods of aridity: arroyo cutting; calcification of certain deposits; the formation of dunes; the disappearance of hickory, elm, and birch; low-lake levels; and the extinction of large game. Bryan (1950:126) also recognized a warm/dry interval with arroyo cutting between 5500 and 2500 B.C. at Ventana Cave.

At this point the ambiguity of Martin's data must be considered. As we have demonstrated, the higher frequency of pine in the pollen spectra of several samples from southeastern Arizona has led Martin to argue that there was an increase in summer rainfall beginning at 6000 B.C. Several aspects of pine pollen deposition cast doubt on the validity of such conclusions. First of all, the presence of pine in the pollen spectra is not absolute proof of greater precipitation. Even in areas where coniferous forests lie many meters from the study area, a high percentage of wind-blown pine pollen may be found in pollen samples of modern-day soils. Additionally, the relative frequency of pine pollen increases with the reduction of plant cover, as in a desert (Martin and Mehringer 1965). So, as one moves further into the desert (and further away from coniferous forests), pine pollen may increase in frequency. One can only state that Martin's work is indicative of two contradictory phenomena: (1) an expansion of local forests due to moister conditions (Martin 1963), and (2) a reduction in local plant cover as a result of drought (Martin and Mehringer 1965). There is no conclusive evidence for either, and none which applies specifically to the study area.

In his studies, Martin (1963) found an increase in pine and grass pollen percentages in several samples from southeastern Arizona, which dated (using radiocarbon techniques) to the period corresponding to Antevs' Altithermal. Martin attributes their presence to more moist conditions, a consequence of a shift from a winter-dominant to summer-dominant precipitation pattern. Hygric pollen, which also appeared in some of the samples, suggests the occurrence of ponding, a phenomenon associated with summer rainfall. Johnson's work near the Pecos River in Texas (1960) supports Martin's conclusions.

Macrobotanical remains have also been employed in this argument. The
observations of Dick (1965) and Smith, C. E. (1950) pertaining to the plant remains from Bat Cave appear to support the existence of a wet Altithermal period. The floral assemblage from stratum VI (corresponding to the time of the Altithermal) contains a great number of acorn remains. Both Smith, C. E. (1950) and Dick (1965) feel that this is indicative of a greater frequency of oaks in the area, a consequence of increased precipitation. As others have pointed out, however, the presence of changing frequencies of floral species at the site may be more a function of the use of the cave, the reasons for the collection of plants, and their seasonal characteristics, than of climatic change (Martin and Plog 1973:165). In conclusion, I feel that more examination of the paleoclimate of the study area must be undertaken.

SUBSISTENCE AND SETTLEMENT

Cochise

The Cochise were highly mobile hunters and gatherers who exploited a wide range of wild resources on a seasonal basis. Because of this pattern of resource procurement, they (and other Archaic groups such as the Oshara) moved through a diversity of elevational zones, and did not limit themselves to a specific ecological niche (R. Weber, personal communication-1978a). The distribution of sites throughout the major vegetative zones of the study area (see Introduction) would seem to confirm this conclusion.

The floral and faunal remains from Bat, Tularosa, and Cordova Caves and Lemitar Rockshelter enable us to reconstruct the subsistence and exploitation patterns of the Cochise economy. (The flora from O Block Cave have not been analyzed.) Unfortunately, the wild flora from Tularosa Cave were not reported in a manner which enables us to determine the period of deposition. Most of the plants reported by provenience from Bat and Cordova Caves and Lemitar Rockshelter were similar to those found throughout all levels at Tularosa Cave, however.

A list of the wild resources which were procured and used at these sites during the Archaic period is given in Appendix IV. All of the resources enumerated in Appendix IV mature in late summer or early fall. Their presence in the caves and rockshelters suggests that they were occupied during these times or that the plants were harvested and stored in the caves.

The faunal assemblages from Bat Cave (Dick 1965), Tularosa Cave (Hough 1914; Lyon 1907; Martin et al. 1952; Heller 1976), and O Block Cave (Martin, Rinaldo, and Bluhm 1954) indicate that the preceramic occupants of the caves hunted a number of ungulates and rodents. The natural range of these animals suggests further that they were pursued at varying elevations and in varying vegetative zones. A list of fauna reported for the three caves is given in Appendix V.

Only ungulates were enumerated by level and time period at Bat Cave. The occurrence of the other animals, while corresponding in type to those at Tularosa and O Block Caves, were not so enumerated.

Not every animal mentioned in Appendix V was deposited as a result of human activities. Caves and rockshelters are the natural habitat of several animals present in the Archaic strata. Woodrat, fox, and owl, for example, may have inhabited Tularosa Cave once it was vacated by its human occupants. While most of the animals listed were used for one or more purposes the function of several which were present in the Archaic strata is unknown. The raven, a bird of symbolic value in several Indian mythologies, may have served a similar function in prehistory.

The presence of certain animals outside of their normal range suggests that upland-downland patterns of hunting were practiced. The antelope (Antilocapra americana) for example, is an open plains and valley animal. Its occurrence at Tularosa and O Block Caves suggests that the hunters traveled some distance to procure this animal. (It is possible, however, that since antelope are reported to winter in warm and sheltered valleys, this species was hunted as it journeyed to those areas [Bailey 1971].) The presence of Sonoran and mule deer at Bat Cave suggests that the inhabitants hunted in the upland areas. Many of the lithic scatters and hearths found at both lowland and upland sites might reflect the seasonal
hunting patterns employed by Archaic peoples. At one site, LA 5239 (Kayser 1972a), located on the west side of Agua Fria Creek, the remains of antelope (Antilocapra americana), bison (Bos bison), and mountain sheep or goat (Ovis-Capra) were found (Heller 1976:75).

In addition to exploiting the wide range of resources enumerated above, the Cochise inhabitants of Bat Cave grew small amounts of corn, beans, and squash. These remains appear to be the earliest evidence of agriculture in the Southwest. A pre-Chapalote variety of corn occurs in association with Chiricahua artifacts, appearing to date no later than 3049 B.C. or 3655±290 years B.C. and no earlier than 3981±310 years B.C. (Dick 1965:95).

The maize at Bat Cave which dates between 1000 and 500 B.C., exhibits varying amounts of teosinte and/or Tripsacum germplasm in its genetic makeup (Dick 1965:97). Teosinte is related to both corn and a Mexican grass called "Tripsacum" and has the ability to interbreed with corn. The intermixture of teosinte and/or Tripsacum with the pre-existing pod/pop corn variety produced a hybrid variety called "Chapalote." At Bat Cave, Chapalote corn appears in strata containing San Pedro assemblages; it also appears in the pre-pottery levels at Cordova and Tularosa Caves (Martin et al. 1952; Kaplan 1963).

Cucurbita pepo was the only type of squash found at Bat Cave (Dick 1965:98). Stratigraphically, it occurs in the same level as the earliest maize. No apparent variation in its morphology occurs throughout the succeeding occupations at this site or at others in the study area.

Phaseolus vulgaris, the common kidney bean, appears later than corn and squash (ibid.:99; Smith, C. E. 1950:163). According to Dick, the position of these beans indicates that they may have been introduced as early as 1000 B.C., but no later than 600 B.C. (1965:99). Interestingly, beans occur in the levels where the early Chapalote corn first appears, thus the mechanisms responsible for the introduction of the teosinte introgressed maize and the appearance of Phaseolus vulgaris may have been the same.

Oshara

There are no published accounts of Oshara tradition sites in the study area. As a result, the settlement system represented by the sites in the area cannot be reconstructed. As a guide to what might be expected, the settlement system as described by Irwin-Williams (1973) for the Arroyo Cuervo is described briefly. It must be remembered, however, that this model is area specific; further testing in the study area may prove its validity elsewhere. The following description is intended as a guide to a settlement system of the Oshara. Due to the topography in the study area, differences in kinds and numbers of certain sites are to be expected. Whether these represent patterns unlike those of the Cochise remains to be observed, for our knowledge of the settlement system of the Cochise is fragmentary.

Irwin-Williams (1973:3) identified several different micro-habitats in which sites were located in the Arroyo Cuervo area. Since many of these types of micro-environments exist within the study area, one can expect to find similar sites and settlement distributions within them. The types included are:

Canyon rims--frequently covered with low, stable sand dunes, and populated by a variety of floral resources, including large-grained wild grasses, yucca, cactus, juniper, and pinyon.

Canyon bottoms--dominated by grass, saltbrush, composites with communities of bearberry, squawberry, juniper, scrub oak, Indian wheat, and amaranth occurring near the canyon heads.

Valley floors--characterized by grass and composites and with amaranth and chenopods growing in moister areas.

Springs--located in the canyon heads, dominated by willows, sedges, and rushes.

Dune ridges--populated by large-grained wild grasses, yucca, amaranth, cacti, and juniper.

Isolated mesa tops, Large mesa tops, Mesa slopes, Uplands; Faulted uplands--characterized by short grass and cacti.
Upland slopes—characterized by juniper, cacti, and short grasses.

Jay Phase

Many of the sites dating to this period are found in sheet-sand deposits on cliff tops in the canyon head areas, but others have been recorded near ephemeral ponds and on low mesas (Irwin-Williams 1973:5). Irwin-Williams feels that base camp sites are located at canyon heads, while limited activity sites occur at other loci. Examples of the latter include quarry sites, isolated hunting camps, and procurement sites. Sites in the vicinity of the canyon head are small, averaging less than 50 square meters in area, and lithic remains are thinly distributed over the surface. They represent repeated visits to these areas, with occupation during all seasons, but not continuously. Weber finds Jay phase sites, especially widespread in the study area, distributed through a wide range of elevational zones (personal communication-1978a).

Bajada Phase

The settlement pattern in this period is very similar to that of the preceding Jay phase; however, there appears to be a slight population increase. Sites occur in the following associations: base camps at canyon heads; specialized activity sites with base camps on sloping mesas and canyon rims; hunting camps (rare) near ephemeral ponds; and quarry sites with major lithic outcrops (Irwin-Williams 1973:6). The scatter of lithic debris lying on the cliff tops of the canyon heads probably reflects repeated visits to these areas. Weber reports finding many Bajada phase sites in the study area. Their distribution is the same as during the Jay phase.

San Jose Phase

Most of the sites from this time period lie in the canyon head areas, while a few occur at the edges of ponds (Irwin-Williams 1973:8). During this period there is an increase in the size and number of sites. Post hole patterns appear for the first time during this period, suggesting the existence of temporary structures. Fire-cracked, cobble-filled earth ovens are reported from several sites. As in the preceding periods, there is no evidence of functional or seasonal specialization at the canyon head sites (ibid.)

The introduction of grinding stones in the material culture inventory (see Material Culture this section) and the appearance of post hole patterns and earth ovens at certain sites indicate changes in subsistence-settlement patterns during this period. The exact nature of these changes and succeeding ones has yet to be explored.

Armijo Phase

As in the preceding periods, base camps are located at canyon heads. Sites adjacent to ponds are not as numerous as they were in earlier phases, but quarry sites and high mountain hunting camps still occur. Many base camps contain features such as post hole patterns, large fire-cracked cobble heaps, and some evidence of spatial patterning (ibid.:10). Seasonal population aggregation appears to have occurred — another change from earlier periods.

Maize appears in the archeological remains during this period in the Arroyo Cuervo area. Irwin-Williams suggests that it was grown in the narrow flood plains on the canyon floors near the canyon heads (ibid.:9). This maize appears about 1000 years after the first occurrence of maize in the Cochise area to the south.

En Medio Phase

The trend resulting in an increase in the number, size, and density of sites continues throughout this period and reaches a maximum in the first centuries A.D. (Irwin-Williams 1973:12). Seasonal cliff-base rockshelters become more numerous and continue to be occupied repeatedly, while cliff-top sites occur rarely. Seasonal procurement-processing sites on dune ridges begin to appear.

Trujillo Phase

The previous trends continue (ibid.:13), e.g., isolated hunting and gathering camps continue to be located near the canyon heads. Canyon-head cliff sites do not
appear to be inhabited year-round and seasonal sites occur on dune ridges.

MATERIAL CULTURE

Lithic assemblages dating to the Chiricahua stage consist of chipped and groundstone artifacts. A number of projectile points serve as diagnostic indicators of this stage. The most diagnostic group of points is composed of those which are laterally side-notched and have concave bases (the Chiricahua point). At Bat Cave, variation within this category corresponds to temporal differences, there are examples of earlier points which are shallow-notched, and later varieties which have deep notches and deep concave bases (Dick 1965; Irwin-Williams 1967). A less common and less well known point type is the Pelona point. Two sub-types were represented at Bat Cave: an earlier version with an unserrated blade and a later type with a serrated blade. Another indicator of this stage is the Augustin point, which is characterized by a contracting stem. Irwin-Williams (1967:448) questions its validity as a time and cultural marker since examples of similarly manufactured points are evenly distributed in time and space throughout the Southwest. The concave-based Bat Cave point, lying in association with Chiricahua materials at Bat Cave, may represent the survival of an earlier point type; (Beckett 1973, and personal communication-1978; Dick 1965; Irwin-Williams 1967). If it is a survivor, then the Bat Cave point is not diagnostic of the Chiricahua stage, and should not be thought of as a temporal indicator.

While pressure flaking was employed in the manufacture of projectile points, the majority of the other types of chipped stone artifacts were made by percussion flaking. Common to Chiricahua lithic assemblages are heavy percussion-flaked choppers and planes. These were manufactured within a core technology in which a piece of material (frequently a cobble) was reduced and modified to form the finished product. Flake scrapers, knives, and gravers are also common in Chiricahua assemblages. These were manufactured by detaching a flake from the parent material and modifying it by thinning and retouching. Unretouched flakes, modified through use, are found as well.

The groundstone tool assemblage includes: one-handed handstones with flat, convex or rocker surfaces, milling stones that are either flat pebbles or contain an oval deep basin near the center of the stone, and multi-faceted pestles and mortars (Sayles and Antevs, 1941). Bone implements recovered from excavations include splinter and metapodial awls, and spatulate objects (Irwin-Williams 1967).

Perishable materials including coiled basketry, fiber netting, an atlatl, fire-making implements, and woven sandals have been recovered from Bat Cave and the San Lorenzo Rockshelter in the study area (Dick 1965; Anzalone 1973).

While there is continuity among certain classes of artifacts between the San Pedro and preceding Chiricahua stage, new artifact types appear. There are carry-overs in projectile point styles from the Chiricahua stage (e.g., small versions of the Pelona point and a wide, side-notched point). A new class of points, the San Pedro, larger than earlier ones and characterized by low-corner notches or low-shallow side notches and straight to convex bases, appears. In a few assemblages thought to represent very late preceramic San Pedro occupations, such as that at Tularosa Cave, these points "break down into a wide variety of forms, trending in general toward reduction in size, increased length of barb, and in particular instances, exaggerated serration or bulbous convex bases," (Irwin-Williams 1967:448).

While core tools, use-modified flakes, heavy choppers, and planes continue to be heavily represented in San Pedro assemblages, tools produced by pressure flaking, such as knives, scrapers, gravers and drills, were produced for the first time (Martin and Plog 1973; Sayles and Antevs 1941).

Groundstone artifacts include manos, metates, mortars, and pestles. Manos are larger and heavier than the earlier types. Metates are deeper than their predecessors and deep-oval basin forms and mortar types are characteristic.

Coiled baskets, woven wicker sandals, net bags, wooden scoops, gourd vessels, reed flutes, cane cigarettes, dice, and paraphernalia having a possible religious
function have been found in caves, e.g., Bat Cave (Dick 1965) and Tularosa Cave (Martin et al. 1952).

Also found in the study area, especially on the Plains of San Augustin, are points associated with the Pinto-Gypsum Complex (Hurt and McKnight 1949; R. Weber, personal communication-1978a). The determination of the age of these remains is a subject of controversy (Wormington 1957:168). Some investigators believe they predate 5000 B.C., while others suggest a later date. (One researcher estimates their age at about 700 B.C. to A.D. 200 [Wormington 1957:138].) The data are lacking and the time range unknown.

In the Oshara tradition, lithic assemblages dating to the Jay phase consist only of chipped stone, as no groundstone has been reported (Irwin-Williams 1973:5). This is not to preclude their occurrence, however.

The chipped stone assemblage dating to the Bajada phase shows continuity with the preceding Jay phase (ibid.:7). Early Bajada phase points differ from Jay points by the presence of basal indentation and basal thinning. A later point has increasingly well defined shoulders and decreasing overall length. The tool kit also includes side scrapers, but few bifacial knives. Side scrapers, made of thin irregular flakes, occur frequently with large chopping tools and appear to be associated with the processing of coarse plant fibers. The quality of the flaking technology appears to be poorer than in the earlier period. Groundstone has not been reported.

The lithic assemblages dating to the San Jose phase consist of both chipped and ground stone; the latter first appears in the Oshara tradition. The chipped stone assemblage consists of increasing numbers of poorly-made side scrapers on thin flakes (ibid.:8), while the earlier well made side scrapers and bifacial knives are rare or absent. Soft-hammer percussion was rarely employed. The diagnostic projectile points demonstrate continuity with the preceding Bajada points, but serration becomes a common feature. Overall length decreases through time and the stem-to-blade ratio becomes relatively shorter. The groundstone assemblage consists of shallow basin-grinding slabs and simple handstones made of cobbles. Pounding stones become more frequent. Materials similar to these were first discovered in western New Mexico, and termed the San Jose complex (Bryan and Toulouse 1943); they have been excavated by D. Hert near Acoma and called the San Mateo complex (Irwin-Williams 1973:9). The Concho complex of eastern Arizona (Wendorf and Thomas 1951) corresponds to this period, as do many others from northwestern New Mexico and southeastern Utah.

Within the chipped stone assemblage of the Armijo phase, there is a great deal of continuity from the previous periods. The projectile points have evolved from the serrated San Jose style and are characterized by short, widely-expanding stems and concave, straight bases during the earlier portions of this phase. Later, there is significant variation in point types. A small corner-notched or narrow-stemmed point makes its appearance.

During this time the proportion of groundstone relative to other artifact types increases. In addition, a number of objects for which Irwin-Williams assigns magico-religious values appear (1973:10).

Materials similar to these have been termed the Santa Ana complex (Agogino and Hester 1956), the Lobo complex (Bryan and Toulouse 1943), and the Atrisco complex (Agogino and Hester 1956). A number of similar complexes have been reported from Utah and Arizona (Irwin-Williams 1973:11).
During the En Medio phase, the variation in lithic styles is great. Irwin-Williams (ibid.:12) feels that skills in manufacturing improve with the use of soft-hammer percussion and pressure flaking. The diagnostic projectile points are variations of stemmed corner-notched forms which, through time, become increasingly barbed. Bifacial knives and drills increase in frequency.

The groundstone assemblage is characterized throughout the period by deep-basin grinding slabs and cobbled manos, but new types of groundstone appear late in the period, e.g., flat, troughed grinding slabs and long, flat handstones. Fiber, wood, and leather artifacts which resemble those from Basketmaker II sites in southwestern Colorado, have been recovered from excavations.

Artifacts from the Trujillo phase represent trends begun in the preceding En Medio period (ibid.:13). Two major artifact types—the bow and arrow and pottery—appear. The arrow points are miniature versions of the En Medio projectile points; the ceramic inventory consists of Lino Grey pottery. Dune ridge sites are dominated by grinding tools (ibid.:14).

Elements of the Trujillo and En Medio phases correspond to several from the Lobo and Santa Ana complexes (Bryan and Toulouse 1943; Agogino and Hester 1956).

MANAGEMENT AND RESEARCH RECOMMENDATIONS

Areas which have been deflated contain a high density of Archaic sites, especially lithic scatters and hearths (indicated by fire-cracked rock). It has been suggested that the presence of fire-cracked rock is the result of a food-preparation technique in which hot rocks were dropped into baskets filled with liquid [Cordell 1978].) Since no published analyses of such sites currently exist, (the AKE data are still being analyzed), it is suggested that several be mapped, using the point provenience technique, and excavated. Data procured in this manner will help determine site function, time of occupation, possible cultural affiliation, and the relationship between surface and subsurface artifacts. The importance of obtaining floral and faunal (including pollen) samples from such sites cannot be overemphasized. While caves are an excellent source of such data, conclusions regarding subsistence patterns are specific to cave contexts only and are not necessarily applicable to open-air sites. As we demonstrated earlier, the function of open-air sites and their articulation with other sites in the Archaic settlement cycle has not yet been determined. We are aware that the acquisition of ecofactual data from open-air sites is especially difficult and that pollen samples from these sites are usually contaminated with modern specimens.

In their excavation of open-air sites, investigators should be particularly attuned to the correspondence between surface and subsurface remains and the effects of dunes and dune formation on these remains. Several investigations in areas where active sand dunes characterize the landscape have revealed that subsurface remains are not necessarily present under sand dunes which separate one deflated area from another (see Wait 1977). In order to predict whether subsurface remains will be present, various factors should be monitored during excavation.

Another aspect of sand dune sites which should be studied is the amount of displacement which artifacts experience as a result of water and aeolian activity. Beckett monitored such factors in his recent excavation on the Plains of San Augustin (personal communication-1978). The test consisted of mapping sets of artifacts and leaving them in their original position for three months while exposed to forces of wind and water. Preliminary results indicate that displacement was substantial and random.

Although only one pithouse dating to an Archaic occupation has been found in the study area, others have been found elsewhere in the Southwest (Sayles and Antevs 1941), and one should be aware of the attributes which indicate the presence of pithouses. One should remember that sherds will not be present at pithouses of this time period (unless the site was reoccupied), thus identification from surface remains is difficult.

While isolated artifacts should not be classified as sites, their location and association with environmental phenomena should be recorded in the files of the
Laboratory of Anthropology (Santa Fe) and the agency on whose land they occur. The recording of such remains provides a set of data not often available from other sites or other areas. For example, several studies on subsistence-settlement systems and sequences of occupation in the Great Basin of California (Davis 1963; Bettinger 1976; Thomas 1975) have been conducted using these kinds of information. Since our understanding of the origins of the Archaic lifeway and facets of its subsistence and settlement patterns is so vague, the recording of such data may prove critical. In addition, it is recommended that projectile points be retrieved while one makes the above observations in the field. It is the author's feeling that if the archeologist does not collect them and use them for study and teaching, these artifacts may end up in the hands of pothunters and their value lost forever.

As we indicated earlier in this discussion, the genetic history and distribution of cultigens suggest that they were domesticated first in Mexico and appeared several thousands of years later in the study area. One of the most pertinent problems relating to the Archaic in this study area is the identification and explanation of the mechanisms by which cultigens appeared in the Southwest. Another problem is to discover the conditions under which man accepts cultigens and integrates them into his subsistence repertoire. This involves the identification of the processes involved in the acceptance of innovations. Climatic change, population pressure, trade, exchange, and independent invention have been suggested as causative agents elsewhere in the world (Binford 1968; Flannery 1969).

It is very difficult to determine which of these agents was responsible for the adoption and spread of domesticates in the study area. Climatic change may be a factor, but knowledge of the paleoclimate at this time is tenuous. With regard to population pressure, our knowledge of demographic conditions in the study area during this time is limited (Irwin-Williams and Haynes 1970). Models dealing with trade and exchange have not been designed. The distribution of various types of lithic materials throughout the Southwest and Mesoamerica as demonstrated by trace-element analysis might help to determine the routes by which domesticates were brought from the south.

A final set of questions which results from this study pertains to the culture history of the area. First, we must question the distinctiveness of the two cultural traditions represented in the study area. Does the variation in projectile point types represent separate cultural developments or different environmental adaptations? (The fact that such questions are raised does not mean that the validity of cultural differences is negated. I suggest however, that before we assign any meaning to the variability exhibited in lithic assemblages, we must first question the origins of such explanations.) If, in the event that we agree with Irwin-Williams and others, two cultural traditions existed (the Oshara and Cochise), then we should discover the reasons for their presence in the northern portion of the study area. Is this due to temporal differences (the Cochise preceded the Oshara); the exploitation of the same area by two unrelated groups, (a common occurrence in other parts of the world [Barth 1956, 1969]); the sharing of ideas via some medium of exchange; or the movement of men and their stylistic traditions of projectile point manufacture among different groups? Clearly, models must be developed which account for the variability in the northern portion of the study area.
THE FORMATIVE

INTRODUCTION

The following section is concerned with the Formative, a period of time extending from about A.D. 1 to A.D. 900 to 1000. During this period many of the distinguishing features of later southwestern prehistory appeared, including the following: pottery, pithouse architecture, above-ground residential units, ceremonial structures, distinctive lithic assemblages; and a new set of subsistence strategies involving greater integration of cultigens into the diet. (Each of these will be discussed in the following section.)

Throughout the study area the traits mentioned above appear at different times, at different places, and in different forms. This is probably a reflection of the presence of two different groups, each of which exhibits distinctive sets of cultural traits and modes of adaptation to the environment which it occupies. While the boundaries of the two populations are not always explicit, it appears that the mountainous areas and the margins along the Rio Grande were occupied by various representatives of the Mogollon, and those portions of the study area lying in the southern fringes of the Colorado Plateau were occupied by a group of people who exhibited a mixture of Anasazi and Mogollon attributes (Danson 1957).

In the Southwest, there exist a great number of taxonomic systems which have been used to define and record the developments observed for the many prehistoric groups (Martin and Plog 1973; Wheat 1955). In order to maintain comparability with other studies, we will use the two systems most frequently employed by researchers working here. In our discussion of the Mogollon, we will employ the taxonomic system first developed by Haury (1936) and then used by Martin and his associates during their work in the areas of the Pine Lawn Valley and Reserve, New Mexico. The phases are: Pine Lawn (150 B.C. ± 160 years to A.D. 500); Georgetown (A.D. 500 to A.D. 700); San Francisco (A.D. 700 to A.D. 900); and Three Circle (A.D. 900 to A.D. 1000).

In this and adjacent areas, the Pine Lawn and Georgetown phases are sometimes termed the early pithouse phase occupation; the San Francisco and Three Circle phases exemplify the late pithouse phase occupation (LeBlanc 1976). The Anasazi-like groups will be described in terms established by the Pecos classification. During the Formative these include the Basketmaker III and Pueblo I periods. Stratigraphic placement and cross-dating suggest that early Basketmaker III is generally contemporaneous with the Georgetown phase, although Martin and Plog (1973:85) assign A.D. 400 as the beginning date of Basketmaker III. The equivalence of the San Francisco phase with Late Basketmaker III and all of Pueblo I is more firmly established by Wheat (1955). The following chart illustrates the relationship of the two systems:

<table>
<thead>
<tr>
<th>A.D.</th>
<th>Haury/Martin</th>
<th>Pecos</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-500</td>
<td>Pine Lawn</td>
<td>Basketmaker II</td>
</tr>
<tr>
<td>500-700</td>
<td>Georgetown</td>
<td>Basketmaker III</td>
</tr>
<tr>
<td>700-900</td>
<td>San Francisco</td>
<td>Pueblo I</td>
</tr>
<tr>
<td>900-1000</td>
<td>Three Circle</td>
<td>Pueblo II</td>
</tr>
</tbody>
</table>

HISTORY OF WORK IN THE STUDY AREA

Work in the study area is marked by an unevenness of investigation. Some areas such as the Gila National Forest and the Quemado Planning Unit have been studied more intensively than others. In the Gila Forest we have acquired information on all periods of occupation from a variety of surveys and investigations.

The following institutions have conducted surveys and excavations which have contributed to our understanding of the pithouse (and later) periods in the Gila National Forest: Smithsonian-Gates Expedition (Hough 1907, 1914, 1917, 1918, 1919, 1923); Peabody Museum—Upper Gila Expedition (Danson 1950, 1957); Field Museum of Natural History—Southwest Expedition (Martin 1943; Martin and Rinaldo 1940, 1947, 1950a, 1950b; Martin, Rinaldo, and Antevs 1949; Martin, Rinaldo, and Bluhm 1954; Martin, Rinaldo, Bluhm, Cutler, and Grange 1952; Rinaldo n.d.; Rinaldo and Bluhm 1956); Gila Pueblo
Pithouse phase occupations are present at the following sites which have been excavated in, or adjacent to, the Gila National Forest: Mogollon Village (Haury 1936); SU site (Martin 1943; Martin and Rinaldo 1940, 1947); Starkweather Ruin (Nesbitt 1938a, b); Promontory site (Martin, Rinaldo, and Antevs 1949); Turkey Foot Ridge (Martin, Rinaldo, and Antevs 1949; Martin and Rinaldo 1950a); Three Pines Pithouse (Martin and Rinaldo 1950b); Pine Lawn Camp Pithouse Powerline site (Rinaldo n.d.); LA 5407, LA 6074 (Kayser 1973c); LA 6082, LA 6083 (Kayser 1972c, 1975); LA 4986 and LA 5936 (Kayser 1972b); LA 2948 (Wendorf 1956b); Luna Junction site—LA 3337 (Peckham 1963); and LA 5041 (Kayser 1972a). Strata in Cordova, O Block, and Tularosa Caves date to the early pithouse phase (Martin et al. 1952; Martin, Rinaldo, and Bluhm 1954). LA 5934 and LA 5932 appear to be early pithouse phase, outdoor, limited-activity sites (Kayser 1972b). Analysis of the sherds from the mixed strata at Y Canyon Cave indicate occupations extending from the Pine Lawn to the Reserve phases (Martin, Rinaldo, and Bluhm 1954).

Data on the late pithouse phase come from an equally large number of sites in the Gila National Forest, many of which lie above earlier pithouse phase occupations. Late pithouse phase occupations have been excavated at the following sites: Luna Village (Hough 1917, 1918, 1919, 1923); Starkweather Ruin (Nesbitt 1938a, b); Twin Bridges site (Martin, Rinaldo, and Antevs 1949); Mogollon Village (Haury 1936); Wheatley Ridge (Rowe 1947); SU site (Martin 1943; Martin and Rinaldo 1940, 1947); Turkey Foot Ridge (Martin, Rinaldo, and Antevs 1949; Martin and Rinaldo 1950a); LA 3280—Switchback site (Peckham 1957); South Leggett Pithouse (Martin and Rinaldo 1950b); LA 4986 (Kayser 1972b); LA 6083 (Kayser 1972c, 1975); LA 2947 (Peckham, Wendorf, and Forden 1956); LA 8890 (Allen 1969); and occupations in Tularosa and O Block Caves (Martin et al. 1952; Martin, Rinaldo, and Bluhm 1954). Surface sherds at the WS Ranch site indicate a late pithouse phase occupation, but a radiocarbon date of A.D. 380±70 from the roof support of one of the pithouses suggests an early pithouse phase excavated occupation (Neely 1978:4).

Generally speaking, the lands held by or adjacent to the Socorro District of the Bureau of Land Management have not been as well investigated as the Gila National Forest. Much of the data for pithouse phase and later occupations comes from the work of the Peabody Museum-Upper Gila Expedition in the Quemado Planning Unit (Smith, W. 1950; Brew and Danson 1948; Danson 1950, 1957; Bullard 1962; McGimsey 1951, 1957, personal communication-1978). The area studied by the Upper Gila Expedition team consisted of portions of Largo Creek, Rito Creek, Carrizo Creek, and their tributaries, and the southern edge of the North Plains (Danson 1957:66, Fig. 8). The survey of the Rito Creek and Largo Creek areas was extensive, that of Carrizo Wash and its major tributaries was intensive, and that of the North Plains was very rapid. An intensive survey within a five-mile radius of the northern tip of Mariana Mesa was conducted (ibid.). One Basketmaker III pithouse village—the Cerro Colorado site—has been excavated (Bullard 1959, 1962). In addition, the Cerro Colorado site experienced a minor reoccupation during the Pueblo I period. Three sites with Pueblo I occupations have been excavated on Mariana Mesa (McGimsey 1951, 1957). Several pithouses dating to the Pueblo I period have been excavated at the Williams site located a few miles south of Quemado near the Gila Forest boundary (Smith, W. 1973). Sherd scatters and Basketmaker III-Pueblo I villages have been recorded for tributaries of Carrizo Wash (Wilson 1972; Danson 1957).

Mera’s (n.d., 1943) investigations and Yeo’s (n.d.a, b) notes have contributed to our knowledge of this time period in the Ladron and Stallion Planning Units and parts of the Cibola Forest. The Upper
Gila Expedition team surveyed portions of the Rio Salado (Danson 1957:76, Fig. 9). Several sites dating to this time period were recorded (ibid.:75-76). Honea and Benham (1963) have reported a site from the Alamocita Creek drainage. Winkler and Davis (1961) and Warren (personal communication-1978) have reported Pueblo I sites from the Rio Salado. The results of a 10% stratified survey of the Stallion Planning Unit conducted by the Socorro District of the Bureau of Land Management will contribute greatly to our understanding of this and later periods in areas bordering the Rio Grande.

Few sites dating to this period have been recorded for the Cibola Forest. This may represent the lack of investigation which characterizes this area or true demographic patterns. The Upper Gila Expedition team surveyed portions of the Datil and Gallinas Mountains, the area lying between them and an area near Magdalena, New Mexico (Danson 1957:76, Fig. 9). The Datils, the area lying between the Datils and Gallinas, and the area near Magdalena were examined rapidly. The eastern portion of the Gallinas Mountains was examined extensively. Nowhere in the Forest did the Upper Gila Expedition perform an intensive survey.

Several sites dating to this time period have been recorded for the Forest. Danson (1957) has reported finding pithouse phase sites in the Gallinas Mountains. A few late pithouse phase sites (LA 13702, 13708, 13709, 13711, 13714) have been reported in the Ox Spring Canyon area by the Museum of New Mexico (n.d.).

SITE LOCATION

The early pithouse villages in the Gila Forest are located atop elevated areas such as mesas, knolls, bluffs, ridges, and hills. While the location of sites on high landforms is a characteristic of this occupation (Bluhm 1960; Danson 1957; Wendorf 1956a), it is not always possible to determine from the literature how much higher above the surrounding landscape the sites really are (Rice 1975:62). Most investigators would like us to believe that the Mogollon always settled in inaccessible locations at this time (Wheat 1955). Survey data from the Gila Forest suggest this is not the case. In the Stallion Planning Unit, however, early Jornada Mogollon sites are located on mesas overlooking the Rio Grande (Yeo n.d.b; Marshall 1976). Many of these mesas make good defensive sites. However, these sites, with few exceptions, lack subsurface features.

The reasons for the location of villages on elevated areas are unclear. The following explanations have been suggested: defense (Martin and Plog 1973; Wendorf 1956a); a good view of the surrounding countryside (Bluhm 1960; Martin and Rinaldo 1947); and moderate temperatures, good drainage, and protection from floods (Wheat 1955). However, no completely convincing argument has been advanced for any of these postulations.

Although it is true that many of the sites lie on high, inaccessible mesas (Wendorf 1956a; Danson 1957; Kayser 1975), only the Promontory site in the Pine Lawn Valley (Martin and Rinaldo 1947; Bluhm 1960) has any on-site features which suggest that defense played a key role in the determination of site location. These consist of three boulder walls which span the southern end of the mesa on which the site is located. Yeo (n.d.b) reports the presence of a wall at a pithouse site above the Rio Grande. Unfortunately, no pottery was found at that site, so we cannot assign it to this time period.

Regarding the need for defense, Martin and Plog (1973) argue that the incorporation of agriculture into the subsistence regime of many southwestern groups created conflict between them and the hunting and gathering groups who previously occupied the area. The location of certain villages in inaccessible areas was a response to such conditions (ibid.:182).

While defense is a popular explanation, factors relating to subsistence rather than defense may have had a greater role in the determination of site location, e.g., Haury (1956) and Bullard (1962) have argued that villages were located relative to arable land and water. While this view has come under attack (Plog 1968), the proximity of water and cultivable land, and the availability of wild resources in the vicinity of a site might have been considerations in site selection. Those sites lying on elevated landforms did allow their
inhabitants a commanding view of the surrounding countryside. The presence of game, as well as the identification of intruders, could be monitored from such vistas.

During the late pithouse phase, there appears to be a change in settlement location. While some villages (many of them with occupations dating to the early pithouse stage) continue to be situated on high eminences, others are located on more accessible ridges or terraces closer to the floodplain. In the Stallion Planning Unit, sites dating to this time period continue to be found on elevated locations overlooking the Rio Grande (Yeo n.d.a, b).

The Anasazi exhibit a different settlement pattern in the study area. According to Bullard (1962), Basketmaker III sites in the Quemado Planning Unit do not appear to be situated in locations as remote and inaccessible as many early Mogollon villages. Survey data in this region confirm that most of these sites are located on ridges and gentle slopes (Danson 1957; Wilson 1972).

The Pueblo I sites are situated on many of the same features observed for the preceding Basketmaker III sites. Survey data indicate that in the QuemadoPlanning Unit, Pueblo I sites are found on terraces above drainages (Wilson 1972).

It has been argued that the establishment of villages close to rivers or drainages reflects an increased dependence on agriculture and, consequently, a desire to be near one's fields (Bluhm 1960). While no one has questioned this assumption, verification requires more than tacit agreement.

In the study area, sites dating to the Formative period have been reported for the Upper Sonoran and Transitional vegetative zones. In the Gila Forest the greatest number occur in the ecotone between these two zones; while in the Quemado Planning Unit they have been noted for the Upper Sonoran Zone. Differences in site selection between the Mogollon and the Anasazi-like groups are probably related to the nature of the topographic and vegetative zones inhabited by each group and not an expression of distinctive "cultural" preferences.

Two site types have been recorded for the time period discussed above. Pithouse villages are situated back from, or overlooking, major and tributary valleys in all parts of the study area. Sherd and sherd-lithic scatters have been reported from similar locations as well as from along banks of streams and arroyos (Arnold 1943; Bluhm 1960; Danson 1957; Wilson 1972). As we have mentioned, Yeo (n.d.b) reports sherd scatters from elevated areas above the Rio Grande.

DEMOGRAPHIC PATTERNS

As we have mentioned previously, two groups have been recognized as inhabiting the study area (Danson 1957). These are the Mogollon and a group of people whose remains exhibit a mixture of Anasazi and Mogollon characteristics. Thus, part of the study area is a transitional area. The portion of the study area lying in the Gila National Forest was occupied by the Mogollon, but the developments that transpired here were peripheral to those of the core Mogollon to the south and southwest in the Mimbres and San Simon drainages (Bullard 1962). As early as the Archaic period, the prehistory of the Quemado, Malpais, and Ladron Planning Units is characterized by both northern and southern traits. Anasazi architectural traits and both Anasazi and Mogollon ceramic wares are present throughout the occupation of these areas (McGimsey 1951; Danson 1950, 1957). The Stallion Planning Unit was occupied by a group known as the Jornada Mogollon (Lehmer 1948; Marshall 1973, 1976). Considered as representative of the Mogollon culture because they manufactured a brownware and in the early periods lived in pit-houses, many of the traits associated with the Jornada distinguish them from other Mogollon groups. Finally, there are so little data on the archeology of the Cibola National Forest that it is difficult to hypothesize with any certainty who occupied it during this time period. Only through controlled excavation can we determine the origin and cultural relationships of the peoples inhabiting this area.

The Gila National Forest appears to have been the most heavily populated of all the regions in the study area. While representative of true demographic trends, this may be also a reflection of the amount of survey and excavation work performed in
this area. Occupation from Pine Lawn to Tularosa phase appears to be continuous in most portions of the Gila Forest. During the Georgetown phase, however, there appears to be a decrease in the population of the Pine Lawn Valley (Bluhm 1960). The number of sites and pithouses and the area in square feet per house was lowest during this phase (which Martin and Plog indicate lasted from A.D. 400 to A.D. 700) than any other period during which the valley was occupied (1973:190). In his excavation of 12 sites located on the western slopes of Gallita Rincon in the Gallo Mountains, Kayser (1972c) notes a gap in occupation during the Georgetown and San Francisco phases. In addition, a survey conducted in the Gallita Rincon (Wiseman and Kayser 1972), did not reveal any Georgetown and San Francisco phase sites. Surveys and excavations of sites in other areas have not indicated a population decrease during this time.

The Cibola Forest does not appear to have been occupied extensively during the period from A.D. 1 to A.D. 600. One Gallinas Mountains site of this time period has been recorded by Danson (1957). During a field trip to the Cibola Forest, the author and Joseph Tainter, Cibola Forest Archeologist, noted a pithouse phase village overlooking the Plains of San Augustin.

The Quemado, Malpais, Ladron, and Stallion Planning Units were occupied by Archaic groups until the period beginning at around A.D. 500. (As we have indicated in "The Archaic" the occupation of all but the Quemado Planning Unit was sparse.) In the Quemado Planning Unit, a number of sites dating to the Basketmaker III and Pueblo I time periods have been reported for the Carrizo Wash and its tributaries (Wilson 1972). Similarly, several sites were found in the vicinity of French's Arroyo in the course of the surveys performed by the Highway Cultural Inventory (Honea and Benham 1963). To the south, near Quemado, New Mexico, several Basketmaker III sites have been located (Danson 1957; Bullard 1962) and one, the Cerro Colorado, has been excavated. Douglas Fischer reports the presence of Basketmaker III period sites on his ranch located 17 miles northeast of Quemado (personal communication-1978). No Basketmaker III sites have been reported for the Mariana Mesa area.

While Basketmaker III and Basketmaker III-Pueblo I sites have been recorded from the Ladron Planning Unit (Yeo n.d.b; Winkler and Davis 1961; Warren, personal communication-1978; Danson 1957), the quality of the site reports from this area is so poor that it is impossible to obtain demographic details. Pottery and lithic scatters with or without fire-cracked rock have been recorded for this area; pithouse depressions were not reported in any of the observations or notes. As in other areas this does not necessarily indicate that the area was not similarly occupied, but that difficulty in detecting pithouse depressions might have been greater here than in other regions. All reported sites of this period lie along the drainages of the Rio Salado.

During the late pithouse and Pueblo I periods there is a population increase throughout the study area. Populations for this period may be greater than presently realized, since many occupations lie under later ones.

In the Quemado Planning Unit, Pueblo I sites, and transitional Pueblo I-Pueblo II have been found in the Carrizo Wash and its tributaries (Wilson 1972); in the French's Arroyo area (Honea and Benham 1963); and in the Mariana Mesa area (McGimsey 1951; Danson 1950, 1957; Smith, W. 1950). In the Mariana Mesa area, almost 90% of the 34 sites with Pueblo I occupations had Pueblo II components (Danson 1957:71, Table 14).

Sites with San Marcial pottery have been recorded in the Stallion Planning Unit (Mera n.d., 1943; Yeo n.d.b, 1933). Mera (1935) proposes that this represents a southward expansion of northern Plateau peoples moving into the brownware (i.e., Mogollon areas. Yeo has noted sites in Nogal Canyon and along Alamosa Creek (n.d.a, n.d.b). Although pithouses were evident, pottery was lacking so he could not assign a date to the sites. Sites dating to approximately A.D. 700 or later have been noted above the Rio Grande and at the confluences of arroyos and the Rio Grande (Yeo n.d.b; Mera n.d.). Except for LA 764, which consisted of three non-contiguous surface units and two circular depressions, these sites are pottery and pottery-lithic scatters.

No Basketmaker III, Pueblo I or pithouse
Phase sites of Mogollon derivation have been observed on the Plains of San Augustin.

It is apparent that pottery and pithouse architecture appeared first in that portion of the study area located in the Gila Forest and later in the Cibola Forest and lands occupied by the Bureau of Land Management. These observations raise some interesting questions about the population dynamics and economic adaptations of this time period. For example, does the appearance of traits associated with the Anasazi in these areas represent a southward movement of peoples about A.D. 500? Does the appearance of brownwares represent a northward or northeastern expansion of peoples into these areas? If such movements or migrations did occur, what precipitated them? If, on the other hand, the appearance of Formative traits reflected their adoption by existing populations already inhabiting these areas, what were the mechanisms involved in their acceptance? In the absence of other data, we assume that the people occupying these areas practiced the economic and settlement patterns of Archaic groups. Why is it, therefore, that the Archaic (as we have differentiated it from the Formative) endured in these areas and not in the Gila, San Francisco, and Tularosa drainages to the west?

Finally, we should be able to explain why there was an increase in population during Pueblo I times. Were changes in subsistence or the migration of new people into the study area responsible for such changes?

As for the size of communities themselves, there is substantial range of variation. Pithouse villages range in number from one pithouse to as many as 50. There are exceptions; for example, approximately 100 pithouses were noted at LA 4032 in the Quemado Planning Unit by Wilson (1972). Occupation of each structure was probably not contemporaneous. In the Pine Lawn Valley, Bluhm (1960) notes that smaller villages are located closer to larger villages than are the latter to each other. Such patterning may reflect the socio-political-ceremonial relationships between communities, but this must be tested.

Village Organization

Mogollon villages are characteristically lacking in plan and communities in the study area are no exception. Houses are distributed at random and were apparently built wherever it was convenient (Wheat 1955). Extramural hearths, burials, and activity loci occur in and among the pithouses. Ceremonial houses or kivas are a component of many of the communities (to be discussed later).

Anasazi villages exhibit a different arrangement of domiciliary structures, facilities, and ceremonial houses. During the Basketmaker III phase, communities consisted of scattered pithouses and randomly placed storage cists. Later, these cists were consolidated into rows or arcs located north and west of the pithouses. However, while these elements were present at the Cerro Colorado site, such patterning did not occur (Bullard 1962). Toward the end of Basketmaker III or the beginning of Pueblo I, rectangular, contiguous surface rooms with slightly sunken floors appeared. They were usually arranged in rows or arcs located north and/or west of the pithouses. They functioned as storage and/or living rooms. If both were present, the living room was frequently attached to the front of the storage area. Ventilators also made their appearance at this time.

While ceremonial loci appear as components of Mogollon villages as early as the Pine Lawn phase, it was during the Pueblo I period that the transition in pithouse function from residential to ceremonial occurred in the Anasazi area. The change was gradual and as Bullard (1962:103) notes, it is difficult to differentiate one type of structure from another.

While the appearance of surface rooms during the Pueblo I period is noted as an Anasazi trait (ibid.), surface rooms occur both earlier and contemporaneously in the Mogollon area. Three Pine Lawn phase surface structures have been excavated from the SU site (Martin 1940:32, 1943:156, 168). One such structure is reported from the Three Circle phase--Twin Bridges site (Martin, Rinaldo, and Antevs 1949:114); at LA 6083 (Kayser 1972c:16) six
rooms dating to late Three Circle phase have been excavated. The function of the surface structures mentioned above is not known, although it is probable that a variety of tasks were performed there. Surface houses Nos. 1, 2, and 3 at the SU site contained pits and may have been storage facilities.

**PITHOUSE ARCHITECTURE**

Mogollon pithouses are characterized by their variability. Referring to pithouses in the study area, Bullard (1962) believes that they share no more than a generally circular shape and the presence of eastward or southeastward-facing passageways; however west-facing entrances have been reported, e.g., pithouses I and N at the Turkey Foot Ridge Site (Martin and Rinaldo 1950a). In addition, Bullard argues that this area developed no important distinctive traits on its own (1962:187).

Like most features of Mogollon pithouses, the methods of roofing were diverse. Houses were supported by a variable number and arrangement of posts. Some houses even lacked interior supports and entrance was gained presumably through the roof. At Luna Village there were no side entryways to the houses (Hough 1918, 1919, 1923). In many of the Pine Lawn phase houses at the SU site, posthole patterns were so irregular that "it seems possible that the posts were merely props to prevent sag or collapse rather than main supports" (Bullard 1962:128). A more-than-four peripheral post support system occurs in the Pine Lawn region, but nowhere else in the Mogollon area. The occasional use of a single central support suggests influences from the Mimbres area (ibid.:182).

The shape of Mogollon pithouses is equally variable during the Pine Lawn and Georgetown phases. With the exception of several bean-shaped houses, structures are circular. By the San Francisco phase, however, many of the houses had become more square or rectangular in outline, echoing a pattern found in the Mimbres region to the south (Wheat 1955; LeBlanc 1976). A few circular houses persist through this and the Three Circle phase, although the majority of the houses during the latter are rectangular. A major exception is the Luna Village site where during the Three Circle occupation, 77% of the houses were round (Wheat 1955). Due to the singularities of this site, some investigators believe it to be representative of the cultural manifestations typical of the Alpine branch of the Mogollon (see Pueblo II).

Entryways, like other features, vary in design from narrow and long to wide and short. Large, broad entrances are particularly characteristic of the Pine Lawn phase pithouses at the SU site (Wheat 1955:41). Rowe (1947) notes that the length of the entry is proportional to the depth of the structure. Entries were often stepped, but frequently absent entirely.

Size is another characteristic of Mogollon pithouse structures which varies from house to house and from community to community. In the Pine Lawn Valley, houses are larger than those of any other region inhabited by the Mogollon. According to Wheat (1955), the mean house size for these is 27.1 square meters. (House size is calculated in terms of floor area.) He attributes this inflated size to the presence of large house-floor pits. He finds that by deleting the pits from his calculations, the pithouse sizes are no larger than anywhere else in the Mogollon region.

After the Pine Lawn phase there is a progressive decrease in house size in the Pine Lawn Valley (Martin and Rinaldo 1950b). Bullard's calculations based on Wheat's data indicate that there is a decrease of 7 square meters from the Pine Lawn-Georgetown phases to the San Francisco-Three Circle phases (1962:122). Martin hypothesizes that the decrease is due to a change in residential patterns from extended to nuclear family occupancy (Martin and Rinaldo 1950b). As an alternative explanation, Wheat suggests that the larger size and number of floor pits represent a specialized solution to storage problems (1955:42). Bullard on the other hand, suggests that the change corresponds to the adoption of a house type similar to that found in the Mimbres region (1962:122). This author suggests that the change in house size may be related to the use pattern at the site. Activities formerly practiced inside might have moved outside; or the season of occupation or the number of people engaged in certain activities might have changed. Excavation
methods such as the point provenience mapping of artifacts must be employed both inside and outside pithouses to determine the nature of the activities practiced at the site.

Mogollon pithouses tend to be more shallow than Anasazi pithouses. At the SU Site the earlier houses are shallower than the later ones, however, other sites in the study area do not exhibit this trend.

Hearths, plastered, unplastered and cobble-line, are present inside and outside the houses. Their location within the house is variable, i.e., some lie between the center of the room and the entry while others are centrally located.

Interior storage pits are a common feature of the pithouses in the study area. In the Pine Lawn region the occurrence of numerous large storage pits (ranging over one meter in diameter) is common to many Pine Lawn phase houses at the SU site (Martin 1943).

Walls are often plastered or left untreated. Several houses in the study area are wholly or partially lined with masonry, which is a feature common in the Anasazi area (Bullard 1962:151). Only one pithouse was entirely lined with masonry. House No. 7 - Wheatley Ridge site (Rowe 1947) might have functioned in a ceremonial capacity. At House No. 8 - Wheatley Ridge site and Pithouse C - Turkey Foot Ridge site (Martin and Rinaldo 1950a), masonry occurred in patches, as if to reinforce the structure. A ventilator was filled with rubble masonry at Pithouse C. The upper walls of Feature 38 - LA 6083 were set with masonry (Kayser 1972c). All these structures, with the exception of House No. 1, (Wheatley Ridge site) have been assigned a ceremonial function by their investigators. The features characterizing such structures are discussed in a later section.

Among the Anasazi there are a number of distinctive features which characterize their residential units. Bullard finds the following features to be definitive of eastern Anasazi pithouses during the Basketmaker III and Pueblo I periods: an antechamber; a ventilator; a bench which also supported the side poles of a roof; a partition, low wall or ridge, separating the entrance from the rest of the house; a raised clay fireplace coping; a deflector; an ash pit in front of the fireplace; a sipapu; and above-floor storage bins (1962:47). The distribution of these traits corresponds closely with the occurrence of the Anasazi ceramic complex. It is the presence of these traits at most of the pithouses at the Cerro Colorado Site which leads Bullard to believe that the site is affiliated with the eastern Anasazi of this period.

Various other aspects of Basketmaker III architecture at the Cerro Colorado site should be mentioned, so that comparisons with unexcavated sites can be made. Pithouses were oriented most frequently to the south or east, although several faced north and southwest. Most of the houses were circular, oval, or "D" shaped. House size ranged from 9 to 33 square meters with an average of 18 square meters. House depth was variable and seemed to be related to the geological conditions of the site. Walls were plastered or unplastered and stone slabs were frequently employed to strengthen weaknesses in them. The floors of some structures were presumably plastered, for patches of plaster were found in several structures. Sand was spread over many of the floors. The typical four-post roof support was standard in all of the Basketmaker III structures.

The Cerro Colorado site closely resembles pithouse villages located in the region of the Upper Little Colorado to the west and the Chaco region to the north. Similarities exist between the pithouses of this site and those of White Mound, Whitewater, and Shabik'eshee villages, as well as various sites in southwestern Colorado and adjacent parts of Utah (Bullard 1962:47). The pithouses at the Williams site exhibit traits which are both Mogollon and Anasazi in character (Smith, W. 1973).

At LA 4032 (TG & E #103), a Pueblo I site along Carrizo Wash in the Quemado Planning Unit, slab-lined storage rooms, pithouses, and six scattered masonry rooms were reported by Wilson (1972). Pueblo I and transitional Pueblo I-II sites in the Quemado Unit consist of pottery and lithic scatters, small surface pueblos and pithouses with associated jacal or masonry surface structures, and in several instances, slab-lined storage units.

Much of the preceding discussion pertains to the description of the architectural
traits peculiar to, or shared by, the Anasazi and the Mogollon. Such emphasis reflects the interests of the profession in identifying, describing and defining the origins of cultural traits. As the overview develops, it will become apparent that the study area is one where the exchange of architectural traits and pottery types was prevalent. During the pithouse phases the exchange of techniques related to architecture and pottery manufacture appears to have been reciprocal, although as time passes, Anasazi traits predominate.

Various elements of presumed Anasazi affiliation, dating from the Pine Lawn phase onwards, were found in the study area occupied by the Mogollon. At the Luna Junction site, for example, Peckham (1963) reports the presence of a floor ridge and hearth with raised rim. A floor trench (which might represent a foot drum), a clay-rimmed hearth and an oval ash pit were all found at a Pine Lawn phase pithouse at LA 6082 (Kayser 1972c). A southeast antechamber was uncovered in House No. 4 - LA 4986 (Kayser 1972b) and at Feature 56 - LA 6083 (Kayser 1972c), both dating to the Pine Lawn phase. During the Georgetown phase, floor grooves have been recorded for Houses A and Q at Starkweather Village (Nesbitt 1938b). Nesbitt also found a bench which encircled the house, except for a small portion near the entry. A possible bench occurs at Pithouse G - Turkey Foot Ridge site (Martin, Rinaldo, and Antevs 1949). Benches occur at a number of sites of the San Francisco phase, e.g., Pithouses 5A and 2 - Mogollon Village, House Q - Starkweather Ruin, and Pithouses F, J, K, L, M and N - Turkey Foot Ridge. Grooves for a deflector or ladder were present at Pithouse C during this phase at Turkey Foot Ridge. By the Three Circle phase, ventilators and deflectors were present at a number of Mogollon structures. House No. 1-LA 2947 (Peckham, Wendorf, and Ferdon 1956), House No. 6 - Switchback site (Peckham 1957), and Pithouse Y - SU site, contained a ventilator, a clay-lined, collared fireplace, and a deflector. (In the cases of Pithouse Y and House No. 1, the presence of a deflector is inferred.) Pithouse Nos. 2 and 3 - LA 4986 (Kayser 1972b) contained ventilators. A floor drum, antechambers, and a clay-rimmed hearth were also present in No. 2. A possible deflector is present in Pithouse N - Turkey Foot Ridge site; in Pithouse C, a ventilator, entrance partition, and possible deflector were reported. As in the San Francisco phase, benches are a common feature at the Turkey Foot Ridge site; they are noted in Pithouses B, K, L, M, and N. The benches in K, L, M, and N were apparently used during the San Francisco and Three Circle phases. Benches also occur at Luna Village. Floor drums have been found in a number of Three Circle phase houses, including Pithouse No. 2 - LA 4986 (see above) and Pithouse K - Turkey Foot Ridge. Post holes which might have supported deflector slabs were reported for Pithouse N.

**CEREMONIAL STRUCTURES**

As early as the Pine Lawn phase there have occurred some structures, distinctive within a particular village (Martin, Rinaldo, and Antevs 1949). These structures have been referred to as "communal structures," "ceremonial chambers," or "kivas," although their true function is not known (Hughes 1954; Martin, Rinaldo, and Barter 1957). In most cases the characteristics which distinguished these from other pithouses were size, shape, and or the presence of certain features. In the Pine Lawn Valley, the earliest of such structures (House A- SU site and House B - Promontory site) were kidney-shaped (Martin 1940; Martin, Rinaldo, and Antevs 1949). While no such structures have been reported for the Georgetown phase, claim has been made that House 14 - Harris site (Haury 1936) was a ceremonial structure, an assignation based on its larger size.

During the San Francisco phase, many more ceremonial pithouses occur. Houses H and K - Turkey Foot Ridge site and Houses 3, F, 5A, and Q - Starkweather Ruin have been assigned ceremonial status (Martin and Rinaldo 1950; Martin, Rinaldo, and Antevs 1949). While no such structures have been reported for the Georgetown phase, claim has been made that House 14 - Harris site (Haury 1936) was a ceremonial structure, an assignation based on its larger size.
time period and thus are not a definitive feature to be used in identifying ceremonial structures.

By the Three Circle phase, several structures exhibited many of the same features known from modern kivas. Pithouse Y-SU site (Martin and Rinaldo 1947) was rectangular and contained a rectangular firepit with clay coping and ventilator. Feature 38 - LA 6083 (Kayser 1972c) has been classed as a kiva because it was semisubterranean, had a ventilator, a sipapu from which corn pollen was recovered, deflector holes, and exhibited other traits which differentiated it from the rest of the structures at the site. Other structures were considered ceremonial on the basis of criteria mentioned previously; for example, Rowe considered House No. 7, Wheatley Ridge to be a ceremonial house because it was the largest house in the village (1947).

Hughes has argued that "when one structure of a group differs in several respects from all others, the implication is that it served some communal purpose" (1954: 230). Many of these structures which have been called ceremonial appear to differ slightly from the other pithouses in the village and thus there is little to prove their ceremonial status. In order to differentiate one type of pithouse from another, hypotheses and test implications must be devised which enable the identification of house function (Hill 1970).

PALEOENVIRONMENT

Details of the paleoenvironment for the Formative are sketchy and require much more investigation. Within the Pine Lawn region, data from macrobotanical and pollen remains have been employed to study the prehistoric environment. These data are far from complete and are, in some cases, contradictory. As for other portions of the study area, there are no published reports and the paleoenvironment has been inferred from accounts obtained elsewhere on the Colorado Plateau.

Analyses of the available evidence have allowed investigators to argue for and against the occurrence of environmental change in the Pine Lawn Valley region. Cutler's study of the macrobotanical remains from Tularosa Cave indicates that there was a marked reduction in the quantity of cultigens and an increase in the number of wild plant resources during the Georgetown phase (A.D. 500 to A.D. 700), (Martin et al. 1952). Bluhm (1960), after Schulman (1938), has suggested that this change was due to a series of precipitation reductions which took place from A.D. 495 - A.D. 515, A.D. 590 - A.D. 650, and A.D. 690 - A.D. 700. The validity of Schulman's own conclusions can be challenged on two points. First of all, Schulman was aware of neither the subtleties of ring formation nor the complexities of tree-ring analysis (Martin 1963; Fritts 1963, 1965). Secondly, conclusions reached in one area on the basis of dendrochronological information cannot be employed in the paleoclimatic reconstruction of another. Tree-rings are very sensitive indicators of trends which occurred in the particular area where the tree grew. Since Schulman dealt with regions of the Southwest outside of the Pine Lawn Valley, his views can be discounted.

In addition to the fact that the tree-ring data which were used to explain the changing frequencies of plant remains at Tularosa Cave may have been incorrectly interpreted, Schoenwetter's palynological studies of sites in the Pine Lawn, New Mexico and Vernon, Arizona regions indicate that no periods of precipitation decrease occurred. Instead, his data suggest that from a time before A.D. 350 to A.D. 1000, water tables were higher: "winter ground moisture reserves would have been greater at the beginning of the growing season," and "fewer summer rains would have been less destructive" than today (1962:201). The pollen evidence suggests a bi-seasonal precipitation regime in which winter rains were dominant.

A re-examination of the floral remains from Tularosa Cave (Heller 1976) indicates that while there were changes in the frequencies of domesticates and cultigens, use of the chi square test of association did not prove them significant at the 0.05 level. Heller notes, "... the changes in the figures (which are the basis for Martin's and Cutler's comments) may reflect nothing more than normal sampling variation" (1976:55). Finally, Kaplan's data suggest no decrease or increase in wild plants at Cordova Cave during this time period. In
fact, he found an increase in the frequency of both cultigens and wild resources through time (1963: Table 1).

SUBSISTENCE

Most of our knowledge of human subsistence patterns for the Formative period comes from Tularosa and Cordova Caves where the materials collected represent one of the most detailed assemblages of floral and faunal specimens of the Mogollon culture (Heller 1976; Martin et al. 1952; Kaplan 1963). Based on these remains, it appears that the subsistence practices of the Mogollon included the raising of cultigens and the procurement of wild plants and animals. The evidence indicates that the caves' inhabitants exploited a wide range of locally available wild plants and that they exercised great versatility in their use. At both caves, the number of wild species exceeded those of the domesticates or cultivated plants. Unfortunately, the manner in which these remains were reported makes it difficult to determine exactly what wild plants were procured during this period. In his discussion of the plant remains from Tularosa Cave, Cutler neither identifies their provenience nor discusses their use (Martin et al. 1952:478). While Cutler provides a detailed inventory of the range of plants for the entire Mogollon occupation of the cave, it is not helpful in dealing with specific periods of time, nor does it allow us to test possible hypotheses concerning climatic or demographic changes (Bluhm 1960; Martin et al. 1952). Since Cutler's description (Martin et al. 1952) was a "preliminary" survey of the plant remains, it is hoped that a final and more detailed one eventually will be published.

By identifying the provenience and possible use of certain "selected" plant materials, as well as the part of the plant recovered, Kaplan, in his archeoethnobotanical analysis of Cordova Cave (1963), provides more information than Cutler. In both texts, however, the usefulness of the analysis for understanding the subsistence patterns of the Mogollon during this time period is limited.

A list of all of the wild plants identified by Cutler (Martin et al. 1952) and Kaplan (1963) appears in Appendix II. The uses of these plants by Southwestern Indians can be obtained from the following sources: Castetter 1935; Castetter, Bell, and Grove 1938; and Whiting, 1939.

Martin and Rinaldo (1947, 1950a) have suggested that due to the scarcity of projectile points, their decreasing frequency through time, and the variability which they exhibit at a number of sites, hunting was not the primary means of acquiring food during the Mogollon occupation of the Pine Lawn Valley. While this was probably true, faunal resources nevertheless constituted a significant portion of the diet of the inhabitants of Tularosa Cave, from the Pine Lawn through the Three Circle phases. Throughout these and later occupations, the dominant faunal food sources at the cave consisted of artiodactyls and lagomorphs (Heller 1976). Included in the former category were various species of deer (Odocoileus sp.), antelope (Antilocapra sp.), mountain sheep (Ovis sp.), and members of the elk-bison group (Cervus sp. - Bison sp.). While it may be argued that a change in hunting patterns took place during the Georgetown phase with the appearance of elk-bison remains, a chi-square test disproved any such association (ibid.:55). Remains belonging to the order Lagomorpha were an unidentified species of cottontail (Sylvilagus sp.) and jack rabbit (Lepus sp.).

Among the other species of fauna found here, turkey bones were present throughout the strata at Tularosa Cave. Heller suggests that their first appearance in the archeological record was at Tularosa Cave, 300 B.C. ±200 years to 150 B.C. (Heller 1976:61).

It is not known whether turkey was utilized as a food source or raised for its feathers. Burial remains show that their feathers were incorporated in blankets, jackets, and other coverings. At Tularosa Cave, an infant was buried with a feather jacket (Martin et al. 1952). Heller suggests that turkey was eaten at Tularosa Cave. While turkey is reported in the faunal assemblages of sites from this and later occupations (see subsistence sections in later chapters), we are not certain how it was being utilized. An examination of the bone samples from these other sites might clarify the situation.

Another unresolved issue is that of domestication. Reed (1951) has argued
that the Mogollon did not domesticate or keep turkeys. Hough (1914), however, believed that turkeys were both kept and domesticated at Tularosa Cave. He based this conclusion on the recovery of the remains of an adult, poult, a number of desiccated eggs, a quantity of droppings, and indications that portions of the cave had been used as turkey pens. Schorger's analysis (in Heller 1976:60) of the stomach contents (corn and beans) of one of the desiccated examples recovered by Hough, seems to support this conclusion. The provenience of these specimens is not known.

Fauna from LA 5407, an early pithouse site along Largo Creek (Kayser 1973c), correspond to those identified from Tularosa Cave. The faunal assemblage at LA 5407 consists of cottontail, jack rabbit, deer, antelope, bison, lynx, pocket gopher, and raven (Heller 1976). (The generic names for these species are identical to those given in The Archaic.) The economic importance of the latter two is unknown, although the pocket gopher may represent post-occupational deposition. The religious significance of the raven has been mentioned earlier. Specimens from the pithouse levels at O Block Cave yielded similar fauna (Martin et al. 1952:155, Fig. 79). It is interesting to note that the remains from LA 5407 resemble those from cave sites (e.g., O Block and Tularosa). Unfortunately the other available faunal remains from this period could only be identified as those of a large mammal (Heller 1976) from LA 5401, a campsite along Agua Fria Creek.

As we have seen, cultigens constituted part of the prehistoric diet as early as 3000 B.C. in portions of the study area (Dick 1952, 1954, 1965; Manglesdorf and Smith 1949; Smith, C.F. 1950), but it appears that it was not until the beginning of the Tularosa phase (ca. A.D. 1125) that domesticated plants became a primary part of the Mogollon diet (Rice 1975). However, it is during the Formative period that domesticates begin to appear consistently in the archeological record and major changes occur in their morphology and genetic make-up. A brief description of the evolution of domesticates in the study area is provided below.

Corn appears in the earliest or preceramic levels (300 B.C.) at Tularosa and Cordova Caves (Martin et al. 1952; Kaplan 1963). The variety - early Chapalote - is first recorded in the Southwest between 1000 B.C. and 500 B.C. at Bat Cave (Dick 1965:100). (See The Archaic for a discussion of the forms of corn.) Early Chapalote is the product of a pod/popcorn variety and a type of maize which contained large amounts of teosinte germplasm. This hybrid or trisaccoid corn had larger cobs and fewer rows than the pre-Chapalote.

Following the development of the Chapalote varieties, many regional ones emerged. At around A.D. 700, or during the San Francisco phase, a new variety appeared in the strata at Tularosa Cave. This corn was characterized by a decrease in the number of rows per cob from a mode of 12 rows per cob in the preceramic phase to a mode of 8 in the San Francisco (Cutler in Martin et al. 1952). This corn represents the intermixture of Harinoso de Ocho, an eight-rowed flour corn from Mexico and the Chapalote varieties of the study area. The resulting hybrid is frequently called Pima-Papago, "Basketmaker corn," Mais Blanco de Sonora, or Onaveno (Winter 1973). It appears to have been a more vigorous plant than its predecessors and more adaptable to marginal areas (Martin and Plog 1973:277).

The common kidney bean (Phaseolus vulgaris), present throughout the pithouse period at Tularosa Cave, appeared for the first time in preceramic levels there and at Bat Cave. No other species of bean was recovered from Tularosa Cave (Cutler, in Martin et al. 1952:471).

The earliest evidence of squash or pumpkin (Cucurbita pepo) is from Bat Cave where it was found in Chiricahua levels and may date to 3000 B.C. (Dick 1965). It appears in preceramic levels at Tularosa Cave and is present throughout the pithouse period. Originally centered in the Gila-Colorado drainages, Cucurbita pepo spread as far north as Flagstaff by A.D. 1000 (ibid.).

The earliest evidence of sunflower (Helianthus sp.) remains are present in almost all levels of Tularosa and Cordova Caves. At Tularosa Cave, they are the first sunflower seed-
heads recovered from an archeological context in the Southwest (Martin et al. 1952:475).

The floral remains from Y Canyon and O Block Caves have not been analyzed (Martin, Rinaldo, and Bluhm 1954).

It is interesting to note that while new forms of cultigens appeared during this time period, the resource base differed little from that of the earlier Archaic periods (see The Archaic).

MATERIAL CULTURE

Pottery

Pottery first appears during the Pine Lawn phase. This pottery is produced in an oxidizing atmosphere which produces a brown ware. An earlier unfired vegetal-tempered ware precedes or is contemporaneous with the early representatives of this pottery (Martin et al. 1952:70-72; Kayser 1973c:14).

The following types occur in the study area: Alma Plain, Alma Rough, and San Francisco Red. Alma Rough is an unpolished, coarser, and thicker version of Alma Plain. The distinctiveness of Alma Rough as a separate type is questionable (Bussey personal communication-1978). It might be a coarser, less refined representative in the range of variation which characterizes Alma Plain.

The Saliz, a variant of San Francisco Red, occurs in the Pine Lawn Valley. Several attributes distinguish this type from San Francisco Red: lack of finger-dented surfaces, deeper rose color, rarity of marks of polishing tool, coarser paste, less highly polished and less lustrous surface, globular jar and narrow-mouthed jar forms (Martin 1943).

During the Georgetown phase, Alma Rough decreases in popularity and is replaced by Alma Plain (Martin, Rinaldo, and Antevs 1949). In addition, variants of Alma Plain e.g., Alma Incised, Alma Scored, Alma Punched, and Alma Neck-banded, appear. Nesbitt (1938b) and Wesley (1960) believe that Alma Neck-banded is diagnostic of the San Francisco phase. Breternitz (1966:68) finds Alma Neck-banded to appear at A.D. 665-700. Reserve Smudged appears infrequently during the Georgetown phase

(Martin et al. 1952); smudged wares are thought to occur in substantial amounts in the San Francisco phase (Martin et al. 1956:189). As a type Reserve Smudged has not been described in detail. Martin and Rinaldo (1950a:359-360) believe it to be an early variant or antecedent of NESBITT'S Reserve Plain, but it lacks the fillet rim associated with this type.

The following painted wares appear for the first time during the San Francisco phase: San Lorenzo Red-on-brown, Mogollon Red-on-brown, and Three Circle Red-on-white (Wheat 1955). The last type is distinguished by the addition of a white slip to the body of the vessel. Three Circle Neck-corrugated also occurs for the first time. While not a well-dated pottery type, Breternitz (1966:97) believes it to occur around A.D. 750 or 775 along with Three Circle Red-on-white.

The red-on-brown wares disappear by the Three Circle phase. Three Circle Red-on-white reaches its zenith during the early portion of the phase and declines at the end of it; black-on-white wares appear, e.g., Mimbres Bold Face Black-on-white.

Reserve Black-on-white appears during the later part of the Three Circle phase, but does not become popular until the following phase. Breternitz (1966:90) places its appearance at A.D. 940. Reserve Smudged increases in frequency and rivals San Francisco Red in popularity. Reserve Fillet Rim occurs for the first time (Martin and Rinaldo 1950a; Martin, Rinaldo, and Antevs 1949). Reserve Fillet Rim is probably the antecedent of Tularosa Fillet Rim but has a plain corrugated or banded fillet rather than the indented corrugated fillet rim of the latter. The period is characterized by an increase in the frequency of painted, textured, and neck-banded wares and a decrease of plain wares.

Brown wares (Forestdale Smudged, Woodruff Smudged, Woodruff Red, etc.) from other parts of the Mogollon area occur throughout all periods.

In the Anasazi area, pottery does not appear until Basketmaker III times when both plain and painted wares originate. Whereas the Mogollon wares were manufactured in an oxidizing atmosphere, Anasazi wares were produced in a reducing atmosphere. In the Quemado, Malpais, and
Ladron Planning Units, pottery consists of Lino Gray, Lino Black-on-gray and La Plata Black-on-white in that order. Breternitz (1966:82) places the beginning of all three types in the 570's. At the Cerro Colorado site, Bullard notes the presence of a fugitive red wash on Lino Gray (1962:10). A red-slipped gray ware termed Cerro Colorado Red and a type with both Lino and Alma characteristics called Cerro Colorado Plain occur (Wasley 1959).

During the period corresponding to late Basketmaker III-early Pueblo I times, an enigmatic pottery type, San Marcial Black-on-white, appears in the study area (Mera 1935). This type is found in the Ladron and Stallion Planning Units; Wilson has noted its presence in the Quemado Planning Unit and as far north as Tohatchi, New Mexico (personal communication-1978). Thus far, this pottery type has always been found in association with brown wares. The type is not easy to define since it appears in both a slipped and unslipped form, and doubt has been cast recently as to its validity as a discrete type (K. Laumbach, personal communication-1978). Its appearance along the Rio Grande at this time suggests several questions about its origins since it resembles late Basketmaker types in finish and treatment of design (Mera 1935:25).

During the Pueblo I period, Lino Gray continues to be manufactured along with two new variations called Kana Gray and Kana Neck-banded. The appearance of the former is tree-ring dated at A.D. 760 (Breternitz 1966:79). The latter has traditionally been considered diagnostic of this period. Painted wares become more elaborate in style, although Basketmaker III styles persist. In the study area, White Mound Black-on-white and a later type called Kiatuthlanna Black-on-white occur. Neither types have been well dated (Breternitz 1966:102, 80). Red Mesa Black-on-white appears toward the end of Pueblo I.

During both Basketmaker III and Pueblo I times, Mogollon brown wares constitute a substantial proportion of the pottery present at sites in the Plateau or northern sections of the study area. However, the admixtures of gray and brown wares at this time is not limited to the study area. Much of west-central New Mexico, including the Acoma culture province (Dittert 1959) and sites in the vicinity of Albuquerque exhibit this admixture (Cordell 1978; J.P. Wilson, personal communication-1978).

While much time has been invested in an attempt to discover the origins of pottery manufacture and its associated techniques (Rinaldo 1941; Wheat 1955), few studies of the mechanisms responsible for the distribution of pottery and its attributes has been undertaken. An exception is S. Plog's dissertation (1977). It is advised that models pertaining to that subject be developed and that large-scale areal surveys be designed with these and related questions in mind.

Ground and Chipped Stone

The literature suggests that stylistically, functionally, and technologically, there is little variation among the ground stone types found in the study area. The most obvious exception is the raw material used, which frequently reflects the availability of certain raw materials in the vicinity of the site.

Four types of metates (basin, slab, full-trough, and trough with-one-end-open) occur in varying frequencies in each of the time periods considered in this occupation. Basin metates and their associated round and oval manos decrease in frequency from the Pine Lawn phase to later periods, although basin metates persisted in limited numbers as late as Pueblo II-Pueblo III in the areas surveyed by Danson (1957:94, Table 20). The slab metate is in use throughout the entire occupation of the Pine Lawn region (Martin and Rinaldo 1950b:562, Fig. 221) and is most popular during the Pueblo II-Pueblo III period in Danson's area.

The trough metate with-one-end-open increases until the San Francisco and then decreases slightly in frequency through time in the Pine Lawn area. It occurs as late as the Reserve phase in this region, and is most popular in the Pueblo II-Pueblo III period in Danson's area. According to Martin et al. (1952:111) "the Anasazi variety can be differentiated from the Mogollon variety by several characteristics such as a flatter shelf at the closed end, and a more rectangular straight-sided trough." Oblong manos were employed with this type of metate. A flat shelf
which serves as a mano rest is present on several metates from San Francisco and Three Circle phase occupations at the Turkey Foot Ridge site (Martin and Rinaldo 1950a:318), and may occur in other portions of the study area. The full-trough metate occurs for the first time during the Three Circle phase occupation in the Pine Lawn region and is most predominant during Pueblo II-Pueblo III times in Danson's area and the Reserve and Tularosa phases in the Gila National Forest. There is a corresponding increase in the types of manos employed with the other types of metates. (For more information on trends in the core Anasazi area, see McGregor, J.C. 1974.)

Concurrent with the changes in types and frequencies of metates and manos is the change in popularity of mortars, pestles, and plano-convex choppers during Three Circle times in the Pine Lawn region. Martin and Rinaldo (1950a, 1950b) would like to relate such occurrences, and the simultaneous introduction of the hafted axe, to changes in subsistence from a predominantly seed-gathering economy to an agricultural economy. As they admit, these conclusions are tentative and the correlation lacks proof (ibid. 1950b). In addition, these trends have been observed for the Pine Lawn region only, and may reflect a localized pattern.

In his survey, which includes portions of the study area discussed here, Danson observed that a number of different point styles occurred during this and later periods (1957:95). Leaf-shaped and triangular points, with or without lateral side notches, and, with or without basal notches, were present. In their excavation of sites in the Pine Lawn region, Martin, Rinaldo, and Antevs (1949) noted that diagonally notched, expanding stem, and leaf-shaped point types were more frequent during the Georgetown and San Francisco phases than during the Pine Lawn phase where they co-occurred with a laterally-notched point.

Another trend characteristic of the projectile point assemblage of the study region is their decrease in size through time. The replacement of the atlatl by the bow and arrow is responsible for this and for the corresponding increase of triangular lateral-notched projectile points and the decrease of the larger diagonal ones (Martin, Rinaldo, and Barter 1957).

The significance of the multiplicity of point types of the post-Archaic periods in the study area has received little attention. While an explanation may lie in the technological requirements imposed by the mechanics of projection, stylistic and functional causes should not be dismissed. It is recommended that more study be devoted to the explanation of projectile point variability during these and other periods.

The remaining portion of the chipped stone assemblage included scrapers, drills, and choppers which closely resemble those of the Archaic period. The manufacture of these items consisted mainly of flake detachment and the application of some facial and marginal retouch, both by the percussion technique. Rhyolite, basalt, and other igneous materials were commonly modified in this manner. The manufacture of points, knives, and scrapers from finer-grained materials such as quartzite and cryptocrystalline silicates was more complex and included such techniques as thinning and pressure flaking.

The recognition of edge-damage and patterns of utilization of raw materials is a major focus of concern among students of lithic technology. While a few studies have examined the effects of utilization on igneous materials (Bucy 1974), most have concentrated on cryptocrystalline silicates; these studies include assumptions which make them difficult to use (e.g., Tringham et al. 1974). A very fruitful study would be the examination of utilization patterns by experimentation on the materials, especially igneous types, from the study area. The results could articulate well with existing data and could be used in the testing of models related to subsistence and settlement activities.

In the Gila Forest, other elements of the material culture during the Formative are: notched bone awls, pipes, worked shell, hammerstones, abrading stones, and stone bowls. The notched bone awl, incidentally, is a distinctive Mogollon trait (Martin and Rinaldo 1951). Many of the bone implements exhibit striae, grooves, scratches, and other indications of utilization.

**ASSESSMENT**

Some of the most significant events of the
Formative period in the Mogollon area include: the appearance of pithouses as a concomitant mode of habitation; the change in pithouse design from round to rectangular; the construction of ceremonial rooms or kivas; an increase through time in number of houses per village and in the number of villages; the gradual, steady adoption of corn, beans, and squash; the cultivation of a new strain of corn; the change in settlement location; the development of pottery; and the addition of the bow and arrow. Throughout this chapter we have attempted to demonstrate the details of these occurrences as well as prove or disprove previously held notions about them.

In the northern part of the study area, we have seen that above-ground architecture developed to a greater extent earlier than in the Mogollon area (see Pueblo II), that pottery manufacture and design evolved differently, and that settlement patterns, village composition, and pit house architectural styles varied considerably. We were unable to demonstrate why two traditions (the Mogollon and the Anasazi) emerged and why the traits of each culture overlap in the study area. We have suggested elsewhere that exchange, trade, intermarriage, or population movements explain such phenomena. While models relating to these mechanisms have been formulated elsewhere in the Southwest (Tuggle 1970; Wiley 1971; Whittlesey 1974; Plog 1974; Leone 1968), none has been developed in the study area. Although data are far from complete, it is obvious that more data are needed to deal with these and related problems in the study area.

This study has demonstrated that we know considerably more about the western portion of the study area than the eastern. Many of the questions which have been raised reflect the lack of systematic investigation undertaken in the eastern half. The investigations of Danson (1957), Winkler and Davis (1961), Mera (1933, 1943), and Yeo (n.d.a, b) are fragmentary. While they provide some data pertaining to demographic trends and settlement patterns, their usefulness for regional resource management or for cultural and behavioral reconstruction is severely limited. The implementation of large-scale intensive surveys in the planning units of the Cibola Forest and in the BLM’s Quemado and Ladron Planning Units and the resulting data, should facilitate such reconstructions.

Another serious deficiency in our knowledge of the study area pertains to our understanding of the paleoenvironment during this and later periods. Conscientious attention must be paid to securing soil, floral, and faunal data during excavation and survey. As has been demonstrated, human activities are strongly influenced by environmental events and a study of these events is crucial to the identification and explanation of human adaptation.
INTRODUCTION

The Pueblo II period dates from approximately A.D. 900-1000 to A.D. 1100-1150. In the Gila Forest this time period is comprised of the Reserve and Apache Creek phases. In the Pine Lawn region, the Reserve phase lasts from A.D. 1000 to A.D. 1100 (Bluhm 1960), while in the Tularosa River area and along its drainages, the Apache Creek phase extends from A.D. 1075 to A.D. 1150 (Kayser 1972a, b, c). The Apache Creek phase is not well understood and, because occupations of this time period are found in association with Tularosa Black-on-white and most of the other pottery types of the Tularosa phase, it is discussed in Pueblo III and IV. In the remaining portion of the study area the period from A.D. 900 to A.D. 1100 is referred to as the Pueblo II period.

While the foregoing discussion has focused on space-time systematics, it is necessary at this point to examine the cultural divisions within the study area. Beginning at approximately A.D. 900 to 1000, a differentiation appeared in the Gila Forest in the expression of certain cultural traits within the Mogollon cultural complex. As we have pointed out in The Formative, the Mogollon culture was always characterized by diversity. The variability appears of sufficient magnitude that two branches—the Alpine and the Mimbres—can be distinguished (Danson 1957). The Alpine branch is referred to as the Cibola branch by Wheat (1955).

The Mimbres branch occupied the Gila and Mimbres drainages and most portions of the San Francisco River. Its northern boundary adjoins that of the Tularosa and San Francisco Rivers. Following Wheat (1955), Neely (n.d.:7) has proposed the division of the Mimbres branch into two groups at about A.D. 1000. He envisions this "Pine Lawn" branch to be located north of an imaginary east-west line running about 10 miles north of Glenwood, New Mexico. For a map of the boundaries of the Mogollon culture area, see Wheat 1955:3, Fig. 1 or Danson 1957:98, Fig. 10.

The boundaries of the Alpine branch are less well known than those of the Mimbres. Its western boundary, in eastern Arizona, appears to be contiguous with that of the Forestdale branch of the Mogollon. (Consult F. Plog's overview "The Cultural Resources of the Little Colorado Planning Unit," [F. Plog, personal communication-1978].) As for the eastern boundary, Danson suggests that it might coincide with the Continental Divide (1957:101). The northern boundary is equally ambiguous. According to Danson, the border between the Alpine branch of the Mogollon and the Cibola division of the Anasazi "can be said to be the northern edge of the central mountain chain which runs eastward from the White Mountains of Arizona into New Mexico" (ibid.). For a map of the boundaries of the Alpine and Cibola expressions, see Danson 1957:98, Fig. 10.

Members of the Jornada branch of the Mogollon lived along the Rio Grande at this time (Lehmer 1948). Regional variants of this group have been delineated. Mera (1943) has designated the northwest sector of the area occupied by the Jornada as the Socorro district or the Socorro "expression." In the study area, this unit corresponds with the Stallion Planning Unit. The Socorro "expression" represents an adaptation to a mesa and riverine environment (Marshall 1973).

The earliest manifestation of the Jornada branch in this area is known as the San Marcial phase. While exact dates are unavailable, it coincides roughly with the first appearance of San Marcial Black-on-white during the late Basketmaker III-Pueblo I period (see The Formative). The succeeding phases are the Early and Late Socorro (Marshall 1973); these correspond with the Pueblo II and Pueblo III periods elsewhere in the study area.

In addition to sharing traits with the Mogollon area to the south, the archaeological remains in the Quemado Planning Unit exhibit many of the same attributes as those of the Cibola branch of the Anasazi. We will refrain from comparing and contrasting the details of the sites in this area with those in the core-Cibola area. The Zuni Archaeological Center is currently gathering data for an overview which will encompass the Quemado Planning
Unit and that deal with such issues (T. J. Ferguson, personal communication-1978).

In Catron County, east of the Continental Divide, the northern portion of the study area lies in the southern-most extension of the Acoma culture province (Dittert 1959; Dittert and Ruppe 1951, 1952; Ruppe and Dittert 1953). Results of the Acoma Land Claims Survey conducted for the Acoma tribe indicate that the territory encompassed by the Acoma culture province includes land to which the tribe has legitimate historical claim. The cultural sequence developed for the Acoma culture province relates to the development of the modern pueblo of Acoma (Dittert 1959:34).

The Acoma culture province is a hexagonal unit consisting of six culturally-related regions, two of which overlap the study area on lands administered by the Bureau of Land Management. As depicted on Dittert's map of the Acoma cultural province (Dittert 1959:11, Fig. 1), region 2 consists of the area west of Cebolleta Mesa to the Continental Divide in Valencia County, and extends south into Catron County. In the study area, the western boundary of the region (and of the province) corresponds with the Continental Divide in the vicinity of Pietown, New Mexico. This region shares its eastern border with region 3, which is a strip of land about 12 miles wide extending along the north side of Alamocita Creek (Dittert 1959:33). The Malpais Planning Unit and portions of Ladron Planning Unit lie in the Acoma culture province.

During various periods the Acoma culture province exhibited distinctive characteristics, while at other times, it shared a series of cultural similarities with neighboring regions, particularly in the Cibola area. Prior to A.D. 950, the developments discussed for the Ouemado, Malpais, and Ladron Planning Units follow a similar trajectory. Apparently about A.D. 950 a division took place along the Continental Divide between the Acoma culture province and the Cibola region (Dittert 1959:554). At the same time, the boundary of the province at Alamocita Creek became apparent.

Although the cultural developments which transpired within those regions lying in the study area are vaguely understood, it is believed that they generally reflect similar developments which took place in the Cebolleta Mesa region of the Acoma culture province. It is recommended that future surveyors working in these regions compare their data with those of the Cebolleta Mesa region.

**HISTORY OF WORK IN THE STUDY AREA**

The Pueblo II period has received detailed treatment in the literature because the remains are numerous and easily identifiable. Most of the surveys mentioned in previous chapters have located such sites; for earlier periods, most of our data are derived from studies conducted in the Gila National Forest. The reader is referred to The Formative, History of Work in the Study Area. In addition to previously cited undertakings, other investigations have recorded sites of this time period. They are reported in publications by the following Alexander (1966); Duff (1897); Fuller (1972); Kayser and Dart (1977); Levine and Pearson (1972a, b); Pearson, Levine, and Lindsay (1972); Wilson (1972); and Wiseman and Kayser (1972).

Excavation of sites dating to this time period has been extensive in the study area. The following sites in which there are occupations dating from approximately A.D. 1000-1100 have been excavated in the Gila National Forest.

<table>
<thead>
<tr>
<th>Site</th>
<th>Author</th>
<th>Date of Publication</th>
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<tbody>
<tr>
<td>Sawmill Site</td>
<td>Bluhm</td>
<td>1957</td>
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<tr>
<td>Oak Springs Pueblo</td>
<td>Martin, Rinaldo, and Antevs</td>
<td>1949</td>
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<tr>
<td>Wet Leggett Pueblo, Three Pines Pueblo and South Leggett Pueblo</td>
<td>Martin and Rinaldo</td>
<td>1950b</td>
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<td>Hillside Pueblo</td>
<td>Peckham</td>
<td>1958</td>
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<tr>
<td>Switchback Site</td>
<td>Peckham</td>
<td>1957</td>
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The Williams Site, located seven miles south of Ouemado, New Mexico, lies 50 meters north of the boundary of the Gila National Forest (Smith, W. 1973:1).

In the Ouemado Planning Unit, the Peabody Museum-Upper Gila Expedition located several Pueblo II sites (Danson 1950, 1957; Smith, W. 1950, 1951; Brew and Danson 1948). The Peabody Museum excavated Sites 188, 601, and 494 located on Mariana Mesa (Smith, W. 1950; McGimsey 1951, 1957, personal communication-1978). Other surveys conducted in the unit have located sites of this time period (Wilson 1972; Hammack 1964; Honea and Benham 1963). With the exception of Douglas Fischer's excavations on his ranch land located near Quemado, New Mexico (personal communication-1978), there have been no other officially excavated Pueblo II sites in this area. Wilson reports that many sites in the Unit, particularly in the area of Carrizo Creek, have been pothunted (personal communication-1978).

While no Pueblo II sites have been officially excavated in the Cibola National Forest, sites of this time period have been reported from the Bear, Datil, and Gallinas ranges (Danson 1950, 1957; Yates and Plettenberg 1977; Dunham, personal communication-1978; Museum of New Mexico n.d.; Cibola National Forest n.d.; Winkler and Davis 1961). Yeo's surveys in the southern portion of the San Mateo range have indicated sites dating to this time period in San Mateo Canyon and along Alamosa Creek (n.d.a).

Several surveys conducted in the Ladron Planning Unit (Winkler and Davis 1961; A. H. Warren, personal communication-1978; Danson 1957) have reported the presence of Pueblo II sites. Work has not been extensive or formal in this unit. Consequently, while there may be more sites than we realize, they remain unreported. Since only a small portion of the Malpais Planning Unit lies in the study area, Wiseman's report (1974) should be consulted for a review of the work conducted here. In the Stallion Planning Unit, Yeo's work (n.d.a, b) and the Bureau of Land Management survey of the Stallion Planning Unit are the major sources of information for sites in this area. Finally, for the record of all sites recorded in the Socorro BLM District, Marshall (1976) should be consulted.

SITE LOCATION

During the Reserve phase, two trends in site location are apparent. First, there is extensive expansion into areas previously unoccupied or sparsely occupied. Second, sites are located on lower landforms than during the previous pithouse stages, i.e., a continuation of a trend first observed for the Three Circle phase. Sites are located predominantly on terraces or benches above major and minor drainages and basins (Pluhm 1960; Danson 1957; Martin and Rinaldo 1950b; Gila National Forest n.d.). In addition, sites have been noted on low-lying mesas (e.g., the Sawmill site, Pluhm 1957), on steep-sided hills (e.g., the Hillside site [Peckham 1958]), and on valley floors, and in meadows (Gila National Forest n.d.), and around the margins of cienagas (ibid.).

Site locations in the Cibola Forest exhibit the same patterns observed in the Cila Forest (Danson 1957; P. Dunham, personal communication-1978; Whiteaker 1976).
Habitation sites are located on ridges, slopes, and terraces which overlook drainages and basins. A few limited-activity sites have been noted on mesa tops (J. Todd, personal communication-1978; Yates and Plettenberg 1977), overhangs, and valley bottoms (Museum of New Mexico n.d.).

In the Oquendo Planning Unit site location and the landforms upon which sites are situated differ little from earlier periods. Pueblo II sites have been noted on ridges, slopes, and knolls along Carrizo and Largo Creeks and their drainages, and along the drainages in the vicinity of Mariana Mesa (Wilson 1972; Honea and Benham 1963; McGinsey 1951, 1957; Danson 1957; Bullard 1962). Danson notes that "every one of the many ridges that finger down from the sandy sides of Mariana Mesa had at least one site and many had half a dozen or more sites on them" (1957:70). Bullard notes that Pueblo II sites were to be found almost "everywhere along large and medium sized valleys" (1962:7). They are especially numerous and dense along "the tributaries of French's arroyo and the Nations Draw and around the foot of Mariana Mesa" (Bullard 1962:7). In the North Plains area, Pueblo II sites are located on low sandy ridges overlooking arroyos (Danson, 1957:67).

There is continuity in site location from earlier periods in the Stallion Planning Unit also. Pueblo II sites are located on ridges, terraces, and gravel benches above the Rio Grande and its tributaries (J. P. Wilson, personal communication-1978; Yeo n.d.a; Marshall 1976).

In the Ladron Planning Unit, Pueblo II occupations have been recorded on benches above the Rio Salado (A. H. Warren, personal communication-1978) and on its floodplain (Vinkler and Davis 1961). A few Pueblo II pottery scatters occur on the Plains of San Augustin, but these represent ephemeral occupations of the Plains (Bussey and Beckett 1974; Hurt and McKnight 1949).

In the Gila and Cibola Forests, Reserve phase and Pueblo II sites are located in the Upper Sonoran and Transitional ecozones; however, it appears that greatest site density occurs in the ecotone between them. Within the portions of the study area lying on Bureau of Land Management lands, Pueblo II sites are located primarily in the Upper Sonoran ecozone. Those sites located in the Stallion Planning Unit occur in the Lower Sonoran ecozone.

Most investigators cite proximity to water and arable land as critical factors in site location during this time period (Bluhm 1960; Danson 1957). In the northern Mimbres drainage south of the study area, Graybill (1975) believes that available soil moisture was the most important determinant of site location at this time. Here, and in the Pine Lawn region, shifts in site location and expansion in the range of settlements from earlier periods are considered indications of an increasing dependence on agriculture (Graybill 1975; Bluhm 1960). Why did site locations change in the montane regions of the study area, but remain at the same or similar loci in other portions of the study area?

DEMOGRAPHIC TRENDS

During the Reserve and Pueblo II periods, site density is greater than for any of the preceding or succeeding occupations in the study area. In some areas, however, occupation during this and other periods is sparse. The Driveway Planning Unit (Hurt and McKnight 1949) and certain portions of the Datil Mountains (Tainter 1977) are characterized by various environmental features which made habitation untenable. Pottery scatters have been reported from these areas indicating that they were used as corridors for travel or resource-procurement at this time.

While site density is great, its extent cannot always be determined due to an absence of data from controlled, intensive surveys or true random samples from most portions of the study area. Even the survey data cited by Bluhm (1960), believed to be some of the best population data for the Southwest, are woefully inaccurate. Recent surveys conducted in the Gila National Forest indicate that the data Bluhm employed underestimate and thus do not reflect accurately the site density in such areas as the Wet Leggett drainage (Gila National Forest n.d.). The results of the 10% sample of the Stallion Planning Unit will be especially helpful in the determination of Pueblo II site location.
and density in that portion of the study area.

While site density is high for this period, these occupations spanned at least 200 years and did not occur simultaneously. Study of habitation patterns among modern Indians might help in determining the rates at which prehistoric pueblos were abandoned and new ones constructed.

ARCHITECTURE

One-story above-ground habitation structures appear at the same time in the Reserve phase in the Gila National Forest as they do in the Mimbres drainage to the south. As we have noted in The Formative, however, above-ground structures existed occasionally during earlier periods, but their exact function as habitation units is unknown.

The structures of the Reserve phase consist of contiguous rooms arranged in an "L" or linear formation. In the Pine Lawn region, the number of rooms per unit varies from 1-12, with a mean of 5 (Bluhm 1960:541); this estimation is based on limited survey data. The largest Reserve phase pueblo reported for the Gila National Forest thus far is a 30-room structure located about 10 miles southeast of Reserve, New Mexico (Peckham 1958). The sites with approximately 1-3 rooms are usually referred to as field houses, although their true function remains unexplored. For a discussion of small sites such as these consult Ward (1978).

According to several authors, obvious architectural differences exist between sites in various areas during the Reserve phase (Peckham 1958; Wendorf 1956a). The sites in the Pine Lawn region are variable in orientation, room shape, and structure (Bluhm 1960). Rooms were built unsystematically. Peckham (1958) suggests that convenience determined where and how rooms were added, with the exception of Oak Springs Pueblo which seems to have been built according to a preconceived floor plan.

The sites in the San Francisco and Tularosa Valleys are more compact in structure and uniform in detail than the ones in the Pine Lawn Valley. Rooms are generally smaller and contain a number of identically-placed floor features. Although Schroeder and Wendorf (1954) conclude otherwise, Peckham (1958) feels they are systematically placed and exhibit a fairly standardized orientation. Pueblos are smaller also, averaging 30 square meters of floor space, while in the Pine Lawn Valley, Reserve phase sites occupy a mean area of 62 square meters (Peckham 1958:93). The difference in size may be a function of the unequal size of the population of rooms considered in the computations.

Although jacal rooms in association with masonry structures are present at sites elsewhere in the study area (see below), only one, Three Pines Pueblo, has been recorded for the Gila Forest (Martin and Rinaldo 1950b).

Masonry styles, consisting of poorly-modified or unworked river cobbles of assorted sizes set in a number of ways, varied within and between pueblos. At the South Leggett Pueblo (Martin and Rinaldo 1950a:440), two styles were common: (1) a wall form constructed of randomly-set boulders joined by mud mortar; and (2) a wall composed of alternating even courses of thin stone slabs and very large boulders with their flat sides out. It has been suggested that such variability reflected experimentation in building styles (Martin and Rinaldo 1950b).

In the Gallinas Mountains (Cibola National Forest), Pueblo II structures resemble those of the Gila Forest in shape and structure (Danson 1957; Winkler and Davis 1961). Danson indicates that buildings ranged in size from 4 to 12 rooms, but Pueblo II-Pueblo III pueblos varied from 6 to 50 rooms (1957:77). During the Pueblo II period, structures were built of boulder masonry, but during Pueblo II-Pueblo III occupations, surface remains indicate the use of coursed sandstone or shaped volcanic rock for construction (Danson 1957:77; Winkler and Davis 1961; Whiteaker 1976). It is difficult to say whether differences between the architecture of Gila and Cibola Forests reflect cultural preferences or the availability of certain building materials. To the north, in the Cebolleta Mesa area, Dittert and Ruppe (1951) believe there is a correlation between the type of stone used in a site and that found in the area. Jacal rooms (or what seem to be such structures)
appears at some of the Cibola Forest sites (Danson 1957).

Survey data from various portions of the Quemado Planning Unit indicate that Pueblo II sites were similar to those described above for other portions of the study area (Danson 1957; Wilson 1972; Museum of New Mexico n.d.). In the Carrizo Creek area (Wilson 1972), sites are constructed of unshaped sandstone blocks and range in size from approximately 1-8 or more rooms. At many sites in this area, single room units co-occur with multi-room structures. In the Mariana Mesa area, pueblo sizes ranged from between 2-20 rooms (Danson 1957:70), the smaller ones from 2-5 units and the larger ones from 6-20 with an average of 10 rooms. Pueblo architecture consists of both unworked lava masonry walls and coursed sandstone, the latter being less prevalent (Danson 1957; McGimsey 1951, 1957). Jasul rooms are common components of sites throughout the planning unit.

Architectural details for the Ladron Planning Unit are generally fragmentary as little description accompanies the reports and survey forms completed for this area. Yeo (n.d.b) reports finding rectangular blocks of 1-3 rooms, while Winkler and Davis (1961) note the occurrence of "L" and block-shaped structures of 10-30 rooms in the Rio Salado drainage. The presence of a basal slab characterizes some of the pueblos reported by Winkler and Davis (1961), while Warren reports only the presence of masonry (personal communication-1978). Structures are presumably one story in height. Jasul units occur at many of the sites reported from this planning unit.

Architectural details from the Stallion Planning Unit are limited. Yeo (n.d.a, b) reports the presence of room blocks constructed of cobbles and adobe. At the Johnson Hill Pueblo, located a few miles northeast of Socorro, New Mexico, rooms are constructed of coursed block masonry composed of angular and sub-angular limestone and red sandstone clasts (Marshall 1976). As many as 20 rooms per pueblo have been reported and sites containing more than one room block per site occur (Yeo n.d.a, b; Marshall 1976).

While above-ground structures predominate during the Reserve phase, the transition from pithouses was gradual at various sites in the study area. At LA 2948, for example, one Reserve phase structure consisted of a cobblestone-lined pithouse (Wendorf 1956b). At the Switchback site, some dwellings were partly subterranean; masonry was used sparingly on the above-ground portions of the walls (Peckham 1957). Several rooms at LA 6083 exhibited many of the same characteristics as the semisubterranean ones at the Switchback site (Kayser 1972c). Several rooms at the Hillside Pueblo were semisubterranean (Peckham 1958). The Reserve phase occupations at rooms A and E at Higgins Flat Pueblo were partly subterranean (Martin et al. 1956). Whiteaker (1976) noted a number of pithouse sites in the Datil Mountains, located singly or adjacent to Pueblo II surface structures, many of which exhibited pottery assemblages characteristic of this period. Yeo has noted pithouse depressions above Alamosa Creek in association with pottery dating to this time period (n.d.a). However, the chronological relationship between the surface indications and these last examples of pithouses will have to be determined by excavation.

The evidence cited above suggests that the transition to surface structures did not occur simultaneously throughout the study area. The continuation of pithouse occupation, as well as the retention of several aspects of pithouse architecture during the Reserve phase, indicates that experimentation with new modes of construction accompanied the changes in the residential unit and community organization.

The last site type with which we are concerned is one related to water control. In the study area three such facilities (terraces, borders, and dams) have been noted for the time period and, thus far, their distribution is limited to Apache and Largo Creeks and the vicinity of Galita Spring in the Gallo Mountains of the Gila National Forest (Allen 1969; Kayser, 1972c, 1973b).

Terraces are low rock walls built across the bottom of a drainage. Their purpose is to slow run-off to allow it to soak into the ground, and to hold soil while it forms small farming plots. Borders are rows of boulders, two or three courses high, placed across a slope, which function to prevent erosion by slowing run-off (Martin...
and Plog 1973:206). At LA 10984 Kayser (1973c:11) reports a site consisting of a boulder dam at the upper end of a valley, 16 terraces situated below it, and field houses between them. Kayser found two borders at the base of the lower slope of a hill at LA 6079 (1972c:11).

Water-control systems similar to the ones described above began to appear about A.D. 1000 in other Southwestern areas. Most investigators believe these systems were constructed in response to changes in precipitation patterns from a winter to a summer dominant rainfall regime (Schoenwetter 1962). The development of such systems represents a strategy which enabled the people to deal with environmental stress, e.g., stress resulting from a change in precipitation patterns.

As we have indicated, few water-control devices have been noted in the study area. This does not indicate their absence, but rather a lack of attention to such features and their attributes on the part of previous investigators. In fact, many undated features exist along the drainages of the Tularosa River (R. Wiseman, personal communication-1978). South of the study area, LeBlanc (1976) found an intricate check-dam system in the Cold Springs Canyon area of the Mimbres drainage. He notes that the system lies at the "extreme headwaters of minor drainages" and "in upper elevations well away from the valley bottoms" (ibid.: 19). The devices occur in similar areas in the Tularosa drainages; it is in comparable locations that water-control systems are most likely to occur elsewhere in the study area.

PALEOENVIRONMENT

Information about the paleoenvironment for the Pueblo II period is available only for the vicinity of Reserve, New Mexico and is limited to palynological data.

The pollen spectrum from the lowermost sample from Higgins Flat Pueblo, indicates the presence of sub-equivalent amounts of cheno-am and Compositae pollen (Schoenwetter 1962: Fig. 76). Ceramic analysis indicates that the lowest levels at this site date to the Reserve phase (see Pueblo III and IV). It has been argued that the presence of cheno-am pollen reflects periods of soil disturbance brought about by localized, high energy thunder-showers associated with a biseasonal precipitation pattern in which summer rain is dominant (Schoenwetter 1962; Martin 1963). The presence of composites suggests a condition of high water tables and sediments undisturbed by erosion. Such a situation might exist when there is a light summer rainfall pattern.

The representation of both cheno-am and Compositae pollen in sub-equivalent amounts at Higgins Flat is confusing. On one hand, it might reflect a localized reduction in the production of cheno-am pollens, possibly resulting from a period of stable, nonerosing drainage. On the other, it might indicate that certain wild plants were preferred by the inhabitants of the site. The latter possibility is frequently related to environmental conditions, although even if the environment prohibited the growth of certain plants, specific preferences would have required that these species be obtainable. Finally, it might reflect the fact that the room from which the sample was taken was built on top of a previous occupation (Schoenwetter 1962:181). The pollen from the sampled level may, in fact, represent an earlier pollen distribution. In any case, cheno-am pollen dominates the record for a period of time between A.D. 1000 and 1250 (ibid.: Fig. 76).

The pollen remains from the lower part of the pollen spectrum at Higgins Flat Pueblo conflict with data from the upper Little Colorado, where, beginning at approximately A.D. 1000 (Schoenwetter prefers A.D. 1000 ± 100 years), cheno-am pollen dominates the pollen record (Schoenwetter 1962). This has been interpreted as indicative of a change from a winter dominant rainfall regime to a pattern similar to that of today, in which summer rainfall prevails.

SUBSISTENCE

Existing data indicate that, like during earlier periods, both wild plant procurement and the raising of cultigens took place in the Mogollon area (Martin et al. 1952; Kaplan 1963). Remains from Tularosa and Cordova Caves indicate that Zea mays, Cucurbita pepo, and Phaseolus vulgaris were grown during the Reserve
phase (Cutler in Martin et al. 1952; Kaplan 1963). Corn shows the same developmental trends noted during earlier periods (see The Formative). It must be remembered that the plant remains attributed to Tularosa Cave came from mixed San Francisco-Tularosa phase levels, thus any variability which might have existed for the Reserve phase is impossible to delimit.

The botanical material from Reserve phase levels at O Block and Y Canyon Caves (Martin, Rinaldo, and Bluhm 1954) has not been analyzed.

It is interesting to note that while the Mogollon area shows continuity with earlier periods in the cultigens present in the archeological remains, new species of squash and beans had appeared by this time elsewhere in the Southwest. Cucurbita mixta and Cucurbita moschata were present in the Anasazi region by A.D. 900 (Graybill 1975:89). Phaseolus lunatus and Phaseolus acutifolius occur in the Verde Valley in Arizona by about A.D. 780 (ibid.). Since subsistence data are lacking from elsewhere in the study area, we are unable to say whether the floral remains from these areas resemble more closely those from the Mogollon area or other areas of the Colorado Plateau.

Faunal remains from Tularosa Cave indicate that the same resources hunted in the earlier pithouse periods were exploited during the mixed Reserve-Tularosa phase levels (Heller 1976). As we mentioned earlier, Heller (ibid.) has analyzed the faunal remains from various sites in the Tularosa and Apache Creek drainages; however, it is often impossible to employ Heller's data as he failed to provide provenience information. At more than one site, for example, several occupations might be present, but one cannot separate them. For the sites with Reserve phase occupations (e.g., LA 8887, LA 8888), the following fauna were identified: duck (Anatidae sp.), turkey (Meleagris gallopavo), antelope (Antilocapra americana), jack rabbit (Lepus Californicus), cottontail (Sylvilagus sp.), and possible intrusive species such as pocket gopher (ibid.:76).

Similarly, over 500 pieces of unworked bone recovered from Wet Leggett, South Leggett, and Three Pines Pueblos (Martin and Rinaldo 1950b:492) were not identified by site or by provenience within each site. The faunal assemblages from these three sites correspond to those from Tularosa Cave and from sites in the Apache Creek-Tularosa River areas (Heller 1976). Cottontail (Sylvilagus sp.), jack rabbit (Lepus sp.), and deer (Odocoileus sp.), constitute the major components of the assemblage. In addition to these and the species enumerated in other sections for this and earlier periods, the remains from these three pueblos include various species of birds, e.g., sage hen (Centrocercus urophasianus), quail (Colinus sp.), great blue heron (Ardea herodias treganzai) and jay (Cyanocitta sp.), and one bison bone fragment. The economic importance of the heron and jay is not known; they may represent intrusive elements of the assemblage, or species to which ideo-religious significance was attached.

Analysis of the unworked bone from the Sawmill site (Bluhm 1957) reveals bison, pronghorn antelope, deer, fox, jack rabbit, cottontail, turkey, Canis sp., and unidentified species of mammals and birds.

No faunal data are available for other portions of the study area.

MATERIAL CULTURE

Pottery

The Reserve phase is marked by the appearance of Reserve Black-on-white, a ware which originated in the Little Colorado and San Francisco-Tularosa River Valleys. The manufacture of Reserve Black-on-white represents a major technological change in ceramic production. Whereas Mogollon wares described for the study area were produced in an oxidizing atmosphere, Reserve Black-on-white was produced in a reducing atmosphere. As we have noted, Anasazi wares were also manufactured in this manner. Most popular around A.D. 1075 (Preternitz 1966:90), Reserve Black-on-white was replaced in the early 1100s by Tularosa Black-on-white. Other wares indigenous to the Tularosa and San Francisco drainages at this time which represent departures from earlier types include: Reserve Indented Corrugated (and its smudged variety), Reserve Plain Corrugated (and its smudged variety), Reserve
Punched Corrugated, Reserve Incised Corrugated (and its smudged variety), Tularosa Patterned Corrugated (and its smudged variety), and Starkweather Smudged Decorated (Rinaldo and Bluhm 1956). Smudged, corrugated, and textured wares prevail over the plain wares such as Alma Plain and San Francisco Red (Martin and Rinaldo 1950b: 500-501). Mimbres wares such as Mimbres Classic, Mimbres Corrugated and Mimbres Neck Corrugated also occur. The beginning date of Mimbres Classic is not well known (Breternitz 1966:86). Many northern (i.e., Anasazi) black-on-white and black-on-red wares occur as trade wares in the Mogollon area (see below).

In the Datil and Gallinas ranges of the Cibola Forest, northern (Anasazi), southern, and eastern (Jornada Mogollon) wares are found in substantial proportions during Pueblo II. The types found include brown (Alma) and gray wares, Escavada Black-on-White, Socorro Black-on-white, Reserve Black-on-white, Wingate Black-on-red, and Puerco Black-on-red (Danson 1957).

In the Ouemado Planning Unit, the predominant Anasazi wares are Puerco Black-on-white and Red Mesa Black-on-white plus some Escavada Black-on-white and Gallup Black-on-white (Danson 1957). A major innovation at this time is the development of White Mountain Red Wares, e.g., Puerco Black-on-red and Wingate Black-on-red (Carlson 1970:96). The tree-ring evidence suggests a beginning date of A.D. 1030 for the former (Breternitz 1966:89). The latter, however, is dated on the basis of its occurrence as a tradeware (Breternitz 1966:102). Plain, painted, and textured wares from the Mogollon area are found in this Unit. In some areas of the Unit, brown wares predominate over gray wares (Danson 1950, 1957). As for some of the painted wares, in the unit, Danson (1950: 387) notes,

The local black-on-white ware seems to be closer in design to the Reserve-Tularosa types but lacks the thick and crazed slip so common in the Tularosa River area . . . . The slip closely resembles that described by Gladwin and Fawley for Puerco Black-on-white, in that the pottery is less heavily slipped and resulting grey and white streaks are common.

During the Pueblo II period, great regional variation in Anasazi pottery production takes place, marking a change from the preceding periods when a single major style dominated ceramics. According to Wasley:

It is evident that a single major style dominated the ceramics of each of these two stages of Anasazi development, the Lino style during Basketmaker III and the Kana-a style during Pueblo I.

This situation is in sharp contrast to that of Pueblo II which was characterized throughout by three major styles and by two other styles in the last half (1959:292).

Danson noted a similar pattern from west central New Mexico and east central Arizona, where localized developments took place after A.D. 800 to 900, and "a real difference can be detected between the various types of black-on-white wares" (1957:92). (See also S. Plog 1977.)

In the Ladron Planning Unit, Socorro Black-on-white makes its appearance for the first time. According to Mera:

Socorro Black-on-white is one member of a ceramic complex which includes two additional types, both belonging to a more western line of descent from a basic Mogollon brown-ware ancestry. These two, Los Lunas Smudged and Pitoche Rubbed-Ribbed are characterized by outer surfaces showing various forms of unobliterated coiling by way of decoration (1943:11).

Socorro Black-on-white, however, is of Anasazi origin. More specifically it is believed to derive from Chaco II wares (Human Systems Research 1973). Non-indigenous wares found in the Unit include types known from the Cibola and Gila Forests to the west and south (Winkler and Davis 1961; Mera n.d.).

In the Stallion Planning Unit, El Paso Brown, Mimbres Classic, plain and textured brown wares, and Socorro Black-on-white are the predominant wares which have been noted (Yeo n.d.b; Laumbach, personal communication-1978). Small amounts of Pitoche Rubbed-ribbed and Los Lunas Smudged are present.
Chipped and Ground Stone

As Martin and Rinaldo note, chipped and ground stone artifacts of the Reserve phase "give one the impression of cultural continuity and cultural change" (1950b: 451). As evidence of the former, implements such as plano-convex choppers and pebble manos which are associated with preceding periods continue to be manufactured and used. As evidence for the latter, small numbers of artifacts such as beveled manos, saws, and full-grooved axes appear for the first time in the San Francisco and Tularosa drainages during the Reserve phase. The full-grooved axe is of northern (Anasazi) origin. Rectangular stone slabs with a smoothed surface area and chipped edges also appear for the first time. It has been suggested that these items were used as baking slabs, lapboards, hatchway covers, dampers, or plate-like utensils (Martin and Rinaldo 1950b:452; Peckham 1958:88). The trough metate, while appearing initially during the Three Circle phase (Martin and Rinaldo 1947:328), becomes much more numerous in the Reserve and Tularosa phases. At Reserve phase sites the slab metate is also found, as are rectangular manos. As we have mentioned elsewhere, it has been suggested that stylistic and formal changes in metates and manos were due to a shift in dependence from wild plant items to agricultural products (Martin and Rinaldo 1950b).

Reserve phase projectile points are highly variable, unlike the pattern to the north where contemporaneous examples are more homogeneous (ibid.:453). Nevertheless, Reserve phase points tend to be small, diagonally notched, and triangularly shaped (Martin, Rinaldo, and Bluhm 1954). Many exhibit down-raking barbs and expanding stems with convex bases (Peckham 1958:89). Photographs of Reserve phase points are included in Martin and Rinaldo (1950b) and Martin et al. (1952).

Other components of Reserve phase lithic assemblages include flake knives, scrapers, drills, stone dishes, and mortars. Miscellaneous artifacts consist of bone awls, shell bracelets, and stone pipes.

Away from the Tularosa and San Francisco drainages, elements of chipped and ground stone assemblages are less well known. Survey data indicate that slab and trough metates occurred, as well as full-grooved axes and unifacially and bifacially-ground manos (Wilson 1972; Danson 1957).

SUMMARY AND ASSESSMENT

It is apparent from the above discussion that our knowledge of settlement patterns, subsistence practices, paleoenvironmental and demographic trends is much better developed for the Mogollon occupation of the Gila Forest than for any other occupation in the study area. Even though this is the case, many obvious hiatuses exist which should be corrected. Emphasis should also be placed on the acquisition of data pertinent to these topics from other loci within the study area. In this way more detailed comparisons can be made.

The following is a brief summary of the major trends noted for the study area, based on what we know from published and unpublished sources. The major developments which took place during the Reserve phase in that portion of the study area lying in the Gila Forest include: a change in landform selected for habitation from elevated to nonelevated; an increase in the range of settlement loci from major and minor drainages to a diverse set of situations; an increase in site population and density; a movement from subsurface structures to surface or semisubterranean with contiguous masonry dwellings; the construction of water-control devices; and the development of regionally distinct black-on-white pottery types. The presence of square, masonry-lined kivas or ceremonial houses at a few Reserve phase communities such as the Sawmill site represents a continuation of a similar trend observed for the earlier Formative period (Bluhm 1957, 1960). The appearance of pueblo domiciliary structures and black-on-white pottery is thought to represent the adoption of Anasazi traits.

The most noticeable developments in the Cibola National Forest consist of an increase in the number and density of sites and a movement of the population into diverse ecological settings. Data pertaining to the transition from subsurface to surface structures are limited because
information from the previous period is scarce and excavation has not taken place. Although the predominant mode of habitation is above-ground units, pithouses have been noted at Pueblo II sites (Whiteaker 1976). In addition, jacal units have been noted in surface remains (Danson 1957), but their presence awaits verification. (Jacal structures are not major components of sites in the Gila Forest.) The presence of kivas remains unstudied, but they have been noted at Pueblo II sites in the Cibola Forest (Danson 1957). No Pueblo II water-control structures have been observed for the Cibola Forest, however, their existence is not precluded.

The obvious trends noted for the Cuemado, Stallion, Ladron, and Malpais Planning Units include an increase in population and a change in village organization. In the Cuemado Planning Unit the latter is indicated by an increase in the number of contiguous surface rooms, a standardization in their arrangement, and a change in the function of pithouses from residential to ceremonial units, during the Pueblo I to Pueblo II periods. Jacal units continue to be constructed. Kivas are square in some portions of the Unit resembling those in the Mogollon area to the south (Danson 1950).

In all Planning Units, settlement location corresponds closely to those observed for the previous Pueblo I and Basketmaker III periods. No water-control devices have been noted for these areas.

The foregoing account of the events which took place in the study area fails to explain why such occurrences transpired. As we have demonstrated throughout this overview, the study area suffers from a neglect of processual concerns and a subsequent lack of systematically formulated and tested models.

While we discussed a number of shared trends in the study area during the time period under consideration, a significant issue which has received little attention is that of population dynamics. In other parts of the Southwest, two approaches have been employed in explanation: (1) population increase was internal and reflected factors endogenous to the society under examination; and (2) the influx of populations from other areas was responsible for population growth. The latter explanation has been preferred for the study area. Bluhm (1957, 1960) and others have suggested that the introductions of black-on-white pottery and above-ground architecture in the Mogollon region were due to the influx of northern people. The presence of these new groups, as well as their increased reliance on agriculture, was responsible for population growth. "At present the evidence for such a migration is largely conjectural" (Bluhm 1960: 544).

In other portions of the study area, Danson (1957) argues that the movement of groups to the south and east explains the increases in population. In parts of the Ladron Planning Unit and the Stallion Planning Unit, south, east, and northward-moving groups may have converged and so increased the population (Mera 1943; Lehmer 1948).

North of the study area, population increase has often been attributed to the introduction of new cultigens, the versatility and hardiness of which apparently allowed for population growth. In the Mogollon area, however, we have seen that the contents of the floral assemblage differed little from the preceding pithouse periods; and that in addition, it lacked many of the domesticated species present in the Anasazi region to the north. The suitability of Harinoso de Ocho, first introduced during the San Francisco phase, to grow at high altitudes and to interbreed with pre-existing races, may have made possible the settlement of new areas. In addition, the planting of this hardy corn at diverse loci and the continued exploitation of wild resources might have guaranteed greater subsistence security to the population, and resulted in increased population growth. Floral data are lacking from other portions of the study area, therefore explanations can neither be formulated nor evaluated.

Finally, we should not ignore the issues related to the sharing of cultural traits within the study area. Models must be developed which explain why at this time, there is both uniformity in architecture and heterogeneity in localized pottery styles.
INTRODUCTION

In this section we are concerned with two segments of time: the Pueblo III and IV periods. They are discussed together because it was then that most of the study area was abandoned. The Pueblo III period begins at approximately A.D. 1100-1150 and lasts until A.D. 1300-1350. Among the Mogollon, this period of time is known as the Tularosa phase which is preceded in certain portions of the Gila Forest by the Apache Creek phase, dating from approximately A.D. 1075 to A.D. 1150. The Pueblo IV period begins about A.D. 1300-1350 and lasts until sometime in the seventeenth century (Danson 1957:5). In this section we will discuss primarily the events prior to 1400.

HISTORY OF WORK IN THE STUDY AREA

Our knowledge of the period of time discussed in this section comes from the survey work discussed in previous sections. Rather than repeat the names of these surveys or their sponsoring institutions, the reader is referred to sections on The Formative and Pueblo II. In addition, excavations of Pueblo III and IV sites have been extensive and are listed below.

As we have seen, the Tularosa phase and the Pueblo III period are contemporaneous. Tularosa phase sites have been defined on the basis of pottery and architecture. According to the criteria employed by Martin, Rinaldo, and Barter (1957), Tularosa phase sites are larger and better built than those of the Reserve phase. In order to be assigned to the Tularosa phase, five pottery types must be present at the site (ibid.:97): Tularosa Black-on-white, Tularosa White-on-red, St. John's Polychrome, Tularosa Patterned Corrugated and Tularosa Fillet Rim. (See the pottery section for a discussion of each.)

Not every investigator has followed all aspects of this scheme, however. Danson, in his surveys of Johnson Basin, Largo Canyon, Agua Fria Creek, Perry Lawson and Hardcastle Canyons, the Upper San Francisco River Valley, Centerfire Creek, the Apache Creek-Tularosa Rivers, and the Gallo Mountain-Jewett Ranger Station areas, reported certain sites as belonging to the Pueblo III period, even though they lacked St. John's Polychrome (1957). According to the guidelines of Martin, Rinaldo, and Barter (1957), such sites would not be Tularosa phase sites. Since the Tularosa phase and the Pueblo III period correspond temporally (Danson uses the terms interchangeably [1957:5, 20]), such sites would not be Pueblo III period sites either. Elsewhere, Martin, Rinaldo, and Bluhm (1954:37-50) have resolved similar situations by referring to a Transitional Reserve-Tularosa period. Schroeder and Wendorf (1954) designated two Tularosa phases- early and late. Sites which lacked polychromes but which contained Tularosa Black-on-white were identified as "early." Sites with Tularosa Black-on-white and polychromes were classified as "late."

On the basis of his review of the record, F. Plog suggests that the Tularosa phase is a late expression of the Reserve phase (personal communication-1978). According to this view, there is no distinct break between the Reserve and Tularosa phases. The changes in pottery and architecture which are observed for the Tularosa phase represent the culmination of developments which began earlier in the Reserve phase. An examination of excavated site data reveals these changes to be gradual and cumulative.

I have found it useful for the purposes of viewing settlement patterns and demographic trends to draw a distinction between the early and late Tularosa phases. As described above, early Tularosa is characterized by the presence of Tularosa Black-on-white and the lack of polychromes, and late Tularosa, by the presence of polychromes. In most cases, however, it was difficult to distinguish between these periods. Survey reports and site survey forms frequently do not include data which enable the distinction to be made. I have had to, therefore, accept the assignations made by the original investigators. A more careful examination and evaluation of these data may be required for some sites and areas. Anyone undertaking serious study of portions of the study area will have to
re-evaluate some of the conclusions of the previous investigators.

Occupations dating to the Tularosa phase are known from the following sites excavated on lands in or encompassed by the Gila National Forest:

Table 3. Excavated Sites 1100-1300 A.D.

<table>
<thead>
<tr>
<th>Site</th>
<th>Author</th>
<th>Date of Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starkweather Ruin</td>
<td>Nesbitt</td>
<td>1938a, b</td>
</tr>
<tr>
<td>LA 5240, and LA 5939</td>
<td>Kayser</td>
<td>1972a</td>
</tr>
<tr>
<td>LA 6083, LA 6082, and LA 6081</td>
<td>Kayser</td>
<td>1972c</td>
</tr>
<tr>
<td>LA 4986, LA 4987, LA 4988,</td>
<td>Kayser</td>
<td>1972b</td>
</tr>
<tr>
<td>LA 4989, LA 4991, LA 5933,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and LA 10645</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA 5409</td>
<td>Kayser</td>
<td>1973c</td>
</tr>
<tr>
<td>Higgins Flat Pueblo</td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td>Apache Creek Pueblo and Valley</td>
<td>Martin et al.</td>
<td>1956</td>
</tr>
<tr>
<td>View Pueblo</td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td>Hinkle Park Cliff Dwellings</td>
<td>Martin, Rinaldo, and Bluhm</td>
<td>1954</td>
</tr>
<tr>
<td>Site 9</td>
<td>Borhegyi</td>
<td>1956</td>
</tr>
<tr>
<td>LA 3279</td>
<td>Wendorf, Ferdon, and</td>
<td>1963</td>
</tr>
<tr>
<td></td>
<td>Bradbury</td>
<td></td>
</tr>
<tr>
<td>Tularosa Cave</td>
<td>Martin et al.</td>
<td>1952</td>
</tr>
<tr>
<td>Sites 11 and 12</td>
<td>Wendorf</td>
<td>1954</td>
</tr>
<tr>
<td>Jewett Gap</td>
<td>Bullard</td>
<td>1950</td>
</tr>
<tr>
<td>Site 13</td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td>Saddle Mountain Pueblo, Negrito</td>
<td>Schroeder</td>
<td>1954</td>
</tr>
<tr>
<td>Cliff Dwelling, Hood Station</td>
<td>Rinaldo</td>
<td>n.d.</td>
</tr>
<tr>
<td>Cave, and the Delgar Site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA 8889 and LA 8891</td>
<td>Allen</td>
<td>1969</td>
</tr>
<tr>
<td>WS Ranch site</td>
<td>Neely</td>
<td>n.d., 1978a, b</td>
</tr>
</tbody>
</table>

A description of the findings of the 1978 field season (University of Texas at Austin) at the WS Ranch Site should be completed early in 1979 (J. Neely, personal communication-1978a). Examination of the ceramic list from Higgins Flat Pueblo (Martin et al. 1956:150-173) indicates that Reserve phase occupations are also present at the site. These were neither accounted for in the dates given for the site (ibid.: 188), nor in the tree-ring dates studied from the site (Bannister, Hannah, and Robinson 1970:62; P. Minnis, personal communication-1978).

The Apache Creek phase is an enigma both temporally and culturally. Its temporal range postulated for the Apache Creek phase. Culturally, the pithouses associated with the phase represent a departure from the prevalent architectural style of the Reserve or Tularosa phase.

Apache Creek phase occupations have been excavated at the sites listed in Table 4. In a later publication, Kayser assigns the Apache Creek phase occupations at LA 6083 to the late Reserve phase (1975). Kayser (1972a) assigned a four room, hillside unit at LA 5939 to this phase on the basis of the absence of St. John's Polychrome. Although no other pottery types are mentioned in his report, it is probable that this site lies in the early
Table 4. Excavated Sites Apache Creek Phase

<table>
<thead>
<tr>
<th>Site</th>
<th>Author</th>
<th>Date of Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA 5240 and LA 5939</td>
<td>Kayser</td>
<td>1972a</td>
</tr>
<tr>
<td>LA 6083</td>
<td>Kayser</td>
<td>1972c</td>
</tr>
<tr>
<td>LA 4987, LA 4990, LA 5933,</td>
<td>Kayser</td>
<td>1972b</td>
</tr>
<tr>
<td>and LA 4986</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higgins Flat Pueblo</td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td>LA 2949 (Apache Creek site)</td>
<td>Peckham, Wendorf, and Ferdon</td>
<td>1956</td>
</tr>
<tr>
<td></td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td></td>
<td>Martin, Rinaldo, and Barter</td>
<td>1957</td>
</tr>
<tr>
<td></td>
<td>Bullard</td>
<td>1950</td>
</tr>
</tbody>
</table>

Tularosa or the Reserve-Tularosa transition phase. While Wendorf (1954) assigns the pithouses at Sites 11 and 12 to the early Tularosa phase, they correspond to the Apache Creek phase as it has been defined. Finally, Peckham, Wendorf, and Ferdon (1956) report that before its dissolution, Gila Pueblo excavated a number of pithouses in the Tularosa drainage. They believe that these structures correspond to those defined for the Apache Creek phase.

In the Cibola Forest, only one site dating to the Pueblo III period has been excavated. This is the Gallinas Spring site (Winkler and Davis 1961; Green 1974; Keller 1975; McGregor, D. 1974; Wycoff 1974).

Several Pueblo III sites have been excavated on lands encompassed by, or adjacent to, the Quemado, Malpais and Stallion Planning Units. The Peabody Museum - Upper Gila Expedition excavated three sites with Pueblo III occupations, i.e. Site 481, Site 616 and Site 143 on Mariana Mesa in the Quemado Planning Unit (Smith, W. 1950; McGimsey 1951, 1957, personal communication-1978). The Sandstone Hill Pueblo Ruin, excavated by Franklin Barnett, is located approximately 7 miles north of Quemado, New Mexico (Barnett 1974). In the Malpais Planning Unit, Theodore R. Frisbie excavated LA 13422, also known as the Newton site (Frisbie n.d.). In the Stallion Planning Unit, Robert Weber excavated a Pueblo III pithouse (1973). Sandal Cave, partially excavated by Harrington (1928), was probably inhabited during this period (Marshall 1976). No Pueblo III sites have been excavated in the Ladron Planning Unit. Little survey data exist for this unit.

Few Pueblo IV sites have been excavated in the study area. Site 616 on Mariana Mesa (Quemado Planning Unit) contained evidence of an early Pueblo IV occupation (Danson 1957; McGimsey 1951, 1957, personal communication-1978; Danson 1957), Winkler and Davis (1961), and Green (1974) believe the Gallinas Spring site was occupied into the Early Pueblo IV period.

SITE LOCATION

Tularosa and Apache Creek phase sites are situated on benches, ridges, terraces, and bluffs along major and minor drainages and the margins of basins or cienagas (Danson 1957; Gila National Forest n.d.).

In the Gila Forest, Tularosa phase sites are concentrated in the following areas: the Tularosa River (Duff 1897; Hough 1907; Wendorf 1954, 1956b; Martin, Rinaldo, and Barter 1957; Shroeder 1954; Borhegyi 1956; Schroeder and Wendorf 1954); Apache Creek (Danson 1957; Hough 1907; Allen 1969; Kayser 1972b); Hardcastle and Perry Lawson Creeks (Danson 1957); Largo and Agua Fria Creeks (Danson 1957; Kayser 1973c); the Gallo Mountain–Jewett Gap areas (Hough 1907; Danson 1957; Bullard 1950; Kayser 1972c, 1975); Harris Creek (Kayser 1972a); and Johnson Basin (Danson 1957). Danson (1957) has reported Pueblo III occupations for the upper San Francisco–Centerfire Creek areas near Luna, New
Mexico. No St. John's Polychrome was found on these sites, so they appear to fall into an earlier period, perhaps the Reserve-Tularosa transition or early Tularosa phase. Hough (1907, 1914, 1923) has reported what appear to be early and late Tularosa phase sites from these same areas and has excavated many of them in the Centerfire Creek area. Danson (1957: 37) notes that the larger ruins of this valley have been badly pothunted. Other sites located along the San Francisco include: the WS Ranch site (Neely n.d., 1978); LA 3279 (Wendorf, Ferdon, and Bradbury 1963) and Higgins Flat Pueblo (Martin et al. 1956; Martin, Rinaldo, and Barter, 1957). Starkweather Ruin (Nesbitt 1938b) lies above Starkweather Canyon.

Apache Creek phase sites have been noted along the Tularosa River (Martin, Rinaldo, and Barter, 1957; Schroeder and Wendorf 1954; Peckham, Wendorf and Ferdon, 1963); Apache Creek (Kayser 1972b); Harris Creek (Kayser 1972a); and the Gallo Mountain-Jewett Gap areas (Bullard 1950; Kayser 1972c). An Apache Creek phase occupation is present at Higgins Flat Pueblo (Martin, Rinaldo, and Barter 1957) situated above the San Francisco River. It is interesting to note that within the study area, Apache Creek phase sites occur exclusively north of the confluence of the San Francisco and Tularosa Rivers. It appears, therefore, that the Apache Creek phase is a phenomenon associated with the Alpine Branch of the Mogollon (see Pueblo II).

Examination of survey data indicates that Tularosa and Apache Creek phase sites occur predominantly in the Transition ezone and in the Upper Sonoran ecotone (Danson 1957; Gila National Forest n.d.). In the Cibola Forest, Pueblo II-III and Pueblo III sites are located on ridges and terraces overlooking drainages in the Datil and Gallinas Mountains (Museum of New Mexico n.d.; Winkler and Davis 1961; Danson 1957). Weber has found small rockshelters in Point of Rocks Canyon in the San Mateos (personal communication-1978b). While the data from this Forest are from widely distributed loci, it is interesting to note that all of the reported sites of this time period are located at elevations ranging from 7000 to 8000 feet. This may reflect a movement to higher elevations at this time, however survey data are insufficient to substantiate a pattern. In reference to the Gallinas Springs site, LeBlanc (1978) and Green (1974) suggest that environmental deterioration caused populations to move to higher elevations where increased precipitation allowed for the practice of agriculture.

In the Quemado Planning Unit, Pueblo II-III and III sites are known from Carrizo Creek (Wilson 1972); Largo Creek (Hammack 1964); the Mariana Mesa area (Danson 1957; McGimsey 1951, 1957, personal communication-1978); and the North Plains region (Danson 1957). Fischer reports Pueblo III sites from his ranch near Quemado, New Mexico (personal communication-1978). Bullard believes that the population from the Quemado-Tejana Mesa-Mariana Mesa region "was tending to gravitate toward the eastern tributaries of French's Arroyo and the Nations Draw, moving closer to the better-watered highlands near the Continental Divide" (1962:7).

Sites dating to this time period are located on knolls and ridges overlooking drainages. In the vicinity of the North Plains and the region of Mariana Mesa surveyed by the Upper Gila Expedition (Danson 1957), no benches were found which had been occupied at this time. Examination of the survey data indicates that benches were abandoned at the conclusion of the Pueblo II period (Danson 1957:71-73, Tables 14-16). Some Pueblo III sites in the Mariana Mesa area have been reported from valley bottoms (Danson 157:73, Table 16).

In the Stallion Planning Unit, sites of the time period (i.e., Late Socorro) have been noted on terraces, ridges, benches, and mesas above the Rio Grande (Yeo n.d.; Marshall 1976; Hammack 1964). Yeo found several sites of the same period located on terraces and ridges above Alamosa Creek and its tributaries (Yeo n.d.a).

Details of the Pueblo III occupation of the Ladron Planning Unit are fragmentary. Danson (1957) and Warren (personal communication-1978) reported several Pueblo II-III and Pueblo III sites along the Rio Salado.

In the Cibola Forest sites with Pueblo IV occupations have been noted on the banks
of Gallinas Canyon in the Gallinas Mountains (Danson 1957); and in the area close to Magdalena (Mera 1940:7) Warren and Wilson (1974) report a large Pueblo IV site at Goat Springs. Mera (1940:7) notes a late Pueblo IV site situated near Bear Springs, about 5 miles northeast of Magdalena. In the Ladrón Planning Unit, Pueblo IV sites have also been found along the Rio Salado (Mera 1940; Warren, personal communication-1978, Danson 1957). Mera (1940:8) notes a Pueblo IV site located on a shoulder of La Jara Peak located 9.5 miles west of Riley. He believes the site was located here for reasons of defense. In the Stallion Planning Unit, Mera (n.d., 1940) and Yeo (n.d.a, b) have found Pueblo IV occupations on benches, terraces, mesas, and bottom lands overlooking the Rio Grande. Yeo (n.d.a) noted sites along Alamosa Creek. One large site was located near Ojo Caliente. A few early Pueblo IV occupations have been located in the Mariana Mesa area, Quemado Planning Unit (McGimsey 1951, 1957, personal communication-1978), and one has been found on the North Plains (Danson 1957). Fischer has reported Pueblo IV occupations on sites in the vicinity of Quemado, New Mexico (personal communication-1978).

Neither Pueblo III nor Pueblo IV occupations have been noted from the Driveway Planning Unit.

Pueblo IV settlements in the Quemado, Ladrón, and Stallion Planning Units appear to follow the same modal trends in site location noted for the preceding Pueblo II and Pueblo III periods. This is confirmed by the fact that most, if not all, of the sites with Pueblo IV occupations have earlier occupations on them. Because probabilistically-derived sample data are lacking, any subtle differences in settlement location cannot be presently detected. The results of the 10% survey of the Stallion Planning Unit will enable us to see, at least in that Planning Unit, what settlement criteria were employed in site selection during the Pueblo III-Pueblo IV periods. Models must be devised which can explain the uniformity of site location, or its diversity.

DEMOGRAPHIC TRENDS

In terms of site numbers and sizes, the entire study area is characterized by similar trends. There are fewer sites, they are larger in area, and they contain more rooms than sites of the preceding period, possibly indicating a consolidation of small communities. In the Gila Forest, consolidation appears to take place around A.D. 1200 or slightly earlier with gradual abandonment of other areas.

The abandonment of the study area did not proceed uniformly throughout. Ceramic and tree-ring data suggest that the Gila Forest was abandoned first at around A.D. 1300. The Quemado Planning Unit and the Cibola Forest appear to have been abandoned later, i.e., some time in the early fourteenth century. While portions of the Ladrón Planning Unit might have been abandoned, it is here that occupation—although poorly understood—might have continued to the present. Finally, while portions of the Stallion Planning Unit were similarly unoccupied during parts of the Pueblo III-IV period, occupation lasted into historic times in areas along the Rio Grande (Marshall 1976; Bandlier 1929).

In the Gila Forest, abandonment appears to have taken place first along minor drainages, narrow alluvial valleys, and at high elevations (Rice 1975; Danson 1957). The latest sites of the period are located at lower elevations along wide alluvial stretches of the San Francisco and Tularosa Rivers.

This pattern is evidenced by available ceramic and tree-ring data. For example, the Pine Lawn Valley, with the exception of the Starkweather Ruin (Nesbitt 1938b), was abandoned at the end of the Reserve phase (Bluhm 1960). Although the elevation of the Pine Lawn Valley is between 6000 and 7000 feet, it is considered a minor drainage. The San Francisco River area near Luna, New Mexico, and the Centerfire Creek areas were abandoned during the early part of the Tularosa phase (Danson 1957). No St. John's Polychrome was present at the sites. Both these areas lie above 7000 feet. Part of the Luna Valley where the Upper Gila Expedition survey was conducted is located in a box canyon (Danson 1957:34). Pottery observed from the surface of sites located in the Gallo Mountain-Jewett Ranger Station areas, at between 7000 and 8500 feet, indicate that the area was abandoned around A.D. 1250 (Danson 1957). The Jewett Gap Site appears to have been abandoned sometime in the late
twelfth and early thirteenth centuries (Bullard 1950; Martin, Rinaldo, and Barter 1957). A tree-ring specimen from Room 1F is dated A.D. 1196-1263, but for this specimen there is no way to estimate how far the last ring is from the outside (Bannister, Hannah, and Robinson 1970: 23-24). Other dates in the room are the oldest at the site and cluster in the latter part of the twelfth century. The pattern observed for this area is somewhat questionable, however, as polychromes found at excavations along Harris Creek (Kayser 1972a:3) extend the period of occupation to approximately A.D. 1300.

According to surface ceramic data, Johnson Basin was abandoned around A.D. 1250 (Danson 1957). Johnson Basin lies between 7000 and 7500 feet. The Hardcastle-Perry Lawson Creek Valleys, averaging 7000 feet in elevation, appear to have been abandoned around A.D. 1250; the Largo and Agua Fria Valleys, were abandoned at approximately the same time (ibid.). Portions of the Tularosa and San Francisco River valleys appear to have been occupied late. Tree-ring data from Higgins Flat Pueblo date the Tularosa phase occupation at A.D. 1249 to A.D. 1281 (Bannister, Hannah, and Robinson 1970:62). In Room #2, Room Block "B" at the WS Ranch site, four non-cutting tree-ring specimens dated around A.D. 1253-1267 (Neely 1978a:5). A radiocarbon date of A.D. 1320± 50 was obtained from Room #1, Room Block "A" (ibid.:4). In addition, the ceramic assemblage from the floor of the site's Great Kiva suggests a date of A.D. 1250-1300.

The Gila Forest appears to have been totally abandoned by A.D. 1300; the destination of the inhabitants is unknown (Raynor 1955). Some have speculated that they moved north and west and that the Zuni are their descendants (Martin, Rinaldo, and Barter 1957:134; Mera 1937). The Gila Forest was not reoccupied until the onset of historic times when the Apache are reported to be in the area (Schroeder 1974).

By noting the percentage of abandoned sites in each area surveyed by Danson (1957), we are able to argue that certain areas, (e.g., those of higher elevations and in narrower alluvial valleys) were abandoned with greater intensity than others. Eighty-nine (89) percent of all the Reserve phase sites in the Upper San Francisco - Centerfire Creek areas were abandoned at the end of the phase. In the Gallo Mountain area, the highest of the areas examined, 85% of all the Pueblo II sites were abandoned. In the Largo Canyon-Agua Fria, Johnson Basin, and Hardcastle-Perry Lawson Valleys, abandonment of Pueblo II occupations ranged from 74 to 79%, while for the sites observed in the Apache Creek-Tularosa River Valley, 36% were abandoned.

Rice (1975) has approached this from another perspective by examining the relative numbers of sites per area surveyed. This has led him to argue that there is a higher proportion of Tularosa than Reserve phase sites at elevations below 7000 feet (ibid.:80). He has suggested that during the Reserve phase population was concentrated at higher elevations. From the Reserve to Tularosa phase times, he believes that the "density of sites decreased in the higher elevations but increased at elevations under 7000 to 6500 feet" (ibid.:81, Fig. 4-2). Rice employed data from the Gallo Mountain area, Hardcastle and Perry Lawson Valleys, and the Apache Creek and Tularosa River Valleys in his analysis. My computations of all areas surveyed by Danson (1957) concur with Rice's graphs. By computing a ratio of the number of sites observed for the Reserve and Tularosa periods to the total number of sites observed per area, both Rice (1975) and I arrived at a means of expressing the changes in site frequency relative to each area.

For example, while the number of Tularosa phase sites in the Apache Creek-Tularosa River Valleys (elevation 6500-7000 feet), decreased from the preceding Reserve phase, the percentage of sites with Tularosa phase occupations was higher here (64%) than anywhere else surveyed by Danson (1957). In the Gallo Mountain-Jewett Ranger Station areas, the site frequency decreased from approximately 96% for the Reserve phase to 14% for the Tularosa phase. In the Johnson Basin Seven Troughs area, the percentage of sites with occupations dating to the
Reserve phase decreased from 85.71% to 30.35% during the Tularosa phase. In the Hardcastle Canyon-Perry Lawson areas, sites with Reserve phase occupations decreased from 79.16% to 22.21% during the Tularosa phase. In the San Francisco River Valley-Centerfire Creek regions, Tularosa phase occupations consisted of 10% of the total number of sites; while during the previous period, Reserve phase occupations were present on 90% of all sites. Finally, in the Agua Fria-Largo Canyon areas, the percentage of sites with Reserve phase/Pueblo II occupations decreased from 100% to 25.81% during the succeeding period. It must be remembered, however, that the areas encompassed by this survey included portions of mountain (e.g., Largo Canyon) and plateau areas.

Thus, the demographic trends preceding the complete abandonment of the Forest consisted of the abandonment of most of the Pueblo II sites in all of the drainages and the consolidation of pre-existing ones during the Tularosa phase. For example, in the Gallo Mountain, Largo Canyon-Agua Fria and Apache Creek-Tularosa River Valleys, 100% of all sites with Pueblo III occupations also had Pueblo II occupations. In the Johnson Basin area, 70.6% of all sites with Pueblo III occupations contained Pueblo II occupations. In the Hardcastle-Perry Lawson Valleys, Reserve phase occupations were present on approximately 73% of the Tularosa phase sites. A very high percentage of sites noted by the Gila National Forest had both Pueblo II and III occupations on them (Gila National Forest n.d.). It appears, therefore, that anywhere from 70% to 100% of all Pueblo III occupations had an earlier Pueblo II component associated with them. (This pattern was also observed on Mariana Mesa and the North Plains, see below.) While it is tempting to state this pattern in terms of probabilities or statistical likelihoods, it is suggested that any further analysis be performed with data derived in a controlled and statistically valid manner.

The preceding percentages were calculated using information Danson provided in Tables 3-9 and in his text (1957). In some cases my calculations differed from his. While the figures are of interest, what is important is the relative proportion of site frequency at various elevations. Additionally, it should be noted that the occupations calculated above included cave sites, sherd scatters, and campsites, as well as sites with above-ground architecture.

Most of the Cibola Forest appears to have been abandoned early in the Pueblo IV period (Danson 1957) although adequate survey data are lacking to confirm this. Two late Pueblo IV sites are present north of Magdalena, New Mexico (Mera 1940). The Forest, therefore, appears to have been largely uninhabited during the Pueblo IV period. Sufficient site information is absent, however, and thus, any statements regarding demographic trends in the Forest are unsupportable and purely hypothetical.

The exact dates of the Pueblo IV site noted at Goat Springs is unknown. Warren and Wilson (1974) believe that it might represent a "refugee" Piro Site. As such it would date to the late seventeenth century.

Changes in site size and frequency associated with the abandonment of the Quemado Planning Unit resemble those for the Gila Forest. Sometime during the twelfth and thirteenth centuries approximately 70% of the Pueblo II occupations in the Mariana Mesa area were abandoned (Danson 1957: 71-73, Tables 14-16). Survey data indicate that with the abandonment of most of the sites in the Quemado Planning Unit, consolidation with pre-existing communities took place (Wilson 1972; Danson 1957). On Mariana Mesa, for example, almost 75% of the Pueblo III sites had earlier occupations on them (Danson 1957:71-73, Tables 14-16).

On the North Plains, 87.5% of the sites with Pueblo III occupations had Pueblo II materials present (ibid.:67, Table 13). It must be remembered that the survey on the North Plains was performed rapidly and that on Mariana Mesa was confined to the northern tip of the mesa (ibid.:66). While the patterns are comparable with other portions of the study area, the exact percentage of abandoned sites will have to be revised once a systematic survey is performed.

A great portion of the Quemado Planning Unit appears to have been abandoned between A.D. 1300 and A.D. 1350. Both Mariana Mesa and the North Plains appear
to have been abandoned at the same time. Tree-ring data from Site 616 on Mariana Mesa indicate that occupation extended into the 1280s (Bannister, Hannah, and Robinson 1970:16). This sample is small and therefore, may not be representative of the site (ibid.). Pottery dating to a later time period is present on the site (McGimsey 1951, 1957; Washburn 1977). The construction of the kiva can be dated to A.D. 1243. Site 481 (McGimsey 1951, 1957, personal communication-1978) was abandoned in the mid to late thirteenth century. The clustering of dates around A.D. 1248 probably indicates a period of major construction at this site (Bannister, Hannah, and Robinson 1970:14).

The details of the depopulation of the Ladron Planning Unit are unknown, but it might have been occupied sporadically by groups related to the modern Acoma, as sites of the Cubero phase (A.D. 1400 to A.D. 1600) are known from the Rio San Jose (Dittert 1959:564). Sites in the Stallion Planning Unit date into the historic period; thus, it was not abandoned entirely.

ARCHITECTURE

In the Gila Forest, Pueblo III sites vary in size from small one or more room, single-story buildings (e.g., fieldhouses) to multi-story sites with hundreds of rooms. The latter are large, multi-story walled and seemingly planned communities. In the Hardcastle-Perry Lawson, Gallo Mountain, and Apache Creek-Tularosa drainages the average pueblo appeared to be of 20 to 25 rooms (Danson 1957:49). There is a variation in the size of the communities, as well as in their internal organization; at least three types of communities exist. The most common is a single large unit, either "L" shaped or rectangular, which often includes small kivas and plazas. The second type is a multi-unit community of several unconnected pueblo units arranged in an "L" shape or in parallel rows. A large "great" kiva, a series of smaller kivas, and one or more plazas are present. The third type of village is the hollow rectangular pueblo, the rooms of which enclose a central plaza. Danson (1957) noted the existence of such sites in the Johnson Basin and the Agua Fria Valley, and believes these pueblos to
involved in construction in the community. Differences in masonry style may thus communicate information regarding possession or occupation by a particular individual family or group.

Tularosa phase occupations are also known from caves and rockshelters. Because architecture is lacking at O Block Cave (Martin, Rinaldo, and Bluhm 1954) and LA 5933 (Kayser 1972b), it is possible that some of these sites were used on a short-term basis or for specialized activities. Architecture is present at Hinkle Park Cliff Dwelling and resembles that of surface structures dating to the Tularosa phase (Martin, Rinaldo, and Bluhm 1954). The site consisted of 11 rooms and contained two stories in places.

Overlapping slightly in time with both the Reserve and Tularosa phases, the Apache Creek phase (A.D. 1075-1150) differs from them in architectural style and ceramics. While above-ground masonry architecture occurs in the Reserve and Tularosa phases, the Apache Creek phase is distinguished by the presence of deep, rectangular masonry-lined pithouses "with a southeasterly-oriented ventilator and variation of a gabled roof" (Peckham, Wendorf, and Ferdon 1956:63). (The inclusion of varying amounts of masonry in pithouses is a trend which begins in the pithouse stages discussed in The Formative.)

The function of the Apache phase pithouses is unclear. Wendorf (in Martin, Rinaldo, and Barter 1957:129) believes they were domiciles because he found mealng bins, manos, and flour receptacles in them. Others have argued that the presence of ventilators in many of them suggests both a domiciliary and ceremonial function (ibid. 1957). Consequently, such structures have been called "pit-kivas" (Kayser 1972b; Martin, Rinaldo, and Barter 1957). As I demonstrated earlier, however, ventilators were regular components of Anasazi residential pithouses (Bullard 1962), so their presence in Apache Creek phase pithouses does not necessarily mean that the structures were used for religious purposes. The construction of ventilators may be related to the need for supplying the inhabitants of the structures with a fresh supply of air (Martin, Rinaldo, and Barter 1957).

Other researchers have suggested that the pithouses represent seasonal adaptations to high elevations since the sites occur at altitudes from 6300 to 8000 feet (R. Wiseman, personal communication-1978). Thus, pithouses are winter habitations and above-ground structures would be summer domiciles. The absence of polychrome pottery at the pithouses may reflect the fact that, due to harsh conditions and difficulties in movement, trade was not conducted in the winter. Other pithouses in high elevations dating to comparable time periods have been recorded elsewhere in the Southwest; e.g., pithouses dating to this time period have also been reported at Point of Pines (Wendorf 1950).

The composition of pueblo villages in the Oquendo Planning Unit closely resembles that described for the Gila Forest. The following comments refer to the villages located on Mariana Mesa:

The Pueblo III sites varied in size from small one or more room buildings to larger pueblos. There would seem to have been three general types of villages in this period. The first and most common was a single large unit--either "L" shaped or rectangular. This was similar to the second, the multi-unit type of village, where a group of pueblo units are to be found clustered together, frequently near a large or "great kiva" depression. The third type is the "hollow square" pueblo built with rooms on three or four sides and all buildings connected by walls wherever the rooms did not abut. These quadrangular sites were not common, were always large, and seemed to be of late Pueblo III, perhaps having persisted past the date regularly given for the end of that period (Danson 1950:388).

Only three Pueblo III-Pueblo IV sites on Mariana Mesa belong to the latter category. According to Danson (1957:70), the typical Pueblo III ruin here had 20 or more rooms, and two sites were reported to have had approximately 500 rooms.

Site 616 consisted of 500-600 rooms arranged in multiple rows around a central plaza. Seven independent room units, one
kiva, several pithouses, and one feature (a walk-in well and potter's clay pit) were located within the confines of the plaza (McGimsey 1951, 1957). The last feature has been reported for another site in the Mariana Mesa area (Danson 1957:71). Contemporaneous with Site 616, Site 143 was composed of five separate units, each containing 12-50 rooms, arranged around a circular kiva. Site 481 is an "L" shaped pueblo consisting of 34 rooms, arranged in three rows, and a kiva. This site, as well as the other sites excavated on Mariana Mesa, will be described in greater detail in McGimsey's forthcoming book entitled, Mariana Mesa, Seven Prehistoric Settlements in West-Central New Mexico, in press, Harvard University, Cambridge (C. R. McGimsey, personal communication-1978). At Mariana Mesa and at the other sites observed in this planning unit, masonry consisted of shaped and unshaped lava boulders and sandstone slabs. Of the 54 Pueblo III-IV sites noted by Danson (1957) in the Mariana Mesa area, one-third were constructed of shaped volcanic rock. The remainder were composed of a combination of coursed sandstone and shaped lava boulders. At Site 616, three different styles of masonry were used; some rooms were constructed with cobbles and unshaped boulders, while others consisted of sandstone slabs (McGimsey 1957, personal communication-1978). Adobe bricks were also employed in the construction of some portions of the site. It is interesting to note that there is a tendency for pueblos constructed of shaped volcanic rock, rather than coursed masonry, to consist of fewer rooms (1-10). A chi square (with a Yates correction for lack of continuity) value of 23.17 is significant at the .01 level (Downie and Heath 1974:307). This association appears to be valid and not due to chance. Functional differences might exist, therefore, between rooms and structures constructed of different building materials.

Information regarding Pueblo III and IV village organization and architecture in the Ladron Planning Unit is scarce. Of the two sites dating to this time period observed by Danson (1957:79, Table 17), both are constructed of coursed sandstone masonry. A kiva is present at the Pueblo III site. Since little was present of the Pueblo IV site, it is not known whether a kiva occurred. The former pueblo consisted of more than six rooms; the number at the latter is unknown.

Few Pueblo III sites are known from the Cibola Forest, so it is difficult to discuss in great detail aspects of community organization. (In the previous section we discussed details of Pueblo II-Pueblo III sites.) We do know from survey data, however, that both "L" shaped and rectangular pueblo community and the multi-compound site type exist in the Datil and Gallinas Mountains (Danson, 1957; R. Dunham, personal communication-1978; Winkler and Davis 1961). Walled sites are known from this area and two of them occur in Gallinas Canyon (Danson 1957: 77-78). Of the two, the Gallinas Springs site has been partially excavated (Green 1974). The results of the 1974 field season have been summarized (ibid.) and analyses of the lithics (Keller 1975), burials (Wycoff 1974) and fauna (McGregor, D. 1974) from this field season have been reported. A report of the 1977 investigations by the University of New Mexico is being prepared (J. Tainter, personal communication-1978). Other descriptions of the site are also available in Winkler and Davis (1961), Museum of New Mexico (n.d), and the National Register of Historic Places Nomination Form. The site is described below in an attempt to demonstrate the wealth of information present. Much of it is being lost due to the increasing erosion and vandalism occurring at the site.

Situated along the banks of Gallinas Creek, the Gallinas Springs site is a multi-tiered, multi-storied pueblo consisting of 500 or more rooms. An arroyo, presently 40-feet wide, divides the site in half. The northern portion of the site consists of a lineal room block which contains 100 or more rooms. The southern portion of the site, larger and structurally more complex, consists of at least three architectural units, a midden, and a possible pond or reservoir.

Sitting atop an elevated area and extending down its sides at the extreme southern edge of the site is a 100-room domiciliary unit. Below this knoll and to its north is a "D" shaped or circular pueblo of 100 or more rooms, with a plaza containing three kiva depressions. The original shape is unknown because the northern edge of this unit has been washed away by the arroyo. In addition to the excavations performed in this area of the site by Western Michigan University (Green 1974) and the University of New Mexico (J. Tainter, personal
communication-1978), Davis made test excavations in one of the kivas (Winkler and Davis 1961). Her probings revealed so much fallen wall debris that she has suggested that the structures might have been tower kivas. Green's (1974) excavations in the habitation portion of this area revealed an earlier undated occupation.

To the east of the "D" shaped pueblo, there is another room block and a depression; several of these rooms have been excavated. Two middens which have been tested occupy the eastern region of the site (Green 1974). A pond or reservoir also was identified by Green (ibid.), but it could not be determined whether it was formed naturally or purposefully by the occupants of the site. Excavation demonstrated that the reservoir did not exist during the latest occupation of the site.

The Gallinas Springs site is in urgent need of protection and preservation. It is unfortunate that a National Register Site such as this is being decimated by erosion and vandalism. The eastern and western portions of the site are being destroyed by the arroyo and the gullies and ravines which empty into it. The intensity of the summer rains and resulting floods are washing away major parts of the site, and undermining other segments causing rooms and walls to collapse. Although several rooms were stabilized in the 1974 field season (Green 1974), the effort was insufficient to slow the destruction by water and to prevent further damage. Kramer (1974) devised a plan for the protection of the site, but it was rejected as too expensive.

In addition to its destruction from erosion, the Gallinas Springs site is being extensively pothunted. Notes on file at the Cibola Forest (1973) indicate that vandalism had been restricted to rooms exposed by flooding and to a number of rooms within the interior of the site; however, the activity is now widespread. The situation is critical, and emergency measures are necessary if the site is to be saved.

At the Gallinas Springs site, masonry consists of finely-worked, laminated sandstone and igneous slabs. The style in which the masonry has been laid reminds one of Mesa Verde, a reason why certain investigators have been quick to attribute such remains to Mesa Verde migrants. As we have mentioned in The Formative, however, the masonry of the Pueblo II and Pueblo III periods varies both in workmanship and type of material employed. At Site 117, located downstream from Gallinas Springs, I observed a variety of masonry styles in one pueblo. This situation resembles that described in the Gila Forest for sites of the same period and may be due to the same reasons.

Details of the Pueblo III-Pueblo IV communities located in the Quemado Planning Unit were given above. Goat Springs, a late Pueblo IV site located in the Cibola National Forest, consists of over 200 rooms arranged in three room blocks shaped in the form of a "U" around a plaza (Danson 1957; Warren and Wilson 1974). More than 12 kivas have been sighted. During this author's visit in summer 1978, it appeared that extensive and recent pothunting had taken place at the site. Since this site is one of a few of its kind noted in the Forest, the author recommends that strict measures be taken to conserve and protect it.

Regarding village architecture and organization among the Pueblo III and IV sites located in the Stallion Planning Unit, little is known. Yeo's notes (n.d.a, b) indicate the sites were constructed of arroyo and river cobbles and adobe. The notes suggest that the structures ranged in size from three or four rooms to approximately twenty. One particular site along Alamosa Creek was built around a central court (ibid.). In order to ascertain the size, structure, and organization of the pueblos in this planning unit, this author recommends that those on the land of the Bureau of Land Management be mapped. As for the ones lying on private property, it is suggested that the State Planning Office or one of the member organizations of the New Mexico Archeological Council undertake a project consisting of locating, mapping, and photographing the sites included in Yeo's manuscripts (n.d.a, b).

While above-ground masonry structures appear to be the dominant mode of habitation, there are, in addition to the Apache Creek phase pithouses discussed earlier, occurrences elsewhere in the study area of pithouses dating to the Pueblo II-Pueblo III period. In the Stallion Planning Unit, for example, Weber (1973) located one such pithouse on the second terrace above the east bank of the Rio
Grande, about 2 1/2 miles southeast of Socorro. This circular pithouse featured plastered walls and floors, four-post roof supports, and an eastward-oriented ventilator tunnel. Both the Denison site near Isleta, New Mexico, and the Sedillo site, in Albuquerque, date to the same time period and exhibit similar architectural features (ibid.:17-18).

Within the Quemado Planning Unit, three pithouses contemporaneous with the Pueblo III occupation at Site 616 on Mariana Mesa have been reported (McGimsey 1951, 1957). Measuring approximately 2 meters square, each pithouse contained a firepit, ventilator, and unplastered walls and floors (McGimsey 1951:302). One pithouse had a mealing bin, while two had wall cists. The function of these pithouses has not been established; like the pithouses along the Tularosa and its auxiliary drainages and the ones reported from the Rio Grande, they remain subject to examination.

It is apparent that the transition from pithouses to above-ground structures did not occur uniformly as has been traditionally postulated. In addition, it may be that the function of the surface structures as well as their season of occupation varies from one area to another.

There is one more type of Tularosa phase architectural unit, (water-control structure) of which land managers should be aware. Many such features have been located in the montane portions of the study area (Kayser 1973b). Irrigation canals have been observed along Harris Creek (Kayser 1972a), and a complex arrangement involving canals, check dams, masonry dams, diversion walls, and agricultural borders has been noted along Largo Creek (ibid. 1973c:11). Kayser feels that the simpler devices such as check dams and diversion walls, date to both the Reserve and Tularosa phases, and further that the more complex systems involving the articulation of several devices co-occur with Tularosa phase remains (1973c:20).

The proof of such an association raises interesting questions regarding agricultural practices during the Tularosa phase. The construction of water-control devices may represent one of a number of strategies employed to deal with subsistence stress. The cause of such stress remains unexplained in the study area and will be discussed further in the Summary.

The author has observed trough-like structures, resembling irrigation canals, at a Pueblo II-Pueblo III site in the Cibola Forest. As we mentioned, a possible pond or reservoir was noted at the Gallinas Springs site (Green 1974). It is likely that other devices related to water control and diversion exist elsewhere in the Forest.

Water-control structures have not been found anywhere else in the study area. As we noted previously, this may mean that investigators were not attuned to locating such remains until recently.

**PALEOFENVIRONMENT**

Within the study area, the paleoenvironment is poorly understood for the period A.D. 1100 to A.D. 1350, for geological and tree-ring data have not been studied here. The single source of information from this period comes from palynological remains from Higgins Flat Pueblo (Schoenwetter 1962). As we have mentioned, Schoenwetter based his observations on the period dating from A.D. 1000 to A.D. 1250. In addition, the pollen sample comes from one site and its representativeness of regional trends is questionable (Rice 1975).

With the exception of the two top levels (dominated by Compositae), the pollen samples taken from above the dated level are dominated by cheno-am pollen (Schoenwetter 1962:Fig. 76). He believes that a high percentage of cheno-am pollen reflects a situation of disturbed sediments resulting from a precipitation pattern characterized by high energy summer showers.

In the upper Little Colorado drainage west of the study area, Schoenwetter believes that the interval dating from A.D. 1200 to A.D. 1350 was characterized by heavy summer rainfall and periods of local standing water (1962:199, Table 21). He cites the increase in hygric pollens (typha and Cyperaceae) in levels dating to this period to support his conclusion. Hygric pollen is not present at Higgins Flat Pueblo and thus a similar condition does not appear to have existed there.
Pollen, tree-ring, macrobotanical, and faunal samples have been taken at the Gallinas Springs site (Green 1974; J. Tainter, personal communication-1978) and the WS Ranch site (J. Neely, personal communication-1978). With the exception of the faunal and floral remains from the 1974 season at the Gallinas Springs site, these data await analysis. Their contribution to an understanding of the paleoenvironment of the study area during the time period considered here should be significant.

The National Park Service has prepared a paleoclimatic reconstruction of the Colorado Plateau, extending as far south as Cuemado, New Mexico. At the time of this writing, however, the document had not been released. The information contained in the reconstruction will be useful in studying the Cuemado Planning Unit.

SUBSISTENCE

From the plant remains recovered from Higgins Flat Pueblo, it appears that its inhabitants were primarily agriculturists who also exploited a number of wild resources (Martin et al. 1956). Several different varieties of corn were grown, although it is not possible to determine the exact number represented. Some were similar to the Pueblo III corn recovered from Mesa Verde, but in most of its characteristics, the corn at the Higgins Flat site resembles that traditionally grown by the Pima and Mohave Indians (ibid.: 178). The characteristics of this corn bear close resemblance to the Pima-Papago variety, a hybrid formed by the intermixture of Harinoso de Ocho and Chapalote (see The Formative). The remains of Phaseolus vulgaris (the common or kidney bean), P. acutifolius (the tepary bean), P. lunatus (a possible lima bean), P. multiflorus (scarlet runner bean), and Canavalia ensiformis (jack bean) were recovered at the site. In addition, three species of Cucurbita were grown or used by the inhabitants of Higgins Flat; the seeds of Cucurbita pepo were most abundant. The remains of Cucurbita mixta as well as C. foetidissima (a wild gourd) and Lagenaria siceraria (a cultivated bottle gourd) were recovered. As we have noted, C. mixta, P. lunatus, and P. acutifolius have been found in earlier centers elsewhere in the Southwest.

Among the other wild plants represented at Higgins Flat Pueblo were the remains of walnut, yucca, pigweed, saltbush, seepweed, cactus, stickerf, and datura (ibid.: 182-183). It is interesting to note that the datura seeds were recovered from a room which yielded ceremonial items. Datura is a hallucinogenic still used for religious and medicinal purposes among various Indian groups.

At the WS Ranch site, preliminary analyses of the macrobotanical remains indicate that Cucurbita sp., members of the cheno-am complex, and various grasses were components of the diet (G. Weir, personal communication-1978). Floral remains from the Gallinas Springs site are limited and reveal little of the subsistence regime practiced by the inhabitants of the site. The assemblage consists of 22.5 grams of corn, a small number of pinyon nuts, and three samples of unidentified seeds.

Heller's analysis of the faunal remains at Tularosa Cave indicate that the exploitation of many of the same species reported for earlier occupations continued into this period (1976). In the mixed Reserve-Tularosa levels, deer bones (Odocoileus sp.), are the most common of all animal remains. In the San Francisco-Tularosa phase levels, deer (Odocoileus sp.), antelope (Antilocapra sp.), mountain sheep (Ovis sp.), and elk-bison (Cervus sp.-Bison sp.) remains constitute the greatest edible meat weight in grams (ibid.: 30, Table 8). Lagomorphs continue to contribute greatly to the diet.

Faunal data from other Tularosa phase occupations in the Gila Forest (LA 4988, LA 4989, see Kayser 1972b) correspond to those recorded from Tularosa Cave (Heller 1976). Turkey (Meleagris gallopavo), duck or quail (Anseriformes or Galliformes), deer (Odocoileus sp.), pronghorn antelope (Antilocapra americana), jack rabbit (Lepus californicus), cottontail (Sylvilagus audoboni), and bison (Bos bison), and raven (Corvus corax) constitute the assemblages from the sites (Heller 1976:78-9). The value of the raven in an ideo-religious system has already been mentioned. Probable intrusive animals such as pocket gopher, prairie dog, woodrat, and fox were also present.

Faunal assemblages from sites with occupations spanning the Reserve, Apache Creek,
and Tularosa phases, or the Reserve and Tularosa phases consist of the same resources enumerated above. These sites, LA 5939 (Kayser 1972a); LA 4986, LA 4987, LA 5933 (Kayser 1972b); and LA 8889 and LA 8891 (Allen 1969) are located along Harris Creek, and Apache Creek in the Gila National Forest. In addition, faunal remains from Trash Area D at Hinkle Park Cliff Dwelling correspond to those from other Reserve-Tularosa occupations (Martin, Rinaldo, and Bluhm 1954: 155, Fig. 79).

Analysis of the faunal assemblage from the Gallinas Springs site (McGregor, D. 1974) reveals a similar array of animals. However, in some cases, the species differ from those reported from the Gila Forest. Of the total usable meat represented in the sample derived from the 1974 excavations (Green 1974), mammals accounted for 96.9% and birds for 3.4% (McGregor, D. 1974:18). Of these, artiodactyls—mule deer (Odocoileus—hemionus), pronghorn antelope (Antilocapra americana), bison (Bison bison), and mountain sheep (Ovis canadensis)—were the most important sources of meat. Jack rabbit (Lepus californicus) and desert cottontail (Sylvilagus audoboni) were also used extensively. Small rodents such as squirrels and gophers contributed negligibly, if at all, to the subsistence base. McGregor, D. (1974) identified turkey and red hawk, but he feels that they were not utilized as a food source. It is interesting to note that at the Gallinas Springs site more species were represented in the faunal than floral assemblage. The extent to which this difference relates to subsistence patterns or to sampling error cannot be evaluated at this point. Nevertheless, future analysis of the ecofactual remains from the site should heed this observation.

The faunal assemblages from sites dating to the twelfth to fourteenth centuries resemble one another in composition. It is apparent that the prehistoric occupants of these montane-situated sites in the Gila and Cibola National Forests hunted a wide range of animals from a number of environmental zones. Riparian, woodland, and plains animals are represented in these assemblages. As we have mentioned, several plains-dwelling animals seek refuge in sheltered mountain valleys during the winter (Bailey 1971); it is at this time that these animals might have been procured.

The assemblages enumerated for the period discussed in this section differ little, if at all, in content from those identified from the Reserve-Pueblo II, Formative, or Archaic periods. As quantitative data relating to the relative dietary importance of each species are not provided in many of the references cited above, changes in the degree to which each species was utilized through time cannot be estimated. This is unfortunate because such data would be useful in determining whether changes in resource strategies took place concurrently with or in response to changes in settlement patterns, agricultural methods, and environmental factors such as the depletion of other resources or changes in the precipitation regime.

No other subsistence-related faunal data are available from elsewhere in the study area.

**MATERIAL CULTURE**

**Pottery**

Five ceramic types are considered indicators of the Tularosa phase. According to Barter (Martin, Rinaldo, and Barter 1957: 97), the following appear in the study area for the first time during this phase: Tularosa Black-on-white, Tularosa White-on-red, St. John's Polychrome, Tularosa Fillet Rim, and Tularosa Patterned Corrugated. According to Rinaldo and Bluhm (1956), Tularosa Black-on-white differs from Reserve Black-on-white in several ways:

The hatching in Tularosa Black-on-White is usually longitudinal, i.e., parallel or almost parallel to the framing lines, while the Reserve Black-on-White hatching intersects the framing lines at about a 45 degree angle. In Tularosa Black-on-White the framing lines are heavier than the hatching, but in Reserve Black-on-White they are about the same. Hatching in Tularosa Black-on-White is also finer and the lines are closer together, but frequently the draftsmanship is poor and the hatched lines merge with one another and the hatching runs over the framing. Solid elements in Tularosa Black-on-White are smaller and more compact,
sometimes giving the effect of negative designs; negative designs occur here but not in Reserve Black-on-White (1956: 180).

The body of Tularosa Fillet Rim pottery has the same attributes as Reserve Smudged and Reserve Fillet Rim, and, in the absence of the rim, can be mistakenly identified. St. John's Polychrome is a trade ware with its origins in eastern Arizona (Carlson 1970), although locally made St. John's is known from the Reserve area (Martin, Rinaldo, and Barter 1957). Houck and Querino Polychromes also occur at this time, but in the Reserve area, they appear to be imported (ibid.:98). Carlson (1961:17) subsumes these two types under the category of Wingate Polychrome. Two varieties of Springerville Polychrome have been found in the Reserve area. One variety is characterized by sub-glaze paint, and the other by the addition of white paint to the interior design (Martin, Rinaldo, and Barter 1957).

As we have mentioned previously (Pueblo II), Tularosa Patterned Corrugated appeared in small numbers earlier in the Reserve phase. It became common during the Tularosa phase. Barter (ibid.) has recognized two variants. One, found primarily on Tularosa phase sites, possesses indented geometric patterns against a plain corrugated background. The other, Tularosa Patterned Corrugated, a Reserve variant, is found in late Reserve sites, as well as Tularosa phase sites. It is characterized by alternating plain and indented corrugated bands. Indenting, apparently of Anasazi origin, is applied to a Mogollon brown ware.

In addition to the above types, earlier wares were also found at Tularosa phase sites. They include, among others, Reserve Black-on-white, Reserve Indented Corrugated, Mimbres Classic, Wingate Black-on-red, Alma Plain, San Francisco Red, and Reserve Plain Corrugated (and its smudged variants).

Martin, Rinaldo, and Barter (1957) note that several trends obtain during this phase: for example, the replacement of unindented wares with Reserve Indented Corrugated; the decline in frequency of Reserve Black-on-white, as Tularosa Black-on-white increased in frequency; the sudden decline in popularity of Reserve

Incised Corrugated at the beginning of the Tularosa phase; and the substitution of textured utility wares for San Francisco Red and Alma Plain. Toward the end of the Tularosa phase there is a slight decline in Reserve Indented Corrugated as Tularosa Patterned Corrugated and Tularosa Fillet Rim increase. Finally, Martin, Rinaldo, and Barter (1957) note that corrugations tend to become more narrow throughout this period and that smudging on the interiors of all plain and textured wares increases. In the Apache-Sitgreaves Forest west of the study area, Plog has noted stylistic differences in Reserve and Tularosa phase corrugated and indented wares as one moves from east to west (personal communication-1978). While similar variability might well exist in the study area, its significance is unexplained at this time.

Wares reported from the WS Ranch site (Neely n.d., 1978a, b) include those reported above for other portions of the Gila Forest. A few late polychromes (Springerville, Pinedale, and Fourmile) as well as Chihuahuan and other southern wares were present on the site.

Apache Creek phase pottery consists of most of the pottery types noted for the Tularosa phase, however, polychromes and black-on-red glaze wares are absent (Peckham, Wendorf, and Ferdon 1956:63). Tularosa Black-on-white, Tularosa Fillet Rim, and Reserve Indented Corrugated are the prominent pottery types found at Apache Creek phase sites.

The pottery types observed in the Quemado Planning Unit indicate that occupation lasted into the fourteenth century. Survey data confirm the presence of late polychromes such as Springerville and Wingate, in addition to the black-on-white and White Mountain red wares enumerated above for the Tularosa phase occupation in the Gila Forest (Danson 1950, 1957; Wilson 1972). Pottery identified by McGimsey at Site 616 (McGimsey 1957) correspond to those identified by surface survey and include Pinedale and Heshotauthla Polychromes. McGimsey's analysis indicates that black-on-white wares at the site were locally manufactured, but most of the red wares were of non-local origin.

Washburn (1977) studied the same assemblage using a mode of analysis which she
calls "symmetry analysis." Her results indicate that not all of the white wares at Site 616 were locally produced, and that the red wares were both locally produced and imported. Finally, she found certain wares to be atypical in design when compared to those prevalent in the Upper Gila area.

Washburn's technique offers an alternative to the type system most often employed in the study of ceramic assemblages. Those who have studied pottery know, however, that specimens cannot always be positively identified as belonging to one discrete class or another. The study of design structure through the classification of the properties of symmetry eliminates this problem. It provides a standardized method of ceramic analysis. Symmetry analysis allows the comparison of these assemblages with others similarly studied. Washburn feels that such comparative analyses will enable us to determine the direction and degree of interaction between and within communities (1977:189).

The available survey data from the Ladron Planning Unit fail to provide adequate information regarding the pottery found here during the Pueblo III occupation. Danson (1957) notes, however, that a site located on the Rio Salado contained a greater number of utilitarian gray wares than brown wares.

In the Stallion Planning Unit the dominant wares are: Chupadero Black-on-white; Socorro Black-on-white; Casa Colorado Black-on-white; Pilares Banded; El Paso Brown; Elmendorf Black-on-white; El Paso Polychrome; and Los Lunas Smudged. Casa Colorado Black-on-white is identical to Chupadero except that its undecorated surface is smooth rather than rough (Mera 1935). Stylistically, Elmendorf Black-on-white is the same as Chupadero Black-on-white, although carbon paint rather than mineral is used in the former. Many intrusives including Chihuahuan wares and White Mountain Red wares have been recorded (Yeo n.d.a, b).

Sherds present on Pueblo III sites in the Datil and Gallinas Mountains show an equally extensive range of origins and derivations. Pottery observed here includes imported and local versions of St. John's Polychrome, Tularosa Black-on-white, Reserve Black-on-white, and Wingate Black-on-red (Danson 1957; T. O'Laughlin, personal communication-1978; Museum of New Mexico n.d.). Danson has also noted eastern intrusive types including Three Rivers Red-on-terracotta and Lincoln Black-on-red in Gallinas Canyon (1957:77).

Considerable attention has been paid to the ceramic assemblage from the Gallinas Springs Site (Davis 1962). An unnamed pottery type present at this site closely resembles Mesa Verde wares, which, in addition to the site's masonry style, has led some to conclude that the site represents an influx of Mesa Verde people into the area.

It seems reasonable to assume that the Mesa Verde-like pottery found near Magdalena was not traded to that area, but was the local production of dispersed Mesa Verde craftsmen who had migrated south. The reasons for this assumption are as follows: the appearance of a variety of Mesa Verde pottery in Gallinas Canyon was sudden. It worked a sharp disconformity with previous local traditions. Mesa Verde derivatives then became the dominant black-on-white ware of the site [the Gallinas Springs site], for, perhaps 100 years. Subsequently, the Mesa Verde manifestation dispersed as suddenly as it had arisen (1962:110).

This similar pottery differs from Mesa Verde pottery in a number of ways. Davis summarizes the differences:

The designs resemble those found on Mesa Verde and McElmo bowls and jars but the graphic vocabulary is more limited. Also, hybrid design forms occur, as though Mesa Verde prototypes had received fresh stimulus from the styles of Gila polychrome, late Tularosa and other unknown sources. When the Magdalena sherds are compared with counterparts from the Mesa Verde area, it can be seen that the former have layouts which are simpler and painting which is cruder. The paste is brownish. The slip, although thick and crackled, is frequently buff in color. The paint is carbon but with a soft, unfamiliar bluish hue (1962:1).

Warren has studied the pottery from the
The temper, consisting of crushed ryholitic tuff, is distinctive and requires microscopic examination for identification; however, other physical attributes of the pottery are not singular enough to set it off from the McElmo or Galisteo Black-on-white pottery made in other areas to the north (1974:4).

Those who say the site represents a Mesa Verde influx are looking exclusively at this particular painted ware and are ignoring the other painted wares and utility pottery at the site (T. O'Laughlin, personal communication-1978). While the assemblage has not been carefully studied, O'Laughlin notes that the other components of the pottery assemblage are both imported and locally manufactured versions of wares from the north (i.e., Anasazi) and west (i.e., Mogollon). The indented utility wares are particularly interesting too. My examination of the sherds collected by Mera (on file at the Laboratory of Anthropology) revealed that they are crudely constructed and exhibit less craftsmanship than the contemporaneous indented wares in the San Francisco-Tularosa River Valleys. Questions remain, therefore, as to the origins and distribution of both the painted and utility wares of the Gallinas Springs site.

Pueblo IV pottery, found in the Quemado, Ladron, and Stallion Planning Units and the Gallinas Mountains of the Cibola National Forest, consists of polychromes, some of which have been glazed. The distinctive aspect of Pueblo IV pottery is that it is glazed. The application of a glaze represents a major technological change in pottery manufacture, a development which first occurred during late Pueblo III with the application of glazes to black-on-red and polychrome wares. Late St. John's Polychrome and St. John's Black-on-red were sometimes decorated with a glaze (Carlson 1970). At the Gallinas Springs site, for example, a greenish-black glaze is present on St. John's Polychrome (T. O'Laughlin, personal communication-1978; Danson 1950). These early glazes are of poor quality and their application sloppy, perhaps a result of experimentation with the technique. However, the quality improves during the Pueblo IV period (Carlson 1970).

In the classification system devised by Mera for the northern Rio Grande, the rim forms of each glazeware type are divided into groups lettered A-F (Mera 1933, 1940). Each group contains one or more sub-types. However, the correspondence of these northern wares with the ones occurring in the Stallion and Ladron Planning Units has never been established. Wilson notes that while resemblances with the northern glazewares exist, the details of these similarities have never been examined (J. P. Wilson, personal communication-1978). Nevertheless, along the Rio Salado, Mera (1940:8) identified D, F, and F glazeware types. At Coat Springs (Warren and Wilson 1974) and at the Pueblo IV site near Bear Springs (Mera 1940:7) in the Cibola Forest, D and E types have been observed. Along the Rio Grande, Mera (1940:7-8) and Wilson (personal communication-1978) have identified the full range of glazewares from A to F.

Chipped and Ground Stone

The categories of chipped and ground stone artifacts from the Tularosa phase are basically the same as those reported for earlier periods. As Rinaldo notes:

Although changed somewhat in form and frequency, the major categories such as manos, metates, choppers, scrapers, flake knives, projectile points, bone awls, bracelets, and stone bowls, are the same as those of Pine Lawn Phase and Pre-Pottery times. In fact, if they were mixed with the artifacts from earlier phases, it would be impossible to separate out many such Tularosa Phase artifacts on the basis of types (Martin, Rinaldo, and Barter 1957:39). (Emphasis supplied by this author.)

Nevertheless, certain types of artifacts which first appeared in the Reserve phase are represented in greater numbers in the Tularosa and now constitute major components of the lithic assemblage. These include: beveled manos; small, triangular, side-notched projectile points; grooved axes; rectangular stone bowls; the through-trough metate; and the two-hand, rectangular mano with a flat grinding surface. Mealing bins are reported from Tularosa Phase levels at Higgins Flat Pueblo (Martin et al. 1956). The metates
found in the mealing bins were simple slabs or small metate-like grinding stones (ibid:74).

The most common types of projectile points in Reserve and Tularosa phase occupations found in the study area are notched. (Unnotched points are rare in Mogollon assemblages.) Martin, Rinaldo, and Bluhm (1954:140) note that the following types of notched points are found predominantly at occupations dating to these time periods: diagonal-notched points with a convex base and down-raking barbs; a lateral-notched point with a straight expanding base wider than the shoulder; a shallow, lateral-notched point with an expanding stem and a concave base; a small triangular, lateral-notched point with a serrated stem; and a small, shallow lateral-notched point with a round stem. Photographs of these points are found in Figures 61, 62, 63, and 64 (ibid.:117, 119, 123, 126).

Interesting components of the lithic assemblage dating to the Tularosa phase at Higgins Flat Pueblo are painted slabs, painted grinding slabs, painted bowls, and paint palettes (Martin et al. 1956:74). While paint grinding stones have been recovered from earlier levels at other sites in the Reserve area, the occurrence of worked stone with painted decorations is singular. Other investigators "have indicated that these painted slabs have predominantly a western and southern distribution during Pueblo III and IV, particularly in the area inhabited by peoples thought to be ancestral to either the modern Hopi or the Zuni Indians" (ibid.). (It is curious to note that most investigators feel that the Zuni are descended from the Mogollon.) A photograph of the painted objects (as restored) appears in Martin et al. (1956:125).

While unnotched points are rare in the Mogollon assemblages noted for the study area, Keller found that the predominant point type at the Gallinas Springs site was a small, triangular unnotched point (1974: 110, Fig. 29). He believes these points resemble closely those found in the Cebolleta Mesa area to the north. According to Dittert (1959) small, unnotched triangular points such as these were common throughout Cebolleta Mesa during Pueblo III times. Keller notes that they are also common in eastern Arizona (1974: 77), and thus might be expected in portions of the Quejado and Ladron Planning Units. At the Gallinas Springs site, these points are usually of obsidian. Keller (1975) postulates that they and the style associated with their manufacture were brought south from the Mt. Taylor area. Corner and side-notched points are also found at the site, but they are in the minority.

Throughout the area surveyed by Danson there is an increase (during the Pueblo II-Pueblo III periods) in the number of full-trough (i.e., through-trough) metates, close-end trough metates, and slab metates observed (1957:94), and rectangular, uniface, and rectangular biface manos predominate. Mealing bins were absent from the Gallinas Springs site (Keller 1975), but were present at Sites 494, 481, and 616 on Mariana Mesa.

SUMMARY AND ASSESSMENT

The major events characterizing the entire study area during the Pueblo III period include: the consolidation of the population into large and seemingly planned communities with similar internal organization; the appearance of both large (i.e., "Great") and small kivas at one site; the occurrence of pithouses at a time when the predominant structures were surface-masonry units; and the abandonment of large portions of the study area. In addition, we have noted water-control structures in certain portions of the study area, as well as the development of polychromes and glazes during the course of the time period.

While we have been able to note some of the demographic and organizational trends which took place during this time period, our knowledge of regional settlement patterns remains deficient. From the available data it appears that three major forms of settlement behavior took place during the Pueblo III and IV periods. The first, and perhaps best understood, is that observed for the Gila Forest; it consists of the continuous occupation from the Formative period to the time of abandonment of all portions of the Forest. Beginning at around A.D. 1200 we see the beginning of the depopulation of the Forest with the abandonment of narrow alluvial
valleys located along minor drainages. As we have seen earlier, these occur primarily at elevations exceeding 7000 feet.

The second settlement pattern derives from observations from the Cibola Forest and the Quemado Planning Unit. In these areas there appears to have been a movement to higher elevations during the Pueblo III period. It has been noted, for example, that there was a trend in the Quemado Planning Unit toward the location of sites close to the well watered highlands near the Continental Divide. In the Cibola Forest, we have noted that sites dating to this time period lie above 7000 feet. With the exception of a small area near Magdalena, we see the abandonment of these regions, sometime during the early fourteenth century. It cannot be emphasized enough, however, that the regional trends noted for these areas are based on very limited data and must be confirmed via systematic survey.

The third type of settlement pattern concerns portions of the Ladron and Stallion Planning Units lying in the study area. In both areas, Pueblo III and IV occupations, as well as earlier ones are confined to landforms located along the Rio Salado, the Rio Grande and their drainages. In these areas subtle differences in site location may pertain through time. Settlement and paleoenvironmental data are less well known for this portion of the study area than for the other areas, so we will exclude this area from our discussion except in a general way.

Concomitant with our poor knowledge of the settlement patterns is our lack of understanding of the site selection system which governed them or the factors which precipitated changes in them. I will concentrate, therefore, on the major change which took place in the study area during the Pueblo III and IV periods, i.e., the abandonment of the study area.

While abandonment is a widespread phenomena throughout most of the Southwest during this period, few explanations have proved satisfactory. Deteriorating climate (Schoenwetter 1962; Bluhm 1960; Schulman 1938; Danson 1957); fear of invading nomads (Jett 1964); internecine strife; disease; and cultural isolation (Hough 1907; Bluhm 1960) are among the causal factors which have been suggested. (For a review of any of these arguments and evaluations of their empirical fit or explanatory powers Martin and Plog (1973:318-333) and Rice (1975:82-93) should be consulted. Furthermore, for examples of adequately tested models dealing with abandonment, I refer the reader to Cordell (1975) and Cartledge (1977).) In the following discussion I will review a few of these explanations offered for other parts of the Southwest and then evaluate their adequacy for explaining abandonment in the study area.

Until recently a popular explanation for both the consolidation of people into larger and frequently defensively organized communities and the abandonment of large areas was the fear of invading bands of Athapaskans (Jett 1964; Danson 1957). According to this argument, fear of the enemy caused people to join together. Abandonment was a result of the failure of the sedentary groups to exist under constant threat from the warlike groups.

This view is subject to question on several counts. First of all, little evidence exists that nomadic groups such as the Apache or Navajo were present in the Southwest or in the study area much before A.D. 1500 (Danson 1957:112). Danson has noted that the Apache did not enter the mountain country of New Mexico prior to the 1700s. Other investigators find no data to prove the presence of Athapaskan populations in the Southwest until A.D. 1390-1500 (Martin and Plog 1973:325). Thus, even if nomadic groups were present as early as the last part of the fourteenth century, it is still later than the period when most portions of the study area were abandoned.

While some data in the study area suggest that strife did exist among various communities, we have no means of demonstrating that it was caused by invading Athapaskans. At some communities, however, warfare and defense do seem to have been factors in construction and eventual abandonment. As has been noted earlier, in the Gila Forest several early Tularosa phase pueblos were wholly or partially enclosed by walls. Other communities such as those in the form of a hollow square appear to have been built with defense in mind. In the Cibola Forest, Site 117, located downstream from the Gallinas Springs site, was surrounded
by a wall and "appears to have been
planned for defense" (Danson 1957:77).
The occupation of cave sites at this time
might have been related to protection as
well.

Elsewhere in the study area, other fea-
tures suggest that defense might have
played a key role in the organization or
location of some communities. At the
Gallinas Springs site, for example, Green
(1974:9) has argued that the thick exterior
wall of the "D" shaped pueblo formed a
defensive shield around the site. In
addition, she believes the site to be situ-
atuted in a naturally defensive location.
Similarly, Site 616 on Mariana Mesa
(McGimsey 1957, personal communication-
1978) appears to have been built for
defensive purposes. The inclusion of a
walk-in-well and a potter's clay pit within
the pueblo suggest that certain major
activities were confined to the community
itself. If the pueblo were threatened, this
minimized the movement of members of the
community outside of it. Finally, several
sites reported for the Stallion Planning
Unit are situated on high and relatively
inaccessible locations along the Rio
Grande. In addition to providing protec-
tion, such locations offered good visibility
of the surrounding area.

There is some, albeit minor, evidence that
abandonment of certain of the pueblos was
sudden and involved violence. (As we
have pointed out, however, the source of
this violence remains to be identified and
explained.) At the Gallinas Springs site,
two skeletons were found which had been
"severed prior to burial" (Green 1974:10).
At Site 616 on Mariana Mesa most artifacts
had been left in situ suggesting a sudden
departure. (The metate remains are an
exception to this. McGimsey [1957,
personal communication-1978] believes that
there was a definite attempt to carry them
away.)

While some forms of violence characterized
the abandonment of certain communities of
the study area, we have insufficient data
to support the attribution of large-scale
abandonment to warfare or internecine
strife. For example, if these had been
major causal factors, it seems likely that
far more sites would have been constructed
with walls or other features related to
protection. While it can be argued that
cave sites offered that protection, we have
seen that many of the caves occupied at
this time were also inhabited during earlier
periods when defense was not a considera-
tion in site location or construction. Also,
many more sites should have been located
at defensively strategic loci or in areas of
low visibility. Finally, it seems that if
violence and defense were key determi-
nants of abandonment, more skeletal
remains would have exhibited violent
deaths. (Burials from 8 sites in the
Apache Creek and Largo Creek areas are
currently being analyzed by Dr. Mahmoud
El-Najjar, New Mexico State University.
Quick perusal of the burials does not
suggest violent death [personal communi-
cation-1978].) War and invasion from
nomads, therefore, can be disregarded as
major causes of abandonment within the
study area.

Those supporting the concept of deterio-
rating climate have pursued three lines of
argument: drought (Schulman 1938; Bluhm
1960; Danson 1957); changes in rainfall
patterns (Schoenwetter 1962); and changes
in the growing season. Bluhm (1960:544)
has employed Schulman's (1938) findings of
a drought between A.D. 1050 and A.D.
1100 to argue for the abandonment of
minor drainages such as those constituting
the Pine Lawn Valley. As we have seen in
The Formative, Schulman's interpretations
were based on limited knowledge of tree-
ring formation and from samples which
were not obtained in the study area.
Danson (1957) suggests that drought
during the thirteenth century caused
abandonment in some of the drainages of
the Gila Forest.

Elsewhere on the Colorado Plateau,
Schoenwetter (1970) has documented a
series of five effective moisture curves
based on a correlation of pollen and tree-
ing data. While the data were not
obtained from the study area, the occur-
rence of drought is so widespread in
portions of northern New Mexico and
eastern Colorado during certain periods,
that it is possible that it occurred within
the study area or certain parts of it as
well. For example, Schoenwetter (1970:42,
Fig. 1) sees a period of relative drought
during an interval preceding and imme-
diately following A.D. 1300. The move-
ment of sites to higher elevations in the
Cibola Forest and the Quequod Planning
Unit at approximately this time might have
been a response to this period of
decreasing moisture. As we have seen (Introduction), precipitation is greater at higher elevations. The walk-in-wells at Sites 616 and 190 (Danson 1957:73, Table 16) in the Quemado Planning Unit might be explained as a means of dealing with water shortage. The location of the Gallinas Springs site is adjacent to a spring. In speaking of the entire area he surveyed (which included portions of eastern Arizona not included in our study), Danson states, "It is interesting to note that only in places where water was always available do we find sites lasting long after the beginning of the fourteenth century" (1957:117). (In the study area, these sites lie in the Cibola Forest and the Quemado Planning Unit.) It is possible, therefore, that the drought which occurred in certain portions of the Colorado Plateau also occurred in its southern reaches located in the study area and affected settlement behavior. Before reaching any definite conclusions, however, we must first be able to correlate more precisely the exact years during which the drought occurred and the settlement patterns observed for these areas.

The change in precipitation patterns from a winter dominant to a high energy, localized summer pattern has some empirical support in the study area, although its role as a cause of abandonment must be fully explored. The data, as we have seen, are limited to Higgins Flat Pueblo. Prior to making statements about the extent of this pattern, we must first acquire data from other parts of the study area. In addition, more temporal control must be employed in our interpretation of palynological information. The role of this rainfall and its cumulative and immediate effects in causing erosion, downcutting, and the lowering of water tables must be more fully understood and compared with settlement behavior and agricultural practices. Finally, we have no data to prove that growing seasons decreased within the study area.

Hough (1907) and Bluhm (1960) suggest that portions of the Gila Forest were abandoned for reasons related to cultural isolation. This argument is difficult to prove at this juncture; models which consider the role of information flow might be designed to test this.

The lack of adequate agricultural land to support large numbers of people is a factor which Danson (1957:115) believes contributed to the abandonment of the higher mountain valleys and the movement to lower, wider alluvial valleys. While this might have been a causal factor, it appears that other characteristics of the higher mountain valleys (e.g., shorter growing season) might have contributed to abandonment.

It is evident that abandonment is a complex issue and one in which a variety of causal factors were operating. It might be most profitable to approach the problem from the perspective of a number of variables rather than one. The interaction of many variables and their effects on one another is a more realistic approach.

In the construction of models related to abandonment, factors including population, technology, availability of resources, amount of agricultural land, nature of soil, length of growing season, and precipitation patterns must be considered. Cartledge (1977) has argued convincingly that population growth, and the strains it imposed on agricultural productivity in an environment which he defined as marginal to agriculture, was instrumental in the abandonment of the Vosberg locale in Arizona. We might be able to apply this to the study area. While drought might have had some effect on the movement to higher elevations in the Cibola and Quemado Planning Units, population pressure in an environment marginal to agriculture might have caused the eventual abandonment of the region. In the Gila Forest, abandonment of the upper reaches of the tributaries of the Tularosa and San Francisco Rivers might have been due to the inability of the land (because of the short growing season and erosion of the poor soil) to support a large population. The eventual abandonment of the lower alluvial valleys might have been due to the inability of the land to support a growing population resulting from the influx of people from the higher elevations.

In considering population growth as a significant factor in site abandonment many of the other causal factors can be explained. For example, Danson's (1957) suggestion that the loss of reliable land, through the depletion of soil nutrients and soil erosion, resulted in abandonment makes more sense when population pressure is considered. It is clear, therefore, that population and its needs
for biological and social survival must be considered in the construction of explanations of abandonment. In identifying features of the biophysical environment and their relationship with population growth, we may be able to arrive at a more complete explanation of abandonment.
HISTORY
By David "A" Gillio

INTRODUCTION
The earliest contacts between New Mexico's Indians and Spanish-Mexicans were the result of the sixteenth century explorations of the Spanish military and priesthood (Fig. 10). It seems that the first contact must be credited to a Negro guide in the service of a Franciscan, Fray Marcos de Nizza. The guide, Estevanico, did not survive the experience. Fray Marcos, in 1539, penetrated as far as "Cibola" which is thought to be Zuni (Bandelier 1929:41).

The following year Coronado's troops entered the state and made a more lasting impression. They entered from the west and began exploration of the central Rio Grande Valley (Jenkins and Schroeder 1974). Coronado's party was larger, better equipped, and produced more voluminous records than was possible for Fray Marcos. Still the Franciscan's brief report can be said to mark the dawn of history in New Mexico.

The Rio Grande Valley subsequently provided a major route for explorers, traders, and colonists. It also became the location of sites which were fortified and of administrative/religious centers. The more important locations, presidios, housed colonial troops, but some towns had their own priests and missions with some armed protection. Senecu, for example, had a bronze cannon which was recovered by the retreating Spanish during the Pueblo Revolt (Hackett and Shelby 1942:126). The extent to which the Spanish were successful in their colonization was owed to their strength of arms; unprotected missions were as likely to lead to martyrdom for the friars as to permanent settlement.

Much of what was recorded by the colonists has been preserved. However, the study area is documented less fully than is the more heavily populated upper Rio Grande Valley. Evans (1970) provides a useful guide to relevant Spanish manuscripts for the period 1540 to 1750. A common problem in using the old records involves the difficulty of accurately correlating the modern place names or geographic features with those reported. The historical archeologist might play an important role in untangling some mysteries through the excavation of sites along the Rio Grande. For example, the Camino Real, known to parallel the river, has not been definitely located on the ground even though the thousands of people and animals who traveled on it must have left numerous artifacts. Portions may have been destroyed by modern road building reservoirs, etc., but the infamous section, the Jornada del Muerto, is located in inhospitable terrain and thus probably little altered.

EARLY HISTORIC PERIOD
Of the Indians who inhabited the study area when the Spanish first came it is the Piro about whom most is known. Among them were the first converts to Christianity and it was in their village that the missionaries first built. Marshall (1976) has summarized the historic documents reflecting contact with the Piro between 1541 and 1693. His summary should be a starting point for anyone who plans to explore their sites.

At the time of contact, many of the Piro villages found by the Spanish were deserted ruins, perhaps because the Apaches frequently preyed upon them. Accounts vary, but it seems that in 1582 there were about forty pueblos containing some 12,000 Piro. Of these sites only a few are mentioned in any detail in historical sources. The outline of events in Piro territory after 1540 is that the Spanish settled among them, made converts, suffered depredations of the Apache, and finally left the area along with the Piro in 1680. Although the Piro did not participate in the Pueblo rebellion of 1680 it appears that they had seen enough of the Apaches and were willing to move south with the surviving Spanish to seek safety near El Paso.

Perhaps the most interesting challenge for the historical archeologist is to positively identify historic Piro sites. Often the descriptions are contradictory or fall just short of certainty. For example, there is a question as to whether San Antonio
SPANISH EXPEDITIONS in the study and adjacent areas

CHAMUSCADO-RODRIGUEZ, 1581-82
Cabeza de Vaca, 1536
CORONADO, 1540-41
CASTANO DE SOSA; 1590-91
ESPEJO, 1582

Figure 10
de Senecu is extant or has been destroyed by shifts of the Rio Grande (Marshall 1976:17). Having once identified a site there are numerous questions, e.g., regarding the acculturation of the Piro, which might be asked. Numerous Spanish missions have been excavated by archeologists, mainly in California, so there is both historical data and comparative field data available to add depth to further study of the Piro.

When Governor Otermin passed through Piro territory in 1681, he burned some of the pueblos which had been abandoned in 1680 (Marshall 1976:46). Since burned structures often present archeologists with good conditions of preservation, there is reason to attempt relocation of such villages in expectation that they might yield more information than those simply abandoned to the elements. Piro houses were often three stories high and the associated mission building often thick-walled. Even though they were constructed mainly of adobe, they should present fairly substantial targets for field research.

The Apache are often mentioned yet little described. These nomadic raiders supplemented their living by stealing from the Piros' gardens. The coming of the Spanish was probably welcomed by the Apaches as they were able to add sheep to their diet. Spanish attitudes about the Apaches were not at all ambivalent; they represented a threat to all that the Spanish hoped to accomplish.

The Spanish approach to the problem of controlling the Indians was like a replay of European politics. Power blocs were identified, alliances arranged, and the balance of power maintained through trades, bribes, and threats. A major difficulty in applying this formula in New Mexico was the lack of similar high level organization among the Indians. The Apache were seen as five major groups, one of which was the Navajo, but the Apaches themselves did not acknowledge tribal leaders (Moorhead 1958:170). Later the Spanish came to call various Apache groups by names derived from geographic locations, but there is no assurance that these names indicated cultural differences (Schroeder 1974:2).

Just as some names imply diversity where there was none, some generalizing also took place. The Navajo were closely aligned with the more southern Apache and termed "Apache de Navajo" in early accounts (Schroeder 1963:6), although they had important cultural traits (e.g., agriculture) not shared with the nomadic Apache. Both Apache and Navajo are speakers of Athapaskan. See Forbes (1959) for a discussion of linguistic identification.

Living in the northwest corner of New Mexico when the Spanish came, the Navajos were pushed south by the expanding Utes (Fig. 11). A series of alliances with the Spanish and Apaches aided in the drift to the south. By the 1860's Navajos were avoiding U. S. troops by taking refuge in several areas of Socorro and Catron Counties including locations near Socorro, the Datil Mountains, and Zuni Salt Lake (Schroeder 1963:9). Some 10,000 Navajos surrendered to the Army by 1864, mainly due to the campaign of Colonel Kit Carson who then escorted them to Bosque Redondo.

Distinguishing between Apache and Navajo archeological sites in the study area should be difficult. Since both groups were raiding settlements and fighting a continuing war with American troops, it might be expected that their material culture was quite similar by the mid-nineteenth century. One research problem which might interest archeologists is to determine the degree to which manufactured goods and other artifacts traceable to American or Mexican origin had displaced native Apache and Navajo goods. Sites within the study area should prove useful, especially those in the Forest Service lands which once served as refuge areas (Figs. 12 and 13). U. S. military artifacts might prove valuable for dating such sites as there are numerous stylistic changes which are firmly dated (Brinckerhoff 1972).

One area in which assuredly Navajo sites are found is the small Alamo reservation in northwest Socorro County. Several archeological surveys have been done there for project clearance reports but with little information discovered. A field school directed by Ellis in 1949 has produced no publications.

One place which has been a focus of human activity from prehistoric times to the present is the Zuni Salt Lake. Sodium chloride from this source has long been
Figure 11

POPULATION SHIFTS IN
APACHE AND NAVAJO COUNTRY 1700 to 1860's

PORTION EARLY NAVAJO LOCALE
ABANDONED BY 1770's

1860
DATES AND LOCALES OF EARLY NAVAJOS
OUTSIDE OF THE DINÉTAH

1864
AMERICAN PERIOD REFUGEE NAVAJOS AND
FIRST DATES IN NON-NAVAJO COUNTRY

1860
DATES AND LOCALES OF EARLY APACHES
LIVING NEAR SAN JOSE RIVER

80
Figure 12

GILA APACHES
1796–1860

RAIDS
1850 DATA FROM MAPS

1809
1856b
1855
1799
1856a
1852b
1830a
1852d
1863
1800
1854
1852c
1850
1855
1847
1823
1811
1855
1826
1812
1865
1865
1826
1812
1865
1865
NAVAJOS AND APACHES
1863 to 1868

Figure 13
valued for both dietetic and ritualistic purposes and served as an important resource through recent times. Salt from the lake has been identified as far away as 200 miles (Hodge 1937); trace element analysis is given in Waring and Andrews (1935:160).

Because intense ritual activity has been associated with the gathering of salt from this location, there are numerous possibilities for the discovery of sites around the lake. The sacrifice of native jewelry and ritual objects was a common practice by Navajos and others (Hill 1940). For a description of Hopi salt ritual, see Beaglehole (1937:52-55). A search for these sites and artifacts should not be encouraged as the religious significance of these sites is upheld by living Native Americans. Recent commercial structures built at the north end of the lake may have destroyed the richest artifactual areas.

Salt from the Zuni Lake source was praised in early Spanish expedition reports (e.g., translation in Hodge 1937) and it was said to be superior to commercially available salt. This desirableness, and the fact that the vicinity of the Lake was neutral ground even between Indians and Euro-Americans, eventually led to commercial exploitation starting in 1875 (Gray et al. 1977).

Zuni Salt Lake has been placed on the State Register of Cultural Properties (Purdy 1973:47). A manuscript entitled, "Proposal for National Scientific Landmark Status" by Anderson and Bradbury (1965) has an extensive bibliography for Zuni Salt Lake.

### AMERICAN PERIOD

Within old Socorro County short-lived Fort Conrad (Fig. 14) was the first American military post. In 1851 Fort Conrad was established along the west bank of the Rio Grande (Beck and Haase 1969). Built of flimsy cottonwood and adobes on land claimed by private owners, the fort was abandoned in 1854 and relocated a few miles down the river with the name Fort Craig (Myers n.d.). The later fort has been added to the New Mexico Register of Historic Places and is commemorated at a nearby rest stop on Interstate Highway 25 (see Purdy 1973:47).

The battle of Valverde, the first major Civil War engagement in New Mexico, took place between the Union defenders of Fort Craig and General Sibley's Texas force in February, 1862. The garrison was bypassed and Sibley marched into northern counties in an effort to control the Colorado gold fields for the Confederacy, only to meet defeat at Glorieta Pass (Myers n.d.:4).

Fort Tularosa once stood on the present site of Aragón in Catron County. At its best it consisted of a frame hospital, a dozen log cabins and one adobe structure. For a discussion of the strategy of military construction, see Bender (1934:253). Established in 1872 to facilitate observation of the nearby Apache reservation (Fig. 15), its purpose ended when the Indians were moved back to their original lands at Ojo Caliente in 1874. Most of the buildings and equipment of the post were salvaged and transported to other forts in New Mexico, so there will be considerably less here to interest the archeologist than at some other forts. Perhaps the significance of Fort Tularosa is that it briefly provided a focal point for settlers and thus encouraged Euro-Americans to enter the west-central portion of the state (Kayser 1973d). In 1874 the post was abandoned (U. S. War Department 1875:302).

The Ojo Caliente Post, a satellite of Fort Craig, was established in 1874 to watch over the Warm Springs Apache Agency. The site is now marked by adobe ruins near the Alamosa River. For an early photograph of the Post, see Myers (1975:22); for a recent photograph, see Carmack (1972). This site's main historical significance lies in the events surrounding the capture of Geronimo, the Apache Chief. Clum, who engineered the capture, gives a full personal account of the action (1928).

Little physical evidence of Geronimo's capture can be expected at the site, but there are other research interests. The population at the Apache community at Warm Springs totaled about 450 when orders were given to shift them to Arizona along with Geronimo's war party. Prior to that time, 1876, the site had been a
Figure 14

MILITARY FORTS in the Study and Adjacent Areas

FT. LEWIS (1880-1891)
FT. LOWELL (1866-1869)
FT. DEFIANC (1851-1868)
FT. CANBY 1863-1864
FT. WINGATE II (1860-1912)
FT. WINGATE I (1862-1868)
FT. TULAROSA (1872-1874)
CAMP OJO CALIENTE (1859-1882)
FT. WEST (1863-1864)
FT. BAYARD (1866-1877)
FT. MC LANE (1860-1864)
FT. CUMMINGS (1863-1886)
FT. GARLAND (1858-1883)
FT. CANTONMENT BURWIN (1852-1860)
FT. UNION (1851-1891)
FT. MARCY (1846-1894)
FT. BASCOM (1863-1871)
FT. SUMNER (1862-1862)
FT. STANTON (1855-1896)
FT. MC RAE (1863-1876)
FT. THORN
FT. SELDEN (1865-1889)
FT. FILLMORE (1851-1862)
SOUTHERN APACHE AGENCY

Figure 15
favored camp due to its springs and beautiful setting. For those interested in determining the range of nineteenth century artifacts in use by the Apache, the vicinity of the Post could prove to be a valuable resource.

Until the Indians were finally pacified at the beginning of the twentieth century, there were countless clashes between them and the Army or settlers. A few of the larger encounters have been documented in military reports. The sites of these encounters, where dozens of persons lost their lives, might be located by the cast-off accouterments of war. In particular, cartridge cases might be a valuable clue. Public interest in battle sites is generally high and might repay the effort of searching.

RANCHING

The story of ranching in New Mexico is intimately tied to the history of land grant litigation, the enactment of homestead laws, and the pacification of the nomadic Indians. Livestock was introduced by the Spanish; sheep were the most important herd animals until cattle were introduced in large numbers around 1880. The colonists of Oñate brought some 7000 head of livestock into New Mexico in 1598, most of which were sheep and goats (Hammond and Rey 1953:44).

During the first Spanish colonization, the importance of cattle increased, both for subsistence and for a wide range of leather products and tallow. Baydo (1970:17 ff) summarizes the impact of cattle on the colonial economy. Progress toward increasing the herds was reversed during the Pueblo Revolt in 1680, and when the Spanish reclaimed the area in 1692, their livestock had vanished. It was many years before the former levels were attained. Baydo states that documentation for numbers of animals is rare, but that in 1800 the governor sent over 18,000 sheep and 213 cattle down the Chihuahua Trail (ibid.:25).

The determination of the size of the later herds is also difficult. One reason lies in the practice of letting cattle run free on the open range. Ranchers typically owned the relatively small areas where water was found but controlled all the surrounding range lands (Wilson 1938:26). It was only during roundups that one could obtain a head count and even then there were invariably large numbers of cattle which were not included. Also, there was a suspicion in the minds of cattlemen, as is common when those who work the land meet with those who represent a taxing authority, that no good would come of telling exactly how many animals they owned. Carlson says there were 5.5 million sheep and 1 million cattle in 1884; by 1888 the balance had shifted to 3.5 million sheep and 1.5 million cattle (1969:37). Baydo cites several sources which point to a maximum range population in 1884, the height of prosperity, of about 1.5 million head of cattle. At that time all available land was being exploited, demand was high and environmental conditions were favorable. In 1885 prices fell and the rains failed (1970:216-217). The events of the next decade led to abandonment of many cattle-herding outfits and the decline of some towns. Alma, in Catron County, is one which rode the crest of mining and ranching prosperity, but is today a virtual ghost town.

It is unlikely that very accurate statistics can be gathered for smaller areas, but it does appear that a figure of under 2 million head represents a maximum population of cattle in New Mexico. Populations for drainages and counties might be estimated using the Public Land Commission's statement (Baydo 1970:157) that it takes from 10 to 30 acres of land per head in this state to prepare cattle for market. Socorro County was in one of the low-density sheep areas with from 5 to 19 head per square mile (Carlson 1969:38).

Symptomatic of the general decline of ranchers after 1884 is the decline of their advertisements. The "Las Vegas Stock Grower," which had run pages of advertisements for brands of cattle companies in the 1880s, listed none at all for Socorro County in 1892.

The ranchers added a colorful chapter to New Mexico's history, one which the public has romanticized and enjoys. A steady diet of Hollywood cowboy films has kept alive images of rustlers, trail drives, and shoot-outs. However, the artifactual legacy of the period has been little explored except by amateur collectors who sometimes dig through abandoned ranch
sites in search of antique bottles and coins. One of the best known studies of a ranch site of the period by historical archeologists is that of Johnny Ward's ranch in Arizona (Fontana and Greenleaf 1962). The report gives an indication of the range of information which could be discovered by systematic investigation. Excavation of a ranch site in this study area could provide valuable comparative data and indicate possible recreation values.

Few large sites will be found to represent the ranching industry because of the dispersed nature of the work. A conspicuous exception is the Magdalena Stock Driveway. Starting as an informal stock trail in the 1880s, it was formalized in 1918 when the Secretary of Interior withdrew it from public domain. Sheep were driven to the Magdalena railhead from as far away as Springerville, Arizona. In later days the 5- to 10-mile wide route was fenced and wells were placed at intervals to provide assured feed and water for animals on their way to market. Now returned to public domain and subdivided into allotments, a portion of the old driveway along U.S. Highway 60 has been nominated to the National Register of Historic Places by the Bureau of Land Management (Anderson n.d.).

For a complete listing of properties identified in the New Mexico Historic Preservation Program, see Purdy (1973); for a current listing of properties nominated to the National Register of Historic Places, see the Federal Register, Part II, dated on the first Tuesday of February each year.

Many isolated graves may be found throughout the study area. Some of them, those of ranchers and miners, resulted from Indian troubles, while others were due to accidents. Woodrow (1943) lists several grave sites which should be relocated prior to undertaking developments in their vicinity.

The railroad might be viewed as an aspect of ranching, although it is also tied to mining interests. Fast, cheap transportation was the key to marketing livestock in the American period. The railroad at Magdalena filled that need by tapping the old Stinson Trail and stimulated development of the Magdalena Driveway (Gray et al. 1977:9). Railroad buffs have created a voluminous history of the iron horse, but its importance in the study area is not well understood.

Papers presented at the 1978 meetings of the Society of Historical Archaeology demonstrated a growing interest in railroad archeology. In these studies the focus was on the camps of the workmen who built the lines. Already, interesting advances have been made in studies of the ethnic origin of the workers, the social stratification in the camps, and the trade networks which brought preserved foods from China to end-of-track. Similar studies might be profitable along the existing or abandoned rights-of-way in Socorro County.

MINING

Some of the oldest mines in the United States are in north-central New Mexico. Turquoise was probably mined as early as 900 A.D., lead and silver were being extracted by 1600, gold was discovered in 1828, and coal was being mined by 1880 (Elston 1967:1). Late in the eighteenth century copper was mined (USGS 1965:131). Gold was the lure which first attracted the Spanish explorers, but it remained hidden until after the region had passed from their control. In the study area mining became important only in the American period and then mainly after pacification of the threatening Apaches removed the major risk.

Figures 16 and 17 give the locations of the most important mining districts and towns. The Mogollon district in Catron County has been a rich producer of minerals (e.g., gold, silver, copper, lead, and iron); in some ways it can stand as representative of the others.

An often told tale concerns Sergeant James C. Cooney, for whom the town of Cooney is named. The Sergeant, while on an Army scouting mission, discovered rich ore on Mineral Creek near Mogollon. Keeping the news of his find secret, he served out his enlistment and returned 1876 to stake claims. Apache raids harried the miners and led to several dramatic incidents as well as a loss of lives on both sides. Cooney was killed and scalped in 1880; his brother died of exposure in 1914 while
PRINCIPAL MINING DISTRICTS in the Study Area

1. SOCORRO PEAK, SILVER
2. SOCORRO PERLITE, PERLITE
3. SOCORRO MANGANESE, MANGANESE
4. MAGDALENA DISTRICT, ZINC, LEAD, COPPER, SILVER, GOLD, PERLITE
5. ROSEDALE, GOLD, SILVER
6. IRON MOUNTAIN, IRON FLOSPAR, BERYLLIUM

Figure 16
MINING TOWNS
in the Study Area

Figure 17

89
fruitlessly attempting to relocate a lost mine. The killing of James Cooney resulted from the successful ambush of several Indians of whom one was a son-in-law of the Apache, Victorio. A number of miners lost their lives when Victorio went on the warpath seeking revenge (Wolle 1958:55).

The town of Mogollon was founded in the 1880s in one of the last districts to be exploited. By then Indian troubles had abated, but the high cost of transportation reduced profits. Still, by 1904 over four million dollars worth of silver and gold had been mined. The introduction of cyanidation boosted profits so much that another 10 million dollars worth of metal was found before the richness of the ore declined in 1926. Although reopened in the 1930s, the mines closed at the start of World War II (USGS 1965:145).

Sixty-seven newspapers have been published, from time to time, within the study area. Many of these, particularly in Socorro County, were published in mining communities and span the period of most intense mining activities. Grove, Barnett, and Hansen (1975) provide a full listing of New Mexico newspapers along with the repositories of extant copies. These newspapers would provide an important primary source for anyone wishing to research mining history.

Many of the mines active in the nineteenth century have now fallen into disuse. Facilities and equipment at those mines were removed for salvage and often the surrounding communities became ghost towns. Howard (1967) provides useful summaries of the history of mineral production of each district. The Shermans (1975) have gathered photographs and anecdotes about ghost towns.

Most towns have been dismantled and looted over the years, but San Marcial was destroyed at its peak by a flood of the Rio Grande. The silt overburden has probably preserved much for the archeologists which otherwise would have been removed by collectors. An earlier San Marcial, on the opposite bank of the river, was destroyed by flood water in 1866; it, too, provides a fertile field for archeological investigation (Sherman and Sherman 1975:184).

Most of the ghost towns (e.g., Graham and Rosedale) of the area had a very brief life. Graham was founded at Graham's mill in 1893 and died when the mill closed in 1913 (ibid.:104). Such a short life span would allow tight control for dating artifacts and make such sites useful to historical archeologists for resolving certain chronological problems.

Although gold and silver represent much of the romance of mining, the total value of those elements is today far exceeded by more prosaic petroleum products; 1963 figures show petroleum and gas as making up 66% of New Mexico's mineral production with potassium in second place. All of the precious metals are lumped in the small category "other" (USGS 1965:15). Still, the historian and the public will be attracted to the tales of the Indian fighting and claim jumping associated with the gold fields.

Each of the region's ghost towns has its individual stories of misadventure and unfulfilled hopes. Whether overcome by truculent acts of nature, as was San Marcial, or downs by disappointment, like Robinson, abandoned towns represent a page in the history of the average man. Sadly, people leaving their homes in despair seldom record their motives or specific events that lead them to abandon a dream. In some cases the archeologist or historian can piece together a story or perhaps even construct a cautionary tale. Can we learn not to build on flood plains and to avoid speculation with land values?

Though we lack specific histories of the last days of these abandoned towns and mining camps, perhaps we can find answers in the ground. Artifacts may reflect the origins and tastes of those who populated the town; long buried paths may suggest the degree and kind of social interactions which took place. At many sites structures have disappeared, either having been salvaged or simply decayed beyond hope of reconstruction. Even these sites exert a strong attraction for the public because walking through such places pleasantly conjures up ghosts of the past.

As a recreation resource, and for potential scientific/historic value, protection of such town sites as are in the public domain
should be a management objective. Their protection is authorized under the Antiquity Act of 1906 but complicated by the continued interest in mineral resources in the vicinity of many towns. Serving both interests is a challenge for the land manager.

SUMMARY

This section's brief summary of historic events and resources of the study area has been painted with the broadest of brushes. It could only trace the outlines and suggest resources which might be tapped for future study. Various research problems have been suggested in passing, such as the problem of segregating Navajo and Apache sites. Some additional research suggestions follow:

Social and Political Patterns - discovery of the lost Piro pueblos, such as Senecu which has been lost since 1675, (and some of the many small, unrecorded Spanish ranchos along the Rio Grande) may provide a fertile field in which to examine demography, acculturation, and similar topics currently of interest in anthropology.

Land Use - determination of maximum herd populations for domestic animals may be possible through a census of ranch ruins dated to the 1880s combined with tax records, probates, etc.

Domestic Life - the Indian bands of Geronimo and Victorio are credited with the burning of numerous cabins during the Indian Wars; positive identification of these sites would provide opportunities for study of a firmly dated frontier habitation site, probably with many artifacts of daily use in situ.

Civil War - Confederate camp sites associated with the Valverde engagement can probably be located on the ground and interpreted for the public. Also, Silby's route of retreat following the battle of Glorieta Pass could be traced through the study area. Perhaps graves of soldiers who died in the two clashes could be found and marked.

The resources of the study area have much untapped potential for all students of social change. The standard written histories of the area concentrate on the great men and great events of the past; few oral histories have been collected. The archeology has typically focused on the remains of the Indians. Exploitation of the forests has been little noted, while the mines are recorded mainly in sterile lists of minerals and dollar values. All of these areas could profit from further study.

A prime resource of the area lies in the more than 400 years of documentation available to the researcher, a situation enjoyed in very few parts of the United States. Attention has been directed to resources mentioned above and others in the bibliography. Maximum use of these resources can best be achieved when project investigations employ teams, skilled in field and archival research, who appreciate the opportunity to combine several social science interests.
APPENDICES

APPENDIX I
MUSEUM RECORDS AND COLLECTIONS SEARCH

INTRODUCTION

In an attempt to locate artifacts and archival materials from the study area, an extensive search of museum, library, and private collections was undertaken. This program consisted of visits to various museums, the distribution of questionnaires to a number of institutions (see examples at the end of Appendix I), and correspondence. The author visited the following museums and libraries: Museum of New Mexico - Laboratory of Anthropology; University of New Mexico - Rare Books Collection; Western New Mexico State University Museum; the Arizona State Museum; and the Field Museum of Natural History.

Questionnaires were sent to the following institutions and organizations (an asterisk precedes the names of those institutions which responded): *American Museum of Natural History; *Smithsonian Institution; Library of Congress; *New York Public Library; *Logan Museum of Anthropology; *Southwest Museum; *Western New Mexico State University Museum; New Mexico State University Museum; *Albuquerque Archaeological Society; *Eastern New Mexico State University Museum; Maxwell Museum of Anthropology; El Paso Archaeological Society; *Museum of the American Indian (Heye Foundation); *Peabody Museum; *University of Colorado Museum; *Silver City Museum; *Amerind Foundation; *Arizona State Museum; *Museum of Northern Arizona; *Arizona Historical Society; *New Mexico Historical Society; *Museum of New Mexico Historical Library; School of American Research; Socorro Historical Society; and the *Catron County Historical and Archaeological Society. An analysis of the materials held by each institution is included below.

PREHISTORY

Laboratory of Anthropology - Museum of New Mexico, (Gila, Cibola, and BLM). This institution contained a wealth of information, including the following: site forms, published and unpublished documents relating to projects conducted in the study area; all artifactual and ecofactual data which the institution had acquired in the course of its many projects; and maps. Not all of the sites recorded in the survey files have been indicated on the maps, however. The Laboratory holds a set of survey forms which were copied from the survey forms and notes of the work done in the Pine Lawn and Reserve areas by the Field Museum of Natural History. Unfortunately, the original forms could not be located at the latter museum.

Yeo's notes are on file at the Laboratory, as are the records of the Highway Cultural Inventory. Finally, the Laboratory is staffed by personnel who were more than helpful to the author in her search. I am especially grateful to Stewart Peckham, Marsha Jackson, and Laura Holt.

Field Museum of Natural History (Gila) One of the primary goals of the records and collections search at the Field Museum of Natural History was to locate and copy the notes from the 1941 and 1947 surveys conducted by Brigham Arnold and John Rinaldo in the Pine Lawn-Reserve areas (Martin, Rinaldo, and Antevs 1949; Martin 1943). These survey files could not be located. The author did find, however, a small surveyor's notebook in which Rinaldo had recorded site locations and directions to them. The information in this notebook is scanty and difficult to decipher. Furthermore, this notebook does not appear to contain the survey information for which we were looking. (A copy of this notebook was made, however, and it is now at the Gila National Forest.) Finally, Martin reports that there exists a manuscript of Rinaldo's survey results (written by Rinaldo), but investigations at the Field Museum did not yield this manuscript (Martin et al. 1956:199). Subsequent to the Museum visit, the author wrote to Professors John Rinaldo and Elaine Bluhm Herold about the matter of the missing survey files and asked for their assistance in locating them. (Copies of their replies to the author's inquiries are on file at the Gila National Forest.) Staff members of the Field Museum promised to keep the Gila National Forest
informed of any new developments in the continuing search for the files.

Various documents were procured during the course of the collections search. The most important is a manuscript entitled, "Notes on Minor Excavations in the Reserve Area, West-Central New Mexico," written by Dr. Rinaldo to supplement the already existing literature published by the Field Museum on their excavations in the Pine Lawn and Reserve regions. This paper contains a description of the architectural and material remains from the following: The Delgar site, Saddle Mountain Pueblo, Negrito Cliff Dwellings, Hood Station Cave, the Powerline site and the Pine Lawn Camp pithouse. These sites range in time from the Pine Lawn to Tularosa phases. In addition, Apache remains were present at Negrito Cliff Dwelling and the Hood Station Cave. This manuscript is now on file at the Gila National Forest.

Many of the other papers on file at the Field Museum included raw-data counts and lists of the material and ecofactual remains procured in the course of excavations. Much of this data is included in published reports, such as the results of correspondence between Martin and various service institutions (e.g., dendrochronological laboratories) and persons performing specialized analyses for the Museum. Copies of these notes have also been filed with the Gila National Forest.

During the time the author was at the Museum, the staff was preparing to move the Museum's Southwest Expedition collection to a new, temperature-controlled storeroom. The author and Professor Fred Plog of Arizona State University visited the present storeroom to see what it contained in the way of materials from the Gila and Apache-Sitgreaves National Forests. The collection consists of thousands of artifacts from the expeditions led by Dr. Martin in the Ackmen-Lowry (Colorado), Pine Lawn-Reserve (New Mexico), and Vernon (Arizona) areas.

In an attempt to assist in the identification of many of the boxes and stray notes, Professor Plog and the author surveyed the shelves and floors of the storeroom. During the course of this investigation, Professor Plog made a tape recording of our observations. This tape is on file at the Field Museum; a transcript of the recording is on file at the Gila National Forest.

As a result of the survey of the storeroom, the author learned the following about the artifacts housed at the Field Museum. (For a description of Professor Plog's observations, his overview of the Apache Sitgreaves National Forest should be consulted.)

1. Pottery (hundreds of vessels), and sherds (thousands) from the excavations conducted by the Field Museum in the Pine Lawn-Reserve region are housed at this institution.

2. It could not be determined whether chipped stone collections from the sites are housed here, but the author thinks it is likely that they are.

3. Most groundstone, particularly metates, was not taken back to the Museum, but was measured and studied at the Pine Lawn Camp. Several photographs (see below) reveal that metates were used decoratively to line the paths of the camp.

4. The botanical and faunal remains from Tularosa and Cordova Caves are located at the Museum. While it has been reported that similar remains from O Block Cave, Y Canyon Cave, and Hinkle Park Cliff Dwelling (Martin, Rinaldo, and Bluhm 1954) are stored here, they were not located in the course of the survey. Ms. Rabineau seemed to believe that they would be found in the course of the move to the new facility.

5. While some skeletal material from the excavations is stored in the Field Museum, it could not be determined whether all of the skeletons recorded in the site reports were here. The Laboratory of Human Osteology, Department of Anthropology, University of New Mexico, contains a catalogue of the numbers and locations of skeletal material from all sites in New Mexico. Until the Field Museum personnel have sorted their collection, reference should be made to the University of New Mexico for this information.

The author also learned that the Museum owns an extensive catalogue of photographs (over 1000 entries) taken during the course of the Southwest Expeditions in the Pine Lawn-Reserve area. (For a discussion of the many photographs taken
during the years that the project operated out of Vernon, Arizona, Professor Plog's overview should be consulted.) Each photograph contains a description of the subject and identification of all persons in the picture. Many of the photographs in the collection appear in published site reports; the bulk of them, however, have not appeared in print. The photographs are obtainable through the Field Museum's Department of Publications. Several order forms have been deposited with the Gila National Forest.

Of particular interest to the Gila National Forest are a great number of photographs of the Pine Lawn Camp, headquarters for the Southwest Expedition during their field seasons in the Pine Lawn-Reserve region. Pictures of the living, dining, and laboratory facilities, as well as of the many persons involved in the excavations are contained within this album. These photographs hold great potential for an interpretive exhibit involving the history of archeological undertakings in the Forest. They are also excellent reminders of how archeology was conducted in the past and can be used as teaching aids to demonstrate how archeological techniques have changed through time.

Finally, the Field Museum owns a number of reels of film pertaining to the excavation of sites in the Pine Lawn and Reserve areas. During the visit to the Museum, the author viewed several of these. They are black-on-white silent films which Dr. Martin used to accompany his public talks about the work of the Southwest Expedition. (Interestingly, there exist photographs which show the shooting of these reels.) While it is not known whether copies can be made, inquiries can be addressed to the Audio-Visual Department at the Field Museum.

Logan Museum of Anthropology, Peloit College (Gila). The Logan Museum of Anthropology possesses materials from three sites excavated by Dr. Paul Nesbitt. While the artifacts from Starkweather Ruin (Nesbitt 1938a, b) are at the museum, Nesbitt's field notes are no longer there or at the College. Forty-one 8" x 5" index cards with notations regarding the skeletal material and pottery from the Hudson Ruin site are on file at the Museum. The results of this excavation have never been published. The field notes and a brief report of the proceedings at the Wheatley Ridge site are at the Logan Museum. (The site was reported in the 1947 master's thesis by Rowe, entitled, The Wheatley Ridge Site). Correspondence between Nesbitt and Haury, and Nesbitt and Gladwin regarding tree-ring dates at the site is also on file at the Museum.

Museum of the American Indian (Heye Foundation) (Gila, Cibola, and BLM). The Museum of the American Indian has materials from Socorro and Catron Counties; however, the specific origin of many items is unknown other than that they are from Tularosa Canyon. (Hough 1907 refers to a Mr. Heye having made collections along the Tularosa River.) Artifacts in storage at the Museum include between 100 to 500 pieces of chipped stone, pottery, pounding and crushing tools, miscellaneous stone objects, worked bone, worked shell, basketry, cordage, human skeletal remains, and possible hair fragments. The print-out indicating the exact storage location of the ceramic vessels is not yet available. The Museum of the American Indian does not possess any of the materials from Sandal Cave.

Western New Mexico State University (Gila). This museum possesses a small collection of artifacts from the study area. Douglas Dinwiddie was very cooperative in allowing photographs to be taken of many of the vessels recovered from the Gila Forest and its environs. Other materials from the study area stored here include small amounts of ground and chipped stone.

Museum of Northern Arizona (Gila). The Museum collection includes between 1 and 50 whole pots, 1000 or more pieces of chipped stone, and between 1 and 50 items of groundstone, and pounding and crushing tools from the Gila Forest, in addition to worked bone, and botanical and faunal materials from the study area. Both artifacts and ecofactual materials were deposited here as a result of the work performed by this institution and by Franklin Barnett, upon whose land at least one excavation was performed.

University of Colorado Museum (BLM). The University of Colorado Museum (Boulder) possesses artifacts from Bat Cave.

Arizona State Museum (Gila, BLM). The Arizona State Museum possesses the notes
and survey files of the now defunct Gila Pueblo. The Museum also has the survey cards from the Peabody Museum-Upper Gila Expedition. Over 600 sites were recorded by this institution. The survey files from both institutions were copied (xeroxed) and are on file at the Gila National Forest. While the Museum was unable to complete the questionnaire, it appears that collections with artifacts numbering in the hundreds are currently stored there.

The Smithsonian Institution (Gila). The Smithsonian was unable to complete the questionnaire for lack of staff available to do such research. Hough's notes, as well as artifacts he might have collected during his surveys and excavation of Tularosa Cave, are probably at the Institution.

Silver City Museum (Gila). This institution has 50 to 100 pieces of groundstone, between 1 and 50 examples of pounding and crushing tools, and miscellaneous stone objects, worked bone, basketry, and fragmentary skeletal remains from the study area.

Albuquerque Archaeological Society (BLM). This organization possesses the artifacts and field notes from the AS-6 Fischer Ranch site located on the ranch of Douglas Fischer in the vicinity of Quemado. Between 1 and 50 whole ceramic vessels, chipped stone, groundstone, pounding and crushing tools, as well as miscellaneous stone objects, worked bone, and faunal materials are in their collection.

Peabody Museum of Archaeology and Anthropology (Gila, Cibola, and BLM). The Peabody Museum was unable to complete the questionnaire for lack of available staff. According to sources at the Arizona State Museum, the author learned that the artifacts and field notes from the excavations at the Cerro Colorado site (Bullard 1962), Mariana Mesa (McGimsey 1951, 1957), and Bat Cave (Dick 1965) are at the Peabody. Collections and notes from the Peabody Museum-Upper Gila Expedition (Danson 1957) are located there, as well as a small collection of pottery vessels acquired by Samuel K. Lothrop from the Quemado vicinity.

The following institutions reponded but did not possess any prehistoric artifacts or archival materials from the study area: Eastern New Mexico State University Museum; Amerind Foundation; New York Public Library; Southwest Museum; and the American Museum of Natural History.

HISTORY

The University of New Mexico (Special Collections) Zimmerman Library contains a wide range of documents relating to the historic period. Of special interest are the Schroeder Papers, the Speck Papers, and other accounts of the Apache occupation of the study area. As regards ranching, the collection contains land status records and a number of doctoral dissertations related to the history and development of this activity in the state.

The Ben Wittick Collection is located at the Museum of New Mexico. It contains many documents, including photographs of the Mogollon Apaches.

Western New Mexico State University Museum has a collection of Apache baskets and pots which were recovered from the Gila National Forest.

The Bureau of Land Management Public Records Office possesses a collection of historic maps, photographs, and correspondence related to the study area. Of particular interest is the Reservation file which contains maps of Ft. Tularosa and Ojo Caliente.

Dr. John P. Wilson, David Brugge (National Park Service), and the Office of the State Historic Preservation Program were excellent sources of information pertaining to all aspects of the history of the study area.
QUESTIONNAIRE RELATING TO PREHISTORIC RESOURCES IN THE STUDY AREA

1. Does your institution possess any notes or unpublished manuscripts relating to excavations or surveys conducted in the study area?
   
   no __________
   yes __________

2. If yes,
   a. What is (are) the name(s) of the project(s) associated with the excavation(s) or survey(s):
      ____________________________________________

   b. Where is (are) the site(s) located?
      
      Section __________
      Township __________
      Range __________
      County __________

      Private
      Gila National Forest
      Cibola National Forest
      Bureau of Land Management Land
      State

   c. What is the name of the investigator who directed the project?
      ____________________________________________

   d. What is the name of the institution which sponsored the project?
      ____________________________________________

   e. When was the project conducted?
      ____________________________________________

3. Does your institution possess any of the following archaeological remains?*
   a. Ceramics (Whole and partial vessels including bowls, jars, dippers, ladels, effigies, canteens)
      
      no __________
      yes 1-50; 50-100; 100-500; 500-1000; 1000 or more (Please Circle)

   b. Sherd Collections (Fragmented ceramics used for research or study collections)
      
      no __________
      yes __________

   c. Chipped Stone (Unifacial and bifacial tool types, projectile points)
      
      no __________
      yes 1-50; 50-100; 100-500; 500-1000; 1000 or more (please circle)

   *Please note that these must come from the study area.
d. Ground Stone (manos, metates, abraders, other tools associated with grinding, abrading, or smoothing)
   no  __________
   yes  1-50; 50-100; 100-500; 500-1000; 1000 or more (please circle)

e. Pounding and Crushing Tools (axes, mauls, choppers, hammerstones, mortars, pestles)
   no  __________
   yes  1-50; 50-100; 100-500; 500-1000; 1000 or more (please circle)

f. Miscellaneous Stone Objects (e.g. weaving paraphernalia)
   no  __________
   yes  __________

g. Worked Bone  
   no  __________
   yes  __________

h. Worked Shell  
   no  __________
   yes  __________

i. Textiles  
   no  __________
   yes  __________

j. Basketry  
   no  __________
   yes  botanical; faunal (please circle)

k. Cordage  
   no  __________
   yes  __________

l. Human Skeletal Remains  
   no  __________
   yes  1-20; 20-40; 40-60; 100 or more skeletons; fragmentary remains (please circle)

m. Ecofactual Material  
   no  __________
   yes  __________
QUESTIONNAIRE RELATING TO HISTORIC REMAINS IN THE STUDY AREA

1. Does your institution possess any notes or unpublished manuscripts relating to the excavation or survey of historic sites in the study area?
   no __________
   yes __________

2. If yes,
   a. What is (are) the name(s) of the project(s) associated with the excavation(s) or survey(s)? __________________________________________
   b. Where is (are) the site(s) located?
      
      Section ____________
      Township ____________
      Range ____________
      County ____________
      Private Land ____________ (please check)
      Gila National Forest ____________
      Cibola National Forest ____________
      Bureau of Land Management ____________
      State Land ____________
      Unknown ____________
   c. What is the name of the investigator who directed the project?
      __________________________________________
   d. What is the name of the institution which sponsored the project?
      __________________________________________
   e. When was the project conducted?
      __________________________________________

3. Does your institution possess any of the following?*
   a. Textiles
      no __________
      yes Apache, Navajo, Spanish, Anglo-American, Unknown (please circle).
   b. Baskets or Cordage
      no __________
      yes Apache, Navajo, Spanish, Anglo-American, Unknown (Please circle)

*Please note that these items must come from the study area.
c. **Furniture** (Chairs, tables, cupboards, beds, cradles, etc.)
   - no
   - yes

d. **Household Furniture or Equipment** (Looms, wash tubs, telephones, buckets, cutting blocks, spinning wheels, pots, pans, etc.)
   - no
   - yes

e. **Clothing and Costumes, Objects of Adornment**
   - no
   - yes  Apache, Navajo, Spanish, Anglo-American (please circle)
     If you do have Apache or Navajo items, please specify what they are:

g. **Musical Instruments**
   - no
   - yes  Apache, Navajo, Spanish, Anglo-American (please circle)
     If you do have Apache or Navajo items, please specify what they are:

h. **Toys** (Gaming and gambling paraphernalia)
   - no
   - yes

i. **Weaponry** (Bows and arrows, rifles, revolvers, etc.)
   - no
   - yes  Apache, Navajo, Spanish, Anglo-American (please circle)
     If you do have Navajo or Apache items, please specify what they are:

j. **Tools** (Wrenches, scoops, pumps, presses, rakes, digging sticks, shovels, hammers, axes, all farm and ranch related materials)
   - no
   - yes
k. Heavy Equipment (Plows, harvesters, wagons, carts, machinery and all farm and ranch related materials)

l. Religious and Ceremonial Materials (Fetishes, masks, altar paraphernalia, church furnishings, santos, etc.)

   no

   yes Apache, Navajo, Spanish, and Anglo-American (please circle)

Please specify the items:

m. Historic Photographs

   no

   yes Prints, negatives, both (please circle)

Please provide a brief description of the photographs' subject matter (e.g. Main Street in the mining camp of Riley, photograph of Mangas Colorado, The Building of the Railroad to Magdalena, N.M.)

n. Historic maps

   no

   yes

Please specify the subject matter of the maps:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave sp.</td>
<td><em>Agave sp.</em></td>
</tr>
<tr>
<td>Amaranthus sp.</td>
<td><em>Amaranthus sp.</em></td>
</tr>
<tr>
<td>Berberis repens</td>
<td><em>Berberis repens</em> (Oregon grape, hollygrape)</td>
</tr>
<tr>
<td>Bouteloua gracilis</td>
<td><em>Bouteloua gracilis</em> (blue grama)</td>
</tr>
<tr>
<td>Cercocarpus sp.</td>
<td><em>Cercocarpus sp.</em> (mountain mahogany)</td>
</tr>
<tr>
<td>Chenopodium sp.</td>
<td><em>Chenopodium sp.</em> (pigweed, goosefoot)</td>
</tr>
<tr>
<td>Cirsium sp.</td>
<td><em>Cirsium sp.</em> (thistle)</td>
</tr>
<tr>
<td>Cowania stansburiana</td>
<td><em>Cowania stansburiana</em> (cliffrose)</td>
</tr>
<tr>
<td>Cucurbita foetidissima</td>
<td><em>Cucurbita foetidissima</em> (wild gourd)</td>
</tr>
<tr>
<td>Cycloloma atriplicifolium</td>
<td><em>Cycloloma atriplicifolium</em> (tumbleweed, winged pigweed)</td>
</tr>
<tr>
<td>Dasylirion wheeleri</td>
<td><em>Dasylirion wheeleri</em> (sotol)</td>
</tr>
<tr>
<td>Descurainia pinnata</td>
<td><em>Descurainia pinnata</em> (tansy mustard)</td>
</tr>
<tr>
<td>Fchinocereus triglochidiatus</td>
<td><em>Fchinocereus triglochidiatus</em> (hedgehog cactus)</td>
</tr>
<tr>
<td>Fquisetum sp.</td>
<td><em>Fquisetum sp.</em> (horsetail)</td>
</tr>
<tr>
<td>Fragrostandis diffusa</td>
<td><em>Fragrostandis diffusa</em> (lovegrass)</td>
</tr>
<tr>
<td>Helianthus sp.</td>
<td><em>Helianthus sp.</em> (sunflowers)</td>
</tr>
<tr>
<td>Juglans major</td>
<td><em>Juglans major</em> (walnut)</td>
</tr>
<tr>
<td>Juniperus monosperma</td>
<td><em>Juniperus monosperma</em> (one-seed juniper)</td>
</tr>
<tr>
<td>Juniperus pachyphloea</td>
<td><em>Juniperus pachyphloea</em> (alligator juniper)</td>
</tr>
<tr>
<td>Juniperus utahensis</td>
<td><em>Juniperus utahensis</em> (Utah juniper)</td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td><em>Koeleria cristata</em> (junegrass)</td>
</tr>
<tr>
<td>Lagenaria siceraria</td>
<td><em>Lagenaria siceraria</em> (bottle gourd)</td>
</tr>
<tr>
<td>Ligusticum porteri</td>
<td><em>Ligusticum porteri</em> (cough-root)</td>
</tr>
<tr>
<td>Lithospermum incisum</td>
<td><em>Lithospermum incisum</em> (gromwell)</td>
</tr>
<tr>
<td>Mentzelia albicaulis</td>
<td><em>Mentzelia albicaulis</em> (stick-leaf, blazing star)</td>
</tr>
<tr>
<td>Nicotiana attenuata</td>
<td><em>Nicotiana attenuata</em> (wild tobacco)</td>
</tr>
<tr>
<td>Nolina microcarpa</td>
<td><em>Nolina microcarpa</em> (beargrass)</td>
</tr>
<tr>
<td>Oenothera deltoides</td>
<td><em>Oenothera deltoides</em> (desert primrose)</td>
</tr>
<tr>
<td>Opuntia sp.</td>
<td><em>Opuntia sp.</em> (prickly pear cactus)</td>
</tr>
<tr>
<td>Phragmites communis</td>
<td><em>Phragmites communis</em> (reedgrass, carrizo)</td>
</tr>
<tr>
<td>Pinus edulis</td>
<td><em>Pinus edulis</em> (pinyon)</td>
</tr>
<tr>
<td>Pinus ponderosa</td>
<td><em>Pinus ponderosa</em> (ponderosa pine, western yellow pine)</td>
</tr>
<tr>
<td>Poa fendleriana</td>
<td><em>Poa fendleriana</em> (muttongrass)</td>
</tr>
<tr>
<td>Populus sp.</td>
<td><em>Populus sp.</em> (poplar, cottonwood)</td>
</tr>
<tr>
<td>Proboscidea parviflora</td>
<td><em>Proboscidea parviflora</em> (devil’s claw)</td>
</tr>
<tr>
<td>Quercus sp.</td>
<td><em>Quercus sp.</em> (oak)</td>
</tr>
<tr>
<td>Salix sp.</td>
<td><em>Salix sp.</em> (willow)</td>
</tr>
<tr>
<td>Scirpus validus</td>
<td><em>Scirpus validus</em> (bulrush)</td>
</tr>
<tr>
<td>Sorghastrum nutans</td>
<td><em>Sorghastrum nutans</em> (Indian grass)</td>
</tr>
<tr>
<td>Sporobolus contractus</td>
<td><em>Sporobolus contractus</em> (dropseed grass)</td>
</tr>
<tr>
<td>Yucca baccata</td>
<td><em>Yucca baccata</em> (yucca, Spanish bayonet, datil)</td>
</tr>
<tr>
<td>Yucca elata</td>
<td><em>Yucca elata</em> (amole, narrow-leaf yucca)</td>
</tr>
</tbody>
</table>
APPENDIX III

REGISTERED CULTURAL RESOURCE SITES IN STUDY AREA

National Register of Historic Places (June 10, 1979) on file with the Laboratory of Anthropology, Museum of New Mexico

Catron County

Ake Site (VLA-1, NMSU)
Bat Cave (LA 4935)
Mogollon Pueblo (Cox Ranch Pueblo)

Socorro County

Bursum House (Socorro)
Clemens Ranch House (Kelley)
Fort Craig (LA 1091)
Gallinas Springs Ruin (LA 1178, 1180)
Garcia, Opera House
Illinois Brewery
Magdalena AT&SF Depot (Socorro)
Val Verde Hotel (Socorro)

State Register of Historic Places
List prepared August 18, 1978
on file with the Laboratory of Anthropology, Museum of New Mexico

Catron County

Apache Creek Ruin (LA 2949)
Magdalena Stock Driveway (also in Socorro County)
Mogollon Village
TG and F Route Archaeological Sites (also in Valencia County) (LA 3984, 3990, 3993, 3998-C, 4000, 4002, 4010, 4015A & B, 4023, 4026, 4029, 4030, 4032, 4033)
Tularosa Cave (LA 4427)
Zuni Salt Lake

Socorro County

Abeyta y Armijo House
Abeyta Block (Socorro)
212-214 Abeyta Avenue East (Socorro)
216 Abeyta Avenue East (Socorro)
Alvarez-Briggs House (Socorro)
AT&SF Railway Depot (Magdalena)
AT&SF Railway Depot (Socorro)
Baca (A.B.) House (Socorro)
Baca (Juan Jose) House (Socorro)
Bourguignon House (Socorro)
Brown House (Socorro)
300 California Street South (Socorro)
400 California Street South (Socorro)
407 California Street North (Socorro)
Capitol, The (Socorro)
Captain Cooney House (Socorro)
Chambon House (Socorro)
Chihuahua Historic District (Socorro)
Church of the Epiphany (Socorro)
Church McClutcheon Historic District (Socorro)
Church of San Miguel (Socorro)
Corbey House (Socorro)
Crabtree Building (Socorro)
Crown Mill (Socorro)
303 Eaton Avenue (Socorro)
East Abeytia Avenue Historic District (Socorro)
Eaton House (Socorro)
Eaton-Darr House El Torreon (Socorro)
217 Fisher Avenue (Socorro)
249 Fisher Avenue (Socorro)
Fitch Building (Socorro)
Fitch House (Socorro)
Fortune Property (Socorro)
Garcia (Juan Nepomuceno) House
304 Garfield Street (Socorro)
211 Grant Avenue (Socorro)
Herrick House (Socorro)
Hilton Bar of the Owl Bar (San Antonio)
Hilton House (Socorro)
Ilfeld (Charles) Co. Warehouse (Magdalena)
Kelly Mine
Kittrel Park - Manzanares Avenue (Socorro)
Knights of Pythias Hall (Socorro)
Loewenstein/Torres House (Socorro)
Magdalena Bank Building (Magdalena)
Magdalena Historic District (Magdalena)
Magdalena Mercantile Building (Magdalena)
Magdalena Stock Driveway (also in Catron County)
101 Manzanares Avenue East (Socorro)
102 Manzanares Avenue East (Socorro)
106 Manzanares Avenue East (Socorro)
110 Manzanares Avenue East (Socorro)
315 McClutcheon Avenue (Socorro)
Montoya (Eutimio) House (San Antonio)
605 Nicholas Avenue (Socorro)
609 Nicholas Avenue (Socorro)
613 Nicholas Avenue (Socorro)
110 North Sixth Street (Socorro)
Ojo Caliente Military Post (LA 3947)
Park Hotel (Socorro)
301-303 Park Street (Socorro)
405 Park Street (Socorro)
Price-Loewenstein Mercantile (Socorro)
Sandal Cave (LA 8696)
San Miguel Church Historic District (Socorro)
202 San Miguel Street (Socorro)
209 San Miguel Street (Socorro)
Sedillo (Anastacio) House (Socorro)
Sedillo (Jacobo) House (Socorro)
201 Sixth Street (Socorro)
Socorro City Plaza (Kittrell Park) (Socorro)
Socorro Multiple Resource District (Socorro)
St. John the Baptist Mission Chapel (Socorro)
Stapelton Brothers Mercantile (Socorro)
Stapelton (Edward) S. Sr. House (Socorro)
Stapelton (Vivian) House (Socorro)
Torres Block (Socorro)
(A.C.) Torres House (Socorro)
Torres House (Lupe) (Socorro)
White Row (Socorro)
Zimmerly (Delfine) House (Socorro)
Zingerle House (Socorro)
## APPENDIX IV

### FLORAL REMAINS FROM ARCHAIC STRATA

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agave sp.</td>
<td>century plant, mescal, lechuguilla, amole</td>
<td>Cordova Cave</td>
</tr>
<tr>
<td>Amaranthus blitoides</td>
<td>prostrate pigweed</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Amaranthus hybridus</td>
<td></td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Amaranthus powelli</td>
<td></td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Apocynum sp.</td>
<td>hemp</td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Artemisia sp.</td>
<td>sagebrush</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Asclepias sp.</td>
<td>unidentified milkweed</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Atriplex canescens</td>
<td>fourwing saltbush</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Bouteloua gracilis</td>
<td>blue grama</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Bouteloua hirsuta</td>
<td>hairy grama</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Calamagrostis incompansa</td>
<td>northern reedgrass</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Celtis reticulata</td>
<td>hackberry</td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Chenopodium sp.</td>
<td>goosefoot</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Cirsium sp.</td>
<td>thistle</td>
<td>Cordova Cave</td>
</tr>
<tr>
<td>Cucurbita foetidissima</td>
<td>calabazilla</td>
<td>Bat Cave, Cordova Cave</td>
</tr>
<tr>
<td>Dasylirion sp.</td>
<td>sotol</td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Fupatorium sp.</td>
<td>thoroughwort</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Festuca kingii</td>
<td>King fescue</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Helianthus annuus</td>
<td>sunflower</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Juglans major</td>
<td>Arizona walnut</td>
<td>Bat Cave, Cordova Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Juniperus deppeana</td>
<td>alligator juniper</td>
<td>Bat Cave, Cordova Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Juniperus monosperma</td>
<td>one-seed juniper</td>
<td>Cordova Cave</td>
</tr>
<tr>
<td>Juniperus sp.</td>
<td></td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Lagenaria siceraria</td>
<td>bottle gourd</td>
<td>Cordova Cave</td>
</tr>
<tr>
<td>Lycurium sp.</td>
<td>wolfray</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Monarda sp.</td>
<td>beebalm</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Muhlenbergia rigens</td>
<td>deergrass</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Nolina sp.</td>
<td>beargrass</td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Opuntia sp.</td>
<td>prickly pear or cholla</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Oxytropis sp.</td>
<td>crazyweed</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Phragmites communis</td>
<td>reed</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Poa fendleriana</td>
<td>muttongrass</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Poa secunda</td>
<td>pinyon</td>
<td>Bat Cave, Cordova Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Pinus edulis</td>
<td>western yellow pine</td>
<td>Cordova Cave</td>
</tr>
<tr>
<td>Pinus ponderosa</td>
<td>unidentified pine</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Pinus sp.</td>
<td>mesquite</td>
<td>Lemitar Rockshelter</td>
</tr>
<tr>
<td>Prosopis juliflora</td>
<td>unidentified pine</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Quercus sp.</td>
<td>gray oak</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Quercus grisea</td>
<td>birchleaf</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Rhamnus sp.</td>
<td></td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Rosaceae</td>
<td></td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Scirpus sp.</td>
<td>bulrush</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Scirpus olenyi</td>
<td>bulrush</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Scirpus validus</td>
<td>bulrush</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Sporobolus aroides</td>
<td>alkali sacaton</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Sporobolus wrightii</td>
<td>sacaton</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Sorghastrum nutans</td>
<td>Indiangrass</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Suaeda suffrutescens</td>
<td>seepweed</td>
<td>Bat Cave</td>
</tr>
<tr>
<td>Trisetum wolfii</td>
<td>Wolf trisetum</td>
<td>Bat Cave, Cordova Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Yucca sp.</td>
<td>unidentified yucca</td>
<td>Bat Cave, Cordova Cave, Lemitar Rockshelter</td>
</tr>
<tr>
<td>Yucca baccata</td>
<td>datil yucca</td>
<td>Bat Cave, Lemitar Rockshelter</td>
</tr>
</tbody>
</table>
In addition, several species of unidentified birds, mammals, and fish were present in these occupations.

Data for Tularosa Cave were obtained from Heller 1976, *The Zooarchaeology of Tularosa Cave, Catron County, New Mexico*.

Data for O Block Cave are from Martin, Rinaldo and Pluhm (1954:155, Fig 79).
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