



Human prehistory of Socorro County, New Mexico

Robert H. Weber

1963, pp. 225-233. <https://doi.org/10.56577/FFC-14.225>

in:

Socorro Region, Kuellmer, F. J.; [ed.], New Mexico Geological Society 14th Annual Fall Field Conference Guidebook, 204 p. <https://doi.org/10.56577/FFC-14>

This is one of many related papers that were included in the 1963 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual [Fall Field Conference](#) that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

This page is intentionally left blank to maintain order of facing pages.

HUMAN PREHISTORY OF SOCORRO COUNTY

ROBERT H. WEBER

New Mexico Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro,

INTRODUCTION

There has been little formal documentation of the prehistory of Socorro County that indicates the time depth of human occupation of the area, the range of indigenous cultures, and local sources of mineral raw materials employed in the fabrication of utilitarian, artistic, and religious or ceremonial objects. Each of these elements will be discussed briefly in the paragraphs that follow, with the realization that there is a serious lack of continuity in the established record. Many aspects of the prehistory of this area, particularly at early time levels, are probably applicable to a much larger region in central New Mexico, in part extending eastward into the High Plains. The writer's personal observations have, however, been largely centered in the area to be covered by the Fourteenth Field Conference. Furthermore, summarizations of the prehistory of eastern, northeastern, and north-central New Mexico are treated much more fully by others (Sellards, 1952; Wormington, 1957; Wendorf, 1954, 1955, 1959).

Site surveys have extended across most of the area, but have been only partially reported (Mera, 1935, 1940, 1943; Lehmer, 1948; Hurt and McKnight, 1949; Danson, 1957; Toulouse and Stephenson, 1960). Interpretations based on controlled excavation are extremely limited, with a resultant lack of cultural stratigraphic data. Meanwhile, the undisciplined shovels of amateur pothunters have relentlessly gutted many potentially significant sites.

Three broad categories are applicable to the cultural prehistory of the area, based on subsistence patterns that are most characteristic of each. These are, from early to late, the Early Hunters, at time levels in the late Pleistocene; Gatherers and Hunters of the early and middle Recent; and Puebloan Farmers prior to the Spanish *entrada*. These categories are in general conformity with those of Wendorf (1959). The period of the historic Pueblo and the nomadic Plains Indians will not be discussed.

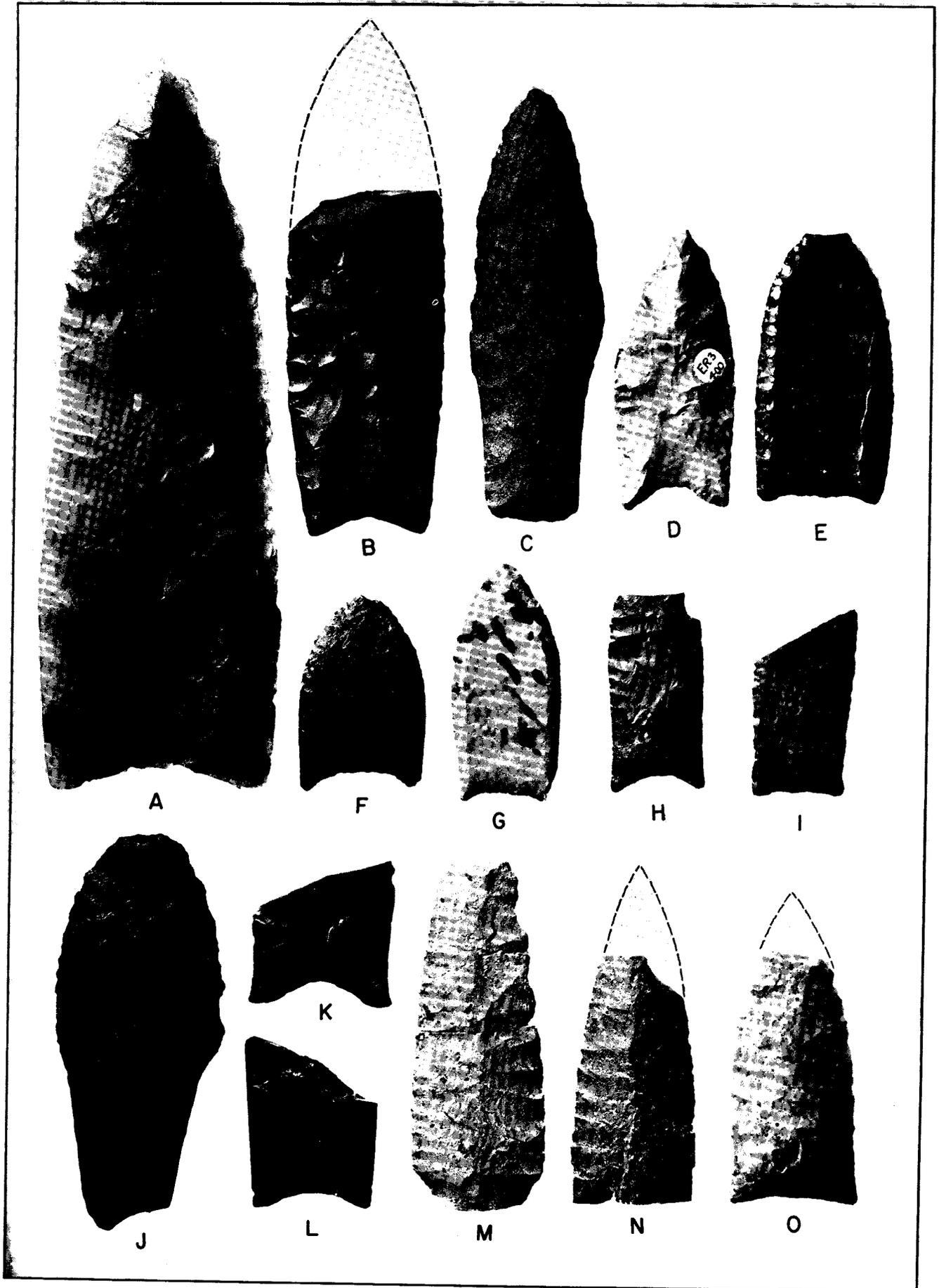
EARLY HUNTERS

The earliest recognized occupants of Socorro County were late Pleistocene hunters of big game whose subsistence was closely tied to the availability

of several now-extinct large mammals. As a consequence of their dependence upon game, it may be presumed that they were nomadic, roaming over large areas and remaining in a given camp site for only short periods at a time. These "people" are commonly referred to as Paleo-Indians, although their skeletal remains are virtually unknown. Previous work in this area has been directed toward the much more conspicuous manifestations of later cultures, and the record here of the Early Hunters remains unreported. Evidence of a putatively earlier culture oriented toward food gathering is still lacking (Willey, 1960).

Recognition of the areas utilized by the Early Hunters is based almost entirely on the recovery of characteristic lanceolate projectile points used in the hunt, each form of which has been identified with a particular cultural complex (Wormington, 1957, 1962). Fortunately, these points also have been found in excavated sites in association with the remains of extinct mammals, some of which were undoubtedly slain by them, and in a stratigraphic context that indicates cultural succession. A growing number of radiocarbon dates has been correlated with specific point types and associated faunal assemblages, with resultant value to the geologist as time-stratigraphic indicators. Representative points of this category from Socorro County are illustrated on Plate 1.

Among the earliest of the Early Hunters were those identified with the use of characteristic fluted Clovis points, a term derived from the occurrence of these points in the lowest cultural levels in lake deposits at the Blackwater Draw locality, between Clovis and Portales, New Mexico (Sellards, 1952; Wormington, 1957). Sellards applied the terms *Llano Complex* and *Llano Man* to the assemblage of artifacts and the unknown men who made them. At Blackwater, as elsewhere in the High Plains region, and extending westward into southern Arizona, Clovis points are associated with remains of mammoth. The horse, bison, camel, and other Pleistocene forms are also present locally in equivalent stratigraphic levels. Clovis points have been recovered as surface finds in several areas of Socorro County. Those found by the writer indicate associa-



tion with diatom-bearing pond, marsh, and stream deposits with unassociated remains of the mammoth and horse at equivalent stratigraphic levels. The earliest known inhabitants of the present townsite of Socorro were correlatives of Llano Man. Radiocarbon dates applicable to Clovis points are lacking for most of the known sites. Wendorf (1959) gives an indicated age of 12,000 to 13,000 years for the Llano Complex at Blackwater Draw. An average of four determinations that are in reasonable agreement from the Lehner site in Arizona is 11,340 years, which may be near the youngest acceptable age for the Llano Complex (Haynes and Agogino, 1960).

Another of the earliest projectile points is the Sandia point, named from a stratified cave site in the Sandia Mountains northeast of Albuquerque, where it was found in the lowest cultural levels (Hibben, 1941). Fossil mammals from the Sandia layer include horse, bison, camel, mastodon, and mammoth. Similar points were later found at the Lucy site in the Estancia basin, also associated with the bones of elephant. The various forms of Sandia points, all of which have an asymmetric stem and shoulder, have been placed by Wormington (1962, fig. 5) in a developmental sequence between simple leaf-shaped forms from Siberia and fluted Clovis points. The two forms known from surface finds in Socorro County are comparable with Type 1 and Type 2 points from Sandia Cave (Hibben, 1941; Wormington, 1957). Stratigraphic and faunal associations for the Socorro specimens are unknown. Conflicting ages have been proposed for the Sandia points from Sandia Cave. Radiocarbon values of 20,000 years and

more from fragments of mammoth tusk in the Sandia layer prompted Hibben (1955) to conclude that the Sandia Culture was established in America at least 25,000 years ago. A recently announced radiocarbon age of $11,850 \pm 1000$ years is the first acceptable date for the Sandia Culture at Sandia Cave, according to a press release quoting Dr. George Agogino of the University of Wyoming.

Clearly somewhat younger than Clovis points, as shown by their higher stratigraphic position in Sandia Cave and Blackwater Draw, are Folsom points. These points, which are still more prominently fluted and finely chipped than typical Clovis points, are named for the type site at Folsom, New Mexico. Their discovery in 1926 in unquestionable association with extinct bison upset prevalent concepts that man had not arrived in the Americas until after the Pleistocene. The widespread association of Folsom points with evident kill sites of fossil bison has led to the identification of Folsom Man with a subsistence pattern centered on bison hunting. In the Folsom layer at Sandia Cave, the faunal assemblage includes horse, camel, bison, mammoth, and ground sloth. Evidence at Blackwater Draw, and other sites in the High Plains, indicated extinction of the elephant, horse, and camel prior to the arrival of Folsom Man (Wendorf, 1961, p. 20). Recent excavations by the Museum of New Mexico at the Blackwater site disclosed a Folsom point near the bones of a mammoth, suggesting a possible later survival of the elephant in that area than had been suspected. Folsom points are widely distributed in Socorro County in topographic situations that range from

PLATE 1

Representative Early Hunter projectile points from Socorro County.

A. Clovis point. An exceptionally large point of the Dent, Colorado type. Broad, shallow flute not clearly visible in photograph. Length, 140 mm. Gray-buff chaledony.

B. Clovis point. Red-brown jasper.

C. Hell Gap point. Red-brown quartzite.

D. Folsom(?) point. Form is more closely related to the Folsom type, but chipping style and fluting show closer parallels with Clovis points. Gray flint.

E. Folsom point. Red jasper.

F. Folsom point. Pale red jasper.

G. Folsom point. Nearly identical with a point from the Lindenmeier site, Colorado. Mottled pale gray chert.

H. Midland point. Brown jasper.

I. Midland point. Brown jasper.

J. Sandia point, Type 1. Basalt.

K. Allen point. Yellowish gray chaledony.

L. Plainview point. Yellow jasper.

M. Scottsbluff point. Buff welded rhyolite tuff.

N. Scottsbluff point. Gray silicified tuff.

O. Cody Complex point. Gray-buff flint.

All illustrations are natural size.

open plains sites to at least the foothill portions of mountainous tracts. Inferred stratigraphic associations show a corresponding range including aeolian sands, a brown soil zone, stream terrace deposits, and pond or marsh deposits. Although no direct association with Pleistocene mammals is known in this area, fossil horse remains have been noted in what appear to be a correlative stratigraphic level. Two radiocarbon dates are available for Folsom sites in the High Plains. One from charred bison bones in a bone bed containing Folsom points at Lubbock, Texas was dated at 9883 ± 350 years (Sellards, 1952). A somewhat greater age of $10,780 \pm 375$ years was obtained from charcoal from the Folsom level at the Lindenmeier site, Colorado (Haynes and Agogino, 1960).

A point type distinctly different from the Folsom point in being stemmed and unfluted, but occurring at about the same stratigraphic level at the Hell Gap site, Wyoming, has been named the *Hell Gap point*. A radiocarbon age of $10,850 \pm 550$ years from the type site corresponds very closely with the Lindenmeier Folsom date (Agogino, 1961). Hell Gap points are represented in surface finds from Socorro County.

Artifacts in the next higher level above the Folsom layer at Blackwater Draw show differences from Folsom points in form as well as lack of fluting. Associated with the points are numerous skeletons of bison. Sellards (1952) has designated the cultural assemblage from this level as the *Portales Complex*. Among the projectile points from the Portales Complex are forms that have been given type names from other sites in the High Plains regions of several states. Point types include Plainview (Texas), Milnesand (New Mexico), Scottsbluff (Nebraska), Eden (Wyoming), and Cody Complex (Wyoming). Fossil bison are common associates with the projectile points from these sites, as well as others containing similar points. With the possible exception of Milnesand points, all other types listed have been identified from surface finds in Socorro County. Two samples of bone from the Portales level at Blackwater Draw gave radiocarbon ages of 6300 ± 150 years and 6230 ± 150 years. Wendorf (appendix I, p. 135) notes that these two dates appear about 1000 years too young when compared with other dated sites of similar artifact content. Geologic and radiocarbon ages for the similar Cody Complex range from 7000 to 9000 years (Wormington, 1957).

With the disappearance of the last of the large Pleistocene bison from this region, at a time commonly placed at about 7000 years ago (Forbis, 1956),

the Early Hunters disappeared from the western scene.

GATHERERS AND HUNTERS

Occupying much of the area formerly utilized by the Early Hunters, and extending into many areas where evidence of the Early Hunters is lacking, was a group of people more dependent upon the gathering of native plants and seeds as a means of subsistence. Some hunting was also done, but it was apparently less important to these people and included a wide variety of small game. The time of their arrival in this area has not been well established but may have overlapped with the later periods of the Early Hunters. In the Great Basin country to the west, related cultural patterns have been categorized under the term *Desert Culture* (Jennings and Norbeck, 1955). From eastern New Mexico eastward, similar cultures are referred to the Archaic stage (Willey and Phillips, 1958).

Local manifestations of the Desert Culture have been described under the term *Cochise Culture* (Sayles and Antevs, 1941) from numerous sites in Cochise County, southeastern Arizona. Three stages were recognized in Arizona, with the Sulphur Springs earliest, followed by the Chiricahua, and finally the San Pedro. Both the Chiricahua and San Pedro stages have been identified in the artifact assemblages of New Mexico, and both appear to be widely represented in Socorro County.

Sites are much more obvious than those of the Early Hunters, being marked largely by scattered camp sites with abundant broken rocks, chips, flake knives, hammerstones, manos, milling stones, crude choppers, scrapers, and hearths. Projectile points are fairly common locally but in many sites are rare to absent, reflecting a high level of dependence upon food gathering rather than hunting. These points are characteristically stemmed or notched and are commonly of a size adaptable to the atlatl and dart but not to the bow and arrow. Pottery is lacking, except in those sites reoccupied later by pottery-using people. Similar artifact assemblages have been described from central New Mexico along the Rio Grande, Rio Puerco, Rio San Jose, and Jemez Creek (Hibben, 1951; Campbell and Ellis, 1952; Bryan and Toulouse, 1943; Agogino, 1952).

It is apparent that these pre-Puebloan Gatherers and Hunters ranged widely over the area that is now Socorro County in search of edible plants, seeds, and game animals. Site locations range from river terraces, through open plains, into the mountain foothills, canyons, and high ridges and saddles. The

lower levels of shelter caves in southern New Mexico contain artifacts and food wastes of people with similar traits, together with primitive corncobs and other evidence of the beginnings of agriculture. Cosgrove (1947) referred these remains to his Hueco Basket-maker Culture, in allusion to certain trait similarities with the Anasazi Basketmakers of the San Juan region. The southern boundary of Cosgrove's Hueco Basket-maker region passes a few miles south of Socorro. On the basis of later studies, Lehmer (1948) referred this cultural assemblage to the Hueco Phase of the Jornada Branch.

Hueco artifacts listed by Lehmer include basketry, matting, cordage (fiber, human hair, cotton), netting, sandals, atlatls, cane darts, fending sticks, fire drills and fire boards, and planting sticks. Both corn and squash were known. There is some faunal evidence that the Hueco Phase may have extended back into late Pleistocene time and lasted perhaps as late as 900 A.D.

A similar pattern is revealed in western New Mexico where an early Mogollon phase developed from a Cochise root at a time near the beginning of the Christian Era (Martin et al., 1952).

Radiocarbon dates applicable to the Gatherers and Hunters include one from the Grants area on amaranth seeds from the San Jose level of 6800 ± 400 years ago (Agogino and Hester, 1958); one from near Reserve on charcoal of 4508 ± 680 years (Libby, 1955); and six from near Santa Ana Pueblo ranging from 2180 ± 250 to 3330 ± 700 years (Agogino and Hibben, 1958).

PUEBLOAN FARMERS

The acquisition of agricultural techniques in time ushered in a new way of life for the people of central New Mexico, as elsewhere in the Pueblo region of the Southwest. The ability to raise and store food against future needs permitted the development of village life at fixed dwelling sites, a characteristic feature of the Pueblo Culture. Although gathering and hunting continued to supply many of the food and material needs of these people, such activities were no longer the primary basis of subsistence. Another newly acquired trait was the manufacture of pottery, which, changing in style through time, provides an extremely useful index to the various periods of Pueblo Culture. Dwellings evolved from rude cave, and perhaps simple brush or skin, shelters to more elaborate structures showing architectural purpose.

Time periods to which reference will be made in subsequent paragraphs are as follows:

Pueblo V	Historic Pueblo
Pueblo IV	1300-1600 A.D.
Pueblo III	1100-1300 A.D.
Pueblo II	900-1100 A.D.
Pueblo I	700-900 A.D.
Basket Maker III	500-700 A.D.
Basket Maker II	pre-500 A.D.

In his survey of part of western Socorro County, Danson (1957) combined the two Basket Maker periods in a single Pre-Pueblo period because of the lack of well-defined Basket Maker features in the area.

Two patterns are indicated in the area during the Pueblo periods. One, originating to the west, is characterized by brown-ware pottery and architectural features that are part of basic Mogollon traits. The other, representing influence from the San Juan Anasazi area to the northwest, is characterized by gray-ware pottery and associated architectural features. In later periods, the native culture probably represented a fusion of these two separate cultural groups.

Mogollon developments in the southern portion of this area have been traced by Lehmer (1948), who established a sequence of seven phases of the Jornada Branch of the Mogollon based on superposition, tree-ring dates, and intrusive pottery types.

1400 A.D.	San Andres	El Paso
1200 A.D.	Three Rivers	Doña Ana
1100 A.D.	Capitan	Mesilla
900 A.D.	Hueco	

The Mesilla, Doña Ana, and El Paso phases are southern variants, whereas the Capitan, Three Rivers, and San Andres are northern variants of the Jornada Branch. Both sequences evolved from the basic Hueco phase in separate areas. The total inferred area occupied by the Jornada Branch extended southward from north of Carrizozo to below Villa Ahumada, Chihuahua, southwest across the Tularosa Valley and southeastern Jornada del Muerto, and southeastward across the Sacramento Mountains (Lehmer, 1948, fig. 1). Future work may show a greater extension to the northwest to the vicinity of Socorro.

Mesilla and Capitan phase dwellings in the Jornada area consisted of pit houses of several types. Pottery was largely brown ware, with intrusive black-on-white wares from the Mimbres area to the west.

Dofia Ana and Three Rivers sites contain both pit houses, carried over from the earlier phases, and adobe-walled surface structures with contiguous rooms. The basic Mogollon brown wares were augmented by intrusive types from the west, northwest, and north. El Paso and San Andres villages consisted of adobe-walled pueblos, some with central plazas. Polychrome pottery came into prominent use, and the number and variety of intrusive pottery types increased markedly from sources to the southwest, west, northwest, and north. Little is known concerning agricultural food crops raised, but it may be presumed that the corn, beans, and squash raised by groups to the north and west were known to the people of the Jornada Branch. Knowledge of corn, squash, and cotton are indicated for the Hueco phase, and continuity into succeeding phases seems probable. With the close of the El Paso and San Andres phases at about 1400 A.D., the Jornada Branch apparently disappeared as a cultural entity; its ultimate fate is unknown.

A pre-Mesilla phase, the San Marcial, was not included by Lehmer with the Jornada Branch. This phase is poorly known and apparently largely restricted to an area along the Rio Grande in central Socorro County (Mera, 1935, 1943). Characteristic southern brown ware is accompanied on San Marcial sites by a Basket Maker III—Pueblo I decorated ware, San Marcial Black-on-white, which is presumed to be of northern origin. There is little evidence of the character of dwellings and the village structure of the San Marcial phase. Excavation of a pit house near Gran Quivira National Monument disclosed a preponderance of Jornada Brown ware associated with small amounts of San Marcial Black-on-white and northern gray ware. Fenenga (1956) referred this site to the Mogollon Culture at a time level correlative with Basket Maker III sites in the Rio Grande Valley.

Although brown-ware sites are prevalent in southern Socorro County, it is impossible in the light of available information to assign these to specific phases of the Jornada Branch.

Concurrent with, and locally continuing after the termination of the Jornada Branch, a series of ceramic and architectural innovations was taking place in northern and western Socorro County. Basic southern brown wares in these sites are accompanied by intrusive and locally made black-on-white wares, and black-on-red types were being introduced from the Little Colorado River area to the northwest. One of the characteristic black-on-white types that succeeded San Marcial Black-on-white was a type named

from its occurrence near Socorro, Socorro Black-on-white (Mera, 1935). The span of use of this type was apparently initiated in Pueblo II and continued into Pueblo III time (Danson, 1957). The character of habitation at this time is poorly known, but “. . . small surface structures with comparatively few rooms, built of adobe or sometimes flat stones laid horizontally, occupied, as a rule, indefensible locations in open country” (Mera, 1935, p. 29). In northwestern Socorro County, Danson (1957) noted that Pueblo II sites are the most numerous of all periods, and that they consisted of small family dwelling units located near arable land. A shift toward large multifamily pueblos occurred during Pueblo III time.

Later black-on-white wares succeeded Socorro Black-on-white in the Rio Grande area near Socorro, spreading rapidly eastward. These wares include two types, Casa Colorado and Chupadero Black-on-whites (Mera, 1935, p. 29-31), continuing into the Proto-Historic Pueblo period on Chupadera Mesa (Toulouse and Stephenson, 1960, p. 40-41). Early Chupadero settlements were formless arrangements of individual buildings of a few rooms. Irregular plaza-type structures developed later, and both stone and adobe were utilized in construction (Mera, 1935, p. 31).

Most villages in western Socorro County were abandoned in Pueblo III time. Two in the vicinity of Magdalena, however, were occupied in the Pueblo IV period, and the eastern of these continued into Pueblo V (Danson, 1957, p. 77-78). Both of these villages were unusually large for this area, consisting of more than 200 rooms for one, and an estimated 300 to 500 rooms for the other. Coursed masonry was used in their construction.

Beginning early in the Pueblo IV period, at about 1350 A.D., a sequence of glaze-paint wares came into popular use in the middle Rio Grande area, providing a useful series for dating sites and establishing trade relations from this time until about 1700 (Mera, 1933, 1940). Based on a survey of glaze-paint sites, Mera (1940, p. 13) concluded that a considerable part of the area was occupied during the first glaze period (1350-1450) by “. . . a fairly numerous sedentary population.” During period 2 (1450-1490), a marked reduction in the number of sites took place, but the evidence indicated no extensive population loss, rather the enlargement of a few villages. During periods 3 and 4 (1490-1650), an expansion in the number of sites again occurred. It should be noted that the Spanish *entrada* took place during period 4. In period 5 (1650-1700), a shift in popula-

tion took place that suggests a breaking up of the larger centers “. . . with the idea of attracting less attention or perhaps a greater degree of security which might be afforded by more isolated though less advantageous localities.”

Site surveys in the vicinity of Gran Quivira National Monument and excavations at Pueblo Pardo led Toulouse and Stephenson (1960, p. 40-41) to establish a series of six foci for that area of northeastern Socorro County and adjacent Torrance and Lincoln counties. These foci are based on associated ceramic types and surface architectural features. The early-middle prehistoric Claunch Focus is characterized by brown-ware pottery and irregularly scattered one- to three-room house units with no obvious plaza. Succeeding Brownware foci are unknown in this area. The Arroyo Seco Focus is apparently equivalent to the Claunch, but is the forerunner of later Puebloan foci of the area. Villages consist of well-planned rectangular pueblos with a central plaza. The succeeding middle prehistoric Gran Quivira Focus illustrates a fusion of Brownware traits with the basic Puebloan pattern in ceramic content and a square pueblo structure with a central plaza. In the late prehistoric Pueblo Colorado Focus, villages consist of irregular clusters of unit structures with five to thirty rooms and associated irregular plazas. The historic Salinas Focus, with the type site at San Gregorio de Abo, has a regular building pattern with a plaza.

The entry of several Spanish expeditions brings the prehistoric period to a close in this area late in the sixteenth century. Chamuscado reached the southernmost Piro village at San Marcial in 1581. In all, thirteen Piro pueblos were passed along the Rio Grande in the stretch from San Marcial to north of Socorro (Hallenbeck, 1950, p. 44-45). The Chupadera Mesa villages of Gran Quivira and Pueblo Pardo may have first been visited by Europeans in the expedition of Espejo in 1582 (Toulouse and Stephenson, 1960). Still later, the Oñate expedition reached the pueblo of Qualacú at San Marcial on May 26, 1598, remained for several days, then pushed on to the pueblo of Teipana at Socorro, arriving on June 14. Hallenbeck (1950, p. 70) refers to Teipana as the northernmost Piro town, but Mera (1940) records the presence of pottery of this period on sites at San Acacia and La Joya, which are within the Piro area. The name Socorro dates from Oñate's visit, when supplies were sent back from Teipana to the caravan of colonists struggling up the Jornada del Muerto behind the small advanced guard with Oñate. There is still some doubt concerning the site

of Teipana, although it must have been in the vicinity of Socorro. Mera (1940) refers to the pueblo buried beneath the modern town of Socorro as Pilabó.

RAW MATERIALS

The Socorro area abounds in a wide variety of useful minerals and rocks that contributed in no small measure to the material culture of its prehistoric inhabitants. The abundance of high-quality stone suitable for the manufacture of chipped implements was important not only locally, but also may have been widely traded into outlying areas deficient in such material.

High-level terrace and channel gravels along the Rio Grande at many places contain abundant pebbles and some cobbles of jasper, chert, flint, chalcedony, silicified wood, obsidian, and quartzite. White to smoky and carnelian chalcedony, jasper, and obsidian were especially desirable constituents of these gravels. Chert, flint, and rare chalcedony occur in many of the outcrops of Pennsylvanian and Permian limestone from Magdalena eastward across Chupadera Mesa. Local gathering grounds and quarries are indicated by the profusion of chipping waste and sparse crude blades of the type referred to by Bryan (1950) as quarry blanks. Conglomerates in the upper part of the Baca Formation, and basal beds of the overlying Spears Member of the Datil Formation, show abundant signs of use at a number of localities east of the Rio Grande. Large pebbles and cobbles of excellent jasper and boulders of reddish brown fine-grained quartzite and quartzitic siltstone in these beds were especially attractive to primitive flint knappers. Outcrops of tabular to irregular masses of yellow, brown, and red jasper, with minor chalcedony, are noteworthy at many places in the volcanic rocks of the Chupadera-Socorro-Lemitar mountain chain, and in the small volcanic ranges east of the Rio Grande. These sites exhibit extensive usage, including local quarrying. One of these revealed an exception to the general lack of well-defined projectile points made on quarry sites by yielding several fragments of Plainview-Angostura points (Alexander, 1963). Welded rhyolite tuff from the Datil Formation and basalt from post-Datil flows were used to a considerable extent for choppers, scrapers, and other coarse implements. Less common was their use for projectile points, which is difficult to explain in an area abounding in more tractable materials except on the basis of traditions originating in areas where flint, chert, jasper, and chalcedony were lacking. Such an interpretation is reinforced by the apparent preferential use of basalt for certain distinctive styles of points.

White to buff quartzite pebbles and cobbles from the Santa Fe Group and older conglomerates were extensively used for hammerstones, manos, and polishing stones. Sandstones of Permian, Triassic, and Cretaceous age provided slabs and cobbles for manos, metates, griddles (comales), and abraders. A wide variety of intrusive and volcanic rocks was also used for these purposes. Schists and gneisses from Precambrian outcrops, but more commonly from gravels derived from them, were similarly used to a lesser extent. Elongate rods of phyllite and schist whose function is uncertain (variously described as pestles, "kiva bells," etc.) were readily obtainable in closely jointed Precambrian rocks in Los Pinos Mountains and in gravels of the upper Santa Fe Group that extend westward therefrom.

Clays suitable for pottery and other ceramic objects abound in Pennsylvanian, Permian, Triassic, Cretaceous, and Tertiary sequences, and in Quaternary flood-plain deposits along streams. Fired colors, in an oxidizing atmosphere, range from white to dark brown and red.

Pigments of all the common hues also are widely distributed. Hematite (red) is common in the Magdalena mining district, and less widespread in the Socorro Mountains, in gravels along the Rio Grande, and in fossil placers in the Baca Formation. Limonite (brown to yellow) is also common in the Magdalena district, in veins in the Chupadera Mountains, in concretions in Pennsylvanian, Permian, and Cretaceous beds, and in lenses of ocherous sand and silt in the Santa Fe Group. Jarosite (yellow) is conspicuous in a mineralized zone in Pennsylvanian limestones east of Socorro and is probably common in the Magdalena mining district. Gypsum and limestone (white) abound in the extensive tracts of Paleozoic rocks east of the Rio Grande and in smaller areas to the west. White clays occur in small quantities at a number of places. Malachite (green) is common in the northern Magdalena Mountains, and less common in the Lemitar Mountains, Ladron Peak, Pennsylvanian and Permian rocks east of the Rio Grande, and in the Oscura and San Andres mountains. Azurite (blue) is less widespread but is especially prominent in the Magdalena mining district. Specular hematite (black) is abundant in the Magdalena district. Manganese oxide minerals (black) are very widely distributed but are especially abundant in the Chupadera Mountains. Galena (black) is common in the Magdalena district, Lemitar, Oscura, and San Andres mountains, and in an area east of Socorro.

Ornamental materials include many of the min-

eral and rock types listed above. Banded travertine used in the manufacture of "finger stones" or "mirage stones" is prevalent in limestone regions of the area, and in the travertine benches and spring terraces west and north of Ladron Peak. Jet may occur in coal-bearing Cretaceous rocks south of the Rio Salado and east of San Antonio.

REFERENCES CITED

- Agogino, G. A. (1952) *The Santa Ana pre-ceramic site: a report on a cultural level in Sandoval County, N. M.*, Texas Jour. Sci., v. 4, n. 1, p. 32-37.
- (1961) *A new point type from Hell Gap, Wyoming*, Am. Antiquity, v. 26, n. 4, p. 258-260.
- , and Hester, Jim (1958) *Comments on the San Jose radiocarbon date*, Am. Antiquity, v. 24, n. 2, p. 187-188.
- , and Hibben, F. C. (1958) *Central New Mexico Paleo-Indian cultures*, Am. Antiquity, v. 23, n. 4, p. 422-425.
- Alexander, H. L., Jr. (1963) *The Levi site: a Paleo-Indian campsite in central Texas*, Am. Antiquity, v. 28, n. 4, p. 510-528.
- Bryan, Kirk (1950) *Flint quarries—the sources of tools and, at the same time, the factories of the American Indian*, Papers of the Peabody Mus., v. 17, n. 3.
- , and Toulouse, J. H., Jr. (1943) *The San Jose non-ceramic culture and its relation to Puebloan Culture in New Mexico*, Am. Antiquity, v. 8, n. 3, p. 260-280.
- Campbell, J. M., and Ellis, F. H. (1952) *Cochise manifestations in the middle Rio Grande Valley*, Am. Antiquity, v. 17, n. 3, p. 211-221.
- Cosgrove, C. B. (1947) *Caves of the upper Gila and Hueco areas in New Mexico and Texas*, Papers of the Peabody Mus., v. 24, n. 2.
- Danson, E. B. (1957) *An archeological survey of west-central New Mexico and east-central Arizona*, Papers of the Peabody Mus., v. 24, n. 2.
- Fenenga, Franklin (1956) *Excavations at site LA 2579, a Mogollon village near Gran Quivira, New Mexico* (in Wendorf, Fred, Fox, Nancy, and Lewis, O. L., eds., Pipeline Archeology: Reports of Salvage Operations in the Southwest on El Paso Natural Gas Company Projects, 1950-1953), Lab. Anthropology and Mus. Northern Ariz., p. 226-233.
- Forbis, R. G. (1956) *Early man and fossil bison*, Science, v. 123, p. 327-328.
- Hallenbeck, Cleve (1950) *Land of the Conquistadores*, Caldwell, Ida: The Caxton Printers, Ltd.
- Harrington, M. R. (1928) *Sandal Cave, a new book of Southwestern prehistory*, The Masterkey, v. 2, n. 2, p. 5-10.
- Haynes, Vance, and Agogino, G. A. (1960) *Geological significance of a new radiocarbon date from the Lindenmeier site*, Proc. of Denver Mus. of Nat. Hist., n. 9.
- Hibben, F. C. (1941) *Evidences of early occupation in Sandia Cave, New Mexico, and other sites in the Sandia-Manzano region*, Smithsonian Misc. Coll., v. 99, n. 23.
- (1951) *Sites of the Paleo-Indian in the middle Rio Grande Valley*, Am. Antiquity, v. 17, n. 1, p. 41-46.
- (1955) *Specimens from Sandia Cave and their possible significance*, Science, v. 122, p. 688-689.
- Hurt, W. R., and McKnight, D. (1949) *Archeology of the San Augustin Plains, a preliminary report*, Am. Antiquity, v. 14, n. 3, p. 172-194.
- Jennings, J. D., and Norbeck, Edward (1955) *Great Basin prehistory: a review*, Am. Antiquity, v. 21, n. 1, p. 1-11.
- Lehmer, D. J. (1948) *The Jornada Branch of the Mogollon*, Univ. Ariz. Bull., v. 19, n. 2, Soc. Sci. Bull., n. 17.
- Libby, W. F. (1955) *Radiocarbon dating*, Chicago: Univ. Chicago Press (2d ed.).
- Martin, P. S., Rinaldo, J. B., Bluhm, Elaine, Cutler, H. C., and Grange, Roger, Jr. (1952) *Mogollon cultural continuity and change*, Fieldiana: Anthropology, v. 40.

- Mera, H. P. (1933) A proposed revision of the Rio Grande glaze paint sequence, Lab. Anthropology, Tech. Ser. Bull., n. 5.
- (1935) Ceramic clues to the prehistory of north central New Mexico, Lab. Anthropology, Tech. Ser. Bull., n. 8.
- (1940) Population changes in the Rio Grande glaze-paint area, Lab. Anthropology, Tech. Ser. Bull., n. 9.
- (1943) An outline of ceramic developments in southern and southeastern New Mexico, Lab Anthropology, Tech. Ser Bull., n. 11.
- Sayles, E. B., and Antevs, Ernst (1941) *The Cochise Culture*, Medallion Papers, n. 24, Gila Pueblo, Globe, Ariz.
- Sellards, E. H. (1952) *Early Man in America*, Austin: Univ. Texas Press.
- Toulouse, J. H., Jr., and Stephenson, R. L. (1960) Excavations at Pueblo Pardo, Mus. N. Mex., Papers in Anthropology, n. 2.
- Wendorf, Fred (1954) A reconstruction of northern Rio Grande prehistory, *Am. Anthropologist*, v. 56, p. 200-227.
- (1955) An alternative reconstruction of northern Rio Grande prehistory, *El Palacio*, v. 62, p. 131-173.
- (1959) The prehistory of northeastern New Mexico, in Panhandle Geol. Soc. Field Conference, Guidebook, Southern Sangre de Cristo Mountains, New Mexico.
- (compiler) (1951) *Paleoecology of the Llano Estacado*, Ft. Burgwin Research Center, n. 1, Mus. N. Mex. Press.
- Wiley, G. R. (1961) *New World prehistory*, *Science*, v. 131, n. 3393, p. 73-86.
- , and Phillips, Philip (1958) *Method and theory in American archeology*. Chicago: Univ. Chicago Press.
- Wormington, H. M. (1957) *Ancient man in North America*, *Denver Mus. Nat. Hist.*, popular ser. n. 4 (4th ed.).
- (1962) A survey of early American prehistory, *Am. Scientist*, v. 50, n. 1, p. 230-242.