

The Excavation of the Cortez CO₂ Pipeline Project Sites, 1982-1983

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The excavation of Rosa phase sites in the Navajo Reservoir district failed to yield radiocarbon or tree-ring dates, but based on ceramic type comparisons with materials dated elsewhere by dendrochronology, Eddy (1966:456) assigned a temporal span of AD 700-850 for the Rosa phase. An early Rosa phase Ceramic Group 3a defined by Eddy (1966:456) for the AD 700-750 period exhibits Rosa Gray and Black-on-white ceramic types but with the persistence of Sambrito Brown in the assemblage. The late Rosa phase, represented by Ceramic Group 3b with an estimated date of AD 750-850, is defined by the presence of intrusive San Juan Redware materials in association with the Rosa gray and whiteware types.

Archeological sites of Piedra phase affiliation were first documented by Roberts (1930), but the phase was not formally defined until the Navajo Reservoir project (Dittert et al. 1961). Excavation of Piedra phase sites in the Navajo Reservoir district yielded a series of reliable tree-ring dates (Eddy 1966:Table 7) during the period from AD 850-900, with a decided cluster in the 880s and 890s (Eddy 1966:449).

The early Piedra phase Ceramic Group 4a contains a predominance of Piedra Gray and Black-on-white but also has traces of Rosa Black-on-white (Eddy 1966:457); it has been defined for the period from AD 850-900. The late Piedra phase (ca. AD 900-950) is represented by Ceramic Group 4b and is recognized by the presence of Red Mesa "style" vessels, a predominance of Piedra Gray and Black-on-white and the absence of Rosa gray or Rosa gray or white wares.

Three archeological components were encountered in the Cortez pipeline excavations that have been identified as late Rosa-early Piedra phase manifestations: the late components of Los Sotanos (LA 38944), the site of Los Jacales (LA 38945), and Hearth 6 at La Ceja Blanca (LA 38951). The late Rosa-early Piedra phase affiliations of the later components at Los Sotanos are defined on the basis of the ceramic assemblage. The ceramic sample is a mixed assemblage that is derived from two occupational events which have been defined on the basis of architectural superpositions. The ceramic inventory includes Piedra Gray, Rosa Gray, Chapin Gray, Moccasin Gray, Piedra Black-on-white, Chapin Black-on-white, and La Plata Black-on-Red and is indicative of Ceramic Group 3b and 4a associations. The predominance of Piedra Gray in the sample suggests that both of the late occupations at Los Sotanos took place in the ninth century AD. A single radiocarbon date, Dicarb Sample 2625, was obtained from Provenience 4, a hearth area in direct association with Piedra Gray, Rosa Gray, Chapin Gray, and Chapin Black-on-white, but the sample yielded a determination of AD 1780 \pm 50. This date is apparently a sample error. Navajo people have been known to reuse Anasazi ceramic containers, although the association of four different Anasazi vessels with a Navajo hearth seems rather unlikely. Clearly this situation demonstrates that radiocarbon determinations can be erroneous and that extreme caution must be used when radiocarbon samples are the primary source of temporal and cultural assignments.

The late Rosa and early Piedra affiliations at Los Jacales can be recognized in spatially discrete areas of the site, but the site is probably the result of a continuous occu-

pation. Evidence of occupation during the late Rosa phase was encountered in the jacal structure (Provenience 2), where a radiocarbon determination of AD 790 \pm 50 was obtained in association with a Ceramic Group 3b assemblage. This assemblage is characterized by high frequencies of Rosa Gray in association with Bluff Black-on-red. In contrast, an early Piedra phase occupation is indicated by the Ceramic Group 4a assemblages from the log structures (Proveniences 1 and 3), where Piedra Gray is predominant and La Plata Black-on-red is present. The midden fill in the pitstructure was probably deposited during the early site occupation, while the ceramic debris associated with the log structures probably represents a composite of both early and late occupational debris. The estimated maximum length of the Los Jacales occupation is AD 750-900. A single radiocarbon date, Dicarb Sample 2627, was obtained from the Provenience 1 area but it yielded a determination of AD 1410 \pm 85. Again, this date apparently represents a sample error of undetermined nature, and it underscores the problem of depending too heavily on radiocarbon determinations, as perhaps we have done.

The other probable late Rosa or early Piedra component was encountered at the predominantly Gobernador phase site of La Ceja Blanca (LA 38951). A radiocarbon determination of AD 820 \pm 45 was obtained from a hearth (Feature 6). No diagnostic artifacts appear in this location, although the spatial position of the hearth area outside the main site complex, the structurally distinct character of the hearth, and the presence of a few Anasazi plain gray sherds elsewhere in the site area tend to verify the Anasazi affiliation suggested by the radiocarbon date.

Navajo Chronology

The Dinetah Phase

The ancestral Navajo occupation of the eastern San Juan district has been defined by Dittert et al. (1961:245) and Hester (1962:62) as the Dinetah phase, with an estimated span of AD 1550 to 1680 (Table 18.3). This ancestral Navajo complex is considered to be largely devoid of Puebloan traits, but both agriculture and ceramics are recognized as cultural aspects that may have been adopted by previous contact with Plains sedentary groups (Dittert et al. 1961:248). Ceramic Group Aa (early Dinetah phase) assemblages were defined as those that contain only Dinetah Utility, whereas the late Dinetah phase sites contain Dinetah Utility, Gobernador Indented, and intrusive Jemez Black-on-white (Ceramic Group Ab; Eddy 1966:453).

The validity of the Dinetah phase was questioned after a series of excavations in the Navajo Reservoir district failed to provide convincing evidence (Eddy 1966:507). No early dates were obtained, and the ceramic group Aa complex samples were suspect due to insufficient sample sizes. Hall (1944a:100) lists a few isolated tree-ring dates from AD 1491-1541 in association with Navajo remains in the eastern San Juan district, but these dates are generally contested; they may represent reused beams or dead wood collected at a later date. The earliest cluster of tree-ring dates in association with a pueblito structure is 1690-1694 (Wilson and Warren 1974). Tree-ring dates evaluated by

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Table 18.3. Navajo phase sequence

Phase	Estimated Dates	Ceramic Associations
Dinetah (Dittert et al. 1961; Hester 1962)	ca. 1550-1680	Early Dinetah phase Ceramic Group Aa includes Dinetah Utility wares Late Dinetah phase Ceramic Group Ab includes Dinetah Utility, Gobernador Indented and Incised, and Jemez Black-on-white
Piedra Lumbre (Schaafsma 1976, 1978, 1979)	Early seventeenth century (at least by 1626) to approximately 1705	No Navajo-made ceramics. Ceramics include Tewa Polychrome and Redware, Kapo Black, Ogapoge and Sikyatki Polychrome, Penasco and Vadito Micaceous
Gobernador (Carlson 1965; Dittert et al. 1961; Eddy 1966)	ca. 1680-1750/1775 (latest tree-ring date is 1768)	Early Gobernador phase Ceramic Group Ba includes Dinetah Utility, Gobernador Polychrome, Rio Grande glazewares, Hawikuh Glaze Polychrome, Jemez Black-on-white, and Tewa Polychrome Late Gobernador phase Ceramic Group Bb includes Dinetah Utility, Gobernador Indented and Polychrome, Frances Polychrome*, Jemez Black-on-white, and Puname and Ashiwi Polychrome
Cabezon (Hester 1962:65)	Early Cabezon phase, ca. 1750/1775-1800/1825 Late Cabezon phase, ca. 1800/1825-1863	Ceramic Group Ca** includes Dinetah Utility, Gobernador Polychrome (Rio Puerco Variant), and Puname, Ashiwi, and Ako Polychrome Ceramic Group Cb includes Navajo Utility, Navajo Bichrome and Polychrome, and San Pablo, Acomita, and Kiapwa Polychrome

* Dittert (in Eddy 1966:406) and Eddy (1966:453) consider Frances Polychrome to be a late variant of Gobernador Polychrome transitional to Navajo Painted, and therefore it is grouped in Ceramic Group Bb. On the other hand, Carlson (1965:57, 99) and Brugge (1982:292) consider Frances Polychrome to be an early expression of Gobernador Polychrome. Since the type is most frequent in assemblages north of the San Juan, the latter two authors consider it to be an element of Ceramic Group Ba. No additional information pertinent to this problem was gained from the Cortez CO₂ pipeline excavations.

** Ceramic Groups Ca and Cb postdate the principal occupation of the Dinetah district and are associated with eastern Navajo remains from Chaco Canyon and south.

Robinson et al. (1974:62, 68, 69, 70-78, 83), primarily from pueblito sites in the southern tributaries of the eastern San Juan district, indicate construction dates which span the early to middle eighteenth century.

The lack of convincing evidence for the Dinetah phase, as reviewed by Eddy (1966:507), and the subsequent recognition of the Piedra Lumbre phase by Schaafsma (1976, 1978, 1979) tended to suggest that the Dinetah phase, like the hypothetical Basketmaker I period, was a figment of the archeologist's imagination. On the other hand, certain factors, including evidence from the Cortez pipeline excavations, support the probability of an ancestral sixteenth and seventeenth century Navajo occupation in the eastern San Juan district. These factors are outlined in the following discussion.

If an ancestral Dinetah phase Navajo occupation of the eastern San Juan Basin did indeed exist, we would expect the cultural remains to be rather infrequent due to a low population density. The remains should also be rather inconspicuous due to the perishable nature of the forked-stick and ramada constructions and the relative antiquity of the sites. ~~Excavations in the Navajo Basin have been infrequent, but the principal archaeological focus in the region is,~~

~~More recent excavations in Canyon (1966), as well as Provenience B, C, and D, and the Basketmaker I period (1965) have produced the few Dinetah phase ceramics. All of these ceramics have been obtained from the same location (Robinson et al. 1974). Little excavation has been done in the region by only a light number of excavations and their labels. Thus, it is likely that the few ancestral Navajo sites which might exist have been overlooked.~~

Two Navajo sites excavated within the Cortez pipeline corridor in the Blanco Canyon region have produced radiocarbon dates which indicate a late sixteenth or early seventeenth century occupation and thus, by definition, represent expressions of the Dinetah phase. Both of these sites had inconspicuous surface remains. El Campo Navahu (LA 38946) consists of a small ramadalike structure with a few associated hearth features and scattered artifacts; it yielded a radiocarbon determination of AD 1550 ± 55. Excavations within La Ceja Blanca also yielded radiocarbon dates indicative of Dinetah phase affiliation: AD 1590 ± 55 from Provenience B and 1600 ± 55 from Provenience D. Later dates of 1700 ± 55 and 1740 ± 55 indicate that other areas of the site were reoccupied during the Gobernador phase. Both of the candidate Dinetah phase

Acoma red-slipped vessel. In addition, a radiocarbon determination of 1780 ± 45 was obtained from Provenience 2 at Rincon Luis (LA 44533), which contained Dineta Utility and Gobernador Yellow (Rio Puerco variety). The Rincon Luis site is the southernmost site excavated in the Cortez pipeline corridor and probably represents a very late Gobernador phase or perhaps an early Cabezon phase site which was inhabited after the general abandonment of the Dineta district to the north.

The Cabezon Phase

The Cabezon phase is a late eighteenth and nineteenth century expression of Navajo culture which appears in the east from Chaco Canyon south to the Rio Puerco and Mount Taylor district. Navajo settlements of the phase are described by Keur (1941) from the Big Bead Mesa area and by Carroll and Marshall (1979) in the Seboyeta area. The phase is defined in Hester (1962:64). As mentioned above, the Rincon Luis site may represent an early Cabezon phase site.

Radiocarbon Dates

The dating of the archeological remains encountered in the Cortez pipeline excavations was obtained primarily through radiocarbon analysis. A total of 25 samples were submitted for analysis (Table 18.4). All were charcoal fragments obtained from hearth locations or midden fill. An attempt was made to obtain two or more samples from each site and from structurally diverse or spatially discrete provenience areas. Samples were obtained from all sites except the Jaques site (LA 38947), Cerro Arena (LA 38948), and the Mosquito Tank site (LA 44531). No samples were submitted from the twentieth-century components since such analysis would not have been productive.

All radiocarbon samples were analyzed by Irene Stehli of Dicarb Radioisotope Inc., Norman, Oklahoma, as discussed below.

All samples are first examined and cleaned of obvious impurities. The sample is treated for humic acids with 2N NaOH at 100 degrees C for thirty minutes, decanted, filtered, washed, and picked for rootlets while wet. Free carbonates are removed with 2N HCl at room temperature for approximately forty-eight hours. The sample is then decanted, filtered, washed, again picked for rootlets while wet, dried at 90 degrees C, and picked for rootlets and remaining impurities under 30 \times magnification [Stehli, personal communication].

A sample data form for each radiocarbon specimen was completed by Dicarb; these forms are on file at the Office of Contract Archeology and list provenience data, information concerning sample combustion, statistical data regarding period of counting, number of counts per minute, weight of the sample, and background statistics. A summary of pertinent information is presented in the following sample descriptions and in Table 18.4.

None of the radiocarbon determinations reported in this study have been "corrected" for the effects of C14/C12. As discussed by Klein et al. (1982:104), the diversity of avail-

able calibration techniques produces conflicting results, and many archeologists are suspicious of using them. In order to avoid confusion, radiocarbon laboratories (including Dicarb Radioisotope Inc.) provide uncorrected dates. Because of the relatively recent ages of the Cortez pipeline project sample, correcting the dates would have meant differences of only 10–15 years for the seventeenth and eighteenth century Navajo samples and only about 160 years for the $3610 \text{ BC} \pm 140$ late Archaic sample. We have therefore chosen not to correct the samples. Interested readers should consult one of the calibration tables provided by Damon et al. (1974) or Klein et al. (1982), for example.

LA 44532

Sample OCA:161:23–28 (Dicarb 2694) was taken from Feature 7 of the Nageezi Divide site, a large basin-shaped hearth filled with dark charcoal-laden soil. This composite sample consisted of wood, probably piñon or juniper, with many rootlets and a slight amount of free carbonates. It appeared to be clean prior to the burn and had a carbon weight of 2.4381 g. A determination of 2160 BP (210 BC) ± 55 was obtained. This indicates a late Archaic period affinity.

Sample OCA:161:23–29 (Dicarb 2695) was taken from Feature 30, an ovoid basin-shaped hearth, between 10 and 40 cm below the ground surface. The sample contained charcoal bits and pieces of burned tabular sandstone. The charcoal was wood, probably piñon or juniper, and a large number of rootlets were present during the first stages of cleaning but were eliminated in the later cleaning processes. A slight amount of free carbonate was present. The carbon weight was 2.4402 g. This sample produced a determination of 1790 BP (AD 160) ± 50 , which is indicative of a late Archaic occupation.

Sample OCA:161:23–36 (Dicarb 2696) consisted of piñon or juniper wood fragments taken from Feature 24, a deep circular basin filled with charcoal-stained soil. It was taken from 10–20 cm below the ground surface and contained some rootlets which were subsequently cleaned. The carbon in the sample weighed 0.8191 g. A radiocarbon determination of 5560 BP (3610 BC) ± 140 was obtained. This date, the earliest from the Nageezi Divide site, indicates that the site was first occupied during the middle Archaic.

Sample OCA:161:23–27 (Dicarb 2697) was a composite charcoal sample recovered from Feature 5. It was taken from 10–40 cm below ground surface in an irregular ovoid basin-shaped pit. Many rootlets were removed during the cleaning process. A slight amount of free carbonates was noted. The weight of the carbon sample was 1.0305 g. A determination of 2700 BP (750 BC) ± 95 was obtained, indicative of the late Archaic period.

Sample OCA:161:23–26 (Dicarb 2698) was recovered from Feature 1, a dual hearth basin filled with charcoal-stained sand. The composite wood sample was from 10–40 cm below ground surface, probably piñon or juniper. Many roots were present but all were removed in the final cleaning. The sample weight was 2.4416 g. A determination of 280 BP (AD 1670) ± 50 was obtained. This date was unexpected, because there is no additional evidence of an early

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Table 18.4 Summary of radiocarbon determinations from sites excavated in the Cortez pipeline corridor

Sample Numbers		Provenience	Date	Comments
OCA	Dicarb			
<u>Sites With Primary Archaic Occupations</u>				
<u>LA 44532 (Nageezi Divide)</u>				
161:23:28	2694	Feature 7, hearth	2160 BP (210 BC) \pm 55	Late Archaic
161:23:29	2695	Feature 30, hearth	1790 BP (AD 160) \pm 50	Late Archaic
161:23:36	2696	Feature 24, hearth	5560 BP (3610 BC) \pm 140	Middle Archaic
161:23:27	2697	Feature 5, hearth	2700 BP (750 BC) \pm 95	Late Archaic
161:23:26	2698	Feature 1, hearth	280 BP (AD 1670) \pm 50	Gobernador phase Navajo (reuse?)
<u>LA 38950 (La Ceja Alemita)</u>				
161:30:4	2638	Feature 1, hearth	3670 BP (1720 BC) \pm 155	Middle Archaic
<u>LA 44530 (Arriba Blanca)</u>				
161:38:1	2699	Feature 1, hearth	2890 BP (940 BC) \pm 70	Late Archaic
<u>Sites with Primary Basketmaker II or Early Pueblo Occupations</u>				
<u>LA 38944 (Los Sotanos)</u>				
161:3:59	2623	Feature 5, storage pit	1840 BP (AD 110) \pm 85	Los Pinos phase
161:3:73	2624	Feature 7, storage pit	2000 BP (50 BC) \pm 55	Los Pinos phase
161:3:4:4	2625	Provenience 4, hearth	170 BP (AD 1780) \pm 50	Possible sample error: hearth contained only Rosa-Piedra ceramics
161:3:1:54	2626	Feature 5, corn sample	1630 BP (AD 320) \pm 85*	Los Pinos phase
<u>LA 38945 (Los Jacales)</u>				
161:4:1:69	2627	Provenience 1, post in log structure	540 BP (AD 1410) \pm 85	Possible sample error: "post" may be burned tree root rather than part of the structure
161:4:62	2628	Provenience 2, midden fill in pitstructure	1160 BP (AD 790) \pm 50	Rosa phase
<u>Sites with Primary Early Navajo Occupations</u>				
<u>LA 38946 (El Campo Navahu)</u>				
161:6:97a	2629	Domicile area, Post C	400 BP (AD 1550) \pm 55**	Dinetah phase
161:6:51	2715	Feature 4 flotation samples	1660 BP (AD 290) \pm 75	Apparent sample error
<u>LA 38951 (La Ceja Blanca)</u>				
107:36:206	2631	Near Hearth 2	70 BP (AD 1880) \pm 70	Probable sample error: burned juniper may be of natural rather than cultural origin
107:36:208	2630	Hearth 7	210 BP (AD 1740) \pm 55	Gobernador phase
107:36:211	2632	Hearth 6	1130 BP (AD 820) \pm 45	Late Rosa - early Piedra phase
107:36:314	2855	Provenience D, shelter	350 BP (AD 1600) \pm 55	Dinetah phase
107:36:317	2856	Provenience B, shelter	360 BP (AD 1590) \pm 55	Dinetah phase
107:36:318	2857	Provenience A, sweatlodge	250 BP (AD 1700) \pm 50	Gobernador phase
<u>LA 38949 (Rincon Alemita)</u>				
161:28:8	2637	South component, associated with sherd cluster	300 BP (AD 1650) \pm 70	Probable Gobernador phase
<u>LA 44533 (Rincon Luis)</u>				
161:40:1	2712	Provenience 3, midden	1310 BP (AD 640) \pm 70	Very late Archaic/early Basketmaker II; aceramic
161:40:2	2713	Feature 1, hearth	20 BP (AD 1930) \pm 80	Apparent sample error: no evidence of twentieth-century occupation
161:40:3	2714	Feature 2, hearth	470 BP (AD 1780) \pm 45	Early Cabezon phase

Note: None of these determinations have been corrected for C-14/C-12 variation.

* C-13 correction for sample 161:3:1:54 (Los Sotanos) revises the date to AD 170-220. This was the only sample corrected for C-13 since it was composed of corn.

** Initially a date of 610 BP (AD 1340) \pm 50 was obtained from this sample. It was later determined that the seal of the sample container had been perforated after the first 2000 minutes of counting, resulting in a deviation. A reevaluation of the first 2000 minutes of counting produced the 400 BP determination.

nistoric reoccupation at this site. The site was probably utilized briefly by Navajos during the late Gobernador phase.

LA 38950

Sample OCA:161:30-4 (Dicarb 2638) was recovered from an oval-shaped hearth (Feature 1) at La Ceja Alemita. Recovered from 30 cm below ground surface, this composite sample was wood. It was free of carbonates and contained a few small roots which were removed in the cleaning process. The carbon weight was 0.4645 g. A radiocarbon determination of 3670 BP (1720 BC) \pm 155 was obtained. This date indicates that the component at La Ceja Alemita is affiliated with the middle Archaic. Unfortunately, no diagnostic artifacts were encountered and a phase affiliation cannot be assigned.

LA 44530

Sample OCA:161:38-1 (Dicarb 2699) was recovered from an accumulation of charcoal-laden soil (0-10 cm) buried 10 cm below the ground surface at Arriba Blanca. It consisted of carbonized wood, probably piñon or juniper. It had a processed carbon weight of 1.7547 g. A number of penetrating rootlets were removed during cleaning. The sample dated to 2890 BP (940 BC) \pm 70. The date indicates a late Archaic affiliation. The site did not yield diagnostic artifacts which would allow phase identification, but it was apparently occupied during a time contemporaneous with the Armijo phase (Irwin-Williams 1973:9).

LA 38944

Sample OCA:161:3-59 (Dicarb 2623) was obtained from a charcoal-laden midden lens within a bell-shaped storage pit (Feature 5) at Los Sotanos. This carbonized coniferous wood sample was taken from a depth of 1.0 m below ground surface, and it was clearly free of surficial contamination. It was a small composite sample (0.7116 g of carbon), but it consisted of large charcoal lumps laced with sand. It was quite clean in both the wet and dry pick. The sample dated to 1840 BP (ca. AD 110) \pm 85. This date is essentially in agreement with the sample taken from the other pit at this site, and it indicates that the pits are associated with the preceramic horizon of the early Los Pinos phase.

Sample OCA:161:3-73 (Dicarb 2624) was obtained from a carbonized coniferous beam fragment in the lower wall of the bell-shaped storage pit (Feature 7). It was taken from a depth of 1.0 m below the surface and was apparently free of surficial contamination, except for a few rootlets found during the wet pick. No rootlets were observed during the dry pick, and no free carbonates were present. The sample weight was 2.4428 g. A radiocarbon determination of 2000 BP (50 BC) \pm 50 was obtained. Other information obtained from the early Los Sotanos component agrees with this temporal placement.

Sample OCA:161:3:4-4 (Dicarb 2625) was obtained from the fill of a rock-lined hearth in the Provenience 4 area. The carbonized coniferous wood composite sample was obtained from 20 cm below the surface and contained some

rootlets, although it appeared clean in both the wet and dry pick processes. There was a mild carbonate reaction. The carbon weight was 2.4374 g. A determination of 170 BP (AD 1780) \pm 50 was obtained. This is at odds with the Los Pinos and Rosa phase identification of the site complex. The hearth is an isolated feature on the site; it could be argued that this feature is from an eighteenth-century Navajo utilization and that the occupants scavenged Puebloan ceramics which appear in association with the hearth. This is unlikely, however, since sherds from at least five different vessels (including Piedra Gray, Rosa Gray, Chapin Gray, and Chapin Black-on-white) are present within the hearth fill. It is more likely that the sample was contaminated or that there was an error in the analysis.

Sample OCA:161:3:1-54 (Dicarb 2626) consists of carbonized corn kernels which were obtained from the base of the storage pit (Feature 5) at a depth of 1.25 m below ground surface. The sample was very clean and contained 0.8836 g of carbon. Corn is known to store more C-14 than most other material; therefore, it will date considerably more recent than it actually is. A C-13 correction ratio is required for accurate dating. The age determination for the sample without this correction was 1630 BP (AD 320) \pm 85. The correction factor of -9.2 per mil indicates that the sample is 100-150 years older than initially calculated, or ca. AD 170-220 \pm 85 (Irene Stehli, personal communication 1984).

LA 38945

Sample OCA:161:4:1-69 (Dicarb 2627) was obtained from a carbonized coniferous post fragment in the jacal lodge (Provenience 1) at Los Jacales. The sample was obtained from 20 cm below ground surface and contained some rootlets, but it appeared clean in the wet and dry cleaning processes. It was a small sample, 0.6255 g of carbon, but of sufficient size to analyze. A determination 540 BP (AD 1410) \pm 85 was obtained. This is unexpectedly late, since the ceramics from this provenience clearly represent a late Rosa-early Piedra phase component and since a radiocarbon determination from another provenience reflects this phase identification. The surface contamination resulting from rootlet penetration probably would not severely affect the sample date; therefore, although during excavation the sample appeared to represent a burned post, it may be from a burned root stump from a postoccupational horizon.

Sample OCA:161:4-62 (Dicarb 2628) was obtained from carbonized coniferous wood fragments which were encountered in a charcoal-laden lens in the lower fill of the pitstructure (Provenience 2). The composite sample was located 80 cm below ground surface. Rootlets were present, but the sample was well cleaned before analysis. The carbon weight was 2.0053 g. A determination of 1160 BP (AD 790) \pm 50 was obtained. The ceramic sample from the midden fill in the jacal structure is in agreement with this temporal placement. Indeed, the ceramic frequencies (predominantly Rosa Gray) identify the assemblage as Ceramic Group 3b (Late Rosa Phase—AD 750-850; Eddy 1966:452). The midden fill in this pit was apparently deposited during the early site occupation, since the ceramics obtained from the adjacent lodges were predominately Piedra Gray, indicative of Ceramic Group 4a (early Piedra phase—AD 850-900).

LA 38946

Sample OCA:161:6-97a was obtained from a partially carbonized juniper post (C) associated with the domicile at El Campo Navahu. It was taken from 20 cm below the ground surface. The sample contained some rootlets but was well cleaned. A carbon weight of 2.4357 g was analyzed and a determination of 610 BP (AD 1340) \pm 50 was obtained. A fourteenth-century date for a Dinetah area Navajo occupation substantially predates all other evidence of Navajo presence in this region. Because of this, a reevaluation of the sample was made and it was determined that after the first 2000 minutes a significant deviation in the counting frequency was apparent. This indicates that the seal of the sample container had been perforated at that time. Thus, a reevaluation of the sample was made using only the first 2000 minutes of the counting process. This reevaluation resulted in a date of 400 BP (AD 1550) \pm 55, clearly within the possible range of the Navajo occupation of the region. This sample indicates a late sixteenth century occupation of the site and is therefore among the earliest dated Navajo remains in the Dinetah district.

Sample OCA:161:6-51 (Dicarb 2715) was recovered from Feature 4, a basin-shaped, rock-lined hearth filled with charcoal-laden soil. The composite sample was wood, probably piñon or juniper, which was extracted from a flotation sample. The sample contained a few penetrating roots on the wet pick but was clean on the dry. A carbon weight of 1.0259 g was analyzed and a determination of 1660 BP (AD 290) \pm 75 was obtained. Since it is unlikely that Feature 4 predates the rest of the site, we must assume a sampling error, although no ceramics or other diagnostic artifacts were found in the fill of Feature 4.

LA 38951

Sample OCA:107:36-206 (Dicarb 2631) was obtained from a partially carbonized juniper beam found at approximately 20 cm below the ground surface in an area adjacent to the hearth (Feature 2) at La Ceja Blanca. The sample contained numerous rootlets but after the dry and wet picks it was "fairly clean." The carbon weight was 2.4373 g. A slight carbonate reaction was noted. A determination of 70 BP (AD 1880) \pm 50 was obtained. Even the earliest possible date, AD 1830, appears to be somewhat late based on the generally recognized abandonment of the Dinetah region in the late eighteenth century and a similar end date for Gobernador Polychrome, which was found at the site. The beam may represent a portion of a naturally felled tree, since there is no other evidence of a nineteenth century reoccupation of the site area.

Sample OCA:107:36-208 (Dicarb 2630) was obtained from carbonized coniferous wood fragments taken from a hearth (Feature 7) in the Grid C-8 area. The composite sample was taken from 20 cm below the surface. It contained numerous rootlets, some of which were still found during the wet pick, but it was well cleaned before analysis. The carbon weight was 2.4362 g. A determination of 210 BP (AD 1740) \pm 55 was obtained. This mid-eighteenth century placement is substantiated by the known dates for the Gobernador phase occupation of the region (Robinson et al. 1974) and by the presence of Gobernador Polychrome at the site.

Sample OCA:107:36-211 (Dicarb 2632) was obtained from the lower fill of a hearth (Feature 6) in Grid A-16 at approximately 30 cm below ground surface. The composite material was carbonized juniper. Many rootlets were found during the wet pick but none were observed in the final cleaning stages. A strong carbonate reaction was observed. The carbon weight was 2.4405 g. A determination of 1130 BP (AD 820) \pm 45 was obtained. This date is nearly a millenia before the estimated occupation date for this Navajo settlement. A single plainware sherd from the hearth fill was identified as Dinetah Plain. Upon reexamination, this sherd was found to be well reduced and to have a light gray paste, relatively hard walls, and sand temper. It is possible that this is a Rosa Gray sherd, and that the hearth (which is separated from the main site concentration) is in fact a Rosa phase Anasazi manifestation. If so, the date is substantiated.

Sample OCA:107:36-314 (Dicarb 2855) was obtained from the hearth basin in the Provenience D activity area. It was located at a depth of 15 cm below ground surface. The composite sample of carbonized wood contained numerous rootlets but a 7 g sample of large pieces was well cleaned. The final carbon weight was 2.4380 g. A determination of 350 BP (AD 1600) \pm 55 was obtained. This date indicates a Dinetah phase occupation for this activity area.

Sample OCA:107:36-317 (Dicarb 2856) was taken from a burned coniferous beam approximately 20 cm below the surface in the area of Provenience B. The sample contained numerous rootlets but a 7 g sample was well cleaned. The analyzed sample had 2.4382 g of carbon. A determination of 360 BP (AD 1590) \pm 55 was obtained. This indicates a Dinetah phase affiliation for the activity area at Provenience B.

Sample OCA:107:36-318 (Dicarb 2857) was obtained from a hearth basin associated with the firecracked rock and charcoal midden of Provenience A. This hearth was probably associated with a sweatlodge. The composite sample of carbonized wood contained 1.7252 g of carbon. A determination of 250 BP (AD 1700) \pm 50 was obtained, which indicates that the hearth area was utilized during the Gobernador phase occupation that had been defined in the eastern site area.

LA 38949

Sample OCA:161:28-8 (Dicarb 2637) was taken from a charcoal stain associated with the cluster of sherds designated as Vessel 1 at Rincon Alemita. This composite sample was obtained from 10 cm below the ground surface and consisted of carbonized coniferous wood. The many penetrating roots present in the sample were cleaned before the analysis. The final carbon weight of the sample was 0.9884 g. A determination of 300 BP (AD 1650) \pm 70 was obtained, which indicates a Gobernador phase affiliation for the southern component of this site.

LA 44533

Sample OCA:161:40-1 (Dicarb 2712) was a composite consisting of charred wood (piñon or juniper) and brush from a midden in the Provenience 3 area of Rincon Luis. It was recovered at 20 cm below ground surface and con-

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tained many rootlets. The carbon weight was 1.4058 g. A determination of 1310 BP (AD 640) \pm 70 was obtained, indicating a late Archaic and/or Basketmaker affiliation.

Sample OCA:161:40-2 (Dicarb 2713) was burned coniferous wood obtained in association with the Dinetah Scored sherd cluster (Vessel 1) in the Feature 1 area. It was a shallowly buried (5-10 cm below ground surface) composite sample, and it contained some free carbonates. Many penetrating roots were removed during the wet pick. The sample had 0.7749 g of carbon. A determination of 20 BP (AD 1930) \pm 80 was obtained. This date is clearly inconsistent with the artifactual association; the small sample

size or the rootlet contamination probably resulted in an erroneous temporal placement.

Sample OCA:161:40-3 (Dicarb 2714) was taken from an area of dispersed firecracked rock and sherds around and in Feature 2. It was 5-15 cm below ground surface and consisted of wood, probably piñon or juniper. The composite sample contained many roots which were removed during the wet pick. The carbon in the sample weighed 2.4357 g. A determination of 170 BP (AD 1780) \pm 45 was obtained. This date is consistent with the artifactual association and is therefore accepted as the date for the Navajo occupation of Rincon Luis.

Chapter 23

CERTAIN OBSERVATIONS REGARDING THE HISTORY AND ARCHEOLOGY OF THE EIGHTEENTH-CENTURY DINETAH OCCUPATION

The following research notes were compiled from both historical documents and archeological literature that concern the eighteenth-century Navajo-Pueblo refugee occupations of the Dinetah district. They were compiled in an effort to provide a focus for the interpretation of the early Navajo cultural properties examined during the Cortez pipeline project. These notes concern only a select number of potential research topics regarding the Dinetah. The topics considered here are architecture and settlement types, subsistence, demography, economy, ceramics, and projectile points. Dinetah ethnoarcheology is a nascent historical field that promises to yield many exciting discoveries. The art and architecture of the Dinetah Navajo and Pueblo refugees and the lucid but infrequent historical accounts of the period provide a stage upon which our imagination can recreate the lifeways and vicissitudes of these proto-historic peoples.

Subsistence, Settlement Patterns, and the Economy of the Eighteenth-Century Dinetah Navajo

The economy of the eighteenth century Dinetah populations involved agriculture, hunting, animal husbandry, plant gathering, raiding (prior to 1720), and trading. This mixed subsistence base allowed a variety of adaptive options to be available. Choices were made depending upon the circumstances of climate, warfare, epidemics, the Pueblo refugee movement, and other factors. Indeed, the acquisition of new cultigens, domestic stock, and metal tools (and occasionally firearms) allowed an expanded and multifaceted approach to characterize the subsistence adaptation. Access to certain resources was thereby greatly improved. For example, the use of the horse and occasional firearms allowed more effective exploitation of the antelope herds of the adjacent San Juan Basin plains grasslands. The acquisition of sheep and goats not only allowed for the exploitation of local forage and, hence, provided meat, hides, and fiber products, but it also stimulated trade in woven blankets to the "Christian" settlements along the Chama and upper Rio Grande and into the Puname province.

Raiding by the Spanish from at least 1647 to 1716 (Brugge 1980:8; Hill 1940) and by the Utes and Comanches after 1716 obviously influenced Dinetah settlement patterns and subsistence adaptations. The destruction of cornfields and the taking of livestock that is documented in the Spanish archives would have required considerable adjustment in

terms of subsistence activities. Likewise, the droughts in the period between 1727 and 1737 (Hill 1940:415) and in 1748 (Brugge 1972) probably resulted in poor crop yields and thereby gave emphasis to other aspects of the subsistence base. The hostile character of the upland canyonland environment (in particular, the early and late frosts); the frequency of warfare; and the variety of introduced cultigens, domestic stock, and tools clearly stimulated various adaptive responses, the diversity of which should be reflected in the archeological record.

The necessity of dispersing into scattered residential units to exploit various agricultural, hunting or foraging, and grazing areas was clearly operative among the Dinetah populations. Such dispersion was probably alternated with the requirement to nucleate in fortified positions. Indeed, in the 1745 testimony of Alfonzo Real de Aguilar we learn "that said Indians live in the valleys when the Yutas do not make war on them, and that when hard pressed in these places they live on the tops of the mesa" (Hill 1940:411). This pattern of dispersion and nucleation probably operated on a seasonal basis, given the necessity to exploit a variety of resources over a wide area in the summer months and the necessity to store and protect certain food products in the winter months. Exceptions to this seasonal pattern were clearly influenced by the circumstances of warfare. Haskell (1975:159, 161) suggests that the pueblitos of Crow Canyon were occupied throughout the year; although plausible, this hypothesis has not been demonstrated empirically.

For the Navajo Reservoir district, Eddy (1966:512) suggests that a pattern of "seasonal dispersion" was operative among the early Navajo populations. He refers to upland encampments, which exhibit domicile features that lack interior hearths, and he relates these components to upland hunting camps used during the summer. Hearths within forked-stick hogans are common features (Hester and Shiner 1963; Keur 1944:76), and the absence of hearths may indeed be a seasonal indicator. Other features indicative of seasonality are the probable use of ramadas in the summer settlements and the closed hogan or masonry room in the winter. Storage facilities, such as the "cuescomates" and masonry bins of the pueblitos, are probable indicators of winter or full-time residential areas. Subsistence remains, such as spring-summer and fall plant products or neonate and migratory animal remains, may also be used to define seasonal occupations, but a data base sufficient to evaluate the nature of seasonality among the Dinetah area occupations does not exist.

Some evidence of seasonality can be demonstrated for the early Navajo sites excavated by the Cortez pipeline project. The placement of these sites in open locations with agricultural potential, the absence of closed domiciles and the presence of ramadas or temporary brush shelters, and the absence of storage facilities (but the clear evidence of corn) all suggest that the sites were utilized in the summer. The emphasis upon the hunting of small animals, primarily rabbits, and the presence of a variety of summer and late-summer wild plant products (but the absence of piñon nuts) also indicate occupations during the summer. The data suggest that the Navajo occupation of the Blanco Canyon region involved a summer dispersal into the open encampments in the lowlands and sage-grasslands and a winter nucleation into the upland canyons and mesa top areas in hogan villages and peblitos.

Agriculture was an important aspect of Navajo-Pueblo subsistence in the eighteenth century. Indeed, the agricultural orientation of northeastern Navajo populations is recognized as early as 1626 in the reference by Father Zarate Salmeron to the "Apaches de Nabaxu" (Apaches of the cultivated fields; Lummis 1900). Based on observations made between 1706 and 1743 and reported in the Rabal Document, the Gobernador Navajo of the early eighteenth century raised "large crops" of corn, beans, squash, and melons (Hill 1940:400, 402, 410). Most of this seasonal cultivation was done in "a long valley and wide with good soil," which is probably Cañon Largo. Irrigation from the San Juan River (Rio Grande de Navaho) is not documented. According to the testimony of Blas Martin, a "small vegetable farm" was irrigated from a spring at a location called "La Peña Tajada" (the cut rock; Hill 1940:402). There is also reference to reservoirs "dammed by the Indians by sand dikes," but these were perhaps for domestic use ("in order to drink it") rather than for irrigation. Carlson (1965:27) describes such a feature. Food storage was "underground in places called cuescomates" (Aztec for "corn bins"; Hill 1940:402). A series of these bell-shaped bins, which were later used as burial pits, was excavated by Carlson (1965:24).

Archeological excavations in the Dinetah district have frequently yielded evidence of corn, beans, and squash, but no melons have been identified. Keur (1944:79) reports corncobs, and squash seeds and rinds. Eddy (1966:512) reports that the beans recovered from LA 4065 are of two species—the common bean (*Phaseolus vulgaris*) and the tepary bean (*Phaseolus acutifolius*).

In 1745 Blas Martin reported that "the soil is very sterile and without any tree groves" (Hill 1940:403). Eddy (1966:126, 512) notes that some peach and apricot seeds were found at LA 4055 but that they were from the surface or from packrat nests and may have been brought to the site from nearby homesteads. Eddy suggests that fruit may have been traded into the Dinetah from the Puebloan and Spanish province. If this were the case, the fruit would probably have been dried and the pits removed before being transported into the area.

Hester (1962:25) and Brugge (1980:20) include cotton and chili as early cultivated crops. There is no archeological evidence of these taxa from the Dinetah, and it is probable that the canyon-woodland environment would

not have been favorable. Cotton and chili weigh very little and are valuable products and may therefore have been exported by Puebloan and Spanish populations into the Dinetah district.

The only cultigen recovered from the early Navajo sites excavated during the Cortez pipeline project is corn. Corn was found at El Campo Navahu, La Ceja Blanca, and Rincon Alemita, but it was not encountered at Rincon Luis. The absence of beans and squash is probably related to poor preservation. Tobacco was found at El Campo Navahu; this taxa is listed as an item traded to the Navajos by the Spanish (Brugge 1980:20).

Hunting was also an important aspect of early Navajo subsistence in the Dinetah district and was probably more prevalent during the early periods prior to the probable depletion of game associated with increasing human population. Deer, antelope, and elk remains are frequently noted (Carlson 1965:11, 21, 25; Keur 1944:79). In addition, bones from mountain sheep (Haskell 1975:135) and big-horn sheep (Reynolds and Cella 1984) have been recovered. Pronghorn antelope remains were quite prevalent in the Cedar Creek site, and its position adjacent to the plains of Gallegos Mesa indicates that it was an antelope hunting and processing encampment (Reynolds and Cella 1984). In the early Navajo components within the Cortez pipeline corridor rabbits were the principal species present, with only occasional evidence of deer or antelope.

Repeated references in the Rabal Document to buckskin as a trade article (Hill 1940) indicate that hunting and the trade of animal products were important aspects of the economy. It is possible that the continued exploitation of big game animals, along with the increased population by the middle of the eighteenth century, resulted in the depletion of these animals. This may have been assisted by the use of the horse, especially in the hunting of antelope, and by the occasional use of firearms, as indicated by the presence of a gun part documented by Carlson (1965:35). It is conceivable that the depletion of big game in the region stimulated increased emphasis on pastoral pursuits for animal products.

Stock raising was clearly an important, but not a dominant, aspect of Navajo-Pueblo subsistence in the eighteenth-century occupation of the Dinetah district. In the Rabal Document there is frequent reference to the presence of sheep, goats, and horses. Cattle are noted only by Juan Tafoia in his 1743 visitation, and only cattle tracks were observed (Hill 1940:405). Sheep and goats appear to have been somewhat more common, with references to "a few small flocks" of 50-150 head and with observations of as many as 700 total. Horses are also noted in the Rabal Document but were said to be "few in number" (Hill 1940:402, 412).

Many excavations that have been conducted in the Dinetah district have yielded remains of sheep, goat, or horse. In addition, the presence of dog bones is reported by Carlson (1965:11, 21). Haskell (1975:135) found sheep bones to be most common, with only a few horse bones, whereas Keur (1944:79) reports the absence of sheep bones but "a considerable number of horse" bones. Kidder (1920:397) is the only one to report the presence of cattle bones. Livestock were apparently rather uncommon north of the San

Juan, as Harris (1963:18) reports only the presence of horse from just one Gobernador phase site (LA 3430).

Brugge (1980:20) observes that the first definite mention of Navajo acquisition of horses from the Spaniards is in 1653, and that there is a suggestion that they were keeping horses in 1678. Some difficulty in stock raising, in particular with respect to equine husbandry, was apparently experienced, as indicated in the 1745 testimony of Juan Vigil: "the Navajos have some horses although only a few that they are unable to feed them because of the war made upon (them) by the Pagan Yutas" (Hill 1940:412).

Horses were clearly used for transportation and perhaps movement of trade goods. They also appear to have been an important food source. An iron bit was recovered from Three Corn House (Carlson 1965:28). Leather reins and lariats have also been found (Hester 1962:119). Mounted horsemen are a common element in Navajo petroglyphs in the region, which also include apparent supernatural motifs (see the section covers of this report). Corrals in fortified or concealed positions would be expected, but corrals of any type appear to be quite infrequent. Indeed, only Haskell (1975:85) reports a corral. This is rather curious since the various mesa rincons and rock ledge outcrops, which often appear in fortified contexts, would seemingly have stimulated the use of rock enclosures. Furthermore, at least some brush corrals should be preserved. (A similar absence of corrals was recorded, however, for the late eighteenth and early nineteenth century occupations in the Seboyeta area [Carroll and Marshall 1979].)

No remains of domestic species were found in association with the early Navajo occupations explored during the Cortez pipeline project. This is perhaps a function of either the open exposure of the sites and the consequent poor preservation or of the early temporal affiliation of El Campo Navahu and La Ceja Blanca. Various native species were recorded from the sites, however (Appendix V). The very occasional presence of sheep, goat, and horse bones in the Navajo Reservoir sites suggested to Eddy (1966:512) that the northern Navajo "never fully adopted historic farm products." The facts that the northern Navajo sites are often somewhat earlier than those south of the San Juan and that the northern Navajo were distant from the majority of the Pueblo refugee populations may also account for the paucity of domestic fauna north of the San Juan.

The Architecture and Settlement Types of the Eighteenth-Century Dinetah Navajo

No pueblitos were investigated during this project, but these structures do appear in proximity to the early Navajo sites that were excavated in the Blanco Canyon area and they were clearly contemporaneous with some of the single- and multiple-unit hogan or ramada complexes in the area. The relationship between the pueblitos and the open settlements, such as those encountered in the Cortez pipeline excavations, remains ill defined, although certain observations can be presented.

The eighteenth-century pueblitos of the Gobernador district are primarily defensive structures that are situated on elevated pinnacles, the tops of boulders, and mesas. In a survey by Keur (1944) within a 10–15 mi radius of Gob-

ernador, New Mexico, 26 pueblitos and 24 hogan settlements were identified. In the vast majority of the cases, a few hogans occur in direct proximity to the pueblitos. The prevalence of pueblitos in the Gobernador area contrasts with the infrequent appearance of such structures north of the San Juan River, where only three small pueblitos were encountered in a sample of 107 early Navajo sites. The relative absence of pueblitos north of the river is usually attributed to the slightly earlier occupation of that district, prior to the principal entrance of Pueblo populations into the region following the Revolt of 1680 and the attempted revolt of 1696 and before the subsequent shift of the Navajo populations south of the San Juan under the Ute and Comanche advance of 1716–1720 (Carlson 1965:100).

Most of the dated pueblitos are from the period between 1720 and 1750, which indicates that they were constructed as fortresses in response to Ute-Comanche predation. Indeed, there is repeated reference in the Rabal Document to the use of these structures for defense against the Utes, as well as to the wish of the Dinetah populations to "shelter themselves behind the Spaniard" (Hill 1940:401). Prior to the Ute and Comanche advance the Navajos of the Dinetah district appear to have been subject to repeated military action from the Spanish population, under the direction of Juan Dominquez de Mendoza and others from 1647–1679 (Brugge 1980:8–9); under Roque Madrid in 1705 (Hodge et al. 1945:278); and in the period from 1706–1716 (Hill 1940:402, 408–409). Cornfields were burned, Indians were killed, captives and stock were taken. It is possible, therefore, that the earliest attempts to construct fortified works in the Dinetah district were stimulated by Spanish predation.

The earliest *dated* pueblito known at present appears to have been built between 1690 and 1692 (Wilson and Warren 1974). This structure is situated some 60 m above the canyon floor and is concealed on a bench to which access is "devious," but the immediate position of the pueblito is not fortified. It is probable that pueblitos as defensive works were introduced to the Navajo by the Puebloan refugees and that earlier Navajo defensive action involved concealment and retreat.

Reference to pueblitos appears in the Spanish archives of the seventeenth and eighteenth centuries. The structures were called "castellejos" (little castles) in the Rabal Document (Hill 1940:406) and "casas fuertes" (strong houses) in various records of the late seventeenth century (Brugge 1980:8–9; Reeve 1957:45). The Gobernador district was often called Los Peñoles or Los Peñolitos (the pinnacles, rocky buttes). There is also a reference to a Navajo settlement near La Pena Tajada (the notched or cut rock) in the Rabal Document (Hill 1940:408). The San Juan River was then known as the Rio Grande de Navahu (Hill 1940:415) and the upper tributaries of the San Juan were in the Sierra de las Grullas (from the Testimony of Antonio Taffoa, 1745 [Hill 1940:412]; also see the Miera y Pacheco map of 1770 [reproduced in Adams and Chavez 1956:2–3]).

Most pueblitos are of moderate size and contain two to four masonry rooms that are often perched on boulders or elevated rock outcrops (Carlson 1965:3, 5, 29). Occasionally larger structures contain 15–40 rooms and exhibit

rather elaborate defensive works. These citadels have attracted considerable attention, and the frequent investigation of such sites has introduced a bias in the data base because the less conspicuous sites are often poorly documented.

Multistory elevations and towers, which are apparent defensive features, appear in approximately half of the pueblito sites investigated by Keur (1944:78). Other defensive features include massive masonry construction, often on elevated or concealed landforms, defensive walls, bastions, retractable or covered ladders or bridge entryways, and entrance labyrinths. Most pueblitos also have observation ports termed "loopholes" (Carlson 1965:6, 8, 17, 29, 33) from which projectiles may have been discharged.

Kidder (1920:323) refers to the "remarkable" amount of wood used in pueblitos, which often included "heavy hewn planks." This abundance is attributed to the availability of iron axes, but it may also be accounted for by the prehistoric Navajo preference for log construction.

The occasional presence of corner hearths with hooded Hispanic-style construction (Carlson 1965:33, 35; Keur 1944:78; Wilson and Warren 1974:8) is also of considerable interest and clearly indicates influences that derived from the "Christian Indians" via their previous association with Spaniards. Most hearths found in pueblitos are simple floor features, however. The very occasional use of molded adobe bricks is also documented (Carlson 1965:19) and indicates influences ultimately derived from Hispanic architectural traditions. The presence of numerous masonry storage bins in certain pueblitos (Carlson 1965:24, 34, 39, 41) should also be noted since it indicates that stored products were important.

Forked-stick hogans appear in direct or indirect association with most pueblitos. Indeed, Keur (1944:76) noted hogans in association with the great majority of the 26 pueblitos she examined. The ratio of hogans to masonry units is quite small, with examples of 1 hogan to 40 masonry rooms, 2 hogans to 14 rooms, and 8 hogans to 15 rooms documented at three large sites (Carlson 1965). Most of the hogans that have been described in the Dinetah district are forked-stick structure, or ramadas, but Keur (1944:76) notes the presence of 16 structures (of a total of 273 hogans) that were large, block-based structures. Whether these structures had cribbed or corbelled roof constructions is not known.

Settlements that contain only hogans represent approximately half of the sample noted by Keur (1944:75). These structures appear to be contemporaneous with pueblito sites, and it is possible that they were in some instances affiliated with certain pueblitos. Pueblitos are often attributed to Puebloan influences and probable Pueblo-Navajo joint residence, whereas sites with only hogans have been attributed to Navajo populations (Keur 1944:79). The relationship of Navajo and intrusive Puebloan populations and the manifestation of that relationship in settlement organization and other traits, however, are yet to be determined. A variety of settlement types have been recognized that indicate a diversity of social and functional determinants. The statement by Keur (1944:83) that

glazewares appear only in association with pueblitos and not with hogan sites does not appear to be justified (Eddy 1966:91, 373; Hester and Shiner 1963).

In the Navajo Reservoir district Eddy (1966:508) recognizes three types of hogan complexes: single-unit, multiple-unit (2-3 habitation units) and village (4 or more habitation units). He notes a tendency for site constellations or "community clusters" to appear at the major drainage confluences. Haskell (1975:149) refers to isolated and nucleated hogan sites and relates nucleation to defensive posture. Encampments associated with agricultural activities, hunting stations, foraging loci, and pastoral pursuits also appear to be present. In addition, rockshelter occupations and rock art sites are known.

Various eighteenth-century Navajo sweatlodges have been documented (Hester and Shiner 1963:47; Hurt 1942:91; Keur 1941:37), but the evidence tends to suggest that the use of sweatlodges was not as prevalent as it became in the nineteenth and twentieth centuries. Keur (1944:77) reports that "twenty sweat houses were located [in the Gobernador district] in association with hogan groups." These features were defined by "a semi-circular heap of fire reddened stones . . . usually somewhat removed from the dwelling houses." It is interesting to note that sweatlodges do not appear with such apparent prevalence north of the San Juan. Indeed, Hester and Shiner (1963) state that one feature at LA 4297 "represents the only positively identified sweat lodge in the Navajo Reservoir."

A single sweatlodge was encountered during the Cortez pipeline project excavations, in association with the Gobernador phase component at La Ceja Blanca. A radio-carbon sample from this location produced a determination of AD 1700 ± 50.

The evidence to date indicates that sweatlodges were in use by the early eighteenth century. It is probable that the use of the sweatlodge is an ancestral Athabaskan trait, since sweat bathing seems to be an arctic/subarctic characteristic and is a common element of Athabaskan culture in the north (Helm 1981).

Care should be exercised in the definition of sweatlodges simply on the basis of firecracked rock, however, since the debris from baking pits may resemble sweatlodge debris. A sweatlodge complex consists of a hearth (abundance of charcoal and oxidized soil), a discard pile (fire-reddened rock), and a lodge. The discard pile should consist of rather small stones. Cobbles are not used since they tend to explode when heated. Hard stones are preferred but soft sandstone is often used. Petrified wood is not used because it is thought to effuse a poisonous gas (D. Brugge, personal communication). Normally the stones are repeatedly used but among the Alamo Navajo the stones are used only once. If an Alamo Navajo sweatlodge is been used for a lengthy period, this results in a rather large discard pile that is usually crescentic and may extend 12 m across and 1.5 m high (Marshall and Walt n.d.).

Early Navajo Ceramic Technology

The origin and ultimate derivation of Navajo ceramic technology remains ill defined. The absence of Dinetah

utility in the Piedra Lumbre phase complex dated between 1626 and 1705 led Schaafsma (1979:249) to suspect that Navajo populations did not manufacture ceramics prior to the seventeenth century. On the other hand, four radiocarbon determinations spanning between 1550 and 1600 obtained during the Cortez pipeline excavations and radiocarbon determinations of 1538 and 1553 from the Gallegos Mesa area (Chapter 18) suggest that Navajo ceramic manufacture was established by the middle to late sixteenth century and perhaps earlier.

The early Navajo ceramic industry was clearly influenced by Puebloan traditions, especially in the eighteenth century, but a preliminary stylistic analysis of early Dinetah utility wares (outlined in Chapter 19) does not suggest a Puebloan origin for the Dinetah wares. Instead, similarities to certain Plains wares and to other Athabaskan wares are recognized. The possibility that Athabaskan peoples manufactured ceramics prior to association with Puebloan populations is not inconsistent with the recognition that ceramics were manufactured by various mobile hunters and gatherers in western North America (Ingbar 1983). Agriculture is definitely not a necessary precondition for the use of ceramics (Linton 1944:379).

Dinetah utility jar forms (elongate, wide-mouthed ollas with elevated maximum diameter, occasional recurved lower body, rounded and occasionally footed bases, and recurved rims; Figures 19.1 and 19.3) do not resemble contemporaneous Puebloan utility vessels, which tend to be more rotund. It is plausible that Dinetah jar forms were derived from imitation of earlier Athabaskan basketry forms (Hester 1962:123; Keur 1944:82). This process of imitation of other containers is a common pattern throughout western North America (Ingbar 1983).

It is also evident that the early styles of plastic embellishment, such as the nail-incised styles and various fillet or coil band decorations, are not derived from neighboring Pueblos. These styles instead are similar to certain Plains industries (Wedel 1959:235) or to Plains-influenced wares, such as Taos-Picuris, and other Athabaskan wares (Brugge 1963; Schroeder 1963). The early textured styles recognized in the Cortez pipeline project assemblage (nail-incised and fingertip-impressed) and the various Gobernador filleted forms recognized by Carlson (1965) show little resemblance to Puebloan styles. It is also possible that true corrugated-indented forms of Gobernador Indented, which are recognized as copies of Jemez utility ware (Carlson 1965:65; Dittert 1958:20), are in fact Jemez utility ware and were not manufactured by the Navajo.

The specific origin of and the dynamics of influence involved in Navajo ceramic technology are not known, but it is evident from the information obtained during this project and during previous research that a reconsideration of the theory of Puebloan origin for Navajo ceramic technology is in order.

The Navajo ceramic group designations presented by Eddy (1966:453) are affirmed by the Cortez pipeline project data, with certain qualifications. Embellishment of early Dinetah vessels is infrequent, although a variety of styles that justify recognition as type variants appear to be present. The variants that have been recognized to date include

nail-incised, nail-incised on a partially closed coil, nail-incised on an appliqued fillet, fingertip-indented on a plain surface or on a filleted band, and tooled. True appliqued fillets appear to have been made during the eighteenth century and were often rather peculiar in form, with a high relief or an appliqued luglike style. The earliest form of plastic embellishment, as indicated by the material obtained from the Dinetah phase components at the Cortez pipeline sites, may have been simple nail-incised bands near the neck, either upon a plain surface or upon a partially closed but nonappliqued coil.

The recognition of phase affiliation of early Navajo sites from surficial observations is often difficult since decorated ceramics of local manufacture (Gobernador Yellowware) or intrusive wares are often quite infrequent. Indeed, only two sherds from a single Gobernador Polychrome vessel were recognized at the Gobernador component at La Ceja Blanca. Perhaps Gobernador Polychrome is more frequent in the context of pueblitos, but the statement by Keur (1944:83, 85) that glazes appear only in association with pueblitos has not been substantiated.

All of the early Navajo sites excavated within the Cortez pipeline corridor are characterized exclusively (or in high frequencies) by Dinetah utility material. The great majority of the vessels are large jars, although occasional bowls may be present. Most of the Dinetah jars exhibit evidence of soot on the exterior surface, indicating a culinary function. The near absence of individual serving, eating, and drinking vessels, and such forms as canteens, indicates that these artifacts may have been made from gourds, wood, basketry, or other perishable materials.

The Navajo Projectile Point

The typical early Navajo projectile point is a small side-notched form with a slightly convex base. These appear either as isosceles or equilateral triangles. Occasional unnotched triangular forms are also known. Navajo arrowheads are best defined in an attribute analysis of 212 projectiles recovered from the Cedar Creek complex (LA 17483; Reynolds and Cella 1984). The five arrow points recovered from the Navajo sites excavated during the Cortez pipeline project are small side-notched points, similar to the Cedar Creek specimens. Similar types (but with occasional basal notches) have been recovered from the sixteenth- or seventeenth-century Athabaskan sites in the Puertocito district on the Alamo Navajo Reservation (Marshall and Walt n.d.).

Numerous small arrow points, as well as occasional large specimens, were located by Keur (1944:79). A large corner-notched projectile is also illustrated by Carlson (1965:20). Projectile points described by Eddy (1966) include "triangular; stemmed, indented base; and corner notch, broad spur styles." Occasional large corner-notched types have also been found in Alamo Navajo sites, indicating that large forms were manufactured, perhaps for lance tips. There is also no doubt a variety of Archaic and Anasazi artifacts that have been reused by the Navajo. The suggestion by Haskell (1975:7, 30) that the eighteenth-century Navajo did not manufacture projectile points is clearly erroneous.

ades may be associated with turkey husbandry cannot be tested.

Excavations within the Los Jacales site complex (located 1.3 km south of Los Sotanos) exposed a portion of what appears to have been a small village composed of a number of large jacal lodges. A radiocarbon determination of AD 790 ± 50 and an associated Ceramic Group 3b and 4a complex (Eddy 1966:452) indicate that the site was occupied in the late eighth and early ninth centuries and perhaps was in part contemporaneous with the late occupations at Los Sotanos. It is interesting that both Los Jacales and Los Sotanos revealed the presence of surface jacal habitations. At Los Sotanos they are circular and 4-5 m in diameter, whereas the single preserved example from Los Jacales is a large subrectangular unit, 9 by 4.25 m. Jacal construction in the previously documented Rosa and Piedra sites is usually restricted to small surface granaries or outside kitchen areas whereas habitations are normally pitstructures. Perhaps a bias has been introduced into the data base by an emphasis on the part of the archeologists to select for excavation with evidence of pithouse depressions. It should be noted that both Los Sotanos and Los Jacales were defined from the surface by only light scatters of artifacts without any definite evidence of structures or features. Such sites are often overlooked by archeologists in their selection of more promising locations. In any event, the excavations at Los Jacales and Los Sotanos indicate that Rosa and Piedra phase villages composed of only jacal habitation units do exist. The data base is not of such character to allow us to determine any subtle differences in temporal affinity, cultural identification, seasonal occupation, or other factors that may be related to these differences in community architecture.

Summary of the Cortez Pipeline Project Navajo Occupation

Four archeological sites that have revealed cultural manifestations of early historical Navajo occupations have been excavated within the Cortez pipeline corridor. All were defined from surficial observation as small artifact scatters without evidence of architecture. Upon excavation, these rather inconspicuous sites proved to be significant in the interpretation of early Navajo culture history, providing an important contribution to the existing archeological data base. It was recognized during the preliminary survey phase of the project that the early Navajo sites encountered in the pipeline corridor had the potential to reveal significant information about a possible ancestral occupational horizon as well as the potential to contribute information to the understanding of settlement patterns and subsistence adaptations in the region (Wozniak and Winter 1983:76). The excavation of the early Navajo sites was therefore directed toward the investigation of these and other topics, with considerable attention given to attempts at dating the sites and obtaining information about subsistence, settlement structure, seasonality, economic interaction, and other topics. These efforts were thwarted to a certain degree by the shallow character of the cultural sediments and, hence, the poor preservation of cultural remains. But certain observations can be made that significantly contribute to our understanding of early Navajo culture history.

The fact that all of the early Navajo components investigated within the pipeline corridor were rather inconspicuous scatters of artifacts in open locations is important since this type of site has not been subject to frequent investigation. Indeed, most of the previous research in the region has been devoted to pueblito sites or to forked-stick hogan complexes of sizable and well-preserved (and hence more recent) character. Some attempts have been made to explore small, reduced open sites, but this has been largely restricted to a few locations north of the San Juan River (Eddy 1966). This emphasis in the archeological exploration of pueblitos and intact hogan complexes (e.g., Carlson 1965; Haskell 1975; Keur 1941, 1944) has introduced an element of bias into the archeological data base and has tainted interpretations concerning the diversity of settlement types, the character of settlement organization, the temporal placement of the ancestral occupation, and other topics. Excavations within the small, inconspicuous sites found within the Cortez pipeline corridor have contributed to our expanding vision of early historical Navajo culture.

The culture history of the early Navajo populations is one of the most fascinating chapters in the history of New Mexico. It is largely unexplored, and much remains to be learned through archeological investigation. The additions to the historical reconstruction which are the result of the Cortez Pipeline Project are presented in previous chapters (Chapters 13-17), while notes on ceramic materials from this region are presented in Chapter 19.

Situation

Four archeological sites investigated in the pipeline corridor revealed manifestations of early historical Navajo affiliation. Two of them are in the Blanco Canyon area (El Campo Navahu and La Ceja Blanca) within the confines of what is traditionally known as the Dinetah district. Another site, Rincon Alemita, is in the upper Cañada Alemita, which drains west to the Chaco, and may be considered to represent a marginal position with respect to the Dinetah. The fourth site, Rincon Luis, is located far to the south on the northern bank of the Rio Puerco near the village of San Luis. This site represents a component of the Puerco Navajo district defined primarily in the investigations conducted by Keur (1944) on Big Bead Mesa. The twentieth-century component defined near the Blanco-Largo confluence at LA 47136 and the recent component at Rincon Alemita will be briefly summarized following the discussion of the earlier occupations.

All of the early Navajo components investigated within the Cortez pipeline corridor are situated in open, normally exposed and unfortified positions. Only La Ceja Blanca is in a position that might be considered marginally concealed. The fact that these sites are located in open and lowland positions is of interest, since most of the documented early Navajo sites in the Dinetah and Puerco districts are situated in the uplands of the canyons and mesas. The Cortez Project sites in Blanco Canyon and at Rincon Alemita and the sites recently documented in the sage-grasslands of the Gallegos Wash area (Reynolds and Cella 1984) indicate that a significant aspect of the Dinetah subsistence adaptation involved the exploitation of the resources in the canyon lowlands and in the open sage-grasslands extending to the west. The evidence indicates that

the open lowlands were variously exploited for cultivation, stock grazing, and antelope hunting.

Chronology

Radiocarbon determinations obtained from El Campo Navahu and La Ceja Blanca indicate occupations during the late sixteenth and the seventeenth centuries, while dates obtained from Rincon Luis, Rincon Alemita, and from La Ceja Blanca indicate occupations during the late seventeenth and the eighteenth centuries (Chapter 18). The early determinations of AD 1550 \pm 55 from El Campo Navahu and of 1590 \pm 55 and 1600 \pm 55 from La Ceja Blanca are of considerable interest, since they suggest the presence of a Dinetah phase occupational horizon. The validity of the Dinetah phase was questioned after a series of excavations in the Navajo Reservoir district failed to provide convincing evidence (Eddy 1966:507). The early radiocarbon determinations obtained from El Campo Navahu appear in association with ceramics of the Group Aa complex (Eddy 1966:435), which consists solely of Dinetah plain and textured styles. No intrusive Puebloan ceramics are associated with these components. The probability that a Dinetah phase occupational horizon does indeed exist has therefore been considered.

Radiocarbon determinations of late seventeenth–early eighteenth century placement were also obtained from Provenience A and the hearth (Feature 7) in Provenience 1 at La Ceja Blanca, and from Rincon Alemita. In addition, a late eighteenth–early nineteenth century radiocarbon determination was obtained from Rincon Luis. These dates indicate the presence of Gobernador phase occupations, although the Rincon Luis occupation due to its location in the Rio Puerco district may be considered to represent a component of the early Cabezon phase. Gobernador Yellowware materials in association with Dinetah utility wares of the Ceramic Group B complex (Eddy 1966:435) were found in association with components at La Ceja Blanca and Rincon Luis. These Gobernador phase occupations appear to be contemporaneous with the majority of dated sites in the Dinetah district (Robinson et al. 1974) and those in the Rio Puerco district at Big Bead Mesa (Keur 1941).

Site Structure

All of the components of early Navajo affiliation investigated within the Cortez pipeline corridor appear to be small, probably seasonal encampments. Evidence of log and brush shelters was encountered at El Campo Navahu, La Ceja Blanca, and Rincon Alemita. Evidence of hearths was noted at all locations, as were scattered artifacts indicative of activity areas. Firecracked rocks were also observed at all locations, but concentrations related to culinary activities were specifically defined at El Campo Navahu and an accumulation related to a sweatlodge was noted in the Gobernador phase occupation at La Ceja Blanca. No storage facilities were recognized. Other structural features observed include large basins, perhaps related to winnowing, a milling basin at El Campo Navahu, and a slab box structure at La Ceja Blanca.

El Campo Navahu, Rincon Luis, and perhaps Rincon Alemita are sites that contain a single habitation struc-

ture. The Dinetah phase occupation at La Ceja Blanca is represented by at least two shelter areas, and based on the numerous hearth areas and ash stains at La Ceja Blanca it is possible that more than one shelter was also present in the Gobernador phase occupation. La Ceja Blanca may have been visited on a number of occasions, and contemporaneous multiple-unit use cannot be assumed. In any event, the village hogan complexes defined by Eddy (1966:508) and the nucleated hogan clusters described by Keur (1944:75) and Haskell (1975:149) are not represented in the sample of early Navajo sites excavated within the Cortez pipeline corridor.

Four defined shelter areas were excavated during the Cortez Pipeline Project: one at El Campo Navahu, two at La Ceja Blanca, and one at Rincon Luis. The rather well preserved shelter encountered in the Dinetah phase site of El Campo Navahu had been burned. It is a small, rectangular, four-post and brush construction with interior dimensions of 2.0 by 2.5 m. This structure (Figure 13.2) contained a small basin hearth, an apparent milling basin, and two possible postholes that may represent a vertical loom or perhaps a drying rack. Most of the sherds from a Dinetah utility vessel were found on the floor surface. This type of structure appears to resemble the small shade houses described in the ethnographic literature (Vestal 1952:13).

The Dinetah phase shelters at La Ceja Blanca are poorly preserved, and it is difficult to determine the specific nature of these constructions. Both structures were defined by concentrations of charcoal-laden soil and occasional beam fragments existing in 3 m diameter areas. A hearth basin and a bin were located in the shelter area (Provenience D; Figure 15.9). These structures may have been forked-stick constructions or perhaps crude, lean-to shelters. Another poorly preserved shelter was found at Rincon Luis. This shelter (Provenience 2) was defined by a partial alignment of stones, a hearth area, and associated artifacts. Other shelters may have existed but had deteriorated to such an extent that they could not be recognized.

Hearth debris or features were encountered in all of the Navajo components investigated. Differences in hearth structures, locations, and the presence or absence of associated firecracked rock illustrate variations in hearth function. For example, it is interesting to note that all hearth areas that occur in shelters are simple basin structures devoid of firecracked rock. It is apparent that stone boiling or baking was conducted in outside areas, presumably to keep the domicile shelter free from the litter of broken stone and ash debris. Most of the hearths encountered in the early Navajo components are simple, unprepared basins or surface burns; only a single slab-lined hearth was found, at La Ceja Blanca.

Notes concerning the use of heated stones as described in the ethnographic literature and the probable origin of firecracked rock observed in the Cortez pipeline project sites are presented in Chapter 22. A cluster of firecracked stones was found in direct proximity to several hearths (Feature 1 at El Campo Navahu, Feature 3 at La Ceja Blanca, and Provenience 1 at Rincon Luis). In other instances only traces of burned stone or a ring of small burned stones appear in hearth areas, suggesting that the stones were used to support a culinary vessel. Burned sandstone

slabs, possibly comal stones, were found in association with both hearth areas at Rincon Luis. A rather sizable concentration of firecracked rock in a 2 by 3 m area was found at La Ceja Blanca, approximately 40 m northwest of the nearest activity area. This rock and abundance of charcoal-laden fill (Provenience A) was found in the area of four closely spaced hearths and a partial alignment of stones. The location of this feature outside the main site area, the abundance of firecracked rock, and the relative absence of subsistence remains indicate that this feature represents a sweatlodge rather than a food-processing area. A radiocarbon determination of AD 1700 \pm 50 indicates that the sweatlodge is associated with the Gobernador phase occupation at the site. This feature is presently the earliest dated Navajo sweatlodge, but it is probable that sweatlodges were used during the ancestral Dinetah phase occupation and that such structures were in use upon the entrance of Athabaskan populations into the Southwest.

Additional features that were encountered in the early Navajo sites include rather curious basins, an apparent milling bin, and a small slab-lined box. The basins (Feature 3 at El Campo Navahu and Features 4 and 8 at La Ceja Blanca) are large (1.0-1.5 m), shallow (20-40 cm) features that show no evidence of formal preparation or oxidation. The function of these structures is undetermined, although they may represent winnowing basins. A probable milling bin (Feature 6), which consists of a rectangular basin with a slab-lined base, was found in the area of the shelter at El Campo Navahu. Similar features have been identified in other early Navajo sites (Eddy 1966:89, 99, 166; Hester and Shiner 1963:47), where metates or the impressions of such stones have been found. A small, slab-lined box measuring 63 by 63 cm was found near the Provenience D shelter at La Ceja Blanca. This feature showed no evidence of fire, and its function is undetermined.

Some rather interesting patterns in the distributions of artifacts were observed in the excavated Navajo sites. In a number of areas a differential distribution of ceramics and ground stone with respect to chipped stone and firecracked rock was observed. In general, this indicates that culinary activities involving the milling of grains and cooking in vessels were largely conducted in the shelter areas, while lithic reduction, butchering, and cooking with heated stones were normally conducted on the occupation surface outside and adjacent to the shelters. The surface distribution of lithic and ceramic artifacts at El Campo Navahu (Figure 13.7) revealed that the ceramics were largely concentrated around the shelter area and in proximity to an outside hearth area. A milling basin in the shelter area suggests that the grains were prepared there. Chipped stone debris occurred throughout the site area, extending around the various features and areas of firecracked rock on the occupation and on the site margins well beyond the limits of the ceramic distribution.

A similar differential distribution was observed in conjunction with Provenience B at La Ceja Blanca. Ceramics and ground stone were nucleated within the shelter and in proximity to the hearth, while chipped stone was found throughout the provenience area. Chipped stone was found in 21 of the 1 by 1 m grids in contrast to the presence of ceramics in only 11 grid units. In Provenience D at La

Ceja Blanca three sherds, some ground stone, and an awl were found in the shelter area while chipped stone clustered in areas outside the shelter.

In the Provenience 1 area at La Ceja Blanca the ceramics and ground stone tended to cluster in the south around Features 1, 7, and 9 (hearths), while the lithics tended to cluster to the north around another hearth (Feature 3) and firecracked rock scatter. This again suggests the differential use of space, possibly between women involved in culinary activities and men involved in tool manufacture, butchering, various craft activities, and the preparation of foods using heated stones.

Subsistence

The preservation of floral and faunal remains in the Cortez pipeline project Navajo sites was generally poor due to the shallow nature of most cultural sediments; however, certain observations regarding subsistence can be made. The only cultigen encountered in the excavation was maize, which was found in association with the Dinetah phase occupation at El Campo Navahu and the Gobernador phase occupations at La Ceja Blanca and Rincon Alemita. Milling stones were also found at all locations but Rincon Alemita, indicating that grain was ground at these locations. An apparent milling bin was found at El Campo Navahu. The presence of maize at El Campo Navahu, found in two locations, is significant since it indicates that agriculture was an aspect of the mid-sixteenth century Navajo subsistence base, an observation that is also corroborated by the presence of cornfields in the late sixteenth century Athabaskan (Querecho) settlements in the Mt. Taylor area (Hammond and Rey 1929:111-114). Indeed, Dittert et al. (1961:248) suggested that agriculture was an aspect of ancestral Navajo culture derived from experiences on the Plains and was adopted prior to the movement of populations west of the Rio Grande. This has not been empirically demonstrated, but it is plausible.

Foraging for wild plant products was clearly a very important aspect of early Navajo culture, and to a certain degree there has been a reliance on certain wild plant products up through the present. Evidence of apparently utilized wild plants found in the Cortez pipeline project sites include purslane, spurge, dropseed, pigweed, goosefoot, and possibly tickseed. These are probably just a few of the plants used, but due to poor preservation little else was found. A single unburned tobacco seed was found at El Campo Navahu, which may represent either a wild variety of *Nicotiana* or a tolerated or cultivated product. Tobacco was later a product traded into the Dinetah district (Brugge 1980:20).

Animal husbandry was also an important aspect of the eighteenth-century Dinetah economy, as related in the Rabal Document (Hill 1940) and in the faunal remains encountered in various Gobernador phase excavations. Sheep, goats, horses, and occasional cattle remains are noted. It is probable that the Navajo had livestock by the middle of the seventeenth century (Brugge 1980:20). It is interesting to note that there is little archeological evidence of domestic stock in the eighteenth-century occupations north of the San Juan (Harris 1963:18). No evidence of domestic stock was found in the Cortez pipeline project excavations.

The sheep bones found at El Campo Navahu came from the surface and are clearly not associated with the site occupation.

Hunting was also no doubt an important aspect of early Navajo subsistence. Trade in hides during the eighteenth century is noted in the Rabal Document (Hill 1940). In archeological sites the remains of deer, antelope, elk, mountain sheep, and bighorn sheep are noted. Antelope hunting encampments have been found in the Cedar Creek drainage area (Reynolds and Cella 1984). The faunal remains that have been identified from the Cortez pipeline project sites include rabbit and deer, although poor preservation is again probably responsible for the low faunal diversity. Evidence of hunting is also suggested by the presence of small arrowpoints found at El Campo Navahu, La Ceja Blanca, and Rincon Luis.

Artifacts

It is probable that the earliest examples of ancestral Athabaskan lithic technology reflect certain elements of the northern continental or Plains industries. They are different in character from the more recent Navajo assemblages. Perhaps the change is related to the decline in hunting, emphasis on agriculture and animal husbandry, and the general acquisition of metal tools which characterizes later periods. Comprehensive lithic studies might provide a foundation upon which a developmental perspective on Athabaskan lithic technology could be formulated. Continued research should also help define the various expressions of Navajo lithic industry that are the result of specific functional or adaptational applications. In other words, the lithic material produced by a given Athabaskan population is likely to vary significantly depending on the context: a hunting camp, a seasonal agricultural settlement, a foraging or resource procurement encampment, a sheep camp, a winter retreat or fortification, or some other setting.

The lithic technology evident in the assemblage from El Campo Navahu is characterized by a high incidence of prepared flake platforms (14.8 percent), a substantial diversity and frequency of bifacial artifacts, and a diversity of material types. In contrast, the other samples from Cortez pipeline project Navajo sites exhibit few prepared platforms, low diversity and frequency of bifaces, and few material types. It appears that the sixteenth century assemblage from El Campo Navahu is more similar to an ancestral industry, whereas the late seventeenth-early eighteenth century assemblages from La Ceja Blanca, Rincon Alemita, and Rincon Luis are different, probably largely because of the availability of metal tools.

Most of the material types present in the sample from El Campo Navahu are local materials, but the Jemez obsidian, Pedernal chert, and basalt are intrusive. Present in the sample are 12 hammerstones, two choppers, 10 small projectile points, 10 bifaces, one drill, seven scrapers, an awl-sharpening tool, one-hand manos, and basin metate fragments.

A comparison of the lithics from the Dinetah and Gobernador phase components at La Ceja Blanca (Table 15.5) revealed little significant difference. In both assemblages

the frequency of formal tool types and bifacial reduction is low, as is the incidence of platform preparation. Ground stone is rather common in both groups. The Gobernador phase material type diversity (14 types) contrasts with the occurrence of only nine material types in the Dinetah phase sample. Intrusive materials include Jemez obsidian in the Dinetah sample and Pedernal chert in the Gobernador sample. Artifact types include small projectile points, hammerstones, choppers, a drill, scrapers, one- and two-hand manos, and basin and trough metate fragments.

Only a few lithic artifacts were found in the south component at Rincon Alemita, and these consisted of primary and secondary reduction debris but no formal tools. Only seven material types are present, and no ground stone was associated with the Gobernador phase component.

A small sample (50 items) of primary and secondary reduction material was likewise found at the late eighteenth-early nineteenth century Navajo site of Rincon Luis. Material type diversity is low, with seven types, one of which is Jemez obsidian. Artifacts consist of hammerstones, choppers, and small side-notched projectiles. No ground stone was present.

One of the most distinctive elements of early Athabaskan lithic materials is the small side-notched projectile point. Five of these points were obtained from the Navajo sites excavated in the Cortez pipeline corridor (Figures 13.8, 15.21, and 16.6). An excellent definition of the early Navajo projectile points is presented by G. A. Rollefson (in Reynolds and Cella 1984) in his attribute analysis of 212 points from the Cedar Creek site.

The characteristics of the lithic materials recovered from the early Navajo sites excavated within the Cortez pipeline corridor are defined in each site chapter. Additional information concerning these samples is also presented in Appendix IV.

Ceramics were recovered from all of the early Navajo sites excavated within the pipeline corridor. All of the 1346 sherds were highly fragmented, but in most instances it was possible to group sherds into a few clusters representing the same vessel. The majority of the material is Dinetah Plain. Minor quantities of Gobernador Indented or Incised, Gobernador Polychrome, Acoma Red, and Acoma Glaze, and Anasazi Plain Gray were also encountered. The samples obtained are discussed in the site chapters. Additional information regarding ceramic materials found in early Navajo sites is presented in Chapter 19, and a few brief conclusions are presented later in this chapter. Ceramic group definitions are presented in Chapter 19.

The samples are dominated by Dinetah utility ware. Sand temper predominates, but traces of sandstone, shale, and sand with sherd were also noted. A few examples of the various Dinetah utility types were selected for petrographic analysis and are described in Appendix VI. Most of the vessels are rather thin (e.g., a mean of 4.12 mm was found in a sample of 250 sherds from La Ceja Blanca). These Dinetah utility vessels were normally fired in an uncontrolled reduction atmosphere that resulted in variable paste and surface colors of gray/black and brown. A brownware variant of Dinetah utility ware has been re-

ported by Farmer (1942:75) and Vivian (1960:113). A dichotomy of gray and brown Dinétah materials could only be consistently recognized in the El Campo Navahu assemblage, whereas other samples appeared to reveal a spectrum ranging from brown to gray-black. The southern micaceous variant noted by Farmer (1942:73), Vivian (1960:113), and Brugge (1963:4) was not encountered in the materials from the pipeline excavations. Dinétah utility materials are often described as scored or striated, but smoothed nonstriated vessels clearly predominate in the Cortez pipeline project sample and other collections. In the attribute analysis conducted on sherds from La Ceja Blanca, only 4.4 percent of the Dinétah utility sample revealed any evidence of striations, and at El Campo Navahu only one vessel in eight had evidence of striations. No striations were present on the single vessel from Rincon Alemita, and only one in six vessels from Rincon Luis is striated. A single Dinétah utility vessel with evidence of pitch glazing was found in Provenience I at La Ceja Blanca.

Most of the Dinétah utility vessels represented by sherds found in the pipeline excavations are large, wide-mouthed ollas probably similar to the forms illustrated in Chapter 19. A few sherds that are apparently bowls were found, and one miniature spoonlike object (Figure 15.20) was found at Provenience B of La Ceja Blanca.

Textured Dinétah utility vessels are infrequent in the pipeline samples; a cluster of sherds representing a single vessel was found at El Campo Navahu, and two clusters were found at La Ceja Blanca. These specimens consist of fingertip-indented and nail-incised embellishments applied to the neck area of the vessels in a "filletlike" style. These impressions were either applied to a smooth surface, such as the specimen from El Campo Navahu, or to partially enclosed, smoothed coil bands. True applied fillets were not present.

Ceramic types other than Dinétah utility are extremely infrequent in the pipeline samples, representing only 0.8 percent of the entire sample. In the early Dinétah phase components at El Campo Navahu and La Ceja Blanca only Dinétah utility materials are present. Traces of Gobernador Polychrome appear in association with the Gobernador phase component at La Ceja Blanca (two sherds from a single jar), and a single sherd of Gobernador Yellowware-Rio Puerco Variety with black rock temper was found at Rincon Luis. The infrequency of Gobernador material in the Gobernador phase sites excavated in the pipeline corridor indicates that the ware was not locally produced and that its production was limited to a specific population, perhaps the Pueblo refugees and those Navajo populations in direct contact with the refugees. In general there is little evidence to suggest that the Navajo occupants of the Cortez pipeline project sites had contact with Puebloan people, since only traces of Acoma material were found at La Ceja Blanca (two sherds) and Rincon Alemita (one sherd).

The traces of plain gray material may be associated with an early Developmental Anasazi occupation suggested by the radiocarbon determination of AD 820 ± 45 from Feature 6, a hearth at La Ceja Blanca. It is possible, however, that some of the Anasazi vessels were reused by the Navajo occupants.

Twentieth-Century Navajo Sites

The twentieth-century Navajo sites in the pipeline corridor were briefly investigated during the mitigation phase of the project. Both sites appear to have been inhabited during the 1950s. One unnamed site, LA 47136, is located near the confluence of Largo and Blanco canyons. The other, Rincon Alemita (LA 38949), is located on the upper Cañon Alemita drainage. Approximately one man day was devoted to the investigation of each of these components. In both locations detailed site maps were made, descriptions were compiled, artifacts were inspected, and limited test excavations conducted.

LA 47136 consisted of a complex of three tent bases with associated ash mounds, woodchopping areas, hearths, and a corral structure (Figure 17.1). Evidence of squash was found in a single flotation sample taken from an ash midden. The artifacts indicate that a variety of commercial food, clothing, medicine, and toys were used but there is no evidence for the use of an automobile.

The twentieth-century component at Rincon Alemita consisted of a masonry hogan base, an ash midden, a hearth area, a small log pen, and two brush corrals (Figure 14.1). Excavations were conducted in the ash midden and in the area of the log pen. Also, a 2 by 2 m grid was excavated in the vicinity of a metate and mano found in the north site area. A variety of commercial products were again in evidence, but again there was no evidence to indicate the use of an automobile.

No attempt was made to evaluate these mid-twentieth century Navajo sites in terms of research perspectives that have been defined for contemporary Navajo culture since the data base offered by these two isolated settlements is of little consequence.

Incidence of Multicomponent Occupation

One significant aspect of the Cortez pipeline project excavations is the frequent occurrence of multicomponent sites within this small sample of 13 locations. The sites were located, with certain topographic exceptions, in a linear transect. Based on the analysis of stratigraphic evidence, artifacts, and radiocarbon determinations, it is recognized that at least half of the sites under consideration are multicomponent. As discussed in Chapter 18, our phase identifications were sometimes based on single or unassociated radiocarbon determinations, which is clearly dangerous. If we assume that our identifications are correct, however, the number of multicomponent sites is notable—especially considering the fact that during the survey only one of the sites was recorded as a multicomponent focus. Four were identified as multicomponent during the excavation phase, and three additional components were discovered as a result of radiocarbon determinations and the reevaluation of the features from which these dates were derived.

The high incidence of multicomponent sites suggests that most of the archeological remains in the region may be the result of two or more distinct occupations. Certain

sites in the Cortez pipeline project inventory, such as Los Sotanos, showed three occupations, and the Nageezi Divide complex had at least five distinct periods of use. The fact that multicomponent sites are often not recognized in survey inventories but may be quite common is a point that must be recognized by archeologists. This fact is especially pertinent if site-phase stratifications or analysis of artifacts is attempted from survey data.

Evidence of Los Pinos Phase Occupation South of the San Juan River

Excavations at Los Sotanos within the pipeline corridor reveal a preceramic storage complex of Los Pinos phase affiliation. Radiocarbon dates obtained from the component range from ca. 50 BC to AD 170-220. These dates affirm the chronology discovered for the early Los Pinos phase in the Navajo Reservoir district (Eddy 1966:454). The early determination of 50 BC \pm 55 obtained from Feature 7 suggests that the Basketmaker III Los Pinos phase horticultural expression may have originated in the first century BC. The discovery of the Los Sotanos storage complex is significant since it indicates that the Los Pinos phase occupation extended into the southern tributaries of the San Juan. This expands the southern range of the Los Pinos occupation.

No habitation structures from this phase were located at Los Sotanos, but much of the adjacent area had previously been disturbed by construction. It is possible that habitations were located nearby. The Los Sotanos storage pits (both large bell-shaped and small cylindrical forms) are similar to those documented in the Navajo Reservoir district (Eddy 1966; Eddy and Dickey 1961). The functional difference between the bell-shaped and the cylindrical pits is unknown. The Los Sotanos storage pits were constructed into a low ridge of hard caliche in an area surrounded by loose, sandy soil. This site was obviously selected for good drainage and compact soil. The pit walls were quite hard and rodent-proof. The pits had not been fired, as were many of the Los Pinos phase features in the Navajo Reservoir district (Eddy 1966:Table 14) and those of historical Navajo affiliation (Carlson 1965:25). The Los Sotanos pits were apparently sealed with logs, brush, and earth. No slab covers or lip constructions, such as those found in the Navajo Reservoir sites, were noted.

A quantity of carbonized, shelled corn was found in the base of Feature 5, indicating that maize horticulture was well established. Other plant seeds found in the Los Sotanos pits include goosefoot, juniper berries, and pigweed, indicating that wild plant products were also stored.

The Los Sotanos pits had been filled through eolian/alluvial action over a long period. The soil within the pits was extremely compact. Only in the lower fill of Feature 5 was there any midden deposition. No Los Pinos phase artifacts were found in the pits. The pits had filled to the point where they probably resembled shallow depressions by the time the area was reoccupied by Rosa phase populations, some 600 years later.

The Function of Stockades in the Eastern San Juan District

A portion of a stockade associated with the late Rosa early Piedra occupation was encountered at Los Sotanos within the Cortez pipeline corridor. This structure is estimated to have been an ovoid enclosure, 20 by 10 m, and it appears to have enclosed a single jacal lodge. Stockades are common features of Rosa and Piedra settlements in the eastern San Juan district. Most of these structures appear to have been built during the ninth century, but examples of tenth-century stockades are also known. Examples of earlier stockades (of Basketmaker III affiliation) are also known in southwestern Colorado (Carlson 1963; Rohn 1975). The Yellowjacket structure documented by Rohn (1975) dates to the seventh century. The characteristics of these early Developmental stockades are discussed in Chapter 20.

Rosa and Piedra phase stockades often enclose a single pitroom or habitation area and appear as either isolated units or within a village complex where rooms also occur outside the enclosure. Apparently the Los Sotanos example contained a single habitation unit of jacal surface construction, in contrast to the more commonly occurring pitroom. Other features, such as hearths and storage units, are common within stockades. Hall (1944b) notes that most stockades were burned, and the Los Sotanos example is no exception. Hall (1944b:7, 13, 18) further notes that burned rooms within stockades appear to have been burned after abandonment, and it is logical to assume that this is when the stockades also burned. The Rosa-Piedra stockades excavated during this project showed no evidence of burning. Both Hall (1944b:28) and Eddy (1966:371) suggest that stockades were defensive structures, but in no instance is there definite evidence of violence at these locations.

Unfortunately, the data recovered from the partial excavation of the stockade at Los Sotanos contributes little information to the definition of function. A brief cross-cultural examination of stockades compiled in Chapter 20 indicates that they are often constructed without defensive intent. Indeed, stockades are often used to contain livestock and to protect domestic animals from predation. Perhaps we associate stockades with defense because we are familiar with the massive log palisades of frontier American posts and with those built by Southeastern and Southwestern Indians to repel Spanish invasion. The Rosa-Piedra stockades, however, appear to have been rather flimsy structures of widely set posts (30-80 cm apart at Los Sotanos) with woven brush and daublike construction (Hall 1944b:28). Furthermore, Rosa-Piedra stockades are normally situated in open, unfortified physiographic situations, which contrasts with most of the clearly defensive works in the Southwest (Farmer 1957).

The fact that stockade fences are often used throughout the world to contain livestock leads us to consider the possibility that they were employed to contain turkeys or dogs, both of which are unusually common in the stockaded settlements described by Hall (1944b:App. C). There are, however, no defined turkey pens or clutch areas documented for this region, and Eddy (1966) does not record conspicuous evidence of turkey husbandry. It is quite cu-

ant they are sand-tempered. Lino Gray has a hard, light to medium dark gray paste, frequent carbon streaks, and unobscured temper grains. Also absent from the Cortez pipeline project collections is the Chuskan series Bennett Plain, a trachyte-tempered plain gray ware with a dark gray paste.

Previous excavations in the eastern San Juan district have revealed that Rosa Gray, which emerged in the seventh century AD and became prevalent during the eighth century, was superseded by Piedra Gray, which emerged in the late eighth century and became prevalent during the ninth century. During the tenth century Rosa Gray was replaced by Piedra Gray, which was manufactured until the early eleventh century (Eddy 1966:452-453). A segment of this successional trend was observed at Los Jacales. A Ceramic Group 3b assemblage characterized by a predominance of Rosa Gray, with lesser quantities of Piedra Gray, was found in a midden-filled pit in association with a radiocarbon date of AD 790 ± 50. In contrast, the ceramic samples from the lodges at Los Jacales, which probably represent the occupation that continued after the pit was filled, exhibit a predominance of Piedra Gray with lesser quantities of Rosa Gray.

The cultural circumstances that precipitated this successional trend from Rosa Gray to Piedra Gray are unknown. There does not appear to be a gradual evolutionary gradient that extends from Rosa Gray into the Piedra Gray industries. The clay and tempering material of these wares are distinct and were derived from differing sources.

The Discovery of Villages of Rosa-Piedra Phase Affinity

Excavations within both of the Rosa-Piedra sites in the Cortez pipeline corridor revealed evidence of jacal lodges. Circular habitations (one 4.0 m and one 5.0 m in diameter) were found in association with the two Rosa-Piedra components at Los Sotanos. One of these structures was enclosed by a jacal stockade. Both were built on the surface and contained a centrally located hearth. The placement of the postmolds indicates a woven brush or rod wall construction of either vertical or slightly inclined posts. No central post supports were present.

Two large jacal lodges were encountered at Los Jacales, and others probably exist outside the pipeline right-of-way. Provenience 1 was a large subrectangular unit with interior dimensions of 9 by 4.25 m. The lodge walls were built of single or double posts spaced 25-75 cm apart. Three posts found in the central room probably supported an elevated roof beam along the long axis. The other lodge, Provenience 3, was substantially eroded but appears to be of similar construction. Preservation of both structures was poor since they had been built upon the surface. Walls and roof constructions were probably woven brush or rods.

The presence of only jacal lodges within the two Rosa-Piedra sites excavated by this project (the only ones to have been excavated in the lower Largo Canyon area) is rather curious since such settlements have not been pre-

viously documented. Jacal surface structures that do appear in documented Rosa-Piedra sites have always been found in conjunction with pithouses (Bussey et al. 1973; Eddy 1966; Hall 1944b). The surface structures described by Hall (1944b:16, 27, 30) appear to be small granaries, often of coursed or turtleback adobe construction with slightly elevated, horizontal-beam floors. Small rectangular jacal and occasional coursed adobe granaries are also documented by Eddy (1966:71, 295, 230, 239, and 485) from the Navajo Reservoir area.

In both the Navajo Reservoir district and the area of the Largo-Blanco confluence occasional large jacal habitation units have been found in association with Rosa-Piedra pithouses. These structures contain hearths and are thought to have been seasonal domiciles associated with the pithouses (Eddy 1966:485). To reiterate, settlements composed of only jacal habitation units, such as those at Los Sotanos and Los Jacales, have not been previously documented. This may be due in part to the emphasis on the excavation of sites where pithouse depressions are evident.

The presence of such late eighth and early ninth century settlements as Los Sotanos and Los Jacales in the eastern San Juan district suggests the persistence of a "Woodland-like" architectural tradition despite the obvious assimilation of various Anasazi culture traits. The size of the jacal structures at Los Jacales and their association at Los Sotanos with a stockade suggests more than just a seasonal occupation. The probability that certain factions of the Rosa-Piedra community in the eastern San Juan district maintained an architectural orientation based on log construction is suggested by the excavation results at these two sites. The character of these sites introduces an element of diversity into the structure of Rosa-Piedra phase settlement organization, and it is probable that similar settlements will be encountered with continued archaeological investigation in the region.

The Dinetah Phase Reconsidered

The ancestral Navajo occupation of the eastern San Juan district was defined by Dittert et al. (1961:245) and Hester (1962:62) as the Dinetah phase, with an estimated temporal span of AD 1550-1680. The validity of the Dinetah phase was questioned, however, after a series of excavations in the Navajo Reservoir district failed to provide convincing evidence (Eddy 1966:507). The late fifteenth-early sixteenth century tree-ring dates obtained by Hall (1944a:100) are generally contested as being from reused or deadwood materials. The earliest tree-ring dates from a pueblito are 1690-1694 (Wilson and Warren 1974). All the dates listed by Robinson et al. (1974) are from pueblito sites and are restricted to the early-middle eighteenth century. The recent definition of the Piedra Lumbre phase (Schaafsma 1976, 1978, 1979), defined as a seventeenth-early eighteenth century Navajo occupation and considered to be prior to the adoption of Navajo ceramic technology, has tended to substantiate the idea of the lack of a Dinetah phase.

The excavations of two Navajo components within the Cortez pipeline corridor in the Blanco Canyon area, how-

ever, support the presence of a Dinetah phase ancestral occupation in the eastern San Juan district. Three radiocarbon dates have been obtained from these components and indicate the presence of a late sixteenth or early seventeenth century occupation. A determination of AD 1550 \pm 55 was obtained from El Campo Navahu and dates of 1590 \pm 55 and 1600 \pm 55 were obtained from Proveniencies B and C at La Ceja Blanca. Recent excavations within a Navajo site in the adjacent Cedar Creek area have also yielded two early dates, AD 1553 \pm 55 and 1538 \pm 75 (Reynolds and Cella 1984). These dates cannot be considered definitive since they may have been taken from deadwood, but they demand recognition and they suggest the probability that a Dinetah phase Navajo occupation did in fact exist in the eastern San Juan district.

Both of the early Navajo components excavated during this project consisted of small post-and-brush shelters that, from surface examination, were defined by small and rather nondescript scatters of Dinetah Plain ceramics and lithic artifacts. Most of the sites that have been previously investigated in the region are either pueblitos or forked-stick hogan complexes of rather conspicuous character. It is possible, therefore, that the earliest remnants of Dinetah phase Navajo occupation in the region have been overlooked. Continued archeological investigations in the region should consider these inconspicuous sites, since the earliest Navajo settlements in the region should be rather deteriorated and may not exhibit surficial evidence of architecture.

REFERENCES CITED

- Abel, Leland J.
 1955 Mesa Verde Gray and White Ware. In *Pottery Types of the Southwest*, edited by H. S. Colton. Museum of Northern Arizona Ceramic Series No. 3. Flagstaff.
- Adams, Eleanor B., and Fray Angelico Chavez
 1956 *The Missions of New Mexico, 1776. A Description by Fray Francisco Atanacio Dominguez with other Contemporary Documents* (reprinted in 1975). University of New Mexico Press, Albuquerque.
- Bailey, Flora L.
 1940 Navaho Foods and Cooking Methods. *American Anthropologist* n.s. 42:270-290.
- Bailey, Vernon
 1913 Life Zones and Crop Zones in New Mexico. *North American Fauna* 35. Washington, D.C.
- Baldwin, Gordon C.
 1950 The Pottery of the Southern Paiute. *American Antiquity* 1:50-56.
- Barrett, Samuel Alfred
 1917 The Washo Indians. *Bulletin of the Public Museum of the City of Milwaukee* 2:1-52.
- Beckett, Patrick H.
 1973 *Cochise Culture Sites in South Central and North Central New Mexico*. M.A. thesis, Department of Anthropology, Eastern New Mexico University, Portales.
- Bolton, Herbert E.
 1949 *Coronado, Knight of Pueblos and Plains*. University of New Mexico Press, Albuquerque.
- Braun, David P.
 1983 Pots as Tools. In *Archaeological Hammers and Theories*, edited by J. A. Moore and A. S. Keene, pp. 108-134. Academic Press, New York.
- Brew, Alan P.
 1973 An Archeological Survey of the Navajo Indian Irrigation Project Main Canal and Adjacent Lands. In *Archeological Surveys and Salvage Operations along the Main Canal of the Navajo Indian Irrigation Project and the Hammond Irrigation Project*, by Stanley D. Bussey, A. H. Warren, James Schoenwetter, Stewart Peckham, and Alan P. Brew. Museum of New Mexico, Santa Fe.
- Brew, J. O.
 1946 *Archeology of Alkali Ridge, Southeastern Utah*. Papers of the Peabody Museum of Archaeology and Ethnology 21. Harvard University Cambridge.
- Brugge, David M.
 1963 *Navajo Pottery and Ethnohistory*. Navajo Tribal Museum Series No. 2. Window Rock, Az.
 1964 Navajo Ceramic Practices. *Southwestern Lore* 30(3):37-46.
 1972 *The Navajo Exodus*. Archeological Society of New Mexico Supplement No. 5. Las Cruces.
 1977 *Tsegai: an Archaeological Ethnohistory of the Chaco Region*. Division of Cultural Research, National Park Service, Albuquerque.
 1980 *A History of the Chaco Navajos*. Reports of the Chaco Center No. 4. Division of Cultural Research, National Park Service, Albuquerque.
- 1981 The Historical Archeology of Chaco Canyon. In *Archeological Surveys of Chaco Canyon*, by Alden C. Hayes, David M. Brugge, and W. James Judge, pp. 69-101. National Park Service Publications in Archeology 18a. Chaco Canyon Studies. National Park Service, Division of Cultural Research, Albuquerque.
- 1982 Apache and Navajo Ceramics. In *Southwestern Ceramics, a Comparative Review*, edited by Albert H. Schroeder, pp. 279-298. *Arizona Archeologist* 15.
- 1983 Navajo Prehistory and History to 1850. In *Southwest*, edited by Alfonso Ortiz, pp. 489-501. Handbook of North American Indians Vol. 10. Smithsonian Institution, Washington, D.C.
- Bussey, Stanley D., A. H. Warren, James Schoenwetter, Stewart Peckham, and Alan P. Brew
 1973 *Archaeological Surveys and Salvage Excavations along the Main Canal of the Navajo Indian Irrigation Project and the Hammond Irrigation Project*. Museum of New Mexico, Santa Fe.
- Carlson, Roy L.
 1963 *Basket Maker III Sites near Durango*. University of Colorado Series in Anthropology No. 8. Boulder.
 1965 *Eighteenth-Century Navajo Fortresses of the Gobernador District*. The Earl Morris Papers, No. 2. University of Colorado Press, Boulder.
- Carroll, Charles H., and Michael P. Marshall
 1979 *Cultures in Conflict: Archeological Evidence on the Eastern Navajo Frontier*. Public Service Company of New Mexico, Albuquerque.
- Chapman, Richard C.
 1979 The Archaic Occupation of White Rock Canyon. In *Adaptive Change in the Northern Rio Grande*, edited by Jan V. Biella and Richard C. Chapman, pp. 61-73. Archeological Investigations in Cochiti Reservoir, New Mexico, Vol. 4. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for U.S. Department of Interior. Contract No. CX700050431.
- Chapman, Richard C., and Jeanne A. Schutt
 1977 Methodology of Lithic Analysis. In *Excavation and Analysis, 1975 Season*, edited by Richard C. Chapman and Jan V. Biella, pp. 83-96. Archeological Investigations in Cochiti Reservoir, New Mexico, Vol. 2. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for U.S. Department of Interior. Contract No. CX702960151.
- Colton, Harold S.
 1955 *Pottery Types of the Southwest*. Tusayan Gray and White Ware, Little Colorado Gray and White Ware. Museum of Northern Arizona Ceramic Series 3. Flagstaff.
- Cushing, Frank H.
 1886 A Study of Pueblo Pottery as Illustrative of Zuni Culture Growth. *Fourth Annual Report of the Bureau of American Ethnology*, pp. 467-505. Smithsonian Institution, Washington, D.C.
- Damon, P.E., C.W. Ferguson, A. Long, and E.I. Wallick
 1974 Calibration of the Radiocarbon Time Scale. *American Antiquity* 39:350-366.

THE EXCAVATION OF THE CORTEZ CO₂ PIPELINE PROJECT SITES, 1982-1983

- De Laguna, Frederica
1960 *The Story of a Tlingit Community: a Problem in the Relationship Between Archaeological, Ethnological, and Historical Methods*. Bureau of American Ethnology Bulletin 172. Smithsonian Institution, Washington, D.C.
- Dittert, A.E., Jr.
1958 *Preliminary Archaeological Investigations in the Navajo Project Area of Northwestern New Mexico*. Museum of New Mexico Papers in Anthropology 1. Santa Fe.
- Dittert, A. E., Jr., and Frank W. Eddy
1963 *Pueblo Period Sites in the Piedra River Section of the Navajo Reservoir District*. Museum of New Mexico Papers in Anthropology No. 10. Santa Fe.
- Dittert, A. E., Jr., J. J. Hester, and F. W. Eddy
1961 *An Archaeological Survey of the Navajo Reservoir District, Northwestern New Mexico*. Monographs of the School of American Research and the Museum of New Mexico No. 23. Santa Fe.
- Dittert, A.E., Jr., Frank Harlow, and others
1965 *Acoma-Zuni Pottery Types*. Seventh Southwest Ceramic Seminar. Museum of Northern Arizona, Flagstaff.
- Donaldson, Marcia L.
1983 *Cultural Resource Inventory along the Proposed Continental Divide Pipeline, Southwest Colorado and Northwest New Mexico*. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Continental Divide Pipeline Co., Transwestern Pipeline Co., and Texas Eastern Transmission Corp.
- Dykman, Douglas D.
1982 *Towards a Typology of Site Function*, by Alan H. Simmons and Douglas D. Dykman. In *Prehistoric Adaptive Strategies in the Chaco Canyon Region, Northwestern New Mexico*, vol. 3, assembled by Alan H. Simmons, pp. 825-852. Navajo Nation Papers in Anthropology 9. Window Rock, Arizona. Prepared for the Alamito Coal Co., Tucson, Ariz.
- Eddy, Frank W.
1966 *Prehistory in the Navajo Reservoir District, northwestern New Mexico*. Museum of New Mexico Papers in Anthropology 15(II).
- Eddy, Frank W., and B. L. Dickey
1961 *Excavations at Los Pinos Phase Sites in the Navajo Reservoir District*. Museum of New Mexico Papers in Anthropology 4. Santa Fe.
- Edwin, L. Wade
1980 *America's Great Lost Expedition: The Thomas Keam Collection of Hopi Pottery from the Second Hemenway Expedition, 1890-1894*. The Heard Museum, Phoenix.
- Elmore, Francis H.
1943 *Ethnobotany of the Navajo*. University of New Mexico Bulletin, Monograph Series 1(7).
- Elyea, Janette, and Patrick Hogan
1983 *Regional Interaction: the Archaic Adaptation*. In *Economy and Interaction along the Lower Chaco River: The Navajo Mine Archaeological Project*, edited by Patrick Hogan and Joseph C. Winter, pp. 393-402. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Ewers, John C.
1955 *The Horse in Blackfoot Indian Culture*. Bureau of American Ethnology Bulletin 159. Smithsonian Institution, Washington, D. C.
- Farmer, Malcolm F.
1942 *Navajo Archeology of the Upper Blanco and Largo Canyons, Northern New Mexico*. *American Antiquity* 8:65-79.
1957 *A Suggested Typology of Defensive Systems of the Southwest*. *Southwestern Journal of Anthropology* 13(3).
- Fenenga, F., and F. Wendorf
1956 *Excavations at the Ignacio, Colorado, Field Camp: Site LA 2605*. In *Pipeline Archaeology*, edited by Fred Wendorf, Nancy Fox, and Orian L. Lewis, pp. 207-214. Laboratory of Anthropology, Santa Fe, and Museum of Northern Arizona, Flagstaff.
- Ferg, Alan
1982 *Historic Archaeology on the San Antonio de las Huertas Grant, Sandoval County, New Mexico*. In *Testing and Excavation Report: MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, New Mexico, Vol. 2: Historical Resources*. CASA Papers No. 3. Submitted to Woodward-Clyde Consultants, San Francisco.
- Gayton, A.H.
1929 *Yokuts and Western Mono Pottery-Making*. *University of California Publications in American Archaeology and Ethnology* 24(3):239-255.
- Gifford, E.W.
1941 *Culture Element Distributions XII: Apache-Pueblo*. *Anthropological Records* 4(1). University of California Press, Berkeley.
- Gunnerson, James H.
1960 *An Introduction to Plains Apache Archaeology: The Dismal River Aspect*. Anthropological Papers 58. Bureau of American Ethnology Bulletin 173:131-260. Smithsonian Institution, Washington, D.C.
1969 *Apache Archaeology in Northeastern New Mexico*. *American Antiquity* 34:23-39.
1979 *Southern Athapaskan Archeology*. In *Southwest*, edited by Alfonso Ortiz, pp. 162-169. Handbook of North American Indians, Vol. 9. Smithsonian Institution, Washington, D. C.
- Hall, Edward Twitchell, Jr.
1944a *Recent Clues to Athapaskan Prehistory in the Southwest*. *American Anthropologist* 46:98-105.
1944b *Early Stockaded Settlements in the Gobernador District, New Mexico*. Columbia Studies in Archaeology and Ethnology 2(1). Columbia University Press, New York.
- Hammack, L., N. Hammack, and B. Bradley
1981 *Cultural Resources Inventory, Shell CO₂ Mainline*. Submitted to Woodward-Clyde Consultants, San Francisco.
- Hammond, George P., and Agapito Rey (translators)
1929 *Expedition into New Mexico Made by Antonio de Espejo, 1582-1583 as Revealed in the Journal of Diego Perez de Luxan, a Member of the Party*. The Quivira Society, Los Angeles.
- Harlow, Francis H.
1973 *Matte-paint Pottery of the Tewa, Keres, and Zuni Pueblos*. Museum of New Mexico, Santa Fe.
- Harris, A. H.
1963 *Vertebrate Remains and Past Environmental Reconstruction in the Navajo Reservoir District*. Museum of New Mexico Papers in Anthropology No. 11. Santa Fe.

REFERENCES CITED

- Haskell, John L.
1975 *The Navajo in the 18th Century: an Investigation Involving Anthropological Archaeology in the San Juan Basin, Northwestern New Mexico*. Ph.D. dissertation, Washington State University, University Microfilms, Ann Arbor.
- Hawley, Florence M.
1936 *Field Manual of Prehistoric Southwestern Ceramic Types* (revised in 1950). University of New Mexico Bulletin, Anthropological Series 1(4). Albuquerque.
- Hayes, Alden C., David M. Brugge, and W. James Judge
1981 *Archeological Surveys of Chaco Canyon, New Mexico*. National Park Service Publications in Archeology No. 18A. Chaco Canyon Studies. Washington, D. C.
- Hayes, Alden C., Jon Nathan Young, and A. H. Warren
1981 *Excavation of Mound 7, Gran Quivira National Monument, New Mexico*. National Park Service Publications in Archeology No. 16. Washington, D. C.
- Heider, Karl G.
1967 Archaeological Assumptions and Ethnographical Facts: A Cautionary Tale from New Guinea. *Southwestern Journal of Anthropology* 23(1).
- Helm, June (editor)
1981 *The Subarctic*. Handbook of North American Indians Vol. 6. Smithsonian Institution, Washington, D. C.
- Hester, James J.
1962 *Early Navajo Migrations and Acculturations in the Southwest*. Museum of New Mexico Papers in Anthropology 6. Santa Fe.
- Hester, James J., and J.L. Shiner
1963 *Studies at Navajo Period Sites in the Navajo Reservoir District*. Museum of New Mexico Papers in Anthropology 9. Santa Fe.
- Hibben, Frank C.
1949 The Pottery of the Gallina Complex. *American Antiquity* 3:194-202.
- Hill, W.W.
1937 *Navajo Pottery Manufacture*. University of New Mexico Bulletin, Anthropological Series 2(3).
1938 *The Agricultural and Hunting Methods of the Navaho Indians*. Yale University Publications in Anthropology 18. Yale University Press, New Haven.
1940 Some Navaho Culture Changes During Two Centuries (With a Translation of the Early Eighteenth Century Rabal Manuscript). *Smithsonian Miscellaneous Collections* 100, pp. 395-416. Washington, D.C.
- Hodge, F. W., G. P. Hammond, and A. Rey
1945 *Fray Alonso Benavides' Revised Memorial of 1634*. University of New Mexico Press, Albuquerque.
- Hogan, Patrick, Jeanette Elyea, and Peter Eschman
1983 Intensive Lithic Analysis. In *Economy and Interaction Along the Lower Chaco River: The Navajo Mine Archeological Project*, edited by Patrick Hogan and Joseph C. Winter, pp. 275-285. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Holmer, Richard N.
1978 *A Mathematical Typology for Archaic Projectile Points of the Eastern Great Basin*. Ph.D. Dissertation, Department of Anthropology, University of Utah, Salt Lake City.
- Hurt, W. R.
1942 Eighteenth-century Navajo Hogans from Canyon de Chelly National Monument. *American Antiquity* 8:89-99.
- Huscher, Betty H., and Harold A. Huscher
1940 Potshards from a Pinyon Tree. *Masterkey* 14:137-142.
- Hliff, Flora Greg
1954 *People of the Blue Water: My Adventures among the Walapai and Havasupai Indians*. Harper and Brothers, New York.
- Ingbar, Eric
1983 Ceramics, Mobility, and Technology. Ms. on file, Office of Contract Archeology, University of New Mexico, Albuquerque.
- Irwin-Williams, Cynthia
1973 *The Oshara Tradition*. Eastern New Mexico University, Portales.
- Jennings, Jesse D., Alan R. Schroedl, and Richard N. Holmer
1980 *Sudden Shelter*. University of Utah Anthropological Papers No. 103. Salt Lake City.
- Jones, John Alan
1955 The Sun Dance of the Northern Ute. *Bureau of American Ethnology Bulletin* 157:203-264. Smithsonian Institution, Washington, D. C.
- Judge, W. James
1982 The Paleo-Indian and Basketmaker Periods: An Overview and Some Research Problems. In *The San Juan Tomorrow*, edited by Fred Plog and Walter Wait, pp. 5-57. National Park Service, Santa Fe.
- Kelly, Isabel T.
1932 Ethnography of the Surprise Valley Paiute. *University of California Publications in American Archaeology and Ethnology* 31:67-210. Berkeley.
1964 *Southern Paiute Ethnography*. University of Utah Press, Salt Lake City.
- Kemrer, Meade F.
1982 *Archaeological Variability within the Bisti-Star Lake Region, Northwestern New Mexico*. Prepared for the Bureau of Land Management Albuquerque District Office.
- Kerley, Janet, and Patrick Hogan
1983 Preliminary Debitage Analysis. In *Economy and Interaction Along the Lower Chaco River: The Navajo Mine Archeological Project*, edited by Patrick Hogan and Joseph C. Winter, pp. 255-261. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Keur, Dorothy L.
1941 *Big Bead Mesa: an Archaeological Study of Navaho Acculturation, 1745-1812*. Memoirs of the Society for American Archaeology 1.
1944 A Chapter in Navajo-Pueblo Relations. *American Antiquity* 10:75-86.
- Kidder, A. V.
1920 Ruins of the Historic Period in the Upper San Juan Valley, New Mexico. *American Anthropologist* 22(4).
- Kidder, Alfred V., and Anna O. Shepard
1936 *The Pottery of Pecos*, Vol. 2. Yale University Press, New Haven.

THE EXCAVATION OF THE CORTEZ CO₂ PIPELINE PROJECT SITES, 1982-1983

- Klein, Jeffrey, J.C. Lerman, P.E. Damon, and E.K. Ralph
1982 Calibration of Radiocarbon Dates: Tables Based on the Consensus Data of the Workshop on Calibrating the Radiocarbon Time Scale. *Radiocarbon* 24:103-150.
- Kluckhohn, Clyde, W.W. Hill, and Lucy Wales Kluckhohn
1971 *Navaho Material Culture*. Harvard University Press, Cambridge.
- Krause, Aurel
1956 *The Tlingit Indians: Results of a Trip to the Northwest Coast of America and the Bering Straits*, translated by Erna Gunther. American Ethnological Society and University of Washington Press, Seattle.
- Laird, Carobeth
1976 *The Chemehuevis*. Malki Museum Press, Banning, California.
- Linton, Ralph
1944 North American Cooking Pots, *American Antiquity* 9:369-380.
- Loose, Richard W.
1977 Petrographic Notes on Selected Lithic and Ceramic Material. In *Settlement and Subsistence along the Lower Chaco River: the CGP Survey*, edited by Charles A. Reher, Appendix VII, pp. 567-571. University of New Mexico Press, Albuquerque.
- Love, David
1977 Geology of Quaternary Deposits of Chaco Canyon National Monument, New Mexico. Ms. on file, Division of Cultural Research, National Park Service, Albuquerque.
- Lummis, Charles
1900 Pioneers of the Far West: the Earliest History of California, New Mexico, etc. *The Land of Sunshine* 12(4):183.
- Mackey, James, and R. C. Green
1979 Largo-Gallina Towers: An Explanation. *American Antiquity* 44:144-154.
- Manners, Robert A.
1974 Southern Paiute and Chemehuevi: An Ethnohistorical Report. In *Paiute Indians*, edited by David Agee Horr, pp. 29-300. Garland Publishing, New York.
- Marshall, Michael P.
1979 Attribute Analysis of Navajo, Laguna, and Acoma Ceramic Material from Seboyeta, New Mexico. In *Archaeological Investigations in the Vicinity of Seboyeta, New Mexico*, by Charles Carroll and Michael Marshall. Public Service Company of New Mexico, Albuquerque.
1984 Native Earthenware Ceramics from Site 77. In *Final Report of Investigations at Sites 48 and 77, Santa Rosa Lake, Guadalupe County, New Mexico*, by Frances Levine, William H. Doleman, and Jack B. Bertram. Office of Contract Archeology, University of New Mexico, Albuquerque. Draft report submitted to the U.S. Army Corps of Engineers, Albuquerque District Office. Contract No. DACW47-83-C-0013.
- Marshall, Michael P., and Henry Walt
n.d. Seventeenth-Century Athapaskan Settlements on the Rio Salado, Alamo Navajo Indian Reservation. Ms. in preparation.
- Mera, H. P.
1935 *Ceramic Clues to the Prehistory of North-Central New Mexico*. Laboratory of Anthropology Technical Series, Bulletin 8. Santa Fe.
- 1939 *Style Trends of Pueblo Pottery in the Rio Grande and Little Colorado Culture Areas from the Sixteenth through the Nineteenth Century*. Memoirs of the Laboratory of Anthropology 3. Santa Fe.
- Moore, James L.
1980 Archaic Settlement and Subsistence. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project*, edited by James L. Moore and Joseph C. Winter, pp. 358-380. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Morris, E. H., and R. F. Burgh
1954 *Basket Maker II Sites near Durango, Colorado*. Carnegie Institution of Washington Publication No. 604. Washington, D. C.
- Palmer, Edward
1954 *Notes on Utah Utes by Edward Palmer, 1866-1877*, edited by Robert F. Heizer. University of Utah Press, Salt Lake City.
- Peckham, Stuart
1963 Two Rosa Phase Sites near Dulce, New Mexico. In *Highway Salvage Archaeology* 21. Museum of New Mexico and State Highway Department, Santa Fe.
- Reeve, Frank D.
1957 Seventeenth Century Navaho-Spanish Relations. *New Mexico Historical Review* 31:36-52.
1958 Navaho-Spanish Wars, 1680-1770. *New Mexico Historical Review* 33:205-231.
1959 The Navaho-Spanish Peace: 1720s-1770s. *New Mexico Historical Review* 34:9-40.
- Reiter, Paul
1938 *The Jemez Pueblo of Unshagi, New Mexico*, 2 vols. University of New Mexico Press, Albuquerque, and School of American Research, Santa Fe.
- Reynolds, William, and Nancy Cella
1984 *Archaeological Investigations in the Gallegos Canyon Area: Blocks IV and V of the NIIP*. Chambers Consultants and Planners, Albuquerque. Prepared for the Bureau of Indian Affairs. Contract No. NOO C 1420 9606.
- Riddell, Francis A.
1960 *Honey Lake Paiute Ethnography*. Nevada State Museum, Carson City.
- Roberts, H. H., Jr.
1930 Early Pueblo Ruins in the Piedra District, Southwestern Colorado. *Bureau of American Ethnology Bulletin* No. 96. Smithsonian Institution, Washington, D. C.
- Robinson, William J., Bruce G. Harrill, and Richard L. Warren
1974 *Tree-Ring Dates from New Mexico, B: Chaco-Gobernador Area*. Laboratory of Tree-Ring Research, University of Arizona, Tucson.
- Rohn, Arthur H.
1975 A Stockaded Basketmaker III Village at Yellow Jacket, Colorado. *The Kiva* 40(3).
- Sapir, Edward
1923 A Note on Sarcee Pottery. *American Anthropologist* 25:217-253.

REFERENCES CITED

- Schaafsma, Curtis F.
 1976 *Archeological Survey of Maximum Pool and Navajo Excavations at Abiquiu Reservoir, Rio Arriba County, New Mexico*. School of American Research, Santa Fe.
 1978 *Archeological Studies in the Abiquiu Reservoir District. Discovery:41-69*. School of American Research, Santa Fe.
 1979 *The Cerrilla Site (AR-4), a Piedra Lumbre Phase Settlement at Abiquiu Reservoir*. School of American Research, Santa Fe.
- Schroeder, Albert H.
 1963 *Navajo and Apache Relationships West of the Rio Grande. El Palacio 70(3):5-23*.
- Schroedl, Alan
 1976 *The Archaic in the Northern Colorado Plateau*. Ph.D. dissertation, Department of Anthropology, University of Utah, Provo.
- Schutt, Jeanne A.
 1980 *An Investigation of the Relationship Between Flakes and Small Angular Debris: Attributes That May Be Used to Aid in the Identification of Archaic and Anasazi Lithic Assemblages*. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project*, edited by James L. Moore and Joseph C. Winter, pp. 390-397. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
 1983 *The Analysis of Formal Tools from NMAP Sites: New Methods of Data Retrieval*. In *Economy and Interaction Along the Lower Chaco River: The Navajo Mine Archeological Project*, edited by Patrick Hogan and Joseph C. Winter, pp. 263-273. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Simmons, Alan H.
 1982 *Modeling Archaic Adaptive Behavior in the Chaco Canyon Region*. In *Prehistoric Adaptive Strategies in the Chaco Canyon Region, Northwestern New Mexico*, vol. 3, assembled by Alan H. Simmons, pp. 881-932. Navajo Nation Papers in Anthropology 9. Window Rock, Arizona. Prepared for Alamito Coal Co., Tucson, Ariz.
- Smith, Anne Milne
 1974 *Ethnography of the Northern Utes*. Papers in Anthropology 17. Museum of New Mexico Press, Santa Fe.
- Snow, David
 1973 *Cochiti Dam Salvage Project: Archaeological Excavations at the Las Majadas Site, LA 591, Cochiti Dam*. Laboratory of Anthropology Notes 75. Museum of New Mexico, Santa Fe.
- Spier, Leslie
 1928 *Havasupai Ethnography. Museum of Natural History Anthropological Papers 29:81-392*.
- Steward, Julian H.
 1941 *Cultural Element Distribution VIII: Nevada Shoshoni*. *University of California Anthropological Records 4(2):209-259*.
- Stuart, David E., and Rory P. Gauthier
 1981 *Prehistoric New Mexico: Background for Survey*. New Mexico Historic Preservation Bureau, Santa Fe.
- Stubbs, Stanley
 1954 *Summary Report on an Early Pueblo Site in the Tesuque Valley, New Mexico. El Palacio 61(2):45*.
- Sudar-Laumbach, Toni
 1980 *Ceramic Artifacts*. In *Prehistory and History of the Ojo Amarillo*, Vol. 3, edited by David T. Kirkpatrick, pp. 959-1022. Cultural Resource Management Report 276. New Mexico State University, Las Cruces.
- Talayesva, Don C.
 1942 *Sun Chief: The Autobiography of a Hopi Indian*, edited by Leo W. Simmons. Yale University Press, New Haven.
- Toll, Mollie S., and Anne C. Cully
 1983 *Archaic Subsistence and Seasonal Round*. In *Economy and Interaction along the Lower Chaco River: The Navajo Mine Archeological Project*, edited by Patrick Hogan and Joseph C. Winter, pp. 385-391. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Toulouse, Julian
 1972 *Bottle Makers and Their Marks*. Thomas Nelson, New York.
- Tringham, Ruth
 1972 *Territorial Demarcation of Prehistoric Settlements*. In *Man, Settlement and Urbanism*, edited by Peter Ucko, Ruth Tringham, and George W. Dimbleby. Duckworth, London.
- Tschoepik, Harry, Jr.
 1941 *Navajo Pottery Making, An Inquiry into the Affinities of Navajo Painted Pottery*. Papers of the Peabody Museum of American Archaeology and Ethnology 17(1). Harvard University, Cambridge.
- Tuan, Yi Fu, C. Everard, J. G. Widdison, and L. Bennett
 1973 *The Climate of New Mexico*. New Mexico State Planning Office, Santa Fe.
- Tuohy, Donald R., and Barbara Palombi
 1972 *A Basketry-Imprinted Shoshoni Pottery Vessel from Central Nevada. Tebiwa 15:46-48*.
- Vestal, Paul A.
 1952 *Ethnobotany of the Ramah Navajo*. Papers of the Peabody Museum of American Archaeology and Ethnology 41(1). Harvard University, Cambridge.
- Vierra, Bradley J.
 1980 *A Preliminary Ethnographic Model of the Southwestern Archaic Settlement System*. In *Human Adaptations in a Marginal Environment: The UII Mitigation Project*, edited by James L. Moore and Joseph C. Winter, pp. 351-357. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Utah International, Inc.
- Vivian, Gwinn
 1960 *Navajo Archaeology of the Chacra Mesa, New Mexico*. M.A. thesis, Department of Anthropology, University of New Mexico, Albuquerque.
- Wait, Walter K.
 1983 *Preliminary Model for the Preceramic at Star Lake*. In *The Star Lake Archaeological Project: Anthropology of a Headwaters Area of Chaco Wash, New Mexico*, edited by Walter K. Wait and Ben A. Nelson, pp. 131-152. Southern Illinois University Press, Carbondale.
- Wallace, Ernest, and Adamson Hoebel
 1952 *The Comanches: Lords of the South Plains*. University of Oklahoma Press, Norman.

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- Ward, A. E., E. K. Abbink, and J. R. Stein
1977 Ethnohistorical and Chronological Basis of the Navajo Material Culture. In *Settlement and Subsistence along the Lower Chaco River: The CGP Survey*, edited by Charles A. Reher, pp. 217-278. University of New Mexico Press, Albuquerque.
- Warren, A. H.
1979a The Glaze Paint Wares of the Upper Middle Rio Grande. In *Adaptive Change in the Northern Rio Grande*, edited by Jan V. Biella and Richard C. Chapman, pp. 187-192. Archeological Investigations in the Cochiti Reservoir, Vol. 4. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for U.S. Department of Interior. Contract No. CX700050431.
1979b Lithics Identification and Quarry Source Workshop. New Mexico State University Cultural Resource Management Workshop, February 22-23, 1979. Ms. on file, Office of Contract Archeology, University of New Mexico, Albuquerque.
1981 The Micaceous Pottery of the Rio Grande. *Anthropological Papers* 6:149-165. Archeological Society of New Mexico.
- Wedel, Waldo R.
1959 *An Introduction to Kansas Archaeology*. Bureau of American Ethnology Bulletin 174. Smithsonian Institution, Washington, D.C.
- Wilson, John P., and A. H. Warren
1974 LA 2298: the Earliest Pueblito? *Awanyu* 2(1):8-26.
- Winter, Joseph C.
1983 Damage Assessment at Site OCA:107:36. Ms. on file, Office of Contract Archeology, University of New Mexico, Albuquerque.
- Wissler, Clark
1910 Material Culture of the Blackfoot Indians, New York. *Anthropological Papers of the American Museum of Natural History* 5:1-75.
- Wozniak, Frank E.
1983 Natural Environmental Background. In *The 1982 Cultural Resources Survey Project for the Cortez CO₂ Pipeline*, by Frank E. Wozniak and Joseph C. Winter, pp. 13-20. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Woodward-Clyde consultants, San Francisco.
- Wozniak, Frank E., and Joseph C. Winter
1983 *The 1982 Cultural Resources Survey Project for the Cortez CO₂ Pipeline*. Office of Contract Archeology, University of New Mexico, Albuquerque. Prepared for Woodward-Clyde Consultants, San Francisco.