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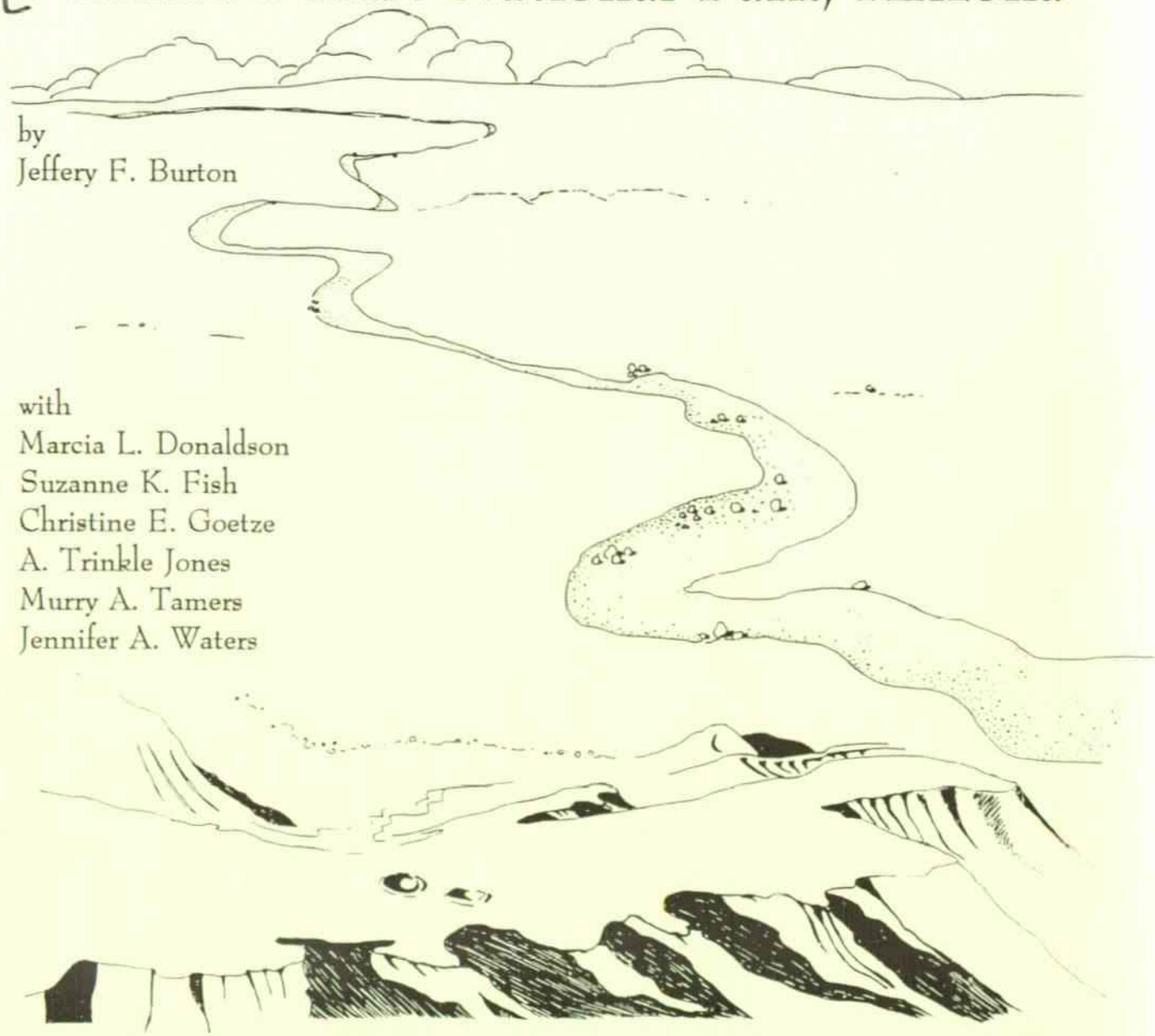
When is a Great Kiva?

Excavations at McCreery Pueblo

Petrified Forest National Park, Arizona



by
Jeffery F. Burton

with
Marcia L. Donaldson
Suzanne K. Fish
Christine E. Goetze
A. Trinkle Jones
Murry A. Tamers
Jennifer A. Waters

Western Archeological and Conservation Center
National Park Service
U.S. Department of the Interior

Publications in Anthropology 63
1993

Excavations at McCreery Pueblo

5505 THE PETRIFIED FOREST, NEAR ADAMANA, ARIZONA. COPR. DETROIT PUBLISHING CO.

"The Petrified Forest alone would be enough to absorb the entire attention of any visitor. When one has the opportunity likewise of scouring the region for traces of the ancient peoples who once lived there, he is doubly fortunate, especially if the quest be successful."

Walter Hough, "Ancient Peoples of the Petrified Forest," 1902.

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PROJECT SUMMARY

Project Name: McCreery Pueblo Excavations.
WACC Project Number: PEFO 1992 F.
Type of Project: Testing.
Project Supervisor: Trinkle Jones.
Field Director: Jeff Burton.
Project Archeologists: Geri Antone, Lynne D'Ascenzo.
Volunteers: Jim Burton, Don Christensen, Dave DeWitt, Caroline Evans, Mary Farrell, Mark and Wendy Flippo, Steve Holmes, Ferrell Knight, Dick Lord, Kathy Makansi, Jack and Pat McCreery, Marie Minnerath, Janice Richman, Sarah and Vince Santucci, Bill St. Clair, Jim and Kitty Stoddart.
Field Work Dates: May 6 through June 4, 1991.
Person Days in Field: 38 (WACC), 95 (volunteers).
Project Location: McCreery Pueblo (AZ K:13:41 [ASM]), Petrified Forest National Park, Apache County, Arizona. T19N, R24E, S 1/2 of the SW 1/4, of the SW 1/4 of Section 27, Gila and Salt River baseline and median.
USGS Quad: Kachina Point, Arizona 1972.
Project Scope: Two structures, five features, and two extramural areas were tested; in all 65 square meters were manually excavated.
National Register Status: None.
Collections Accession Information: PEFO Accession Number 541, WACC Accession Number 803, WACC Photograph Accession Number 92:6.

Front cover: Overview of McCreery Pueblo and Dead Wash by Lynne D'Ascenzo.
Frontispiece: The Petrified Forest near Adamana (Detroit Publishing Co. postcard ca. 1915).

This report is Number 63 in a continuing series, Publications in Anthropology, published by the Western Archeological and Conservation Center, Post Office Box 41058, Tucson, Arizona 85717.

Abstract

During August 1992, the National Park Service conducted archeological test excavations at McCreery Pueblo, Petrified Forest National Park, Arizona. McCreery Pueblo is a late Pueblo II-early Pueblo III site consisting of a small masonry room block, a great kiva, a trash mound, and nine other features. Over 65 m^2 were excavated at the site. Recovered were 5,128 sherds, 3,332 flaked-stone artifacts, 18 hammerstones, 15 ground-stone artifacts, and 18 ornaments. Numerous floral and faunal remains were recovered as well. The main objective of the testing was to enhance the nomination of the site to the National Register, but the excavation also yielded data to address a number of research questions. There is good preservation of both architectural remains and normally perishable materials at the site. Chronological data suggest an occupation span between A.D. 1000 and 1200. Although McCreery Pueblo is on the periphery of the Chaco system, no true Chacoan traits were discovered, and the Pueblo appears to have been outside the area of direct Chaco influence. Subsistence and other data indicate McCreery Pueblo was a small farming community, however the presence of a great kiva suggests it may have functioned as a ceremonial center. While unroofed great kivas have a widespread distribution throughout the region, the McCreery Pueblo example is the only one known in the Petrified Forest area. As a ceremonial center, McCreery Pueblo could have integrated a number of smaller villages in the surrounding area, and may have been used by some of them as a winter residence or for food storage.

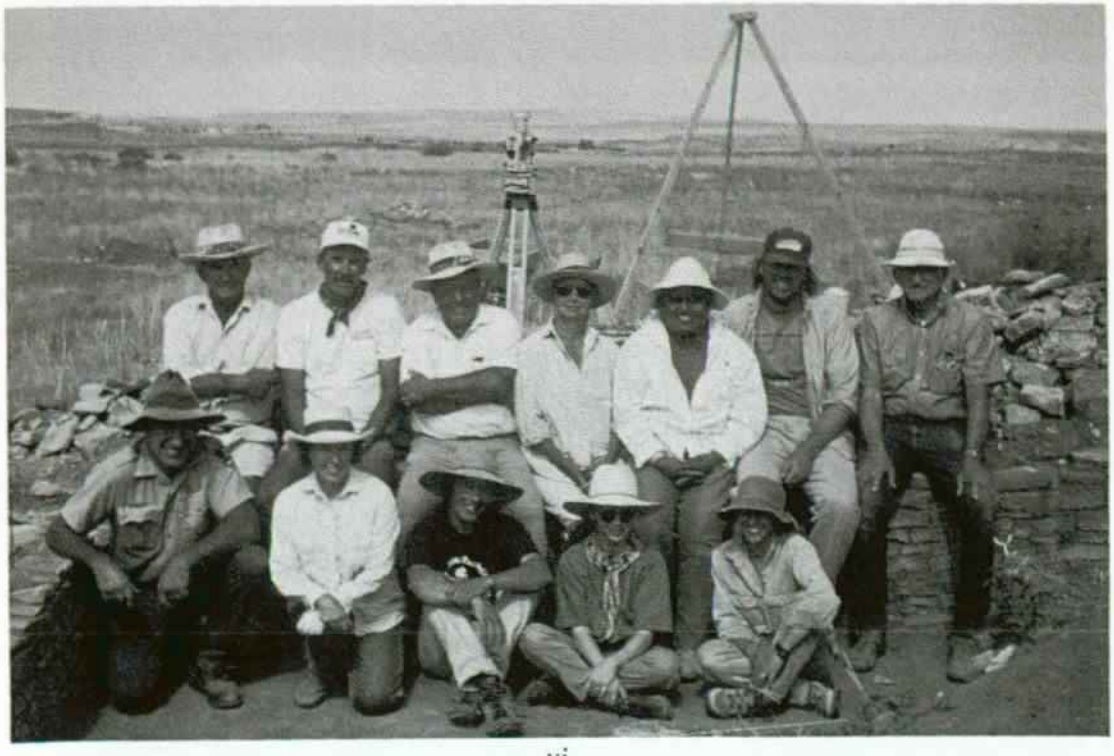
Acknowledgments

Excavations at McCreery Pueblo would not have been possible without funding provided by the Petrified Forest Museum Association and Pat and Jack McCreery. Special appreciation is due Pat and Jack and the Archaeological Conservancy for their foresight and altruism in having this unique site added to the park.

Project Archeologists Geri Antone and Lynne D'Ascenzo were instrumental in the completion of all phases of this project. Once again I have the pleasure of thanking the McCreery's, Jim and Kitty Stoddart, and Don Christensen who have donated their time and energy for eight seasons. Again the services of Dick Lord in field photography were essential. The dedication of these six volunteers has become indispensable to archeological research at Petrified Forest. Park Resource Specialist Ferrell Knight also contributed his considerable energy to the fieldwork. Student interns Caroline Evans and Steve Holmes took time off from their work on the Hopi Reservation to participate in the excavations. Other persons who volunteered their time include Jim Burton, Dave DeWitt, Mary Farrell, Mark and Wendy Flippo, Kathy Makansi, Marie Minnerath, Janice Richman, Sarah and Vince Santucci, and Bill St. Clair. Park Superintendent Gary Cummins supported the excavation. Besides volunteering, Park Resource Specialist Vince Santucci acted as our liaison with the park and facilitated field logistics. Representatives of the Hopi and Zuni tribes visited us in the field and freely shared their ideas and provided special insight.

Special analyses were completed by Marci Donaldson, Suzy Fish, Chris Goetze, Murry Tamers, and Jenny Waters. Ron Beckwith prepared the maps and artifact illustrations. Dick and Florence Lord photographed artifacts and produced all of the plates used in this report. Lynne D'Ascenzo provided the cover art. As project supervisor, Trinkle Jones made sure all aspects of the project flowed smoothly. I thank her for allowing me "the opportunity ... of scouring the region for traces of ... ancient peoples" for the last six years. George Teague and Trinkle provided valuable comments on the draft final report, which was edited by Teresita Majewski. As always my wife Mary and son Daniel have provided help and encouragement. To all, many thanks.

Jeff Burton, Tucson, Arizona



The McCreery Pueblo field crew, from left to right, back row: Jack, Don, Jim, Kitty, Geri, Jeff, Dick; front row: Ferrell, Pat, Steve, Caroline, and Lynne.

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Chapter 1
Introduction

A. Trinkle Jones and Jeffery F. Burton

Between August 6 and 24, National Park Service archeologists from the Western Archeological and Conservation Center (WACC) in Tucson conducted excavations with the aid of volunteers at McCreery Pueblo (PEFO Site 236; AZ K:13:41 [ASM]). McCreery Pueblo, a small masonry pueblo and great kiva within Petrified Forest National Park (Figure 1.1), was occupied around A.D. 1100. Of the over 600 sites known in the park, it is the only one with a great kiva.

In the archeological overview for Petrified Forest National Park, Stewart (1980) recommended that McCreery Pueblo be added to the park. In 1985, a 40-acre (16.2 ha) parcel that included the site was transferred by private donation to the Archaeological Conservancy, a private, non-profit organization dedicated to historic preservation. The land was held pending Congressional boundary changes that became effective in 1986. In honor of the donors, the site was named McCreery Pueblo.

The main objective of the excavation was to enhance the nomination of the site to the *National Register of Historic Places* under Criterion D (the potential to yield significant data) and determine if the site is eligible under other criteria as well. The Conservancy had begun a National Register nomination, and upon transfer, requested that the National Park Service complete the nomination. Funding from the Petrified Forest Museum Association became available in 1992 for research and write-up of the nomination.

Regional Prehistory

Based on archeological work conducted in the region since the late 1800s, numerous chronologies have been proposed, refined, and debated (Figure 1.2). Early chronologies for the Petrified Forest vicinity varied little from the original Pecos classification (Stewart 1980). The earliest detailed chronology was developed by Colton (1939, 1943), on the basis of his informal surveys and on excavations by Fewkes and others at Pueblo IV sites in the region (Gumerman 1988:175). Gumerman and Skinner (1968) provided a framework for the Holbrook area to the west, which combined Colton's phase system with the Pecos classification. Gumerman and Olson (1968) provided a similar chronology for the upper Puerco River valley to the northeast. Based on extensive work in the Hay Hollow Valley, 30 miles south of Petrified Forest, Longacre (1964) developed a chronology that focuses on the development of agriculture and large villages: Stage I, Incipient Agriculturalist; Stage II, Initial Sedentary Agriculturalist; Stage III, Established Village Farming; Stage IV, Beginning of Planned Towns; Stage V, Established Towns; and Stage VI, Large Towns.

The earliest chronology specifically developed for the Petrified Forest area was proposed by Mera (1934), who assigned various pottery types to the cultural periods of the Pecos classification. Reed (1947) used the concept of ceramic horizons to form a sequence of pottery types based on ceramic cross dating. Reed's phases differed slightly from the original Pecos classification. Using Breternitz's (1966) reevaluation of tree-ring-dated pottery, Wells (1988, 1989) found that most sites recorded during recent surveys at Petrified Forest fall into transitional categories, such as Pueblo II to III. Wells developed a chronology that augmented the ceramic horizons originally defined by Reed (1947) with data on changes in architecture, projectile-point types, and rock-art styles. This chronology is necessarily less precise than those developed for surrounding regions because of the lack of directly

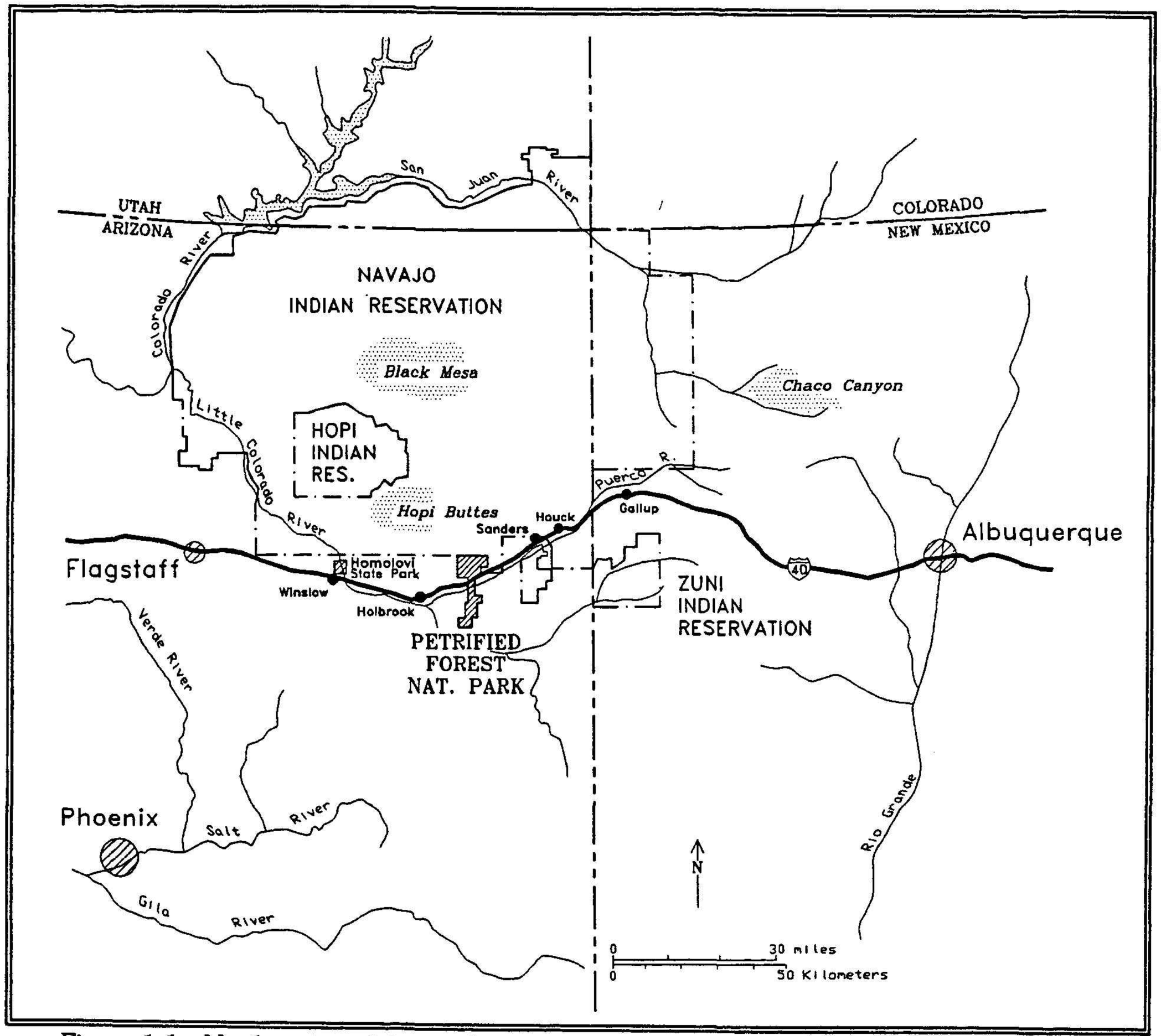

Figure 1.1. Northeastern Arizona showing the location of Petrified Forest National Park.

dated sites at Petrified Forest. The Wells chronology parallels that of Plog's (1983, 1984) political and economic alliances, outlined below.

Based primarily on distinctive groupings of ceramic types, Plog (1983, 1984) suggested that between A.D. 400 and 1450, 10 broad cultural patterns are evident. Three of these, the Adamana (characterized by Adamana Brown pottery), the Little Colorado (Little Colorado White Ware), and the Jeddito (yellow and orange wares), were centered along the Little Colorado River. The White Mountain pattern (White Mountain Red Ware) was centered on the Upper Little Colorado River Valley. The White Mound pattern (Kana-a-style ceramics) was widespread throughout the Colorado Plateau; others such as the Zuni or Kayenta patterns are of more limited extent. These "political and economic alliances," as Plog has termed them, have a homogeneous distribution of one or more ceramic types, a homogeneous architectural style, and at least some large central sites. It has been postulated that the alliances may have linked smaller villages into larger social groupings during times of increased environmental risk (Plog 1984).

The following culture history is based primarily on Wells (1988), but also includes elements from more recent work in the region.

Paleoindian and Archaic

To date, the only evidence of Paleoindian occupation (9500-6000 B.C.) of the region is from surface finds of fluted points (Huckell 1982), including two within Petrified Forest National Park (Tagg 1987; Wendorf 1953). No Paleoindian sites in datable strata (or contexts) have yet been found.

The Archaic period (6000 B.C.-ca. A.D. 1) is well represented at Petrified Forest and in the vicinity (Sims and Daniel 1962; Tagg 1987; Wendorf and Thomas 1951). Several Archaic sites have been recorded within the park, and one, AZ K:13:60, has been excavated (Tagg 1987). The Archaic period marks a shift from the big-game hunting of the Paleoindian period to a broader subsistence base of hunting and gathering. Basin metates, bifacial tools, and the lack of pottery are considered diagnostic of Archaic-period sites. Projectile points at these aceramic sites include Bajada (Pinto-like) and Jay-style (Lake Mohave-like) types (Irwin-Williams 1973). Use of maize is indicated during the late Archaic period at Petrified Forest (Tagg 1987).

Basketmaker II-III Period

Based on recent work at Sivu'ovi and other early Basketmaker sites in the region (Burton 1991, 1992), this period can be divided into early (Basketmaker II) and late (Basketmaker II-III) sites. Basketmaker II sites (*ca.* A.D. 1-A.D. 300) are indicated by the presence of a single pottery type, Adamana Brown, while Basketmaker II-III (A.D. 300-700) sites are indicated by the presence of Lino Gray, Lino Black-on-gray, White Mound Black-on-white, Woodruff Brown, and Adamana Brown pottery. Large side-notched projectile points are common throughout this time span.

This period is marked by increasing sedentism, which is reflected in the change from production and use of formal bifacial tools (common during the earlier Archaic period) to use of an expedient flake technology (Parry and Kelly 1987). Eleven percent of the recorded sites at Petrified Forest, including the excavated sites of Sivu'ovi (Burton 1991) and Flattop (Cosgrove 1934; Wendorf 1953), fall into this period (Wells 1989). Hough (1903) excavated two sites, Milky Wash and Metate Ruin, which date to this period.

Settlements consisted of shallow to deep pit houses and associated slab-lined cists located on isolated buttes and dune ridges. Subsistence was characterized by a heavy dependence on maize, indicated not only by vegetal remains but also by two-hand manos, trough metates, and ceramics for storage.

Sites with Adamana Brown pottery are larger and more numerous than sites in any preceding period; this has been equated with initial settlement of the region (Mera 1934) or interpreted as indicating a sudden influx of people, perhaps from the south where paddle-and-anvil constructed pottery, like Adamana Brown, is more common. Schroeder (1979) has postulated the presence of Yuman-speaking "Hakataya" in the area at this time. According to Plog (1983), Adamana phase sites are distinctive in terms of their location, architecture, and ceramics. This "strong normative pattern" has been argued to reflect an alliance characterized by specialized production, trade and exchange, and possibly social ranking. However, some of the data that Plog uses to support the presence of an alliance need further substantiation. For example, at least some of the sites appear large due to recurrent seasonal occupation, rather than due to simultaneous habitation by large numbers of people (Burton 1991).

Conventionally, the Basketmaker II period is characterized by the *absence* of ceramics. At Petrified Forest, the distinction between sites with this aberrant brown ware and those with diverse Basketmaker III assemblages, as well as very early radiocarbon dates for the Adamana Brown (Burton 1991, 1992), seem to warrant the early designation. In addition, the shallow, saucer-shaped pit houses that date to the early period closely resemble those of Basketmaker II pit houses elsewhere in the region.

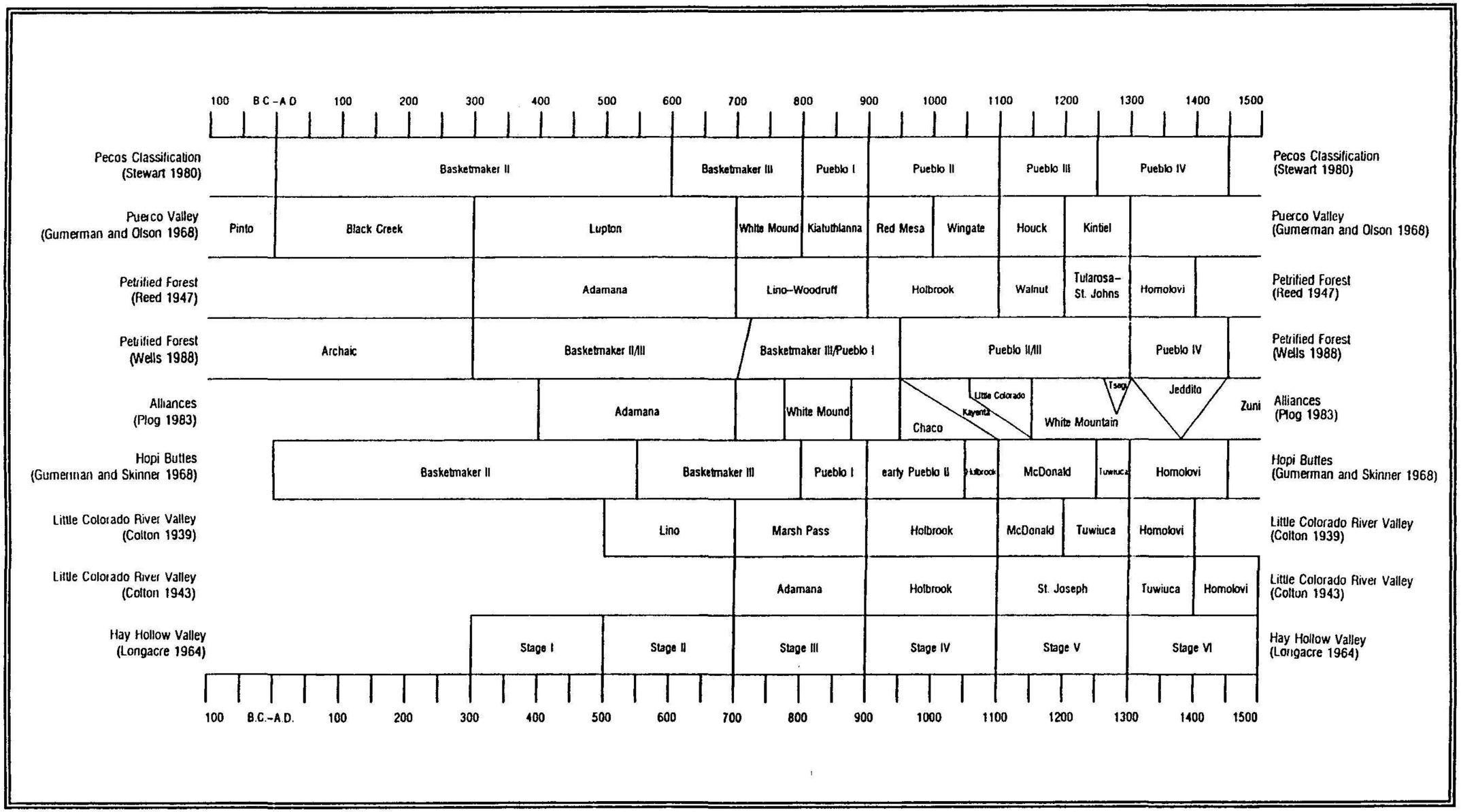

Figure 1.2. Chronologies developed for Petrified Forest and the surrounding area.

Basketmaker III-Pueblo I Period

This period (A.D. 700-950) is recognized by the presence of Kana-a Black-on-white, Kiatuthlanna Black-on-white, Woodruff Brown, and Lino Black-on-gray ceramics. Lesser amounts of Red Mesa Black-on-white may also be present. Trough metates and corner-notched projectile points are indicative of this and later periods. This period sees the establishment of the first year-round villages about A.D. 700 and the development of one-level decision-making hierarchies between A.D. 700 to 1100 (Lightfoot 1981). Settlements are located in diverse topographic settings and include from five to 15 pit houses. In general, the pit houses are deep and have associated features such as wall niches, floor pits, and entry ramps. Surface and subsurface storerooms are also common. Fourteen percent of the recorded sites at Petrified Forest, including the excavated Twin Butte site (Wendorf 1953) and two loci of AZ Q:1:42 (Jones 1983), date to this time period.

Pueblo II-III Period

This period, dating from A.D. 950 to 1300, is characterized by the introduction of corrugated pottery, above-ground habitation rooms, slab metates, and side-notched projectile points. Roughly 80 percent of the recorded sites at Petrified Forest date to this time span (Wells 1989). Sometimes sites can be divided into early (A.D. 950-1100) and late (A.D. 1100-1300) based on ceramics and, to some extent, architecture. Some pottery types such as Holbrook Black-on-white, Puerco Black-on-white, Black Mesa Black-on-white, and Showlow Black-on-red are common throughout the Pueblo II and Pueblo III periods; others are found only at later sites: Walnut Black-on-white, Padre Black-on-white, Tularosa Black-on-white, Snowflake Black-on-white, and St. Johns Polychrome. Early sites appear to be clustered around great kiva sites, such as McCreery Pueblo (Jones 1986), the Plaza Site (Gumerman 1988), and the Sundown Site (Gumerman and Skinner 1968), or possibly around other larger villages (Wells 1988:150). Site clusters appear to be regularly spaced across the landscape, with habitation expanding into new, previously unexploited microenvironments.

Lightfoot (1981) suggests that two-level decision-making hierarchies began to emerge between A.D. 1100 and 1250 in response to population and environmental pressures. In the Little Colorado River region, sites become larger (up to 50 rooms) but fewer in number after A.D. 1000. It has been suggested that this aggregation did not occur in areas such as Hopi Buttes and Petrified Forest because of their fragile and marginal environments (Gumerman and Skinner 1968; Jones 1987; Wells 1989). However, based on recent survey data aggregation, albiet on a smaller scale, also seems to be the case at Petrified Forest (Burton 1993:33-35). Of pueblo-period sites with over 10 rooms all have Pueblo III or later ceramics.

Excavated Pueblo II and III sites within the park include Agate House (Cosgrove 1934), NA 10,808 (Harrill 1971), and four small sites along the park mainline road (Jones 1983, 1986). The excavated Dobell site, just outside the southern park boundary (Harrill 1973), also dates to this period.

Pueblo IV Period

Pueblo IV sites (A.D. 1300 to 1450) contain small triangular projectile points and a variety of ceramics including Homolovi Corrugated, Homolovi Black-on-red, Awatovi Black-on-yellow, Jeddito Black-on-yellow, Homolovi Polychrome, Pinedale Polychrome, Fourmile Polychrome, and Zuni Glaze wares. Piki stones and kachinas in rock art mark the introduction of the Kachina cult during this time span, with evidence pointing to its introduction between A.D. 1350 and 1400 (Adams 1981, 1991).

The Pueblo IV period has traditionally been divided into an early (Tuwiuca) and late (Homolovi) phase (Colton 1939); typically the late phase is marked by the introduction of Zuni Glaze ware and

Jeddito Black-on-yellow pottery. Only four percent of the sites in Petrified Forest have been attributed to the Pueblo IV period. Only two large Pueblo IV sites are known in the Petrified Forest region. Puerco Ruin, within the park along the Puerco River, and Stone Axe Pueblo, at a spring 7 km (4.3 miles) southeast of Puerco Ruin. Only a handful of smaller Pueblo IV sites, such as artifact scatters and rock art, have been recorded within the park. The entire Petrified Forest region was seemingly abandoned by the end of Pueblo IV times, although pueblo groups may have continued to use the area for resource procurement or as a travel corridor.

Four separate excavations have been conducted by the National Park Service at Puerco Ruin (Burton 1990; Cosgrove 1934; Jennings 1980; Schroeder 1961). Other excavated Pueblo IV sites in the vicinity include a small rockshelter south of Puerco Ruin (PEFO Site 171; Gale 1941) and Stone Axe Pueblo (Hough 1903). Excavations at Puerco Ruin indicated occupation from about A.D. 1250 to 1380; it was apparently founded during a period of drought conditions. A wide variety of non-traditional food resources may indicate environmental stress. Pottery and other artifacts suggest ties with the Hopi, Homolovi, Flagstaff, Gallup, and Zuni areas, with some evidence of the increasing importance of Zuni/Gallup trade. Widespread burning of rooms and stored food suggests a rapid abandonment.

Regional Research Focus

Research activity in the middle to upper Puerco and Little Colorado river valleys has accelerated in recent years, in large part due to development by the Navajo Tribe as a result of Navajo-Hopi relocation, and to increased work in state and national parks. Recent research in the region has focused on regional trade (e.g., Douglass 1987; Toll 1991), the Archaic-Basketmaker transition (e.g., Burton 1992, Fowler 1991), growth and westward extension of the Chaco network (e.g., Warburton and Graves 1992), and transition from the prehistoric to protohistoric period (e.g., Adams and Hays 1991; Burton 1990). Threads running through much of this research are the marginal nature of the landscape and resources, and the cultural boundary situation that appears to occur. An extensive summary of background information, previous investigations, and culture chronology for Petrified Forest National Park has been presented by Burton (1993, in press), Jones (1987), and Stewart (1980). The following general research domains, which subsume more recent research, are enumerated below.

Chronology

The park is at the boundary of the Mogollon and Western Pueblo (Anasazi) archeological culture areas, and within the Pueblo area, between the Winslow and Chaco branches. Yet, the identity of archeological remains in the vicinity of the park and their occupation dates do not correspond well to existing chronologies for those areas. Refinement of local chronologies and classifications and determination of the relationship that the people from Petrified Forest had with surrounding groups will be possible with additional analyses of artifacts, features, and nonartifactual specimens, such as radiocarbon samples. Accurate dating of particular sites would allow an assessment of the role of each site in regional prehistory. In addition, this is an area of the Southwest that was inhabited continuously from about 300 B.C. to A.D. 1380, when other areas had periods of depopulation. The analysis of prehistoric chronology at Petrified Forest will contribute to our understanding of population dynamics throughout the Colorado Plateau for this broad period.

Economic Orientation

The nature of the extrariverine settlement along the middle Little Colorado and Puerco river valleys is largely unknown; whether sites represent the remains of dry farming, gathering, and hunting activities should be determined. Collections of fossil pollen and flotation samples, as well as careful screening of excavated deposits to retrieve macrofossils, will help reconstruct the past environment and interpret human adaptation at these sites. As demonstrated by Gumerman (1988) for the nearby Hopi Buttes area, studies of a broad range of environmental data can help facilitate explanations of the cultural and economic differentiation of prehistoric groups. Those data can be used as a baseline with which to compare Petrified Forest data.

Regional Interaction and Trade

Because cultural boundaries often are intangible, determination of prehistoric boundaries is difficult. The study of prehistoric trade goods, both imports and exports, is important in this regard. At Petrified Forest, discovery of procurement locations and routes of dispersal of petrified wood regionally, as well as locally, would illuminate, if not drastically change, perceptions of regional trade. Studies to determine pottery-production localities, such as that conducted by Douglass (1988) for Little Colorado White Ware, is another important topic. Data from a variety of site types, isolated from the more densely populated drainages, will be significant in refining the definitions of trade and interaction networks. Detailed intrasite and community analyses of architectural style and artifact assemblages, such as conducted by Warburton and Graves (1992), can also differentiate between local cultural developments and those originating elsewhere. They were able to determine that the Navajo Springs Great House was a scion, or colony, of the Chaco network, rather than an ancestral local community, which later took on the veneer of Chaco culture.

Technological Change

Studies of the human use of petrified wood are especially important because of its widespread use, both geographically and temporally. Unusually large lithic scatters and quarries have been noted in the park (Burton 1993; Hammack 1979). Further inquiry into patterns of stone procurement, processing and use, and patterns of dispersal of raw materials and finished products is needed. For example, differentiation between the products of primary and secondary reduction at quarries and sites will provide information on what types of material, whether raw material or finished tool, were being transported or traded. Changes in lithic technology through time should be investigated to help determine the relationship of pre-pottery hunters to others of the same tradition. Synchronic studies illuminate their relationships with others of the same horizon.

Site Description

McCreery Pueblo is located on the southeast-facing edge of a mesa about 15 m high (Figure 1.3). The relatively flat grassy area, at approximately 5,460 feet (1,664 m) in elevation, overlooks multicolored eroded badlands, which drain into Dead Wash, one of the larger tributaries in the park. Although the drainage, about 1.1 km (3/4 mile) away, is lined with cottonwoods, tamarisks, and other riparian vegetation, it is dry most of the year. Dead Wash joins the Puerco River 3.5 km (2 miles) to the south of the site. The source of water for domestic uses during the time McCreery Pueblo was inhabited is uncertain. A friable, crumbly sandstone that forms the caprock of the mesa was used for

Figure 1.3. Aerial view of McCreery Pueblo and Dead Wash (rubble mound at arrow).

building material. One small log of beige petrified wood, unsuitable for flaked-tool manufacture, is weathering out of the surface; raw material for flaked stone must have been obtained from the badlands elsewhere. The vegetation on-site is transitional desert-grassland. The soil is silty sand, and areas between the bunch grasses are deflated.

The McCreery Pueblo site, measuring only 70 m by 80 m, includes two substantial structures and 10 additional features. All architectural features were constructed of crumbly, light brown, fine-grained sandstone probably obtained from the cliff at the edge of the mesa. Structure 1 is a large circular depression, about 18 m in diameter by 75 cm deep, with a well-defined exterior wall of upright sandstone slabs. A 3.8-m-wide break in the wall on the southeast may have been an entryway.

Structure 2 is a U-shaped room block, 18 m by 14 m, with at least five rooms. The relief of the structure is more than 1.6 m with the highest section on the northwest corner. One or two of the rooms of the west wing may had two stories.

Feature 1 is a trash mound, 13 m by 15 m minimum, which lies about 8 m southeast of the room block. The low mound, about 25 to 50 cm high, has a small L-shaped depression, 2 m by 2 m, in the south side, which may be a pothole. Features 2 through 6 are small rubble mounds; the rubble seems too sparse to indicate habitation rooms with masonry walls of full height. Of interest to the Hopi consultants, Features 7 and 8 are respectively, five to eight rock slabs in a cluster, 2.4 m by 1 m, and a small rubble mound, about 4 m by 2.5 m. During a site inspection, Hopi consultants indicated that these features may be shrines, which they would like to see excavated. Feature 9 is a sparse artifact scatter, 10 m by 7 m, in a small shallow basin, 90 m north-northwest of the room block. Feature 10 is a small pile of six sandstone slabs, 2 m by 1 m. Most of the surface artifacts at the site were clustered around the individual features. Analysis of surface artifacts by feature produced samples too small to allow development of a construction sequence and site chronology (Jones 1986:80).

Previous Work at McCreery Pueblo

Although McCreery Pueblo fell within the purview of the first archeological survey of the park and environs by H. P. Mera in 1933, the site was overlooked. Not until 1939 did Erik K. Reed, an archeologist with the National Park Service, and Howard Stagner, a park naturalist at Petrified Forest, locate the site. Petrified Forest Site Number 236 was assigned when Reed and a park ranger, Bennet T. Gale, made the first record on August 13, 1940. A scant three lines of description note a small sandstone pueblo, "60' or 75' each way," and a "Stone circle approx 45' diam," in good condition and located "on rim of point." No sketch map was made. The record was submitted to the Museum of Northern Arizona and assigned the site number NA 4936. No specific mention of the site is made in Jepson's (1941) or Reed's (1980) reports on the work conducted at the park.

Site 236 became known to park staff as the Amphitheater Site (Stewart 1980). However, because it is surrounded on three sides by badlands scarps about 15 m high and because there is no access from the park, it is rarely visited, except by park patrols. The major impact on the site was grazing, prevented by fencing in 1986. Prior to addition to the park, the area was subdivided into 40-acre parcels and sold to a retired couple, but was never developed.

In 1975, Stewart recorded, mapped, and photographed the site and made a small surface collection of ceramics for dating. She described the site features in some detail and compared it to similar sites in the region (Stewart 1980:101-103). Her original map (dated 3/76) is in the archives at the Western Archeological and Conservation Center. The other records and the collection could not be located and presumably were lost, because the site was recorded again on March 26, 1981, by Mark Baumler. This record was submitted to the Arizona State Museum and assigned the number AZ K:13:41(ASM).

Owing to the rarity of such sites, Stewart (1980:138) recommended that Site 236 be purchased by the park. After the parcel was purchased for donation to the Archaeological Conservancy, permission was received to conduct 2.5 days of surface reconnaissance in June 1985. The work by Jones (1986:67-89), including instrument mapping and surface collection, is the basis of the following research design.

Site-Specific Research Questions

Research within Petrified Forest National Park in the last 10 years has paralleled regional trends. Within the limited extent of the present work, the following questions were posed in the original research design (Jones 1992).

Preservation

While McCreery Pueblo is not a large site, it includes two substantial structures and 10 smaller features. All architectural features were constructed of crumbly, fine-grained sandstone. The quality of preservation of the structures or of other artifacts was difficult to ascertain from surface examination, although chunks of burned mud plaster seemed to signify good subsurface preservation. Testing subsurface contexts will allow assessment of preservation of both architecture and of perishable material important in the study of subsistence and other activities at the site. Re-establishing the collection grid used in 1985 will allow additional field inventory as a measure of the degree of surface soil deflation that has occurred since the original work. Deflation, dune movement, and alluviation are major problems at sites in the Petrified Forest.

Site Chronology

Surface collections indicate a relatively short occupation span for the site, between A.D. 1075 and 1125 (Jones 1986). This may be the result of using the somewhat archaic type-ware classification on a small sample of surface ceramics. Also, the presence of discontiguous surface features and structures, the density of adjacent trash, and the depth of the midden, a low mound 25-50 cm high, indicates the possibility of a longer occupation span or earlier components. Testing of the midden deposits and portions of outlying features and analysis of diagnostic artifacts will address this question.

Site Structure

Past researchers have described the large depression as a dance court, and alternatively as a great kiva. Testing with examination of masonry style and construction features will help differentiate the two. Functional interpretation of this structure is critical to understanding the role of this site within the community and within the regional system. Also there is little doubt that the depression and the large rubble mound were associated; however, surface reconnaissance allowed no determination of the temporal and functional association of other discontiguous features. Selected testing of the outlying features can provide data regarding this problem.

Particularly important in this arena is a better determination of the construction sequence for the site, to discern whether a small local community existed ancestral to the construction of the structures with Chaco-like features. This would best be done by extensive excavation and exposure of wall tops; however, in the interests of preservation, we hope to address this issue by assessing chronological indicators within the artifact assemblages.

Economic and Political Affiliation

Based on a small sample of the surface collection, the ceramic assemblage is predominately Little Colorado white and gray wares, with a large proportion of Cibola White Ware, and some White Mountain Red Ware, Mogollon Brown Ware, and Tusayan white and gray ware (Jones 1986). Examination of the masonry style of large structures will help determine if the site was part of the Chaco network. Ceramic assemblages from undisturbed subsurface proveniences can help inform on the political and economic relationships between the Winslow and Chaco branches and to establish how this special-purpose site fits between two regional systems. Were the Petrified Forest peoples pawns with changing allegiances on the edge of the various core areas, or were they active middlemen along an important regional boundary? Attribute analyses for vessel form, function, and style will be performed on the larger collection.

Methods

The excavation yielded abundant data to address the research questions posed above. Two structures, five features, and two extramural areas were tested, and a 5 m by 5 m area within Feature 1 (trash mound) was surface collected.

Field methods were generally the same as those used at other sites recently excavated at Petrified Forest (Burton 1990, 1991). Most units were screened through 1/4-inch mesh; to provide a control two 1 m by 1 m units, one in Feature 1 and one in Feature 5, were screened through 1/8-inch mesh. After initially screening of wall fall in the two structures and finding few artifacts, wall fall was generally no longer screened. Units were either placed on the grid system established during the 1985 surface

collection or at right angles to apparent walls. Horizontal provenience was limited to 1 m by 1 m or 1 m by 2 m units and slightly larger units within Room 1, Structure 2. Vertical provenience was maintained in 10 or 20 cm levels or smaller stratigraphic intervals.

During the course of the excavation over 470 lots of artifacts and samples were collected. This included abundant flaked-stone artifacts, predominately petrified-wood flakes. Sherds recovered consisted of corrugated, smudged, plain, and decorated wares. The decorated wares were predominantly black-on-white types with some black-on-red. Two partially restorable ceramic vessels, both from the floor of a room, were recovered. Other artifacts recovered included ground stone, hammerstones, and ornaments. Numerous and varied floral and faunal remains were also recovered. Other samples collected included pollen, flotation, charcoal, pigment, and daub.

All materials from the excavation were transported at the end of fieldwork to the Western Archeological and Conservation Center (WACC). Sherds and lithics were cleaned using tap water and a small amount of isotonic soap. Bone and shell were dry cleaned using toothpicks and brushes. Artifacts and samples not sent to specialists for analysis were analyzed at WACC. Flaked stone and ceramics made up the bulk of analyzed artifacts, with ground stone and other miscellaneous items present in lesser quantities. Certain materials, such as charcoal, daub, and plaster samples, were cataloged without further analysis.

Materials requiring specialized analyses were sent to the following persons or institutions: ceramics to Christine Goetze (Desert Archaeology, Tucson, Arizona), pollen samples to Suzanne Fish (Arizona State Museum), faunal remains to Jennifer Waters (Department of Anthropology, Arizona State University), and flotation samples to Marcia Donaldson (Department of Anthropology, Arizona State University). Samples for radiocarbon dating were sent to Beta Analytic, Inc., Miami, Florida. Methods and results for each of these analyses are presented in the following chapters.

After analysis, artifacts and samples were assigned permanent catalog numbers by the Museum Collections Repository staff at WACC following the Automated National Catalog System (ANCS). The ANCS catalog numbers are used in this report. The Petrified Forest National Park Accession Number is 541, and the WACC Accession Number is 803. All artifacts, faunal specimens, botanical remains, and mineral samples are curated in the Museum Collections Repository at WACC. Field notes, drawings, and maps are curated in the WACC Division of Archeology Archives. Photographs, slides, and negatives are curated in the WACC library (Accession Number 92:6).

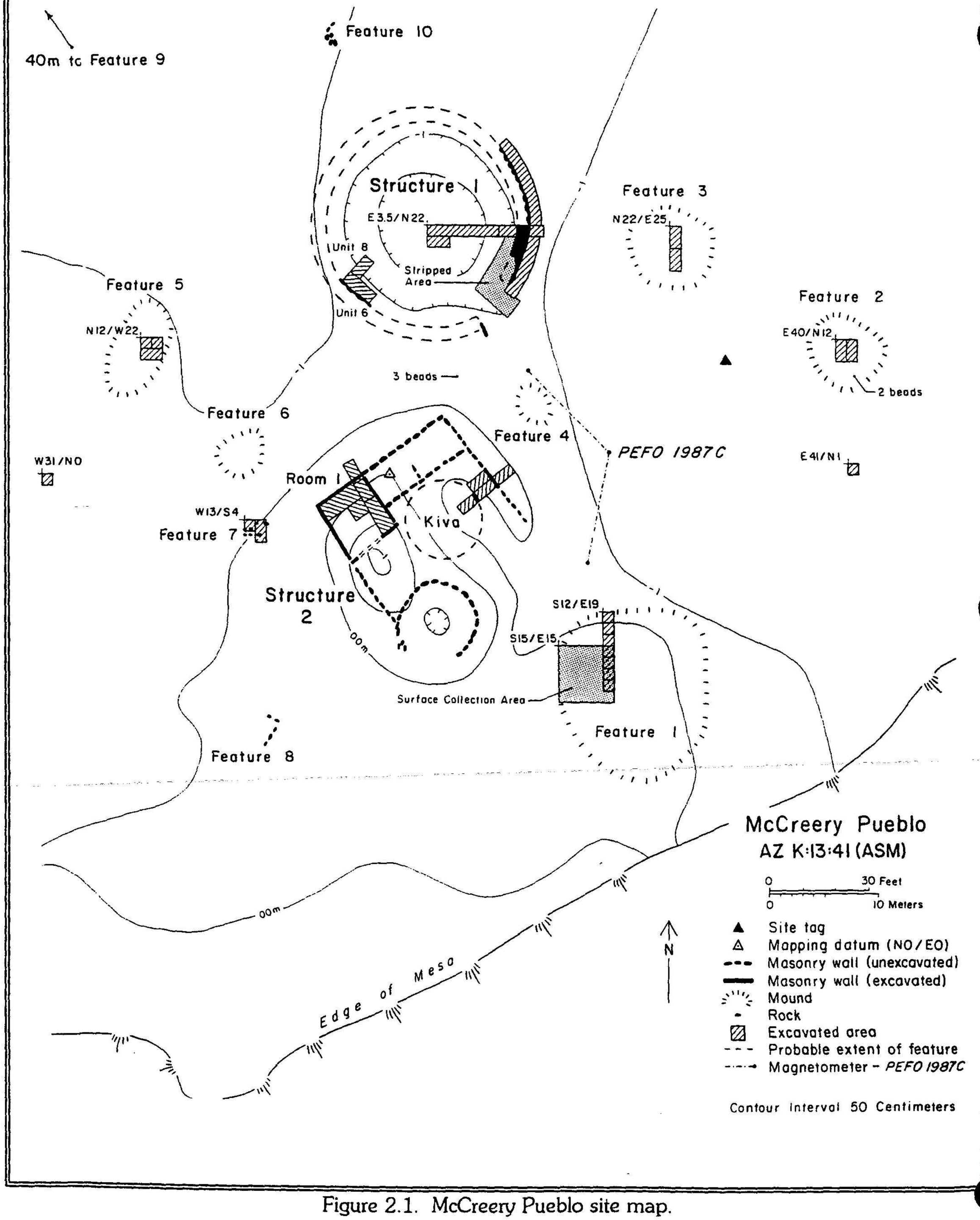

Figure 2.1. McCreery Pueblo site map.

Chapter 2
Architecture, Features, and Stratigraphy

This chapter describes the characteristics of the architecture, features, and stratigraphy at McCreery Pueblo. The site consists of a great kiva (Structure 1), a room block or pueblo (Structure 2), and 10 adjacent features. Both structures, 5 of the 10 features, and 2 extramural areas were tested (Figure 2.1). In all, over 65 square meters were excavated. The depth of the cultural deposit varied from 10 to 175 cm deep, with an average depth of 60 cm. In addition to the excavation, a 5 m by 5 m area within Feature 1 (a trash mound), that was completely surface collected in 1985 (Jones 1986), was recollected to determine if significant erosion is taking place at the site.

Structure 1 (Great Kiva)

This structure is a large circular depression, roughly 18 m in diameter, with a well-defined exterior wall of vertical sandstone slabs (Figure 2.2). A break in the southeast portion of the wall suggests an entryway. Excavation at Structure 1 included both trenching and area exposures (see Figure 2.1).

Testing within the structure revealed that the occupation or use level was a flat excavated area encircled with a low earthen berm. The berm was capped or reinforced by a low masonry wall consisting of upright sandstone slabs on the exterior and interior, with up to three courses of rubble fill and dressed stone laid horizontally between the upright slabs (Figures 2.3-2.5). A slab-reinforced bench-like feature follows the interior perimeter (Figures 2.6 and 2.7). The bulk of the bench is supported by the earthen berm, faced with two to three courses of sandstone slabs along the edge and topped with single larger slabs. Below the bench a clay-reinforced shoulder slopes to a relatively flat, sandy clay floor. In the center of the depression this floor (or use surface) was at 33 cm below the present ground surface. The fill above the floor contained small bits of charcoal and a few sherds while the floor surface itself had ashy/organic stains on its slightly compact surface. Most of the few artifacts recovered at Structure 1 were from within the dirt berm, below the masonry walls. No floor features or evidence of roofing were encountered in the limited excavations.

Structure 2 (Room Block)

Structure 2 is a U-shaped rubble mound, 18 m by 14 m by 1.6 m high, representing a block of at least five rooms. There is a round 7-m-diameter depression in the southwest corner of the rubble mound. This depression has been previously postulated to be a kiva, however it seems just as likely that it represents a pothunted room. The height of the mound in that area suggests one or two of the rooms may have been originally two stories high. Two areas within the room block were selected for excavation, including portions of one room (Room 1) and the east wall of a possible courtyard (see Figure 2.1). A small kiva and two other features was encountered during excavation in the courtyard.

Room 1

This room is located along the northern exterior wall in the northwest corner of the pueblo. Approximately 55 percent of this room was excavated to floor level (Figure 2.8). Interior dimensions are 5.5 m north-south by 5.1 m east-west (floor area of 28.1 square meters). The walls are

Figure 2.2. Overhead view of east end of Structure 1 after excavation (shadow is from camera bipod).

Figure 2.3. Exterior east wall of Structure 1 after excavation (portion south of trench).

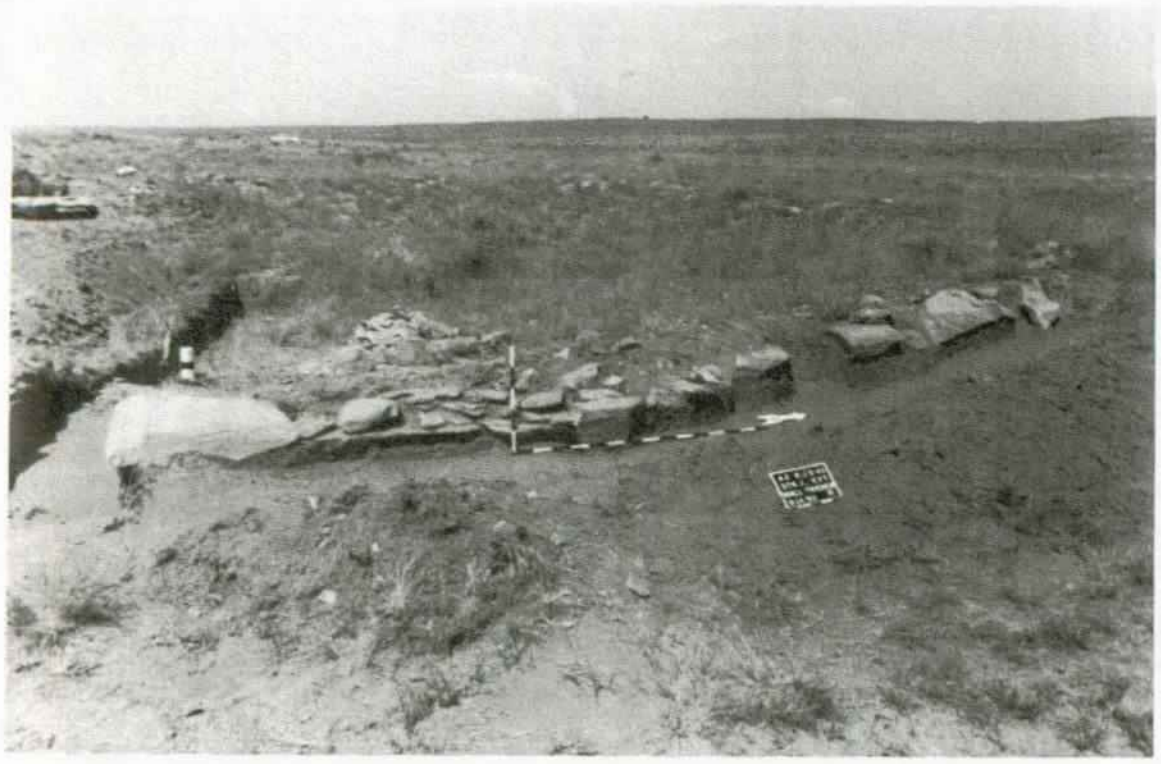

Figure 2.4. Exterior east wall of Structure 1 after excavation (portion north of trench).

Figure 2.5. Excavated trench through east wall (berm) of Structure 1, view towards north.

Figure 2.4. Bench along interior of west wall after excavation.

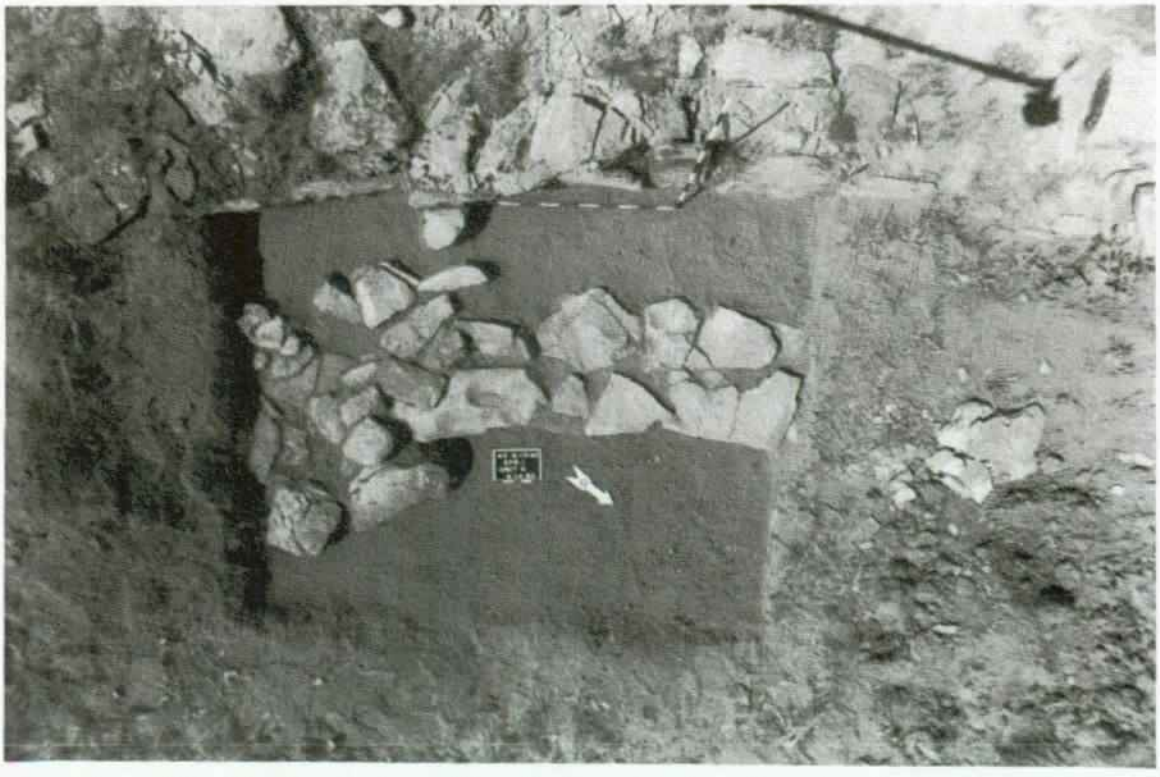

Figure 2.7. Overhead view of bench along interior of west wall after excavation.

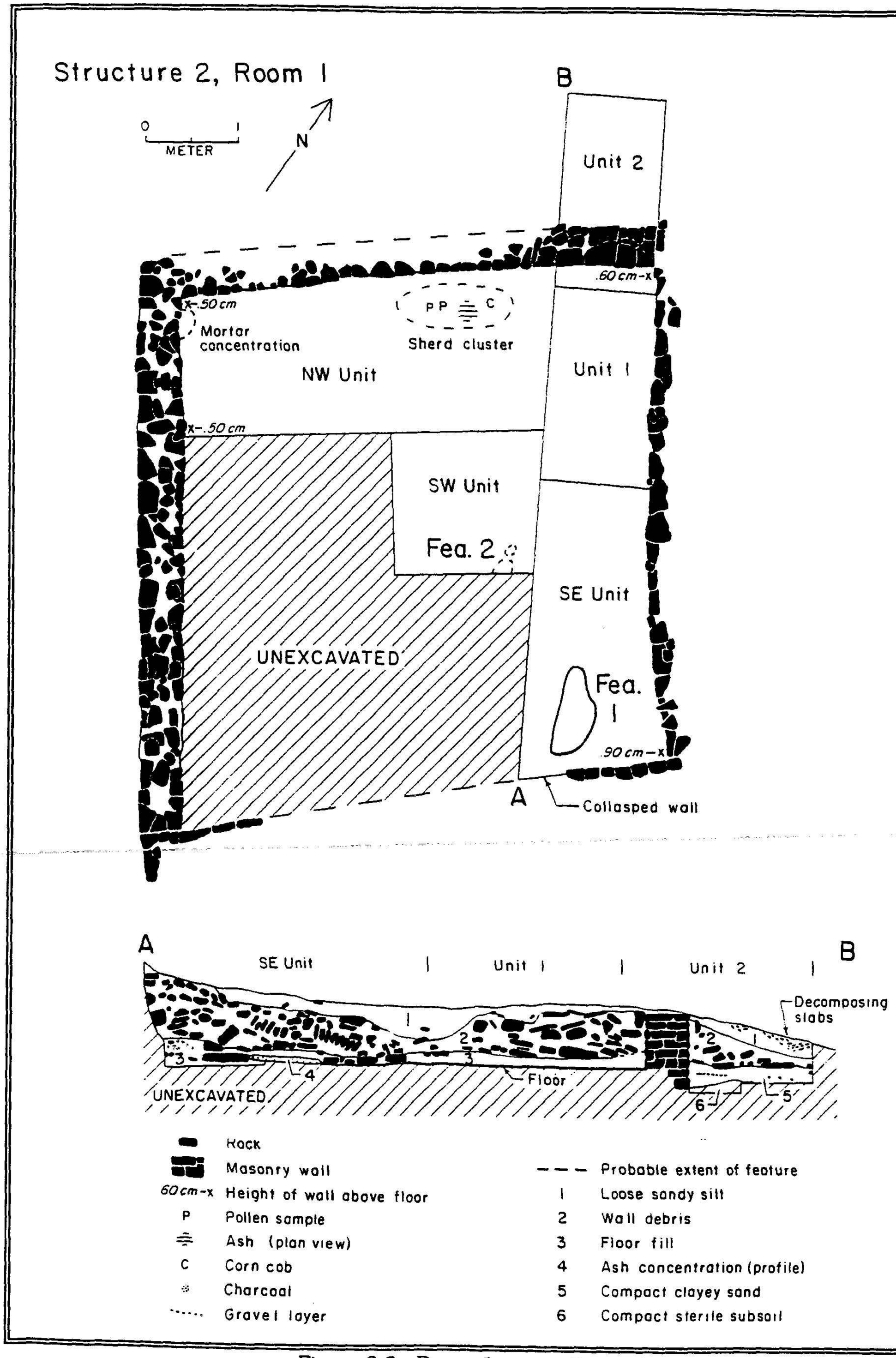

Figure 2.8. Room 1 excavation units.

corrugated jar and a white ware bowl, a few other sherds, and a burned maize cob fragment.

Courtyard

Four contiguous 1 by 2 m units were excavated on the east side of the room block: three in a courtyard area and one on the outside of the exterior wall. Surface inspection in 1985 had suggested that storage rooms could be present along the outside wall; the possibility of a kiva in the interior was suggested by Stewart (1980).

Encountered in the excavation units were portions of the masonry wing wall visible on the surface, two pits (Features 1 and 2), and a kiva (Figure 2.10). The area along the outside wall identified as

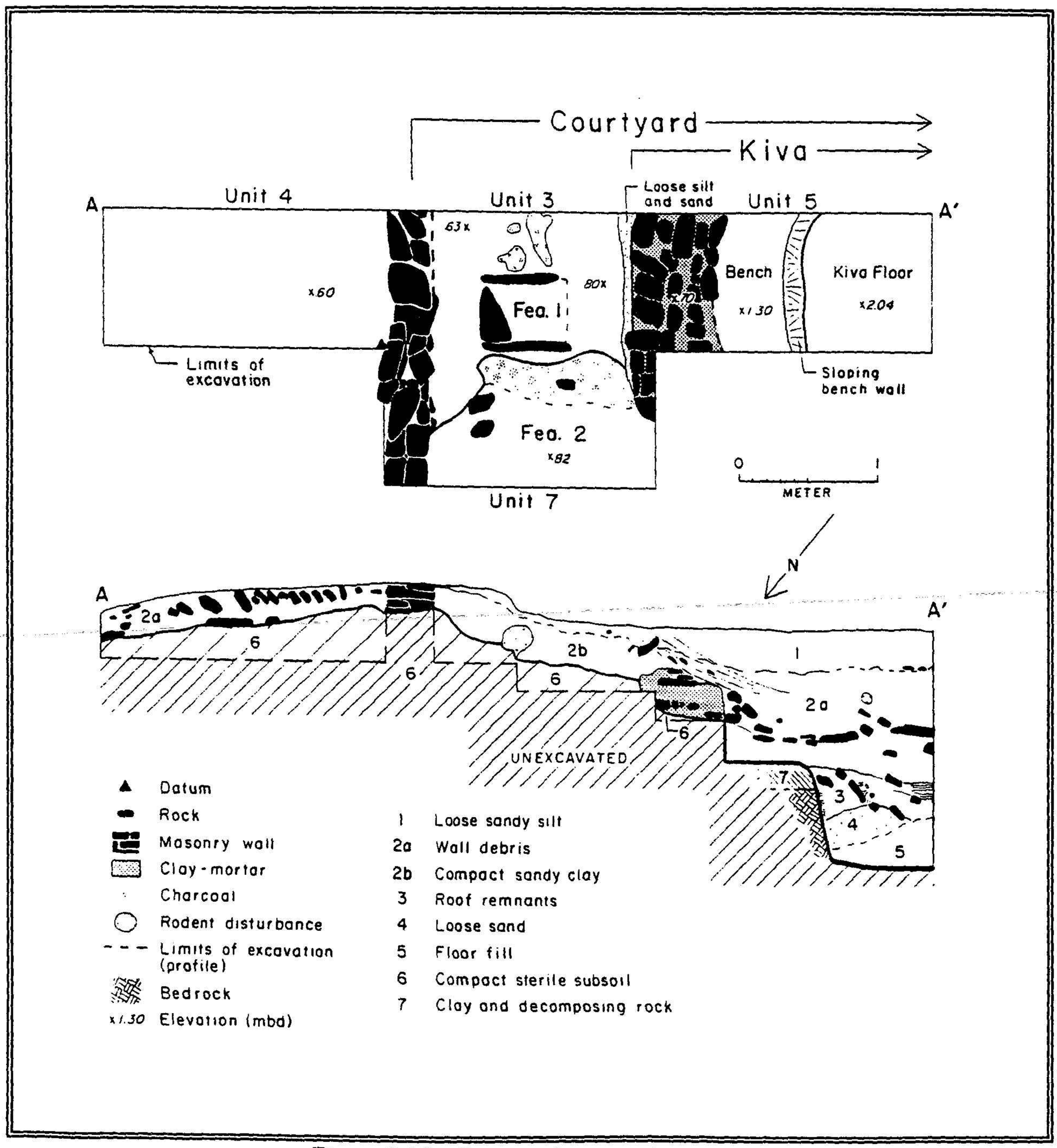

Figure 2.10. Courtyard excavation units.

possible storage rooms turned out to be a segment of the wing wall that had collapsed as a single unit. Abundant artifacts and ecofacts were recovered; most notable were a large milling slab and fragments of eggshell in Feature 1.

Wing Wall

The wing wall extends 8.5 m out from the room block, enclosing a courtyard area of about 75 square meters. In the excavation units only three courses of the double-width wall remain. The collapsed section of wall in Unit 4 suggests an original height of at least 1.5 m. The 35-cm-thick wall is constructed of thinner, less massive slabs than those exposed in Room 1. The wing wall was likely a later addition; massive sandstone blocks under a portion of the wing wall in Unit 7 may have been from excavation of the kiva.

Kiva

The kiva discovered in the courtyard was dug 50 cm into bedrock (see Figure 2.10). The floor itself consists of a combination of compacted clay (7.5 YR 5/4) and decomposing sandstone bedrock, with charcoal flecks and white plaster specks on the upper surface. A bench, 70 cm above the floor, was constructed by capping bedrock around the perimeter with clay mixed with sandstone gravels. Remnants of mud plaster were still present at the base of the bench. Based on the small portion excavated, the kiva is apparently circular, possibly up to 7 m in diameter.

The kiva fill consisted of five discernable strata (see Figure 2.10). The uppermost consisted of 30 cm of loose brown (7.5 YR 4/2) wind-blown sand. This was underlaid by 95 cm of wall fall consisting of abundant sandstone slabs and blocks and compact brown (7.5 YR 5/4) clay with gravels and sand. Beneath this was a 15-35-cm thick layer of possible roof fall that contained compact sandy clay, sandstone slabs, and abundant charcoal, including sticks and twigs. A sample of the sticks was radiocarbon dated to 650±80 B.P. (Beta-60047). Below this was a pocket of loose sand which appeared banked against the kiva wall. Floor fill consisted of a 10-35-cm-thick layer of compact sandy clay, rock, artifacts, and charcoal. A thin discontinuous layer of ash occurred on the kiva floor.

The kiva does not appear to have been deliberately trash filled. Artifacts within the kiva are likely from two sources. Artifacts on the floor and in floor fill may have been dumped just prior to abandonment or left as de facto refuse. Artifacts in other strata doubtless eroded in later; any courtyard surface (and associated artifacts or trash) in use at the same time as the kiva would have eroded into the kiva after the kiva walls collapsed inward.

Feature 1

This feature is a sandstone slab-lined hearth, 40 cm by 60 cm by 35 cm deep, dug into sterile subsoil (see Figure 2.10). Sandstone slabs were still in place on two sides of the pit, one was collapsed, and a fourth may have been removed prehistorically. One of the slabs had been used previously as a milling stone. Fill within the feature consisted of dark grayish brown (10 YR 4/2) ashy sand with gravels, flecks of charcoal, small sandstone slabs, sherds, flakes, and eggshell.

Although the feature is at right angles to the wing wall, it apparently predates both the wing wall and the kiva. The upper most portion of Feature 1 is below the base of the wing wall and the bottom of the large sandstone blocks thought to be from the excavation of the kiva.

Feature 2

This feature is a trash-filled pit encountered in Unit 7 (see Figure 2.10). The extent of the feature is unknown; because the pit extended out of the unit only a portion was excavated, and due to time constraints excavation was halted at 80 cm. The loose silty sand pit fill contained large sandstone blocks in the upper portion (possibly discarded during excavation of the kiva) and small sandstone slabs, charcoal, charred seeds, sherds, and flakes in the lower portion. The pit and fill was capped by debris from the collapsed wing wall.

Feature 1 (Trash Mound)

This feature, located 10 m southeast of the room block (Structure 2), is a trash mound 12 m by 15 m in size. Work here included surface collection of a 5 m by 5 m area and excavation of a trench consisting of seven 1 m by 1 m units (Figure 2.11). The cultural deposit extended up to 60 cm deep. Recovered were abundant sherds, flakes, two beads, a petrified-wood hammerstone, other hammerstone fragments, polishing stones, retouched flakes, ground-stone fragments, pigment, charcoal, and abundant faunal remains.

Figure 2.11. Feature 1 (trash mound) excavation, view towards south.

Three strata were identified (Figure 2.12). The midden (Stratum 1), up to 60 cm thick, consists of loose, rocky, dark grayish brown (10 YR 4/2) silty sand with charcoal bits, abundant artifacts, and roots. It becomes slightly compact with depth. Stratum 2 is a small pocket of compact reddish brown (5 YR 5/3) sand with a few artifacts and roots. It appears to be a mixture of midden and the underlying sterile subsoil. Stratum 3 consists of very compact pale brown (10 YR 6/3) clayey sand with small white calcium-carbonate nodules. It is culturally sterile with very few roots. Rodent burrows mar its upper surface.

Human remains were encountered 16 cm below the surface in one of the test units. As stipulated in the Documentation Plan prepared for the testing (Jones 1992), excava-

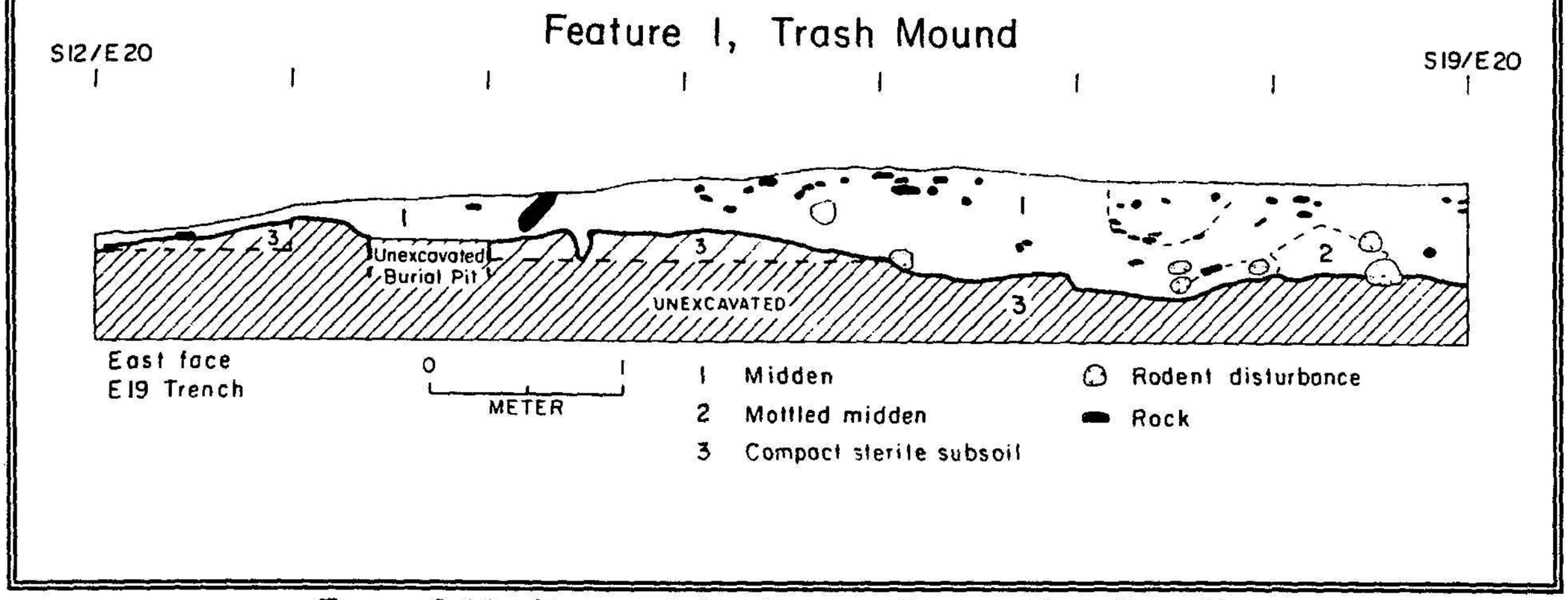

Figure 2.12. Feature 1 (trash mound) east sidewall profile.

tion was stopped in that unit and the burial was backfilled immediately. The remains appeared to be that of an adult, but the limited exposure precluded additional age or sex determination. The small size of the burial pit indicates the body was tightly flexed The location indicates it was placed in a pit dug through the midden and into sterile soil.

Feature 2

This 7 m by 6 m feature, originally postulated to be a detached structure was tested with two 1 m by 2 m units. Encountered in the excavation units were small sandstone slabs and chunks, sherds, flakes, and a small hammerstone in a thin (<10 cm) layer of loose sandy soil. Some of the sandstone rock was imbedded into the compact subsoil, but none of the rock was found in patterns that would suggest a structure. Rodent disturbance was common in the units. Two stone disk beads were found within this feature on an ant hill 1 m south of the excavation units. The abundance of rock and the lack of bone, which was common in excavation units in the trash mound and Structure 2, suggest the feature is predominantly construction debris.

Feature 3

Two adjacent 1 by 2 m units were excavated to trench a portion of this low 7.5 m by 7 m mound. The cultural deposit consisted of reddish brown sand and densely packed sandstone slabs and chunks (larger and more numerous than those in Features 2 and 5 [below]). Recovered within this rubble were a metate fragment, a mano fragment, several other ground-stone fragments, a stone bead (from the surface), and some daub, maize, and charcoal. No walls or occupation surface could be defined. The rubble overlay sterile compact sand (Figure 2.13). Once again, construction debris and trash seems a plausible explanation.

Feature 4

No work was conducted during the 1992 testing at this low 3.5 m by 2.5 m mound. On the surface this feature appears to contain smaller and less rock than the other features. During a 1990 site inspection three beads were collected from an ant hill just northeast of this feature. In 1987, during monitoring of the installation of a magnetometer, numerous artifacts were collected in the vicinity of this feature (see Figure 2.1). A small 20 cm diameter by 25 cm deep pit dug just north of the feature encountered four sherds and two flakes. A 10 cm to 15 cm wide and deep trench dug along the east edge of the feature encountered 12 flakes, five sherds, and a petrified wood hammerstone (Wells 1987). The relative lack of sandstone debris and the artifacts encountered in the vicinity during previous work suggests this feature may be a trash deposit.

Feature 5

Based on surface evidence this low mound, 9 m by 5 m in size, was thought to represent a burned jacal storage room (Jones 1986). The surface of the mound was covered with numerous small burned sandstone slabs and burned daub with stick impressions. This feature also contained the second highest surface artifact density (after the trash mound) during the 1985 surface collection (Jones 1986).

A block of two 1 m by 1 m units and one 1 by 2 m unit were excavated within this feature. As in the 1985 surface collection, these units contained some of the densest concentration of artifacts encountered in the excavations. Within a loose dark reddish brown (5 YR 3/4) sand with abundant roots, small sandstone blocks and slabs (some burned), fire-hardened daub fragments, and small artifacts were found to depth of 25 cm. A total of 20.3 kg of burned daub was collected from the excavation units. Also recovered from these units were two hammerstones and a small amount of bone. A small debris-filled pit was encountered within the excavation units (Figure 2.14). The pit was roughly 30 cm deep and 1 m in diameter at the top. Below the sandstone debris layer was compact brown to dark brown (7.5 YR 4/2-3/2) sandy soil with fewer artifacts and virtually no rock. This strata became sterile and very compact with depth. The subsoil showed no evidence of burning. No structure or postholes could be defined and the daub and sandstone suggests the feature may be debris and trash from the remodeling of a burned room within the room block (Structure 2).

Feature 6

No work was conducted at this low 4 m by 3.5 m mound located between the room block (Structure 2) and Feature 5. Surfacially it appears most similar to Feature 4.

Feature 7

On the surface this feature appeared as a concentration of eight sandstone blocks and slabs in a 2.5 m by 1 m area. During an earlier site inspection, Hopi consultants indicated that this feature and Features 8 and 10 (below) may be shrines, which they were interested in seeing excavated (Jones 1992).

One 1 by 2 m unit and a subsequent 1 by 1 m unit were set up, and vegetation and loose soil removed under the direction of Hopi monitors (Figure 2.15). The main purpose was to see if any

Figure 2.13. Feature 3 east sidewall profile.

Figure 2.14. Feature 5 south sidewall profile.

more rock was present below the surface. Only one artifact, a petrified wood flake, was recovered from these units. After initial clearing revealed no further rock, excavation was stopped at the request of the Hopi, who may recommend proceeding with the excavation after discussion with the Hopi Tribal Council. The excavation units were left as is and covered with a tarp.

Features 8-10

No work was conducted at these three features. Feature 8, southwest of the room block (Structure 2), is a low mound of sandstone rubble about 4 m by 2.5 m. Within the mound is an J-shaped rock alignment, possibly a wall remnant. Feature 9 is a concentration of artifacts in a shallow depression, 10 m by 7 m, located 100 m northwest of the room block. This concentration is likely the result of sheet wash from the main site area. Feature 10 consists of six sandstone slabs in a 2 m by 1 m area just north of the Great Kiva (Structure 1).

Extramural Excavation Units

Three excavation units were excavated in non-feature areas of the site (see Figure 2.1). Unit 2 (1 m by 2 m in size) was excavated adjacent to the north wall of the room block (Structure 2) on the exterior of Room 1. Unit E41/N1 (1 m by 1 m in size) was excavated in an area where a relatively high number of artifacts were collected during the 1985 surface collection. Unit W31/N0 (1 m by 1 m in size) was excavated 25 m west of the room block in the spot chosen for placement of an Archaeological Conservancy plaque.

Unit 2

This unit overlapped the wall, the small portion of the unit that extended into Room 1 was excavated separately from the remainder of the unit. Stratigraphy along the exterior wall consisted of four strata (see Figure 2.8). The uppermost stratum consisted of a 5 cm to 20 cm thick layer of loose dark grayish-brown (10 YR 4/2) sandy silt with a few decomposing sandstone slabs. The next stratum consisted of wall fall, 10 cm to 40 cm thick. It contains abundant sandstone slabs and blocks within a matrix of compact reddish brown (5 YR 5/3) sandy clay. This stratum contained an occasional artifact. Below the wall fall was a 15 cm to 25 cm thick layer of compact reddish brown (2.5 YR 4/4) clayey sand. Slabs, apparently from wall fall, lie flat on upper surface of this stratum. Few artifacts and little charcoal was present. A thin discontinuous layer of gravel within this stratum may have been a previous occupation surface. The final stratum encountered, at 40 cm to 70 cm below the surface, was a very compact sand with clayey silt. Small white calcium carbonate nodules were common in this culturally sterile deposit. The wall of Room 1 rested on this stratum.

Unit E41/N1

This area was originally thought to be a trash deposit associated with a possible structure at nearby Feature 2. However, it appears that the high artifact density encountered during the 1985 surface collection was due to soil deflation and erosion. Only eight small flakes and four sherds were recovered in an area that previously had a surface density of 53 artifacts per 5 m^2. None were recovered below 10 cm. In comparison, Feature 2, with less than 10 artifacts per 5 m^2 collected in 1985, contained abundant subsurface artifacts. Strata within Unit E41/N1 consisted of a thin layer of wind

blown sand and silt over reddish brown clayey silt. Sterile very compact clayey sand was encountered throughout the unit at 20 cm.

Unit W31/N0

No artifacts were found in this unit excavated in the location chosen for placement of an Archaeological Conservancy plaque. Strata consisted of a thin layer (<5 cm) layer of wind blown sand and silt over compact reddish brown clay. Sterile hardpacked clayey sand was encountered throughout the unit at 18 cm below the surface and continued for another 50 cm at which point excavation was terminated.

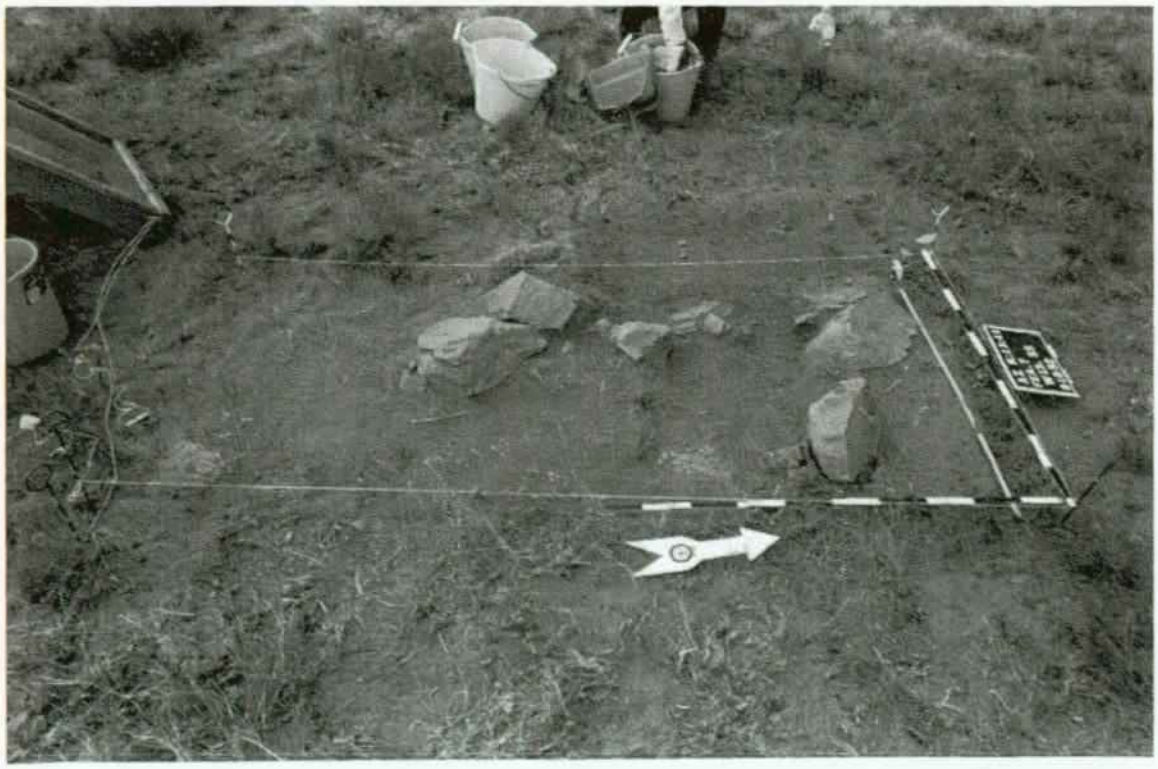

Figure 2.15. Feature 7 after excavation.

Chapter 3
Ceramic Analysis

Christine E. Goetze

During the course of excavations at the McCreery Pueblo, 5,128 ceramic artifacts were recovered from two structures and four features. A relatively diverse array of wares and types was recognized, and these are summarized in Table 3.1.

Methods

Prior to analysis, all ceramic material was processed at the Western Archeological and Conservation Center in Tucson, Arizona, then boxed and delivered to the ceramic specialist (Goetze) for examination. Direct data entry was used during the course of the analysis. This method is more efficient and accurate than the commonly used handwritten tabulations that involve an intermediate step between data recording and electronic file creation (Goetze, in press). To facilitate direct data entry, a computer station was set up and equipped with a binocular microscope and a digital scale. As temper identifications and other measurements were made, the information was entered directly into a data-base file, thus speeding the process of analysis as well as eliminating the need for a separate data entry operation. Range checking through the SYSTAT statistical program provided a means of verifying the accuracy of the data-entry procedure.

Aside from direct data entry, standard laboratory techniques were used during the initial sort analysis. Ceramics were bagged by field number (equivalent to bag number) during excavation, and this and other provenience information were entered into the data base from the field tag located within each bag. No systematic attempt was made to identify minimum numbers of vessels present; conjoins or sherd matches were noted when encountered during the analysis, however.

Tempering material was determined by breaking a corner of each sherd and examining it under the microscope at powers ranging from 15-20X. This allowed each sherd to be placed into a ware category and increased the potential for a specific type designation. In addition, each sherd was weighed to the tenth of a gram on a digital scale, and a thickness measurement was taken using digital calipers.

The selection of attributes for analysis was based on the need to maintain provenience information, to address questions related to site chronology and function, and to provide data for future research questions that may be both site specific or regional in nature. Toward this end, a total of 11 attributes was recorded for each sherd. Five of these provide provenience information, while the other six provide data necessary for dealing with the present and future research goals of the project.

Taxonomic Classifications

The classification of the ceramic material is based on standard published descriptions of the various wares and types recovered. These references are listed in Table 3.2. Type collections at both the University of Arizona's Archaeological Laboratory and at the Arizona State Museum were consulted to increase standardization.

Table 3.1. Frequencies of Ceramic Wares and Types Recovered from the McCreery Pueblo Excavations.

Ware	Type	Frequency	
Cibola White Ware			
	Undifferentiated	114	
	Undifferentiated, BMIII-PI	2	
	Kiatuthlanna Black-on-white	8	
	Red Mesa Black-on-white	12	
	Puerco Black-on-white	2	
	Escavada Black-on-white	25	
	Undifferentiated, PII-III	17	
	Gallup Black-on-white	59	
	Snowflake Black-on-white	3	
	Reserve Black-on-white	13	
	Subtotal/percent	255	(5.0%)
Tusayan White Ware			
	Undifferentiated	36	
	Kana-a Black-on-white	4	
	Black Mesa Black-on-white	8	
	Black Mesa or Sosi black-on-white	36	
	Sosi Black-on-white	32	
	Dogoszhi Black-on-white	1	
	Undifferentiated PII-III	3	
	Subtotal/percent	120	(2.0%)
Tusayan Gray Ware			
	Undifferentiated	3	
	Undifferentiated Plain	6	
	Undifferentiated Clapboard Corrugated	4	
	Tusayan Corrugated	13	
	Subtotal/percent	26	(0.5%)
Mogollon Brown Ware			
	Plain	16	
	Woodruff Plain Brown	103	
	Woodruff Plain Brown, Smudged	397	
	Reserve Plain Corrugated, Smudged	3	
	Reserve Plain Corrugated	12	
	Reserve Indented Corrugated	54	
	Reserve Indented Corrugated, Smudged	106	
	Tularosa Patterned Corrugated	10	
	Undifferentiated Showlow Red	40	
	Showlow Black-on-red	162	
	Showlow Black-on-red Corrugated	30	
	Showlow Red	140	
	Showlow Red, Smudged	105	
	Showlow Corrugated	14	
	Showlow Corrugated, Smudged	19	
	Subtotal/percent	1,211	(24.0%)

Table 3.1 (continued). Frequencies of Ceramic Wares and Types Recovered from the McCreery Pueblo Excavations.

Ware	Type	Frequency	
Undifferentiated Brown Ware			
	Obliterated Corrugated	54	
	Obliterated Corrugated, Smudged	1	
	Indented Corrugated	654	
	Clapboard Corrugated	61	
	Plain	232	
	Plain Smudged	14	
	Indented Corrugated, Smudged	38	
	Subtotal/percent	1,054	(20.5%)
White Mountain Red Ware			
	Undifferentiated	1	
	Subtotal/percent	1	(.02%)
Little Colorado White Ware			
	Undifferentiated	286	
	Holbrook "A" Black-on-white	30	
	Holbrook "B" Black-on-white	61	
	Holbrook "A" or "B" black-on-white	102	
	Padre Black-on-white	1	
	Walnut Black-on-white, Undifferentiated	1	
	Subtotal/percent	481	(9.0%)
Little Colorado Gray Ware			
	Undifferentiated	69	
	Undifferentiated Plain	201	
	Indented Corrugated	1,155	
	Clapboard Corrugated	133	
	"Moenkopi"-style Corrugated	132	
	Subtotal/percent	1,690	(33.0%)
Adamana Brown			
	Adamana Brown	7	
	Subtotal/percent	7	(.01%)
Miscellaneous			
	Red Ware, unknown series	3	
	Red Ware, smudged, unknown series	1	
	White Ware, unknown series	303	
	Plain Gray Ware, unknown series	3	
	Gray Clapboard Corrugated, unknown series	1	
	Gray Indeterminate Corrugated, unknown series	1	
	Unidentifiable	5	
	Subtotal/percent	317	(6.0%)
Total		5,128	(100%)

Table 3.2. References Used for Type Descriptions by Ware.

Ware	References
Cibola White Ware	McKenna and Toll 1984 Mills 1987 Sullivan 1984 Windes 1984 Windes and McKenna 1989
Tusayan White Ware	Ambler 1985 Colton 1955
Tusayan Gray Ware	Colton 1955
Mogollon Brown Ware (includes Showlow Red Ware)	Fowler 1991
Little Colorado White Ware	Colton 1955 Douglass 1987
Little Colorado Gray Ware	Colton 1955
White Mountain Red Ware	Carlson 1970
Adamana Brown	Burton 1991 Mera 1934 Wilson and Blinman 1991

In addition, recently completed taxonomic keys (Goetze and Mills, in press) were used to facilitate comparability between projects. The keys are hierarchically structured, using dimensions that contain mutually exclusive attributes. The initial classification of a particular sherd begins with a decision about its broad ware category, e.g., white ware, gray ware, red ware, or brown ware. Once the broad ware category is determined, a more specific ware identification is made based on temper type, paste color, and the presence of either mineral or carbon paint on decorated wares. After the specific ware has been identified, the sherd is then keyed out using various stylistic attributes that separate each type within that ware. These keys will be published in the cited volume and are not duplicated here.

Gray Wares

Two prehistoric gray-ware traditions are represented in the McCreery Pueblo ceramic assemblages, including Little Colorado and Tusayan Gray Ware. A combination of tempering material and paste color was used to distinguish sherds from both of these individual wares.

The complete lack of identifiable Cibola Gray Ware recognized from the assemblages, as well as the very small quantities of Tusayan Gray Ware present, suggest the likelihood of local production for the gray-ware sherds recovered from the site. Local production does not necessarily mean production at the site level, but reflects the recognition of paste and temper combinations that do not conform to traditionally defined ware characteristics from known core production areas. While compositional comparisons between sherds and locally collected clays are necessary to quantify the degree of local production, a subjective evaluation suggests that many of the gray-ware pastes *do* differ from those

more commonly associated with traditionally defined Little Colorado Gray Ware from other areas. Local production of gray-ware types has been previously noted in the Petrified Forest and elsewhere in the area (Crown 1981; Vint 1990; Vint and Burton 1990), and a similar production pattern may be present at the McCreery Pueblo as well. Because current knowledge of production and distribution systems of ceramics in the area is limited (Burton and Goetze 1993:157), a Little Colorado Gray Ware designation was assigned to the majority of the gray-ware sherds, with the caveat that these may not be comparable to what has been previously identified as Little Colorado Gray Ware.

Little Colorado Gray Ware

Little Colorado Gray Ware is poorly described, with Colton (1955) recognizing only a single type, and no further refinement of the ware has been completed since that time. The majority of the Little Colorado Gray Ware from the site was characterized by a combination of quartz sand and sherd temper coupled with a medium-to-dark gray paste. Surface treatments are analogous to those found on Tusayan and Cibola gray ware types, with the vast majority having an indented corrugated surface (n=1,155). Plain gray (n=201), clapboard corrugated (n=133), and a "Moenkopi"-style obliterated corrugated (n=132) were also recognized. Based on dates assigned to Tusayan Gray Ware (Colton 1955), clapboard corrugated likely dates to between A.D. 700 and 900, while indented corrugated dates to A.D. 950 and 1275, and "Moenkopi"-style corrugated dates to A.D. 1050 and 1275.

Tusayan Gray Ware

Tusayan Gray Ware has a very wide distribution across northwestern New Mexico, southern Utah, and from northeastern to northwestern Arizona (Colton 1955). The presence of imitative surface treatments in both the Cibola and Little Colorado gray wares suggests that its influence was even more widely distributed than the actual type itself.

Quartz sand is the only tempering material used throughout the temporal sequence of the ware, and it is this characteristic, coupled with a light gray paste color that permits classification to this ware. A very small number of sand-tempered Tusayan Gray Ware sherds were recognized from the assemblage. Tusayan Corrugated was the most common surface treatment recognized, with 13 sherds classified to this type. Tusayan Corrugated (A.D. 950-1275) is the indented corrugated type of this ware, produced by finger indenting the coil in a relatively regular pattern. Three undifferentiated Tusayan Gray Ware sherds, six undifferentiated plain gray sherds, and four clapboard-corrugated sherds were also recognized.

Brown Wares

Two specific brown ware traditions were recognized in the ceramic assemblages recovered from the project excavations. These include Mogollon Brown Ware and Adamana Brown. In addition, an undifferentiated brown ware category was used for sherds that had light tan to brown paste colors but were otherwise similar to sherds classified as Little Colorado Gray Ware.

Mogollon Brown Ware

Mogollon Brown Ware makes up the second largest portion of the ceramic assemblage recovered from McCreery Pueblo and is represented by 13 specific types and two undifferentiated categories. Following Fowler (1991), Showlow Red Ware is included under the Mogollon Brown Ware umbrella. The classification of a specific sherd to a Mogollon Brown Ware category was made based on type descriptions provided by Fowler (1991), Haury (1985), Rinaldo and Bluhm (1956), and Mills (1987).

Both the early Woodruff series and the later Reserve series, along with Showlow Red, were recognized and are briefly described below.

Woodruff Brown has both a plain and a smudged variety, and is characterized by a homogeneously brown paste color and relatively thin walls, a lustrous exterior surface that is highly polished but not slipped, and the frequent presence of a smudged interior. Smudged interiors were far more prevalent than unsmudged interiors (n=397 and n=103, respectively), indicating that bowls were the more common form for the type.

Fowler (1991) recognizes an early, sand-tempered Woodruff Brown type, as well as a late variety based on the addition of sherd temper. The present analysis does not recognize this temporal distinction, however. The large variability in the amount of sand and sherd present in the McCreery Pueblo Woodruff Brown Plain and Smudged ceramics make it difficult to determine what amount of sherd is necessary to warrant a late Woodruff Brown designation. In all other respects, these sherds appear to be technologically identical, and the addition of sherd temper could just as easily reflect geographic differences in production locales as it could reflect temporal differences. The fact that nearly 80 percent of all the identifiable Woodruff Brown sherds are smudged suggests that this characteristic may be more temporally diagnostic than the quantity of sherd temper present, and further research is required to address these issues. For the purposes of this analysis, a date range between A.D. 600 and 1000 is suggested for this apparently long-lived type.

Rinaldo and Bluhm (1956) and Mills (1987) describe Mogollon Brown Ware types from the Reserve area, and these were recognized from McCreery Pueblo as well. Surface treatments include

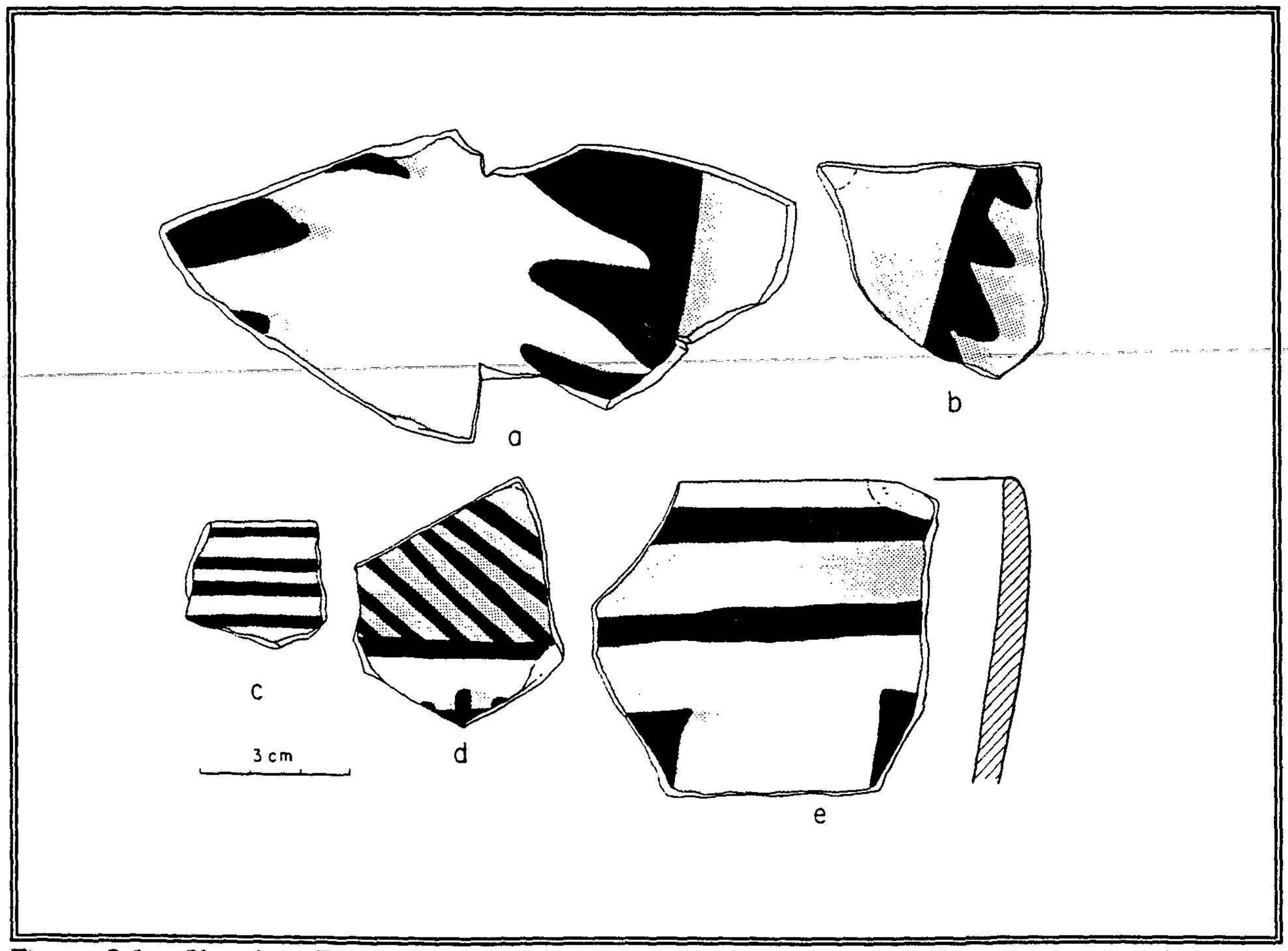

Figure 3.1. Showlow Black-on-red ceramics from the McCreery Pueblo excavations (cat. nos. PEFO-9506-9510).

plain, indented, and patterned corrugations, with both plain and smudged interiors. The distinguishing characteristics for classification to these types is a reddish-orange paste color, and the presence of smoothed and lightly polished coils. These types first appear around A.D. 1000, and the corrugated varieties continue into the A.D. 1200s (Rinaldo and Bluhm 1956).

Showlow Red Ware (Figure 3.1) is present at McCreery Pueblo in relatively large quantities, and is characterized by a thin red slip on a brownish paste. Temper primarily includes quartz sand, although crushed rock and sherd were also present in low frequencies. Plain red and corrugated surface treatments are common, as are smudged interiors. If pigment is present, it is carbon based. The black carbon paint used on the vessels is often fugitive (Fowler 1991:131), potentially leading to some ambiguous classifications. Fowler (1991) suggests that production of red-slipped Showlow Red began around A.D. 1000 and replaced the unslipped Woodruff Brown types.

Adamana Brown Ware

Adamana Brown is considered one of the earliest ceramic types on the Colorado Plateau, and was first named and described by Mera (1934) based on excavations and surveys in the Petrified Forest area. The surface is usually lightly polished, and paste color ranges from dark gray to light gray and into brown. Sherds are generally thick with medium to coarse temper consisting of quartz sand, the occasional angular quartz fragment (considered to be crushed rock in this analysis), and a characteristic mica-like material that may or may not be heat-treated selenite (Burton 1991). Adamana Brown was present in very small quantities in the assemblage (n=7).

The dating of Adamana Brown is somewhat problematic. Wendorf (1948) assumed that it pre-dated A.D. 500 based on an association with tree-ring-dated charcoal recovered from the Bluff Site, dated to the A.D. 300s. The early temporal placement of the ware is supported by recent radiocarbon dates from two sites at Petrified Forest National Park that indicated a pre-A.D. 300 and possibly as early as 300 B.C. date for the inception of Adamana Brown Ware (Burton 1991). The available information also suggests that production of Adamana Brown may have been long lived since it has been recovered from Basketmaker III and Pueblo I period sites (Wendorf 1948).

Undifferentiated Brown Ware

A relatively large number of sherds were recovered with surface treatments similar to those identified on Little Colorado Gray Ware sherds, but with a paste color that ranges from light tan to deep orange. These were classified to an undifferentiated brown-ware category. Plain, as well as indented, clapboard and obliterated corrugated surface treatments are present on these sherds, and a few smudged interiors were also recognized. These sherds differ from those classified to the Reserve Mogollon Brown Ware series in their relatively rough, completely unpolished surfaces.

White Wares

Three white-ware traditions were recognized in the recovered assemblages. These include Cibola, Little Colorado, and Tusayan white wares. These ware categories are distinguished from one another by two principal criteria: tempering material and paint type ("carbon" vs. "mineral").

Little Colorado White Ware

Little Colorado White Ware was produced in a restricted geographic location surrounding the Hopi Buttes area of north-central Arizona (Douglass 1987; Gumerman and Skinner 1968). McCreery Pueblo is on the periphery of this production area that runs just south of the Little Colorado River,

between Holbrook and Grand Falls, north to the base of Black Mesa, and east between Holbrook and Indian Wells (Gumerman and Skinner 1968). Presumably, any Little Colorado White Ware found outside this general area can be considered a trade item (Douglass 1987). Little Colorado White Ware has a carbon-based paint and is distinguished from other white wares by a very dark gray paste that is indicative of the presence of iron and organics in the clay. Because of this dark core, a relatively thick white slip is usually present, providing the contrast needed for the black-painted design. The main tempering material consists of crushed sherds, although quartz sand can also be present in

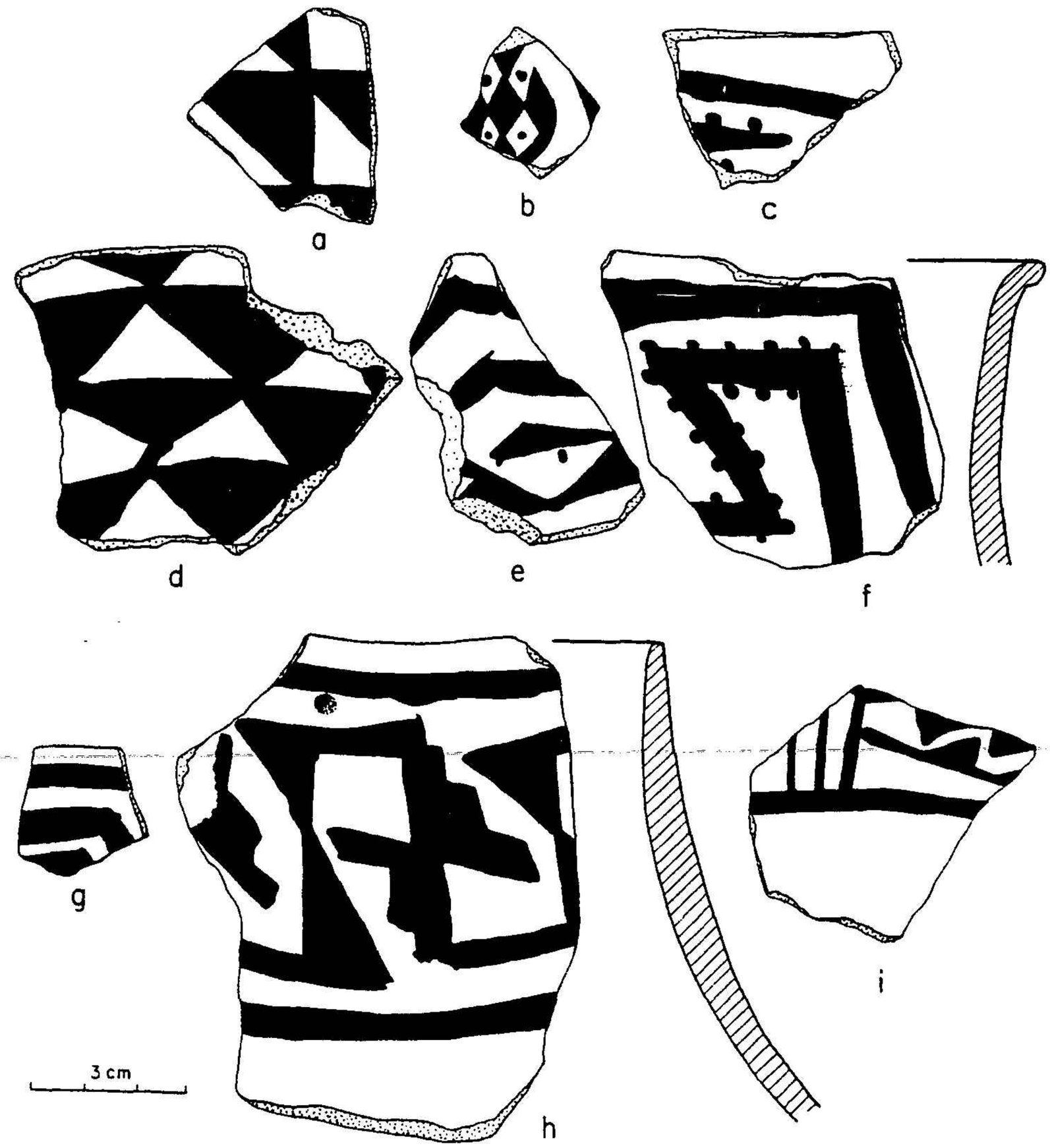

Figure 3.2. Little Colorado White Ware ceramics from the McCreery Pueblo excavations, a-f. Holbrook "A" Black-on-white, g-h. Holbrook "B" Black-on-white, i. Walnut Black-on-white (cat. nos. PEFO-9511-9519).

small amounts, and augite sand has been noted in Little Colorado White Ware sherds recovered from sites north of the Holbrook area (Goetze and Mills, in press).

Four hundred and eighty-one sherds were classified to this ware (Figure 3.2). Specific Little Colorado White Ware types recognized conform to those described by Douglass (1987) and Goetze and Mills (in press), and include Holbrook "A" (n=30), Holbrook "B" (n=61), Padre (n=1), and undifferentiated Walnut Black-on-white (n=1). In addition, a number of sherds were given a Holbrook "A" or "B" designation (n=102) because of equivocal design elements present, and an undifferentiated Little Colorado White Ware category was used for sherds that exhibited all the ware characteristics but had too little pigment present to identify to a specific type (n=286).

Cibola White Ware

Cibola White Ware has a wide distribution across much of the Southwest, ranging from the northern San Juan Basin to the upper Gila River drainages in the south, and from the White Mountains east to the Acoma-Laguna area. It is generally differentiated from other white wares by the presence of sherd temper, or a combination of sherd and sand temper, along with black mineral paint and a light-to-medium gray paste. Sand temper is common in the earlier types.

Two hundred and fifty-five sherds were classified to this ware, and seven specific types were recognized in the assemblage including Kiatuthlanna (n=8), Red Mesa (n=12), Puerco (n=2), Escavada (n=25), Gallup (n=59), Reserve (n=13), and Snowflake (n=3) black-on-whites (Figure 3.3). Classification of these types conforms to descriptions provided by McKenna and Toll (1984), Mills (1987), Sullivan (1984), and Goetze and Mills (in press), and will not be reiterated here. An undifferentiated Cibola White Ware Basketmaker III/Pueblo I category was created for sand-tempered, mineral-painted sherds with obviously early, but undiagnostic design elements (n=2). Likewise, an undifferentiated Cibola White Ware Pueblo II-Pueblo III category was used for sherds with undiagnostic, but obviously late design elements (n=17).

Tusayan White Ware

Tusayan White Ware is distinguished from other white wares by its consistent use of quartz sand temper throughout the chronological sequence, a light gray paste, and the presence of carbon paint. One hundred and twenty ceramics were classified to this ware. Type classifications follow those described by Ambler (1985), Colton (1955), and Goetze and Mills (in press), and will not be reiterated here.

Four specific types were identified from the assemblage and include Kana-a (n=4), Black Mesa (n=8), Sosi (n= 32), and Dogoszhi (n=1) black-on-whites (Figure 3.4). In addition, a Black Mesa or Sosi black-on-white category (n=36) was created for sherds with equivocal design elements. An undifferentiated Tusayan White Ware Pueblo II-III category was also used for sherds with undiagnostic, but obviously late, design elements (n=3). Lightly slipped, sand-tempered sherds without pigment were classified in the miscellaneous category as an undifferentiated white-ware type (n=303).

Miscellaneous Classifications

Several miscellaneous categories were used to classify those sherds that do not fit into one of the ware designations described above. These categories consist of sherds that could be identified to a color group and surface treatment, but not a specific ware, and include both an unknown plain and smudged red ware (n=4), an unknown white ware (n=303), and an unknown gray ware with plain, clapboard, and indented corrugated surface treatments (n=5). In addition, five sherds were grouped into an unknown category.

Feature Discussions

Ceramics were recovered from two structures and four extramural features at the site. The spatial distribution of the wares and types recovered from these features has the potential to provide temporal information, and to illuminate the chronological history of the site. Tables 3.3-3.9 summarize the wares and types by feature number and level.

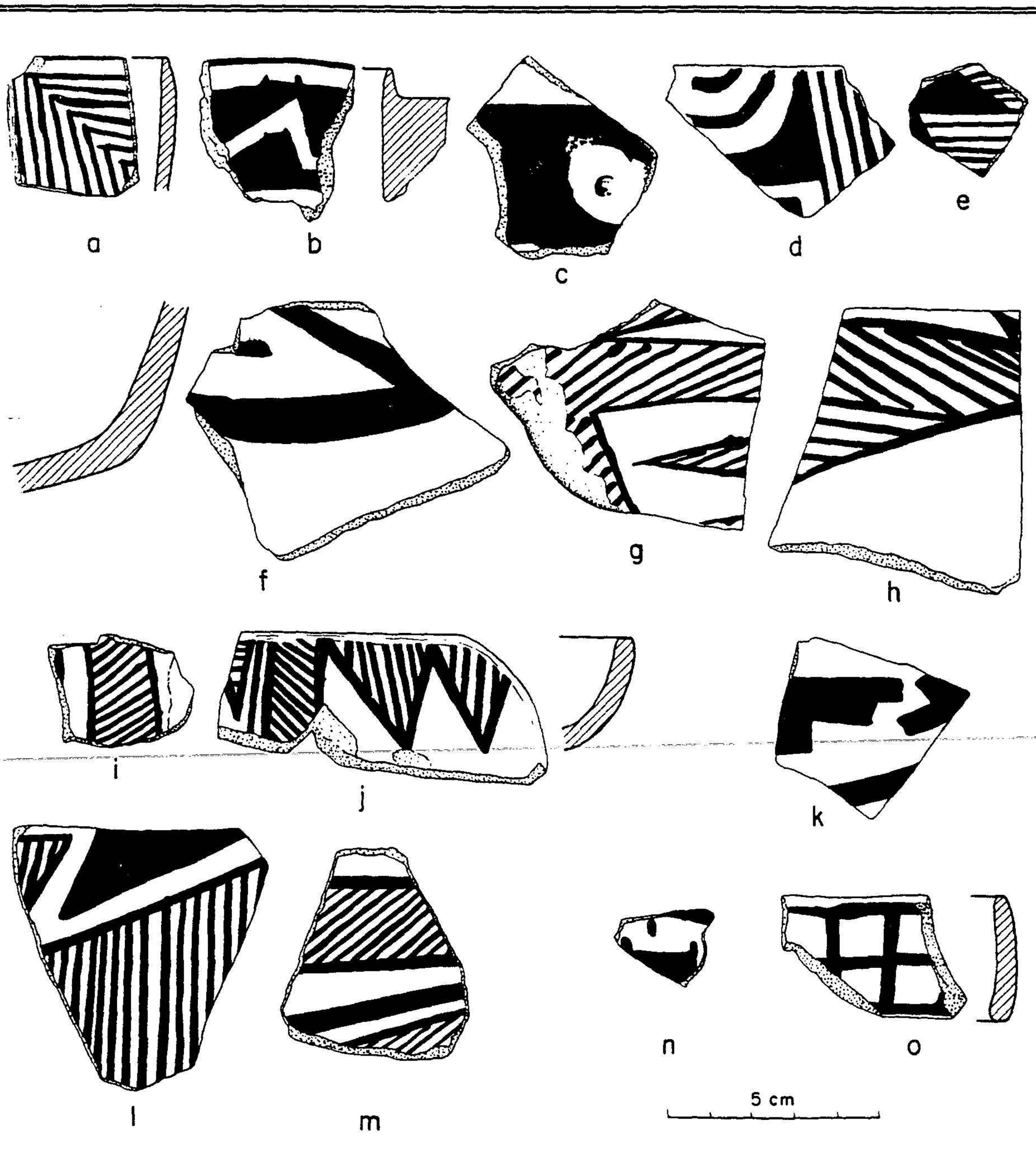

Figure 3.3. Cibola White Ware ceramics from the McCreery Pueblo excavations, a-b. Kiatuthlana Black-on-white, c-d. Red Mesa Black-on-white, e. Puerco Black-on-white, f. Escavada Black-on-white, g-j. Gallup Black-on-white, k. Snowflake Black-on-white, l-m. Reserve Black-on-white, n-o. undifferentiated types (cat. nos. PEFO-9520-9534).

Chronological assignments for each of the features were made using South's Mean Ceramic Date formula (South 1977). Ceramic mean dates have been used on a limited basis in the Southwest, particularly on the Colorado Plateau, where the production spans for ceramic types are relatively well known (Goetze and Mills, in press; Gomolak 1988; Kincaid 1983; Mills 1988, 1990). Because the assumptions and logic behind the technique have been thoroughly discussed in detail elsewhere (Goetze and Mills, in press), only a brief summary of the method of calculation will be presented here.

Mean date calculations are based on the principle of cross dating. Known production spans of ceramic types are determined based on tree-ring-dated assemblages in each type's production area. These date ranges are then used to find a median date for the production of each ceramic type. The median dates for every sherd in the assemblage are added together and divided by the total number of sherds used in the calculation to obtain the mean date for that assemblage. It is important to note that a mean date embodies an overall production span for the ceramic assemblage and may not necessarily represent the occupation date for the feature or structure being dated. Table 3.10 summarizes the date ranges for the diagnostic ceramic types used to calculate mean dates for each feature.

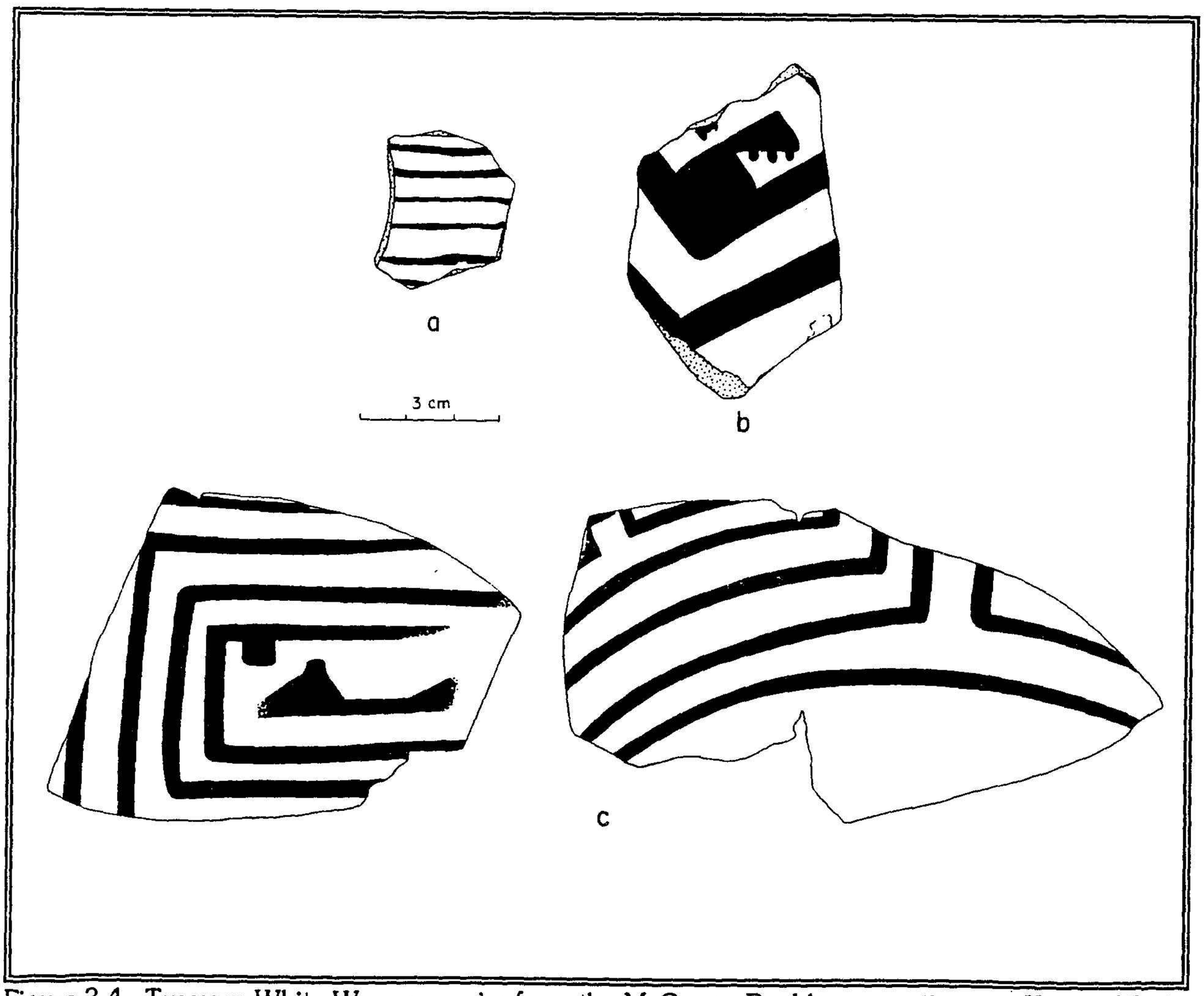

Figure 3.4. Tusayan White Ware ceramics from the McCreery Pueblo excavations, a. Kana-a Black-on-white, b. Black Mesa Black-on-white, c. Sosi Black-on-white (cat. nos. PEFO-9535-9537)

Table 3.3. Ceramic Type by Level for Structure 1.

Type	Surface	0-60 cm	E-W Transect	Exterior Trench	Totals
Mogollon Brown Ware					
Undifferentiated Plain	-	-	-	1	1
Woodruff Brown, Plain	-	2	-	-	2
Woodruff Brown, Smudged	1	3	1	1	6
Showlow Black-on-red	-	-	1	4	5
Showlow Black-on-red Corrugated	1	-	-	-	1
Showlow Red	-	-	1	-	1
Undifferentiated Brown Ware					
Indented Corrugated	1	4	1	2	8
Plain	-	1	-	1	2
Little Colorado White Ware					
Undifferentiated	-	3	4	3	10
Holbrook "A" Black-on-white	-	2	4	1	7
Holbrook "B" Black-on-white	-	1	1	1	3
Holbrook "A" or "B" Black-on-white	-	-	2	-	2
Little Colorado Gray Ware					
Undifferentiated	-	-	-	2	2
Indented Corrugated	1	2	2	1	6
Clapboard Corrugated	1	-	-	-	1
Miscellaneous					
White Ware, unknown series	-	1	-	-	1
Totals	5	19	17	17	58

Table 3.4. Ceramic Type by Level for Room 1 in Structure 2.

Type	Wall Fall	Floor Fill	Floor	Totals
Cibola White Ware				
Undifferentiated	-	1	-	1
Escavada Black-on-white	-	-	1	1
Tusayan White Ware				
Undifferentiated	1	-	-	1
Black Mesa Black-on-white	-	1	-	1
Black Mesa/Sosi Black-on-white	-	18	-	18
Sosi Black-on-white	-	29	-	29
Tusayan Gray Ware				
Tusayan Corrugated	-	1	-	1
Mogollon Brown Ware				
Woodruff Brown, Plain	-	1	1	2
Woodruff Brown, Smudged	2	11	-	13
Reserve Indented Corrugated	-	2	-	2
Reserve Indented Corrugated, Smudged	-	5	-	5
Showlow Black-on-red	-	6	1	7
Showlow Black-on-red Corrugated	-	1	-	1
Showlow Red	-	10	-	10
Showlow Red, Smudged	2	1	-	3
Undifferentiated Brown Ware				
Obliterated Corrugated	-	7	-	7
Indented Corrugated	-	25	-	25
Clapboard Corrugated	-	6	-	6
Plain	-	15	1	16
Plain Smudged	-	1	-	1
Indented Corrugated, Smudged	-	1	-	1
Little Colorado White Ware				
Undifferentiated	1	48	1	50
Holbrook "A" Black-on-white	-	3	-	3
Holbrook "B" Black-on-white	-	9	-	9
Holbrook "A" or "B" Black-on-white	1	2	-	3
Walnut Black-on-white	-	1	-	1
Little Colorado Gray Ware				
Undifferentiated	-	9	-	9
Undifferentiated Plain	2	10	2	14
Indented Corrugated	-	195	8	203
Clapboard Corrugated	-	11	1	12
Obliterated Corrugated	-	13	-	13
Adamana Brown	-	1	-	1
Miscellaneous				
White Ware, unknown series	-	4	5	9
Plain Gray, unknown series	-	1	-	1
Unknown	-	1	-	1
Totals	9	450	21	480

Table 3.5. Ceramic Type by Level for Courtyard Excavation Units.

Type	Level (cm BPGS) 0-20	20-40	40-60	60-80	80-100	100-136	136-174	Totals
Cibola White Ware								
Undifferentiated	-	2	2	-	-	2	1	7
Gallup Black-on-white	-	1	1	-	-	-	-	2
Reserve Black-on-white	-	-	1	-	-	-	-	1
Tusayan White Ware								
Black Mesa Black-on-white	-	-	-	1	-	-	-	1
Black Mesa/Sosi Black-on-white	-	3	-	-	-	-	-	3
Tusayan Gray Ware								
Tusayan Corrugated	-	1	-	-	-	-	-	1
Mogollon Brown Ware								
Undifferentiated	-	-	-	-	-	1	-	1
Woodruff Brown, Plain	1	5	-	-	-	1	-	7
Woodruff Brown, Smudged	2	1	10	4	-	1	1	19
Reserve Indented Corrugated	-	2	-	-	-	-	-	2
Reserve Indented Corrugated, Smudged	1	-	1	2	-	1	-	5
Undifferentiated Showlow Red Ware	-	-	-	-	1	-	-	1
Showlow Black-on-red	-	3	6	-	2	4	24	39
Showlow Red	4	-	13	-	1	2	-	20
Showlow Red, Smudged	-	1	1	3	-	1	-	6
Showlow Corrugated	-	1	-	-	-	1	-	2
Showlow Corrugated, Smudged	1	-	1	-	1	-	-	3
Undifferentiated Brown Ware								
Indented Corrugated	12	5	8	-	1	1	-	27
Plain	1	3	3	3	-	-	1	11
Little Colorado White Ware								
Undifferentiated	8	6	2	-	1	5	-	22
Holbrook "A" Black-on-white	2	-	-	-	-	-	-	2
Holbrook "B" Black-on-white	1	2	-	-	2	5	-	10
Holbrook "A" or "B" Black-on-white	2	2	3	-	3	2	-	12
Little Colorado Gray Ware								
Undifferentiated	-	4	3	-	-	-	-	7
Undifferentiated Plain	6	1	4	-	-	4	1	16
Indented Corrugated	42	29	14	12	2	10	7	116
Clapboard Corrugated	-	9	6	4	-	9	1	29
Obliterated Corrugated	3	9	-	2	-	11	-	25
Adamana Brown	-	-	1	1	-	-	-	2
Miscellaneous								
White Ware, unknown series	9	3	7	-	1	-	-	20
Plain Gray, unknown series	-	-	-	-	-	-	1	1
Gray Clapboard Corrugated, unknown series	-	-	1	-	-	-	-	1
Unknown	-	-	1	-	-	-	-	1
Totals	95	93	89	32	15	61	37	422

Table 3.6. Ceramic Type by Level for Feature 1 (Trash Mound).

Type	Surface Collection	Level (cm BPGS) 0-10	10-20	20-30	30-40	40-50	50-60	Totals
Cibola White Ware								
Undifferentiated	8	16	27	10	7	1	2	71
Kiatuthlanna Black-on-white	-	-	5	3	-	-	-	8
Red Mesa Black-on-white	-	1	4	3	2	-	-	10
Puerco Black-on-white	-	-	1	-	-	1	-	2
Escavada Black-on-white	-	4	6	6	-	-	-	16
Undifferentiated, PII-PIII	-	3	4	9	-	1	-	17
Gallup Black-on-white	-	6	14	15	5	-	-	40
Snowflake Black-on-white	1	-	1	-	-	-	-	2
Reserve Black-on-white	-	2	3	1	4	-	-	10
Tusayan White Ware								
Undifferentiated	-	6	2	4	1	1	-	14
Kana-a Black-on-white	-	-	4	-	-	-	-	4
Black Mesa Black-on-white	1	1	1	-	-	-	-	3
Black Mesa/Sosi Black-on-white	-	5	3	2	-	-	-	10
Sosi Black-on-white	-	-	-	-	-	1	-	1
Dogoszhi Black-on-white	-	1	-	-	-	-	-	1
Tusayan Gray Ware								
Undifferentiated	-	-	1	1	-	-	-	2
Undifferentiated Plain	-	1	1	1	-	-	-	3
Undifferentiated Clapboard Corrugated	-	-	-	4	-	-	-	4
Tusayan Corrugated	-	-	8	1	-	-	-	9
Mogollon Brown Ware								
Undifferentiated Plain	-	-	6	4	-	-	-	10
Woodruff Brown, Plain	1	16	34	11	8	10	3	83
Woodruff Brown, Smudged	6	44	81	68	45	22	5	271
Reserve Plain Corrugated	-	-	5	-	-	-	-	5
Reserve Indented Corrugated	1	5	10	10	5	1	-	32
Reserve Indented Corrugated, Smudged	-	13	27	13	7	6	-	66
Undifferentiated Showlow Red	-	2	1	-	-	-	-	3
Showlow Black-on-red	7	10	39	14	11	3	-	84
Showlow Black-on-red Corrugated	-	9	6	4	-	4	-	23
Showlow Red	3	20	22	17	13	1	1	77
Showlow Red, Smudged	2	12	37	15	12	2	-	80
Showlow Corrugated	-	2	1	5	1	-	-	9
Showlow Corrugated, Smudged	-	3	1	4	-	1	-	9
Undifferentiated Brown Ware								
Obliterated Corrugated	-	8	7	11	2	2	1	31
Indented Corrugated	66	92	188	90	39	28	6	509
Clapboard Corrugated	-	5	20	14	6	1	2	48
Plain	18	22	53	28	33	12	1	167
Plain Smudged	-	-	8	-	2	-	1	11
Indented Corrugated, Smudged	-	2	28	5	-	1	1	37
Little Colorado White Ware								
Undifferentiated	21	26	41	19	11	1	1	120
Holbrook "A" Black-on-white	-	6	7	-	-	1	-	14
Holbrook "B" Black-on-white	2	8	8	4	1	2	-	25
Holbrook "A" or "B" Black-on-white	19	31	9	3	3	-	69	
Padre Black-on-white	-	-	-	1	-	-	-	1
Little Colorado Gray Ware								
Undifferentiated	2	6	8	1	3	2	-	22
Undifferentiated Plain	11	34	39	40	14	5	1	144
Indented Corrugated	55	143	175	82	37	15	4	511
Clapboard Corrugated	3	18	9	17	7	2	1	57
Obliterated Corrugated	-	8	14	18	4	4	-	48
Adamana Brown	-	-	-	2	-	-	-	2
Miscellaneous								
Red Ware, unknown series	-	-	-	-	-	2	-	2
Red Ware Smudged, unknown series	-	1	-	-	-	-	-	1
White Ware, unknown series	26	61	86	41	27	16	4	261
Totals	238	641	1,077	607	310	152	34	3,059

Table 3.7. Ceramic Type by Level for Feature 2.

Type	Level (cm BPGS) 0-10	10-20	Totals
Cibola White Ware			
Undifferentiated	6	1	7
Red Mesa Black-on-white	1	-	1
Gallup Black-on-white	3	2	5
Tusayan White Ware			
Undifferentiated	3	-	3
Black Mesa Black-on-white	1	-	1
Black Mesa/Sosi Black-on-white	1	-	1
Sosi Black-on-white	2	-	2
Mogollon Brown Ware			
Woodruff Brown, Smudged	2	1	3
Reserve Ind Corrugated, Smudged	-	1	1
Tularosa Patterned Corrugated	1	-	1
Showlow Black-on-red Corrugated	2	-	2
Undifferentiated Brown Ware			
Indented Corrugated	9	3	12
Plain	7	1	8
Little Colorado White Ware			
Holbrook "B" Black-on-white	-	1	1
Holbrook "A" or "B" Black-on-white	1	1	2
Little Colorado Gray Ware			
Undifferentiated Plain	5	-	5
Indented Corrugated	16	2	18
Miscellaneous			
White Ware, unknown series	4	2	6
Totals	64	15	79

Table 3.8. Ceramic Type by Level for Feature 3.

Type	Surface	Level (cm BPGS) 0-10	10-20	20-30	30-40	Totals
Cibola White Ware						
Undifferentiated	1	3	4	-	-	8
Undifferentiated Basketmaker III/PI	-	-	-	-	1	1
Escavada Black-on-white	-	-	3	-	-	3
Gallup Black-on-white	-	-	1	-	1	2
Snowflake Black-on-white	-	-	-	-	1	1
Tusayan White Ware						
Undifferentiated	-	4	3	1	-	8
Black Mesa Black-on-white	-	1	-	1	-	2
Black Mesa/Sosi Black-on-white	-	4	-	-	-	4
Tusayan Gray Ware						
Undifferentiated Plain	-	-	1	-	-	1
Tusayan Corrugated	1	-	-	1	-	2
Mogollon Brown Ware						
Undifferentiated Plain	-	1	-	-	-	1
Woodruff Brown, Plain	-	1	-	-	2	3
Woodruff Brown, Smudged	-	3	3	3	1	10
Reserve Plain Corrugated	-	1	2	1	-	4
Reserve Indented Corrugated	-	1	1	2	-	4
Reserve Indented Corrugated, Smudged	-	11	7	-	1	19
Showlow Black-on-red	1	1	-	3	-	5
Showlow Red	1	1	2	2	3	9
Showlow Red, Smudged	-	2	2	5	-	9
Showlow Corrugated	-	-	-	1	-	1
Showlow Corrugated, Smudged	-	-	-	2	2	4
Undifferentiated Brown Ware						
Obliterated Corrugated	-	-	1	-	1	2
Indented Corrugated	-	9	8	3	7	27
Clapboard Corrugated	-	-	3	-	-	3
Plain	-	-	7	2	-	9
Plain Smudged	-	-	1	-	-	1
Little Colorado White Ware						
Undifferentiated	-	7	10	3	4	24
Holbrook "A" Black-on-white	-	-	-	1	-	1
Holbrook "B" Black-on-white	-	2	2	-	-	4
Holbrook "A" or "B" Black-on-white	-	6	-	-	1	7
Little Colorado Gray Ware						
Undifferentiated	1	-	-	9	-	10
Undifferentiated Plain	1	-	2	1	-	4
Indented Corrugated	4	19	16	14	7	60
Clapboard Corrugated	-	1	5	1	1	8
Obliterated Corrugated	1	-	7	-	1	9
Adamana Brown	-	-	1	-	-	1
Miscellaneous						
White Ware, unknown series	-	-	1	1	1	3
Gray Indented Corrugated, unknown series	-	-	-	1	-	1
Totals	11	78	93	58	35	277

Table 3.9. Ceramic Type by Level for Feature 5.

Type	Surface	Level (cm BPGS) 0-10	10-20	20-30	30-40	Totals
Cibola White Ware						
Undifferentiated	-	5	12	3	-	20
Basketmaker III/PI	-	1	-	-	-	1
Red Mesa Black-on-white	-	-	-	1	-	1
Escavada Black-on-white	-	2	3	-	-	5
Gallup Black-on-white	-	2	4	2	-	8
Tusayan White Ware						
Undifferentiated	-	3	4	2	-	9
Pueblo II-III	-	-	3	-	-	3
Tusayan Gray Ware						
Undifferentiated	-	-	1	-	-	1
Undifferentiated Plain	-	-	2	-	-	2
Mogollon Brown Ware						
Undifferentiated Plain	-	1	-	-	-	1
Woodruff Brown, Plain	-	2	1	1	-	4
Woodruff Brown, Smudged	2	13	47	7	-	69
Reserve Plain Corrugated, Smudged	-	-	2	-	-	2
Reserve Plain Corrugated	-	1	1	-	-	2
Reserve Indented Corrugated	-	6	4	4	-	14
Reserve Indented Corrugated, Smudged	-	5	2	4	-	11
Tularosa Patterned Corrugated	-	-	6	1	-	7
Showlow Black-on-red	1	5	9	2	2	19
Showlow Black-on-red Corrugated	-	2	-	1	-	3
Showlow Red	-	4	10	7	-	21
Showlow Red, Smudged	-	-	3	-	-	3
Showlow Corrugated	-	-	1	1	-	2
Showlow Corrugated, Smudged	-	1	-	2	-	3
Undifferentiated Brown Ware						
Obliterated Corrugated	-	1	10	2	-	13
Obliterated Corrugated, Smudged	-	1	-	-	-	1
Indented Corrugated	-	9	21	11	-	41
Clapboard Corrugated	-	1	-	1	-	2
Plain	-	1	7	4	-	12
Plain Smudged	-	-	1	-	-	1
White Mountain Red Ware						
Undifferentiated	1	-	-	-	-	1
Little Colorado White Ware						
Undifferentiated	1	8	32	5	-	46
Holbrook "A" Black-on-white	-	-	3	-	-	3
Holbrook "B" Black-on-white	1	2	2	3	-	8
Holbrook "A" or "B" Black-on-white	-	1	6	-	-	7
Little Colorado Gray Ware						
Undifferentiated	-	6	9	3	-	18
Undifferentiated Plain	-	-	11	-	-	11
Indented Corrugated	2	47	150	21	2	222
Clapboard Corrugated	1	5	13	4	-	23
"Moenkopi" Corrugated	-	4	22	9	-	35
Miscellaneous						
Red Ware, unknown series	-	-	1	-	-	1
White Ware, unknown series	-	-	3	-	-	3
Gray Ware, unknown series	-	-	1	-	-	1
Unknown	-	-	2	1	-	3
Totals	9	139	409	102	4	663

Structure 1 (Great Kiva)

Fifty-eight ceramic artifacts were recovered from Structure 1, a large circular depression of unknown function (Table 3.3). Compared to Structure 2, the large masonry structure, and the other excavated features at the site, relatively few wares and types are present and include Mogollon Brown Ware and Little Colorado white and gray wares. This restricted ware assemblage suggests some specialized function for the structure, and the bowl to jar ratio of 1:1 (n=30 and 28, respectively) supports this contention. A "normal" domestic assemblage is generally composed of a bowl to jar ratio that is at least 1:4 (Mills 1989:49).

Little Colorado is the only white ware present, and the 10 diagnostic sherds represented include Holbrook "A" and "B" black-on-white. An overall ceramic mean date for the structure is calculated at A.D. 1100, however, it should be considered tentative based as it is on a small sample of diagnostic ceramics that are scattered throughout the fill of the structure. Therefore, an occupation span somewhere in the late Pueblo II or early Pueblo III period (A.D. 1000-1200) is postulated.

Structure 2 (Room Block)

Nine hundred and forty-two ceramic artifacts were recovered from Structure 2, a U-shaped room block with at least five rooms, one of which is a possible kiva. Room 1 in the northwest corner, and four units in the southeast corner of the structure were excavated. Unit 1, along with a northwest unit, a southwest unit, and a southeast unit correspond to excavations carried out in Room 1, while Units 3, 4, 5, and 7 correspond to excavations in the eastern portion of the structure. These groupings will be discussed separately below, and the ceramic assemblages from each are summarized in Tables 3.4 and 3.5.

Room 1

Four hundred and eighty ceramic artifacts were recovered from the excavations in Room 1. Represented wares include Cibola, Tusayan, and Little Colorado white wares, Tusayan and Little Colorado gray wares, Mogollon Brown Ware, and Adamana Brown. Nearly 94 percent of these (n=451) were recovered from floor fill contexts.

Escavada (n=1), Black Mesa (n=1), Holbrook "A" (n=3), and Walnut (n=1) black-on-whites are present in very small amounts. The only diagnostic types present in any quantity include Sosi (n=29) and Holbrook "B" black-on-whites (n=9), which were recovered from the floor fill along with the Black Mesa Black-on-white sherd, three Holbrook "A" Black-on-white sherds, and the Walnut Black-on-white sherd. The only type recovered from the floor is the single Escavada Black-on-white sherd. Given the variety of date ranges for the types present, an actual occupational range for the room is difficult to postulate using mean-date calculations. What can be said is that the diagnostic sherd assemblage is consistent with assemblages that are typically assigned to the late Pueblo II through early Pueblo III period (A.D. 1000-1200), and that the very large proportion of Little Colorado Gray Ware indented corrugated sherds (n=201) helps to support this contention.

Courtyard

Four hundred and twenty-two ceramic artifacts were recovered from excavations of Units 3, 4, 5, and 7 in the southeastern portion of Structure 2. Cibola, Tusayan, and Little Colorado white wares along with Tusayan and Little Colorado gray wares and Mogollon Brown Ware are all represented. Diagnostic sherds recovered include small amounts of Gallup (n=2), Reserve (n=1), and Holbrook "A" (n=2) black-on-whites. Ten Holbrook "B" Black-on-white sherds are also present. These

Table 3.10. Date Ranges for Stylistic Types Used in the Calculation of Mean Dates.

Ceramic Type	Begin Date (A.D.)	End Date (A.D.)	Median Date (A.D.)
Cibola White Ware[a]			
Kiatuthlanna Black-on-white	850	900	875
Red Mesa Black-on-white	900	1050	975
Puerco Black-on-white	1000	1175	1088
Escavada Black-on-white	925	1125	1025
Gallup Black-on-white	1000	1125	1063
Snowflake Black-on-white	1175	1325	1250
Reserve Black-on-white	1100	1200	1150
Tusayan White Ware[b]			
Kana-a Black-on-white	825	1000	913
Black Mesa Black-on-white	1000	1100	1050
Sosi Black-on-white	1070	1180	1125
Dogoszhi Black-on-white	1040	1210	1125
Little Colorado White Ware[c]			
Holbrook "A" Black-on-white	1050	1150	1100
Holbrook "B" Black-on-white	1050	1150	1100
Padre Black-on-white	1100	1250	1175
Walnut Black-on-white	1100	1250	1175

a. From McKenna and Toll 1984; Mills 1988, 1990; Windes 1984.
b. From Ambler 1985; Christenson and Bender 1985; Jeffrey R. Dean, personal communication 1992.
c. From Douglass 1987:Appendix C.

diagnostic ceramics are generally scattered throughout the various excavation levels, making a mean-date calculation meaningless. The diagnostic assemblage, however, is similar to that from Room 1 and is consistent with a late Pueblo II through early Pueblo III period (A.D. 1000-1200) assemblage.

Feature 1 (Trash Mound)

A total of 3,059 ceramic artifacts, or nearly 60 percent of the total number of ceramics recovered from the McCreery Pueblo excavations, came from Feature 1, a midden (Table 3.6). Wares represented include Cibola White Ware, Tusayan White and Gray Ware, Mogollon Brown Ware, Adamana Brown, and Little Colorado White and Gray Ware. One hundred and thirty-three diagnostic sherds are present and include Kiatuthlanna, Red Mesa, Puerco, Escavada, Gallup, Snowflake, Reserve, Kana-a, Black Mesa, Sosi, Dogoszhi, Holbrook "A" and "B," and Padre black-on-whites. Ceramic mean dates obtained for each excavation level in the midden provide a relatively narrow date range of approximately 60 years (A.D. 1042-1103). An overall mean date for the feature is calculated at A.D. 1056, which corresponds to a temporal span somewhere in the late Pueblo II period (A.D. 1000-1100). The presence of Reserve and Snowflake black-on-whites in subsurface contexts may reflect the early Pueblo III period occupation suggested for both Structures 1 and 2.

Table 3.11. Summary of Temporal Assignments by Structure and Feature.

Structure/Feature	Temporal Assignment
Structure 1 (Great Kiva)	Late Pueblo II/Early Pueblo III (A.D. 1000-1200)
Structure 2 (Room Block)	Late Pueblo II/Early Pueblo III (A.D. 1000-1200)
Feature 1 (Trash Mound)	Late Pueblo II (A.D. 1000-1100)
Feature 2	Late Pueblo II (A.D. 1000-1100)
Feature 3	Late Pueblo II (A.D. 1000-1100)
Feature 5	Late Pueblo II (A.D. 1000-1100)

Feature 2

Seventy-nine ceramic artifacts were recovered from Feature 2, one of five rubble mounds of unknown function. Ten diagnostic sherds are present and include Red Mesa, Gallup, Black Mesa, Sosi, and Holbrook "B" black-on-whites. An overall ceramic mean date for the feature is calculated at A.D. 1069, corresponding to a temporal span in the late Pueblo II period (A.D. 1000-1100).

Feature 3

Two hundred and seventy-seven ceramic artifacts were recovered from Feature 3, another rubble mound of unknown function. Thirteen diagnostic black-on-white sherds are present and include Escavada, Gallup, Snowflake, Black Mesa, and Holbrook "A" and "B." An overall mean date for the feature is calculated at A.D. 1081, corresponding to a temporal span somewhere in the late Pueblo II period.

Feature 5

Six hundred and sixty-three ceramic artifacts were recovered from Feature 5, another rubble mound of unknown function. Twenty-four diagnostic black-on-white sherds are present and include Red Mesa, Escavada, Gallup, and Holbrook "A" and "B". An overall mean date for the feature is calculated at A.D. 1067, which corresponds to a temporal span within the late Pueblo II period.

Discussion

Table 3.11 summarizes the temporal assignments made for each of the structures and features represented in the ceramic sample. The overall diagnostic assemblage contains types that range from

as early as A.D. 850 (Kiatuthlanna Black-on-white) to as late as A.D. 1325 (Snowflake Black-on-white), however, over 80 percent of these types have date ranges that fall within the late Pueblo II and early Pueblo III periods (A.D. 1000-1200) (Gallup, Escavada, Sosi, and Holbrook "A" and "B" black-on-whites). This temporal span is in keeping with the ceramic mean dates and assigned date ranges made for each of the structures and features and is also the date range assigned to the site based on ceramics collected during the 1985 survey (Jones 1986:78). This suggests that site occupation was contemporaneous, at least for the portion that was excavated.

Despite this contemporaneity, however, the ceramic assemblage recovered from Structure 1 clearly indicates some kind of functional difference that is not recognizable at the rest of the site. The relatively small numbers of recovered ceramics, the presence of only a single decorated ware (i.e., Little Colorado White Ware), and a bowl to jar ratio that does not indicate a "normal" domestic assemblage, suggests some kind of specialized function for the structure. It was originally identified as a great kiva (Stewart 1980), however, the ceramic assemblage does not support a San Juan Basin relationship.

Summary

In general, the wares and types recovered from McCreery Pueblo are typical of ceramics previously identified from the Holbrook/Petrified Forest area (Burton 1991; Fowler 1991; Mera 1934; Reed 1980; Wells 1988; Wendorf 1953), and have production spans that range from the Basketmaker III period into the Pueblo III period (pre-A.D. 700-1100+). These wares include Mogollon Brown Ware, Adamana Brown, and Cibola, Tusayan, and Little Colorado white wares, and Little Colorado and Tusayan gray wares. Nearly 78 percent of the McCreery Pueblo assemblage is made up of brown and gray wares. The remainder of the assemblage is comprised of white, red, and miscellaneous wares. Diagnostic black-on-white ceramics (i.e., those classifiable to a specific dated type) make up less than 0.05 percent of the total assemblage, however, those with date ranges in the late Pueblo II and early Pueblo III periods are represented in the highest frequencies.

Types recovered during the excavations are similar to those collected and analyzed during the 1985 survey of the site (Jones 1986:77-81). The primary difference between the two collections is in the percentages of gray and brown wares vs. decorated wares recovered. More than three-quarters of the excavated assemblage is made up of gray and brown wares, while the survey collection is split nearly equally between gray and brown wares and decorated wares.

The majority of the recovered wares can be equated with the Pueblo occupation generally recognized in the area, however, Mogollon Brown Ware has a more equivocal and contentious cultural association. Based on refiring experiments, Fowler (1991:123-125) provides evidence suggesting that rather than equating the brown-ware tradition with a Mogollon culture affiliation, these ceramics are instead a part of the Pueblo developmental sequence and should be considered an indigenous rather than an intrusive part of the Upper Puerco and Little Colorado River ceramic assemblages. Crown (1981) provides a different perspective, however, suggesting that the petrographic differences she recognized in the brown-ware ceramics from the Upper Little Colorado River area indicate that they are trade wares imported from the south.

Truly local production, particularly of the gray wares, is postulated based on paste and temper combinations that do not always correspond to traditionally defined gray-ware types. This kind of local production has been observed elsewhere in the general Holbrook/Petrified Forest area (Crown 1981; Vint and Burton 1990), though further sourcing studies are needed to fully quantify this phenomenon.

Chapter 4
Flaked-Stone Artifacts

Flaked stone represents the second major artifact category recovered during fieldwork at McCreery Pueblo (AZ K:13:41 [ASM]), making up about 40 percent of the specimens collected. Analysis of the flaked stone was designed to be comparable to that done by other researchers in the region (Burton 1990, 1991; Jones 1983, 1986; Rozen 1979; Sullivan and Rozen 1985; Tagg 1987; Wells 1988), using the same or similar artifact categories and material classifications. The flaked-stone artifacts can be divided into three gross categories: tools, cores, and debitage. Within these categories are more specific artifact classes (or types). Table 4.1 is a summary of the flaked-stone artifacts recovered during this project; 3,322 pieces of debitage, flaked-stone tools, and cores were recovered.

Table 4.1. Summary of Flaked Stone Tools from the McCreery Pueblo Excavations.

	Surface Collection[a]	Str. 2 Room 1	Str. 2 Courtyard	Feature 1 Trash Mound	Other Units & Features	Total
Formal tools	1	-	1	1	1	4
Retouched pieces	-	-	2	6	8	16
Utilized flakes	15	10	16	56	8	105
Cores/Core fragments	12	8	12	77	64	173
Debitage	201	126	329	1,836	532	3,024
Total	229	144	360	1,976	613	3,322

a. Includes projectile point collected 100 m west of site.

Flaked-Stone Tools

Tools in this analysis are defined as pieces modified by use or retouch. These can be divided into three types: utilized flakes, retouched pieces, and formal tools (such as projectile points). These roughly represent a gradation of more intensification and purposefulness in tool production, design, and maintenance. The overwhelming majority of tools recovered are utilized flakes and retouched pieces rather than formal shaped tools.

Formal Tools

Formal tools consist of projectile points and other bifacial tools that exhibit the deliberate manufacture of a specialized tool form, rather than the advantageous retouching of an edge. Rozen (1984:456) suggests that it is reasonable to assume such distinctive implements were functionally distinguished from informal tools prehistorically. Only four formal tools were recovered. These consist of three projectile-point fragments and a biface fragment. One of the projectile points was recovered from the surface west of the site and the remaining formal tools were from excavation units.

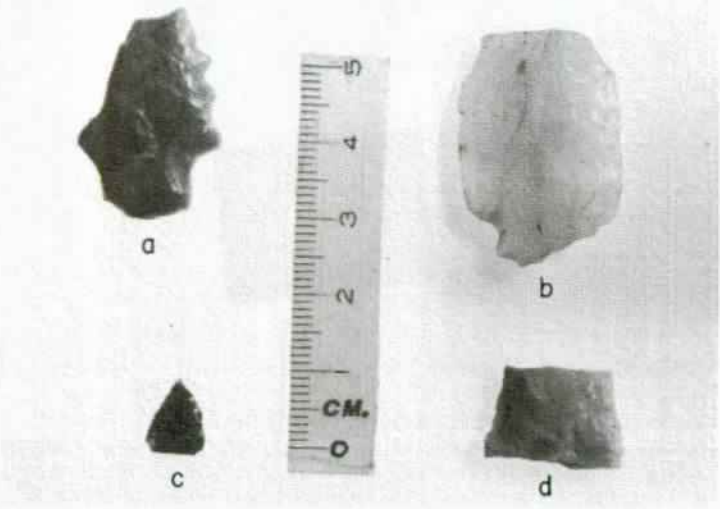

Figure 4.1. Formal tools from the McCreery Pueblo excavations, a. Archaic-period projectile point, b. Basketmaker-period projectile point, c. Pueblo-period projectile point, d. biface fragment (cat. nos. PEFO-9645-9648).

The projectile points include an Archaic period dart point, a Basketmaker-period dart point, and a Pueblo period arrow point. The Archaic specimen consists of the base of a serrated, large stemmed, light brown chert point, found on the surface 100 m west of the pueblo (Figure 4.1a). A late Archaic site, tested in 1985 (Tagg 1987), lies 800 m to the northwest, and the point may be associated with that site. The Basketmaker specimen (Figure 4.1b), of chalcedony, is the mid-section of a Western Basketmaker variety San Pedro point (Burton and Farrell 1993). Recovered from the trash mound (Feature 1) in the 20-30 cm level, it was likely scavenged from a Basketmaker-period site and reused by the site occupants. The Pueblo specimen is the distal portion of a small obsidian side-notched point, broken at the side notches (Figure 4.1c). It was recovered from Feature 3 in the 10-20 cm level. Visually the obsidian is similar in appearance to specimens from Puerco Ruin that were chemically sourced to Government Mountain (Burton and Hughes 1990). It is grainy, semi-translucent, and dark gray, with flow banding.

The sole biface recovered consists of a white chert midsection (Figure 4.1d). It was recovered from the courtyard area (Unit 7) in the 25-35 cm level. Bifacial tools have been interpreted as general-purpose tools, perhaps for butchering and light woodworking. A taxonomy for these items has yet to be fully developed and it is not known if differences in form are functionally significant.

Retouched Pieces

Representing a significantly less "intensive" tool technology than formal tools, retouched pieces were modified (retouched) by pressure flaking to create or maintain a desired working edge (Crabtree 1982:50). An artifact is considered a retouched piece if an edge exhibits three or more contiguous flake scars that may also show use wear, or if there is a single "notch" that exhibits use wear. These are distinguished from utilized flakes by regular, apparently systematic, and invasive flaking. Utilized flakes have much smaller flake scars, which are probably the result of crushing during use. Retouched pieces consist largely of minimally modified flakes suitable for quick use and discard; flaking can occur on one or more edges.

Retouched pieces were notably infrequent in the assemblage: only 16 were recovered during the excavation, accounting for 12 percent of the flaked stone tools recovered. All were recovered from excavation units (Table 4.2). Three are chert and the remainder are petrified wood. Representative examples of the retouched pieces recovered are depicted in Figure 4.2. All of the retouched pieces recovered at McCreery Pueblo are edge-worked flakes. Typically, they have been continuously modified around the flake margin, excluding the platform. Four of the specimens also include a single long, narrow projection suitable for piercing. One specimen has two notches formed by simple blows.

Utilized Flakes

Utilized flakes consist of flakes or pieces of debris that are used without further modification to exploit an existing sharp edge and edge angle. Such pieces were probably only used for a short time, perhaps for a single task, or until the edge was dulled or no longer suitable for use. This use wear is predominantly in the form of unilateral step fracture, accompanied by edge crushing and abrasion.

A total of 105 utilized flakes was recovered during the 1992 testing at McCreery Pueblo, representing 85 percent of the flaked-stone tools recovered. Eighty-eight percent of the utilized flakes are petrified wood, 11 percent are chert, and 1 percent are quartzite. The distribution of utilized flakes is given in Table 4.3. Representative examples of the utilized flakes recovered are depicted in Figure 4.3.

The mean weight of the utilized flakes of petrified wood is 5.4 g and those of chert, 9.0 g. The lone quartzite specimen weighed 5.5 g. At Sivu'ovi, a Basketmaker II pit-house village, petrified wood utilized flakes averaged 3.9 g and chert 5.3 g (Burton 1991). At Puerco Ruin, a 125-room pueblo dating to the late Pueblo III-Pueblo IV period, petrified wood utilized flakes averaged 7.2 g and chert utilized flakes averaged 6.1 g. While three sites cannot be considered a representative sample, they suggest a general trend toward increasing weight and therefore an increase in size of utilized flakes through time. Perhaps this reflects the development of an expedient technology, with the use of utilized flakes replacing formal bifacial tools.

Table 4.2. Distribution of Retouched Pieces from the McCreery Pueblo Excavations.

	Fea. 1	Fea. 2	Fea. 3	Fea. 5	Room 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.
Petrified wood	5	-	2	4	-	2	-	-	-
Chert	1	-	-	2	-	-	-	-	-

Table 4.3. Distribution of Utilized Flakes from the McCreery Pueblo Excavations.

	Fea. 1	Fea. 2	Fea. 3	Fea. 5	Room 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.
Petrified wood	47	-	1	3	10	14	3	1	13
Chert	8	-	-	-	-	2	-	-	2
Quartzite	1	-	-	-	-	-	-	-	-

Cores and Core Fragments

One hundred seventy-three cores and core fragments were recovered. Cores, exhibiting one or more negative flake scars (Crabtree 1982:43), are generally cobbles or blocks of lithic material from which tools and hence flakes and debris (debitage) were produced. Large flakes could be used as cores. A flake core is distinguished from a retouched flake based on the cores larger flake scars and absence of observable use wear. The distribution of complete cores is given in Table 4.4 and the distribution of core fragments is given in Table 4.5. Representative cores are depicted in Figure 4.4.

Figure 4.2. Retouched pieces from the McCreery Pueblo excavations (cat. nos. PEFO-9649-9655).

Figure 4.3. Utilized flakes from the McCreery Pueblo excavations (cat. nos. PEFO-9656-9661).

Twenty-eight of the complete cores are petrified wood and ten are chert. Most are fairly small: the petrified-wood specimens (excluding a large tested block) averaged 40.4 g and the chert specimens averaged 33.6 g. The complete cores can be subdivided into four types, based on the number and types of platforms and the extent of flake removal.

Unidirectional Cores

Three petrified wood and four chert cores were classified as unidirectional cores, which have flakes removed from one platform and in only one direction (Crabtree 1982:57). One of the chert cores is considered exhausted. "Exhausted" cores are subjectively defined as cores from which all usable flakes have been removed, as a result of diminished amount of material, reduction in platform size, or the development of step or hinge fractures (Crabtree 1982:33).

Bidirectional Cores

Six cores were classified as bidirectional cores; these are cores that have had flakes removed from two directions (Crabtree 1982:16). All are petrified wood, and four are considered exhausted.

Multidirectional Cores

Twenty multidirectional petrified wood cores were recovered; these have flakes removed from more than two platforms (Crabtree 1982:43). Eighteen are petrified wood, and six are chert. Nine of the petrified wood cores are classified as exhausted.

Tested Block

One tested block of petrified wood, weighing 200.6 g, was recovered from the courtyard (Unit 7) between a depth of 65 and 82 cm. It has only a few flakes removed in an unpatterned manner. Presumably, the artifact was "tested" for flaws and suitability for reduction by hitting the material in various spots, thus creating the impact scars. It differs from a hammerstone in that the impact scars are fewer and not localized.

Core Fragments

One hundred thirty-five core fragments were recovered during the present fieldwork. Core fragments are pieces of shattered core, broken along flaws or some other structural weakness during reduction. They are chunky in form, and exhibit at least one negative flake scar. Eighty-three percent are petrified wood, 13 percent are chert, and 3 percent are quartzite. The distribution of core fragments is presented in Table 4.5.

Table 4.4. Distribution of Cores from the McCreery Pueblo Excavations.

	Fea. 1	Fea. 2	Fea. 3	Fea. 5	Rm. 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.
Petrified wood	15	1	2	5	2	1	-	-	-
Chert	2	-	1	5	-	1	-	-	-

Figure 4.4. Cores from the McCreery Pueblo excavations (cat. nos. PEFO-9662-9672).

Table 4.5. Distribution of Core Fragments from the McCreery Pueblo Excavations.

	Fea 1.	Fea. 2	Fea. 3	Fea. 5	Rm. 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.
Petrified wood	49	5	9	25	3	9	2	1	10
Chert	11	-	-	2	2	1	-	-	2
Quartzite	-	-	-	3	1	-	-	-	-

Debitage

By far the largest class of flaked-stone artifacts recovered at McCreery Pueblo was debitage — the flakes of lithic material resulting from tool manufacture and core reduction. This category does not include pieces that were subsequently modified by use (retouched and utilized). During fieldwork, 3,024 pieces of debitage were collected. Collins (1975) and Berry (1984) discuss the potential complexity in the life of a flake; it is still not well understood how to determine all of the natural and cultural transformation processes that may be affecting flaked-stone assemblages. However, debitage is generally considered a useful indicator of lithic technology and past behavior (Berry 1984; Rozen 1981; Schiffer 1976; Sullivan and Rozen 1985). For example, because debitage usually remains at the area of manufacture, it would seem a more reliable source of manufacturing data than finished tools (Collins 1975:19).

Sullivan and Rozen (1985; Rozen and Sullivan 1989) provide a simplified method of "interpretation-free" categorization aimed at estimating the intensity and type of lithic reduction. Sullivan and Rozen's categories are aimed at distinguishing two kinds of lithic reduction, primary and secondary, in archeological contexts:

> Primary reduction (e.g., core reduction) is the reduction of pieces of material that have not been artificially detached from other pieces of material. Secondary reduction (e.g., tool manufacture) is the reduction of items that have been previously detached from other pieces of material. We assume that, in comparison to primary-reduction assemblages, those produced by secondary reduction will be characterized by a more restricted range of flake size, smaller flakes, and less cortex, all other factors, such as material size, being equal. We also assume that soft-hammer biface reduction yields assemblages that, in comparison to those produced by hard-hammer core reduction, have higher percentages of flake fragments, and lower percentages of whole flakes and debris [Rozen and Sullivan 1989:173].

Collections composed of both the remains of core reduction and tool manufacturing will exhibit intermediate characteristics of the two kinds of reduction. When primary reduction is intensive (that is, when many flakes are detached from the core), it would produce relatively more smaller flakes and flake fragments and fewer cortical flakes, making it hard to distinguish from secondary reduction. When the object of secondary reduction is the manufacture of bifaces, however, it can be distinguished from primary reduction, regardless of intensity, based on platform characteristics. The by-products of biface manufacture will have faceted platforms rather than plain or cortical ones. The initial stages of biface reduction will have lower frequencies of faceted platforms than later stages (Rozen 1981).

Distribution

The distribution of debitage recovered and the relative densities of debitage, and the ratio of debitage to sherds are listed in Table 4.6. While such measures are not presumed to have direct behavioral correlates, inter- and intrasite comparisons do suggest that differing formation processes were responsible.

Sixty-one percent of all debitage came from excavation units within the trash mound (Feature 1). In addition, another 7 percent was from the 5 m by 5 m surface collection unit on the trash mound. As a whole the excavation units within the trash mound had a lithic density three or more times greater than other units. The only units approaching the subsurface density of the trash mound were Features 3 and 5. Both of these features consist of architectural debris as well as debitage and sherds. The high density of debitage in these features corroborates other evidence that both features represent trash deposits, rather than structures that were built and abandoned at their current locations. In contrast the courtyard excavation units, with a similar debitage to sherd ratio, yielded overall low densities of both debitage and sherds, suggesting the gradual accumulation of primary refuse, rather than purposeful dumping.

The surface density of debitage in the 5 m by 5 m surface collection unit at McCreery Pueblo (including that recovered from the same 5 m by 5 m unit in 1985) was 10 flakes per square meter, rather low considering the unit was placed in one of the densest parts of the site. For comparison, at Sivu'ovi the denser areas of the site contained up to 25 flakes per square meter (Burton 1991), surface-collection units at a quarry area north of Puerco Ruin contained over 55 flakes per square meter, and a midden deposit just outside the walls of Puerco Ruin contained 20 flakes per square meter (Burton 1990). Although several factors can effect the surface density of artifacts, such as soil

deposition, erosion, vegetative cover, and pedoturbation, debitage to sherd ratios suggest that the relatively low amounts of debitage at McCreery Pueblo likely represent cultural, rather than natural, processes.

The debitage to sherd ratios at McCreery Pueblo are remarkedly low compared to those at Puerco Ruin and Sivu'ovi. At Sivu'ovi the ratio from the surface collection units was 3.6 and plaza trash at Puerco Ruin was 4.6. At Puerco Ruin the only values similar to those at McCreery Pueblo were from three trash-filled rooms and an excavation unit adjacent to a room. The relatively low density of debitage and the very low debitage to sherd ratio at McCreery Pueblo suggest that activity areas or trash deposits representing lithic reduction were not encountered during the excavation or surface collection. If indicative of the site as a whole; the pattern may reflect the relative scarcity of lithic material in the McCreery Pueblo vicinity.

Table 4.6. Distribution of Debitage from McCreery Pueblo Excavations.

	Fea. 1	Fea. 2	Fea. 3	Fea. 5	Rm. 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.[a]
Petrified wood	1621	52	181	194	109	304	22	17	165
Chert	175	3	12	35	15	17	2	3	29
Quartzite	40	-	5	5	2	8	-	1	7
Debitage/sherd ratio	.65	.34	.71	.35	.26	.78	.41	-	.85
Density (flakes/m^3)	612	69	124	195	34	47	-	-	n/a

a. Includes debitage from 1985 surface collection.

Material Types

Only four material types are represented in the debitage collection: petrified wood, chalcedony, chert, and quartzite. In this analysis, chalcedony was lumped with petrified wood; very little chalcedony was identified, and it was not possible to consistently differentiate it from the translucent heart "wood" found in petrified logs. Both materials have similar flaking qualities (Schiffer 1976:104) and are available locally.

Most of the petrified-wood debitage recovered at McCreery Pueblo (reds-blacks, grays-whites) is similar in color to that found at Jasper Forest, 13 km (8 miles) southwest, and at the Black Forest 12 km (7.5 miles) north. However, scattered logs of these colors can be found throughout the site vicinity, and the McCreery Pueblo inhabitants may have used the locally available petrified wood. On the other hand, the only known source for the few distinctively yellowish-purple pieces in the collection is the Rainbow Forest area, 24 km (15 miles) south. Chert and quartzite cobbles are both found on site and in nearby terraces and drainages.

Petrified wood comprises over 88 percent of all material types recovered. Table 4.7 shows the distribution of material types. In the various analytical units, petrified wood comprised from 82 to 96 percent of the material types, similar to other sites excavated in the immediate area (Jones 1983, 1986; Tagg 1987). This pattern most likely reflects local availability: petrified wood appears to be the preferred material at McCreery Pueblo simply due to its relative abundance in the site area. The highest percentages of nonpetrified wood material was found in Features 2 and 3, the courtyard

excavation units, and Structure 1 (great kiva).

Material type is also considered in the following discussions of mean weight, debitage type, and platform type for debitage from Feature 1, the trash mound, since this provenience yielded the highest numbers of flakes.

Table 4.7. Percentages of Lithic Material Types from McCreery Pueblo Excavations.

	Fea. 1	Fea. 2	Fea. 3	Fea. 5	Rm. 1	Court-yard	Str. 1	Misc. Units	Surf. Coll.
Petrified wood	88	96	91	83	86	92	92	86	82
Chert	10	4	6	15	13	5	5	14	14
Quartzite	2	-	4	2	2	2	2	-	7

Size-Sort Data

Size classifications of debitage have been used to infer the type, intensity, or stage of lithic reduction (such as primary reduction-quarrying vs. secondary reduction). The principles of size-sort analysis are based on replicative experiments and the patterns observed at sites where the function is adduced through additional evidence (Basgall 1983; Patterson 1983, 1990; Stahle and Dunn 1982). For example, in replicative experiments biface production produces an exponential curve, with many relatively small flakes, no matter what the stage of reduction (such as preform or finished tool; Basgall 1983; Patterson 1983, 1990; Stahle and Dunn 1982; Figure 4.5a). Size sorting at biface reduction sites produces a curve similar to that produced experimentally (Basgall 1983; Goldberg et al. 1990; Figure 4.5b), while at quarry sites a bell-shaped curve results, with few large and small flakes, and many mid-sized ones (Patterson 1983; Goldberg et al. 1990; Figure 4.5c). Size sorting at sites where the predominant activity was tool maintenance shows a truncated distribution, with fewer large flakes (Bettinger et al. 1984; Burton 1986; Figure 4.5d). Figure 4.5e shows the size-sort results for Puerco Ruin, a Pueblo IV site at Petrified Forest (Burton 1990), and Figure 4.5f shows the size-sort results for a Basketmaker II site at Petrified Forest (Burton 1991). Each shows a similar flattened curve indicative of expedient flake technology.

Debitage from McCreery Pueblo was size sorted through nine nested hardware-cloth screens with openings of decreasing size. Artifacts were assigned to the size class of the screen through which they would not pass. The size classes are: (1) less than 6 mm (1/4 inch), (2) 6 mm to 12 mm, (3) 12 mm to 18 mm, (4) 18 mm to 24 mm, (5) 24 mm to 30 mm, (6) 30 mm to 36 mm, (7) 36 mm to 42 mm, and (8) greater than 42 mm. This method is less time consuming than other methods of measurement and provides an assessment of relative size for far more artifacts than would have been otherwise possible.

Size sorting for the various proveniences indicates two patterns, one suggesting primary reduction and the other tool maintenance. The best data for size sorting come from Feature 1 and Feature 5, where excavation units were screened through 1/8-inch mesh. The size-sort curves from these units indicate tool maintenance (secondary reduction) at Feature 1 and quarrying (primary reduction) at Feature 5 (Figure 4.6). The remaining units were screened through 1/4-inch mesh so the smallest size class would be artificially reduced. Taking the recovery method into account, the size sorting indicates

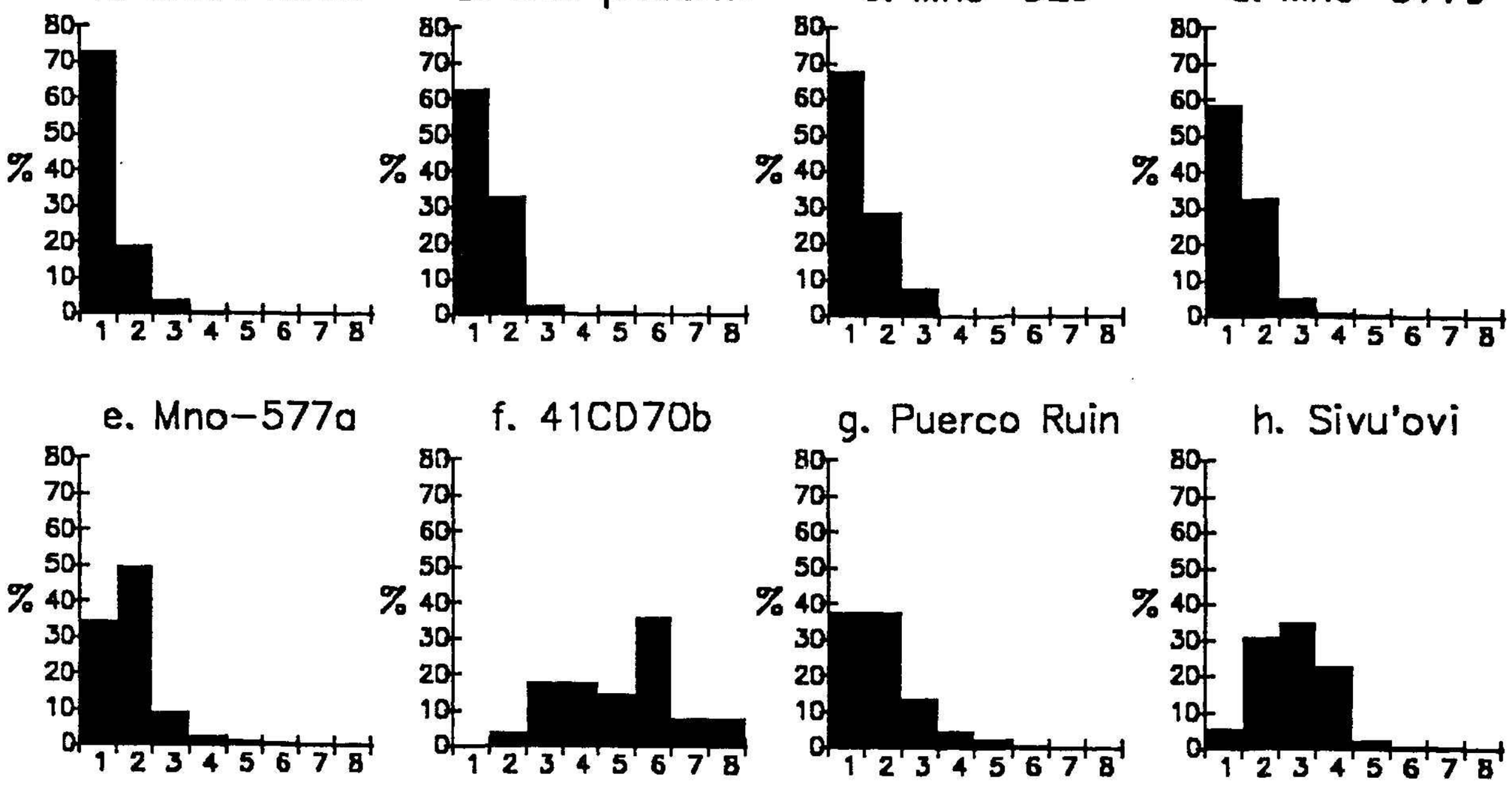

Figure 4.5. Comparative size-sort data, a. Stahle and Dunn (1982), b-c. Basgall (1983), d-e. Goldberg et al. (1990), f. Patterson (1983), g. Burton (1990), h. Burton (1991).

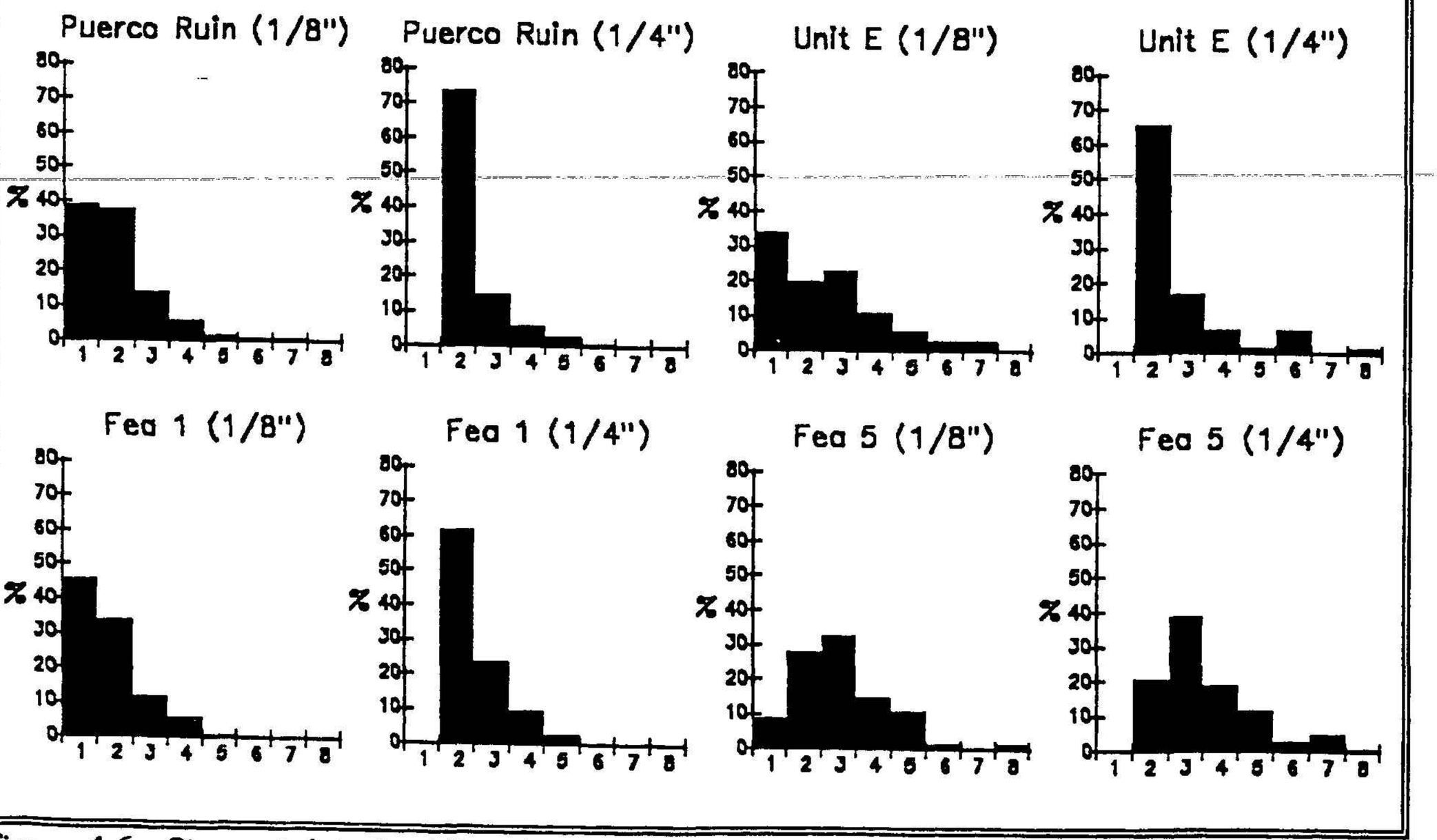

Figure 4.6. Size-sort data for 1/8-inch- and 1/4-inch-screened units at Puerco Ruin (top row) and McCreery Pueblo (bottom row).

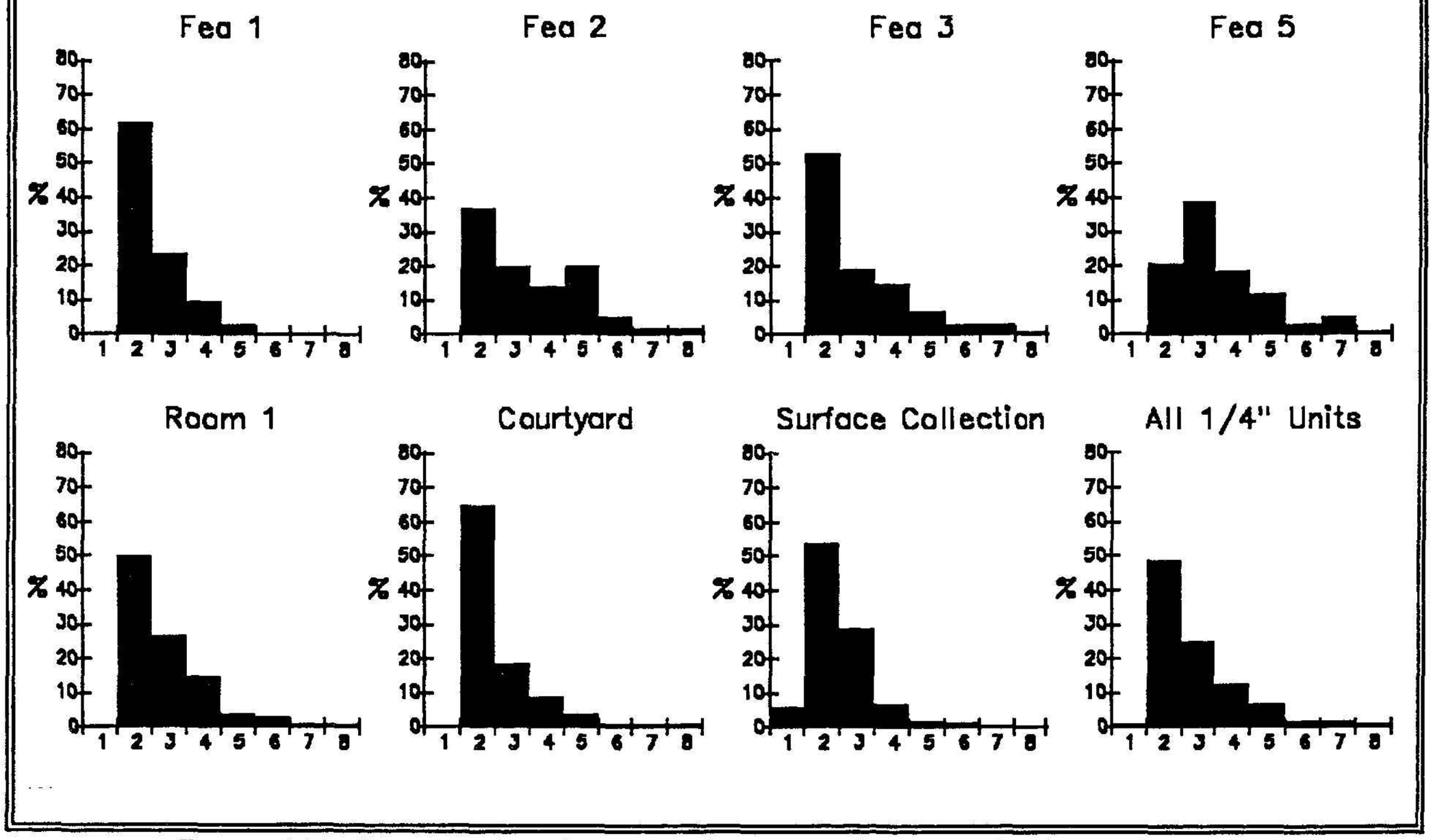

Figure 4.7. Size-sort data for 1/4-inch-screened units at McCreery Pueblo.

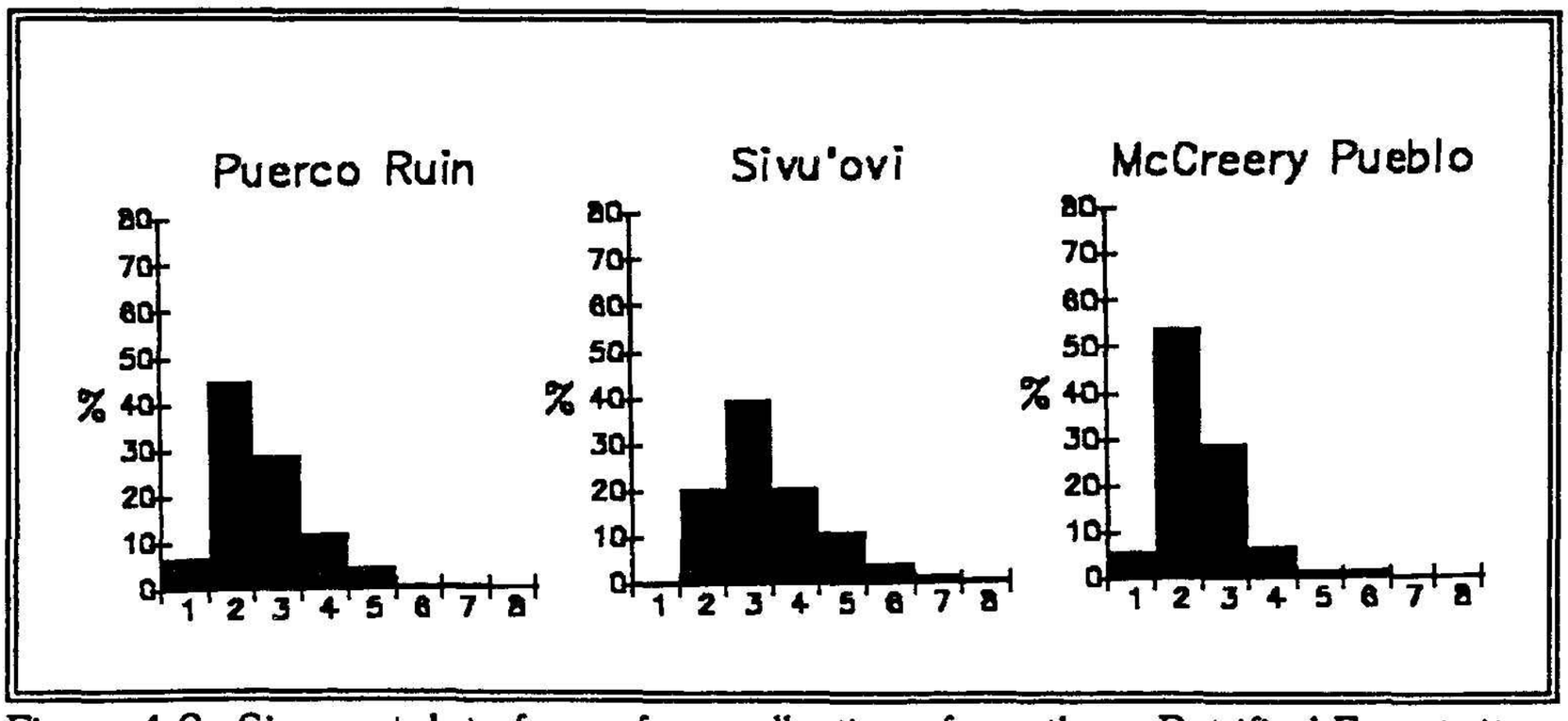

Figure 4.8. Size-sort data for surface collections from three Petrified Forest sites.

Feature 2 (architectural debris and trash) is most similar to Feature 5, suggesting debris from quarrying. Feature 3 (also architectural debris and trash), the courtyard units, and Room 1 are most like Feature 1, and the debitage found in these locations most likely reflects tool maintenance (Figure 4.7). The size-sort data for tool maintenance at McCreery Pueblo are very similar to those for plaza trash deposits (Unit E) at Puerco Ruin, suggesting that both represent similar activities and discard patterns (see Figure 4.6).

The quarrying debris found at Feature 5 of McCreery Pueblo differs from that of quarrying at Sivu'ovi in that McCreery Pueblo, like Puerco Ruin, lacks debitage in the larger size classes. This probably reflects the relative scarcity of lithic material in the McCreery Pueblo area, and hence the more intensive use of lithic resources. Size-sort data from the surface collection at McCreery Pueblo is most similar to that of Puerco Ruin (Figure 4.8)

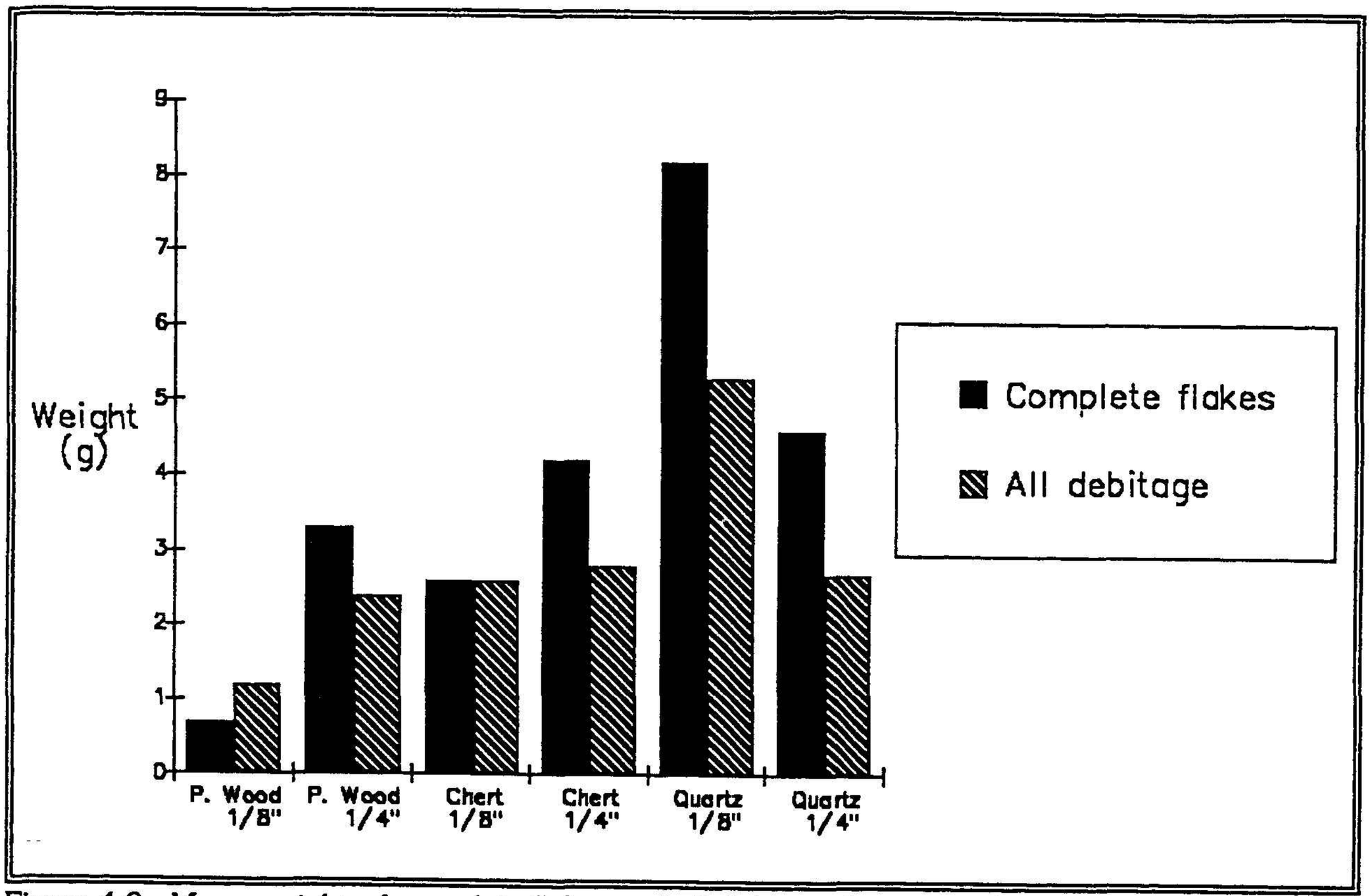

Figure 4.9. Mean weight of complete flakes and all debitage by material type at McCreery Pueblo.

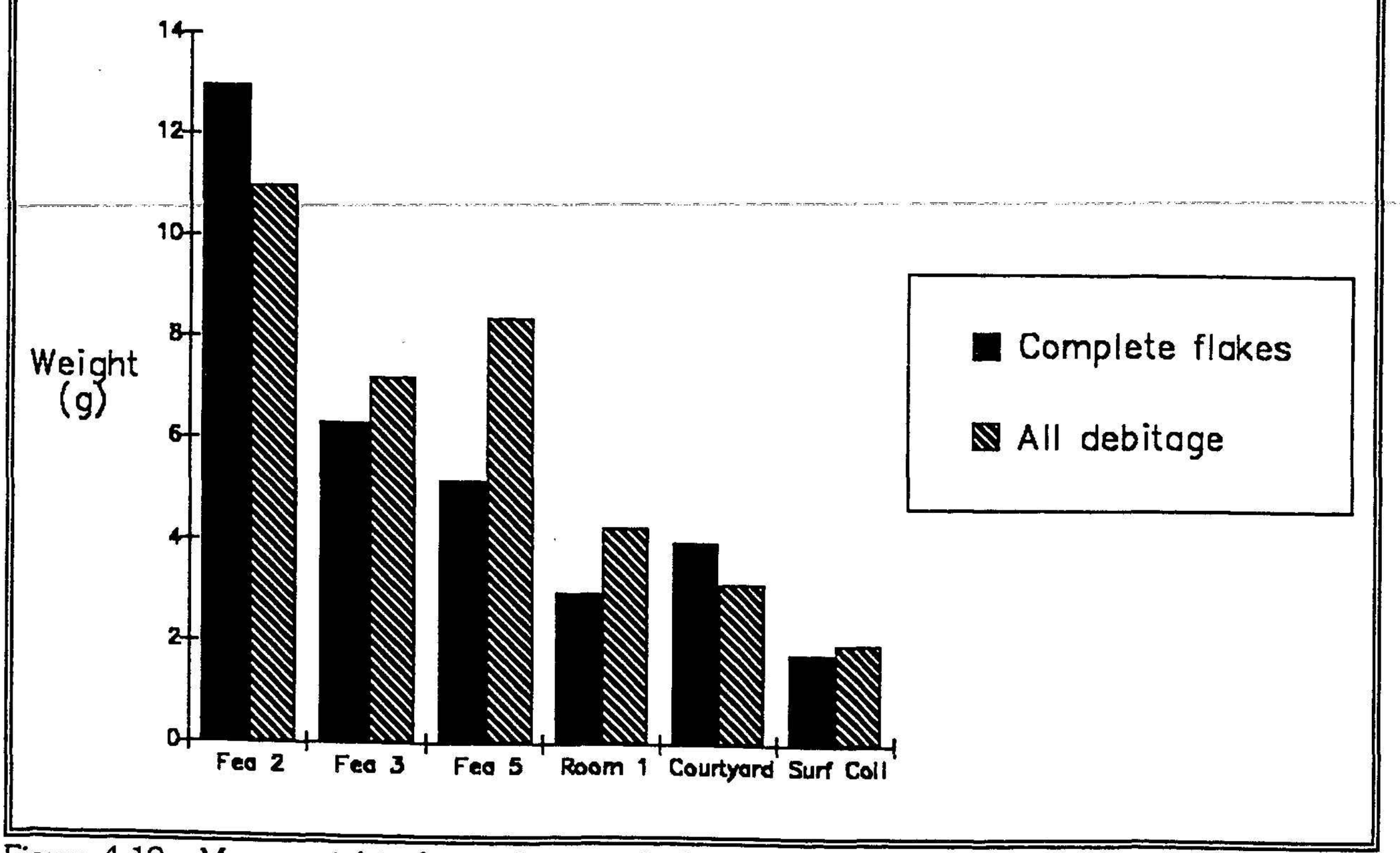

Figure 4.10. Mean weight of complete petrified wood flakes and all petrified wood debitage by provenience at McCreery Pueblo.

Mean Weight

Patterson (1983) notes that mean flake weight is directly correlated to size, and hence should provide the same information as the size-sort data. Lower mean weight may indicate secondary reduction, and higher mean weight primary reduction or quarrying activities.

Figure 4.9 shows the mean weight for the different material types within Feature 1 from 1/8-inch and 1/4-inch-screened units. Quartzite debitage and complete flakes are the heaviest, followed by chert and petrified wood. This suggests that quartzite and to a lesser extent chert were used less intensively than petrified wood. The similar mean weights for chert from 1/8-inch-screened and 1/4-inch-screened units suggests flake production, in that few small flakes from tool maintenance are present even in the 1/8-inch-screened unit. The differences in the petrified-wood mean weights could reflect the brittle nature of that material or tool production and maintenance.

Figure 4.10 shows the mean weight of all debitage and of complete flakes recovered by provenience. Both calculations yield similar results, with chert and petrified wood from Features 2, 3, and 5 the heaviest, followed by debitage from Feature 1, Room 1, the courtyard units, and the surface collection. Following Patterson (1983), these differences indicate that either more primary reduction or less intensive reduction occurred at Features 2, 3, and 5. This corroborates the size-sort data for Features 2 and 5, but contradicts that for Feature 3. Perhaps the debitage from Feature 3 represents a specialized task or an intermediate stage of lithic reduction.

The debitage mean weights are similar to those at nearby Puerco Ruin, which dates to the Pueblo IV period. Mean weights there for room and plaza units were less than 3 g. Even in the units excavated outside the pueblo walls, inferred to be the site of initial stages of reduction, most debitage weighed between 4 and 5 g. Lithic-reduction technology appears to have remained stable from the Pueblo II to Pueblo IV periods. This may reflect the nature of the raw material, as much as any general technological conservatism.

Debitage Type

All debitage was analyzed using the flake classes defined by Sullivan and Rozen (1985; Rozen 1981, 1984), a schematic of which is presented in Figure 4.11. Debitage exhibiting use-wear visible with the unaided eye or under a 10X hand lens were classified under the category of tools and are not included here. The debitage types in the Sullivan and Rozen classification are complete flakes, proximal fragments, medial-distal fragments, split flakes, and debris. **Complete flakes** are defined as those flakes with a striking platform and all edges intact. **Proximal flakes** have intact striking platforms, but one or more edges are missing. **Medial-distal fragments** lack striking platforms. **Split flakes** have bulbs of percussion that are split at the point of applied force, thus removing a portion of one or both margins. **Debris** includes nonorientable pieces that lack a single interior surface. Sullivan and Rozen (1985) determined that primary (core) reduction produces more complete flakes and debris, while secondary reduction (tool making) generates mostly proximal and medial-distal flake fragments.

There are two potential problems in applying Sullivan and Rozen's classification. First, their study is based predominately on cobble chert, and may be less applicable to other lithic materials, such as large blocks of petrified wood. Second, as Sullivan and Rozen note, the model assumes that all material at a site is what Schiffer (1985) terms "primary refuse." Cleanup and trash disposal will affect distributions, and may be difficult to sort out from primary refuse.

Figure 4.12 depicts the percentage of debitage by material type for Feature 1. The high percentage of complete chert and quartzite flakes indicates primary reduction of this material. For petrified wood, on the other hand, the high percent of fragments indicates secondary reduction.

Because petrified wood is more brittle than chert and quartzite, these differences may be partially due to material type. But there are intrasite differences in petrified-wood debitage types that may indicate behavioral differences (Figure 4.13).

The high percentage of petrified wood flake fragments from all proveniences suggests secondary reduction (see Figure 4.13). The relatively higher portion of complete flakes in Feature 5, Room 1, and the courtyard excavation units and the high percentage of debris in all units would indicate primary reduction. This pattern does not appear to be biased by trash-disposal patterns. Larger complete flakes (and perhaps associated debris, if part of a single event) are more likely to be cleaned up and deposited in a trash dump than smaller items (Schiffer 1987). At McCreery Pueblo smaller pieces were more common in trash deposits. Perhaps the complete flakes in Room 1 and the courtyard were left as de facto refuse when the pueblo was abandoned.

Platform Type

Platform types can be divided into four classes: cortical, crushed, plain, and faceted (Rozen 1979, 1981). **Cortical platforms** have any amount of cortex; they are assumed to be indicative of the initial stages of reduction. **Crushed platforms** have failed under the impact of the detaching blow, although the point of applied force and bulb of percussion are left intact. Crushed platforms generally have been attributed to initial-hard hammer reduction. **Plain platforms** consist of a single plane, roughly perpendicular to the dorsal and ventral surfaces of the flake. They lack cortex or intersecting flake scars and are usually flat and smooth. These have been interpreted as flakes removed from a core that has been moderately reduced, that is, most or all of the cortex has been removed; desirable striking platforms may have been created by the initial flake removal. **Faceted platforms** have one or more flake scars intersecting the platform. Faceted platforms may be from more intensively reduced cores, or "bifacial" cores; they are found on biface-thinning flakes, which are characterized by a pronounced lipping of the platform as well. Faceted platforms usually are associated with secondary reduction.

Platform-type classifications are illustrated in Figures 4.14 and 4.15. These data parallel and support that of debitage type. Within Feature 1 the high percentage of chert and quartzite with cortical platforms indicates primary reduction of those materials. Higher percentages of plain and faceted petrified wood indicates secondary reduction. Again, Features 3 and 5 have the best evidence of primary reduction.

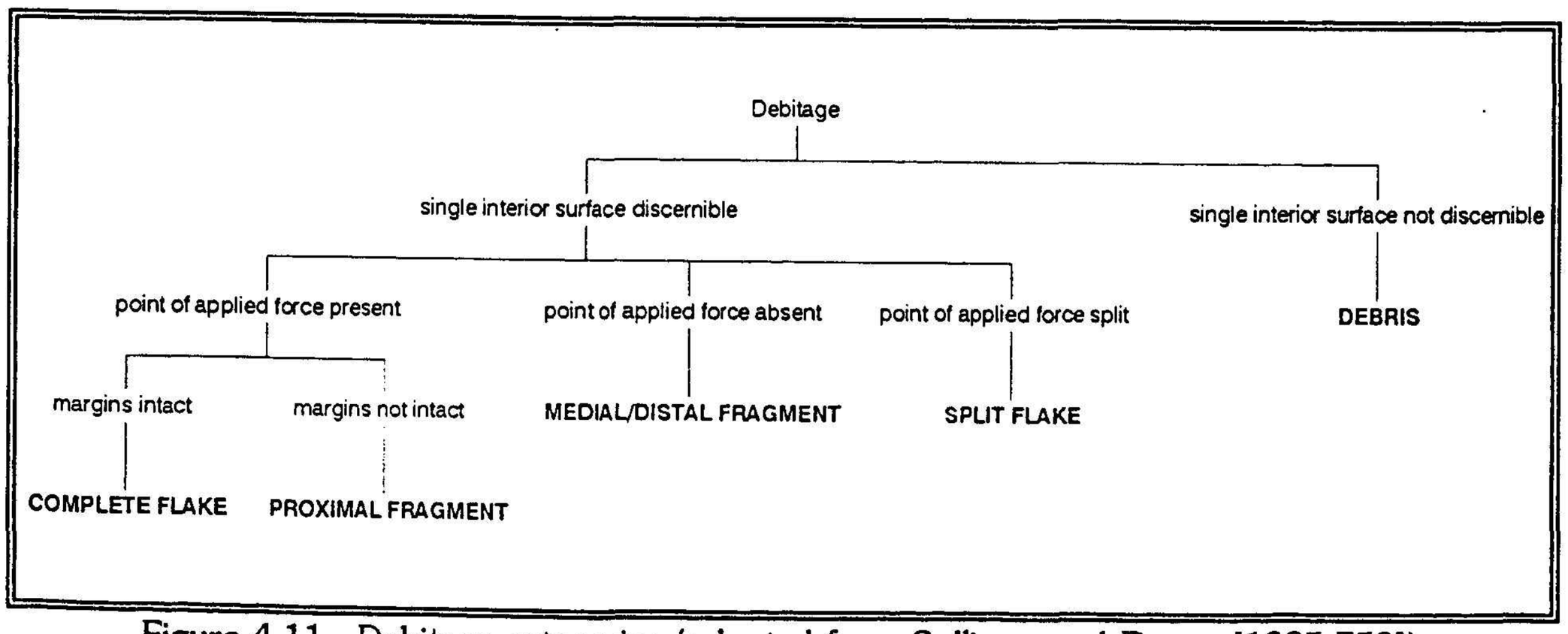

Figure 4.11. Debitage categories (adapted from Sullivan and Rozen [1985:759]).

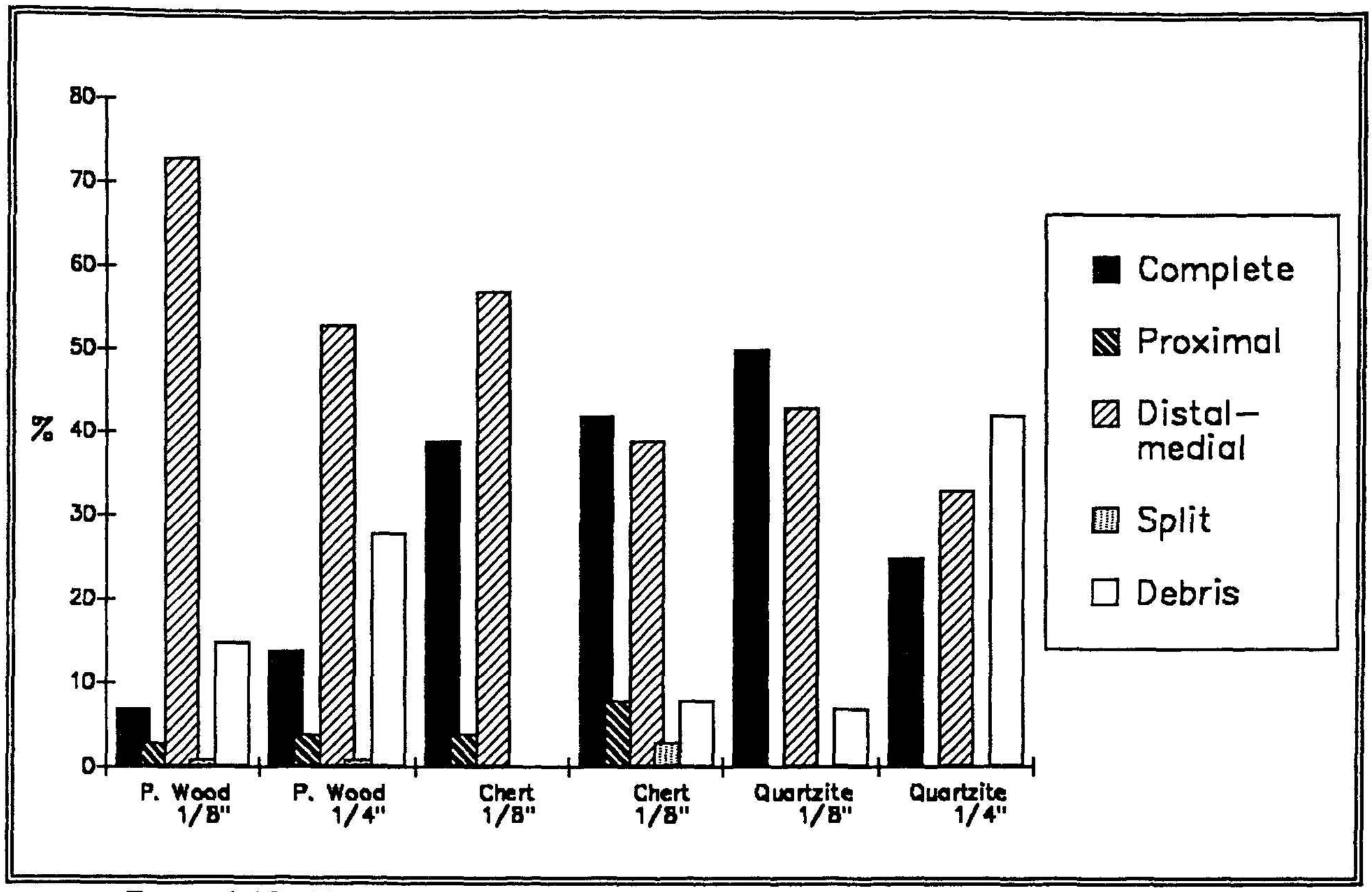

Figure 4.12. Percentage of debitage types by material type at McCreery Pueblo.

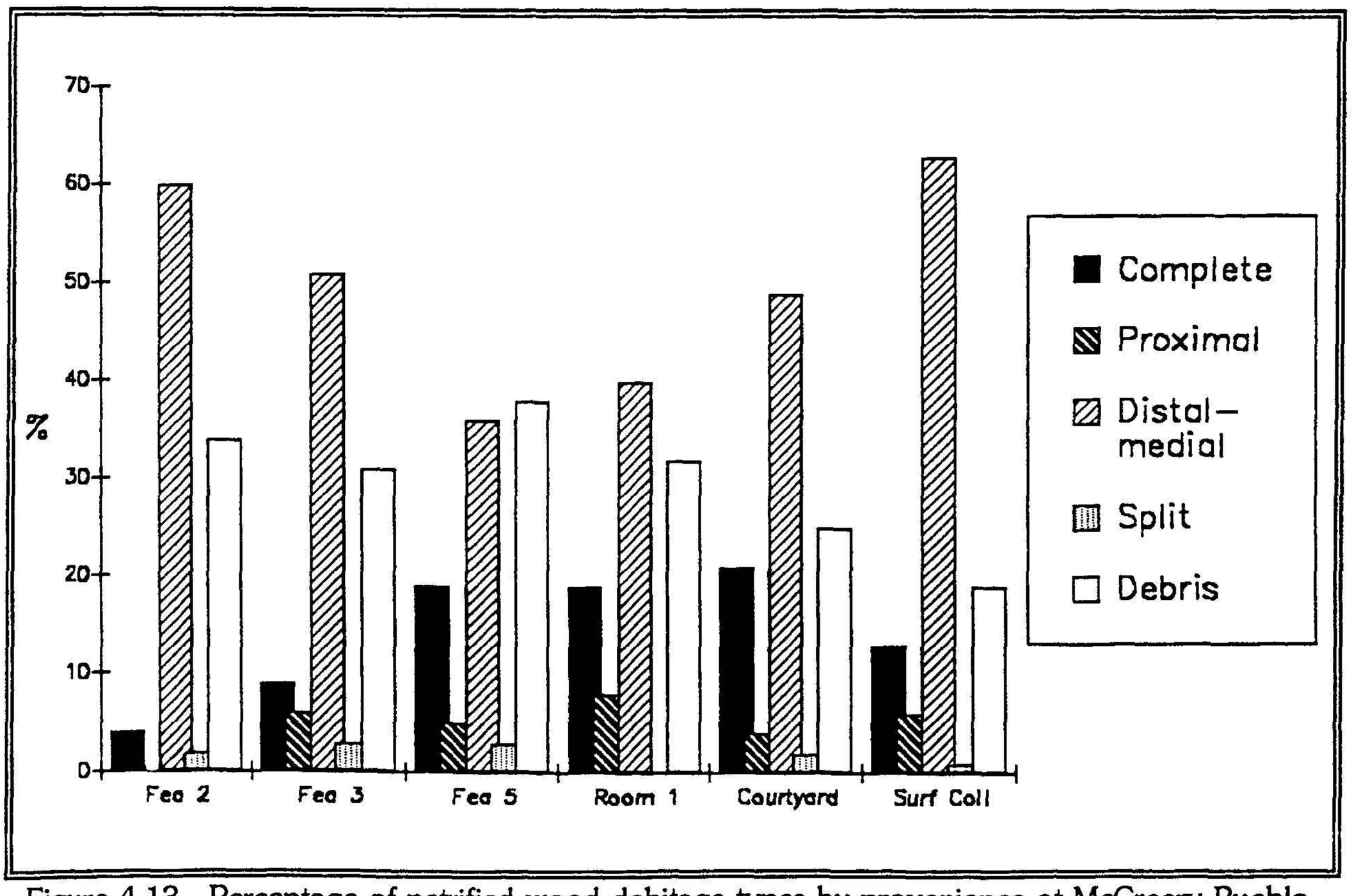

Figure 4.13. Percentage of petrified wood debitage types by provenience at McCreery Pueblo.

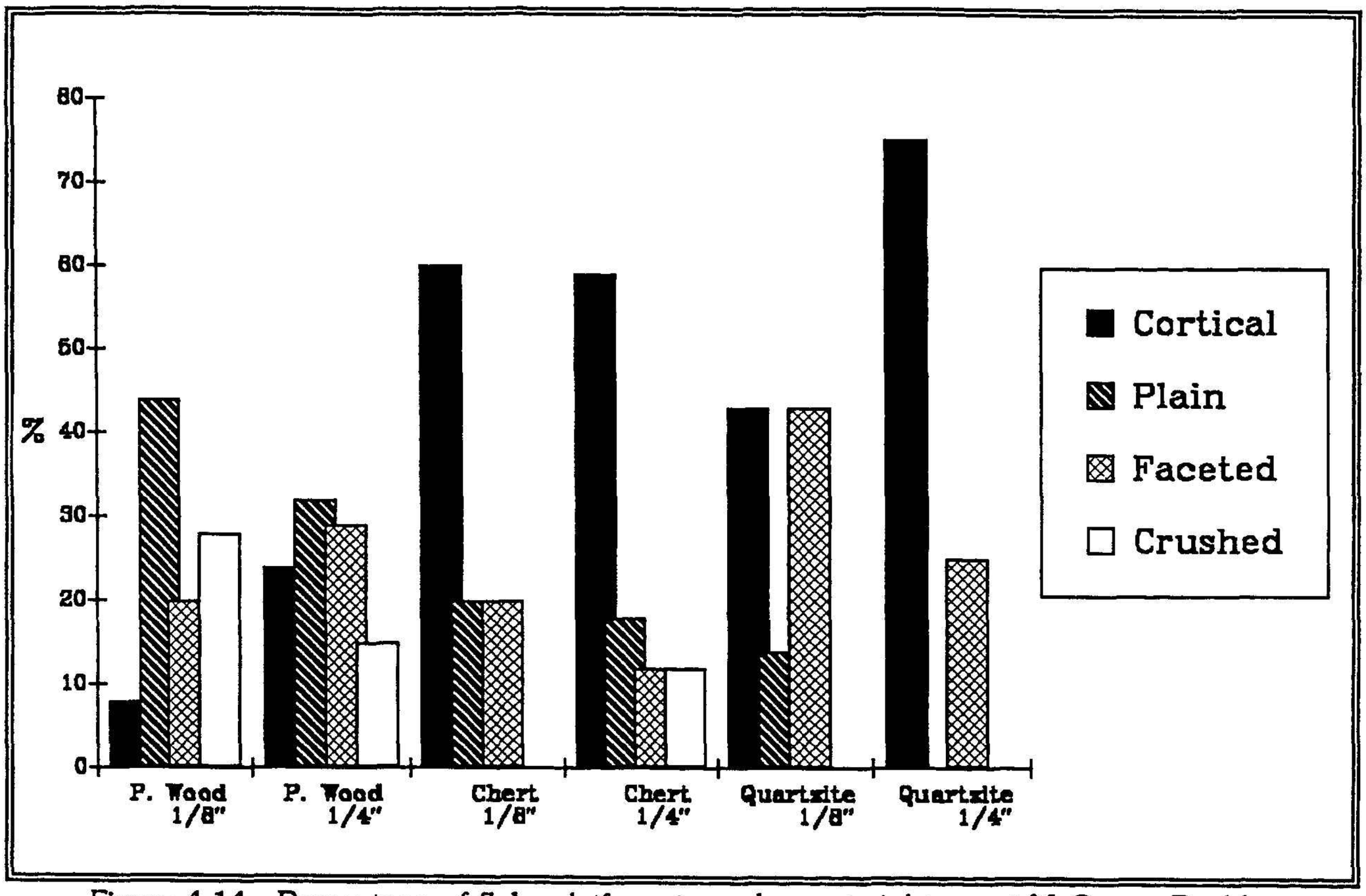

Figure 4.14. Percentage of flake platform types by material type at McCreery Pueblo.

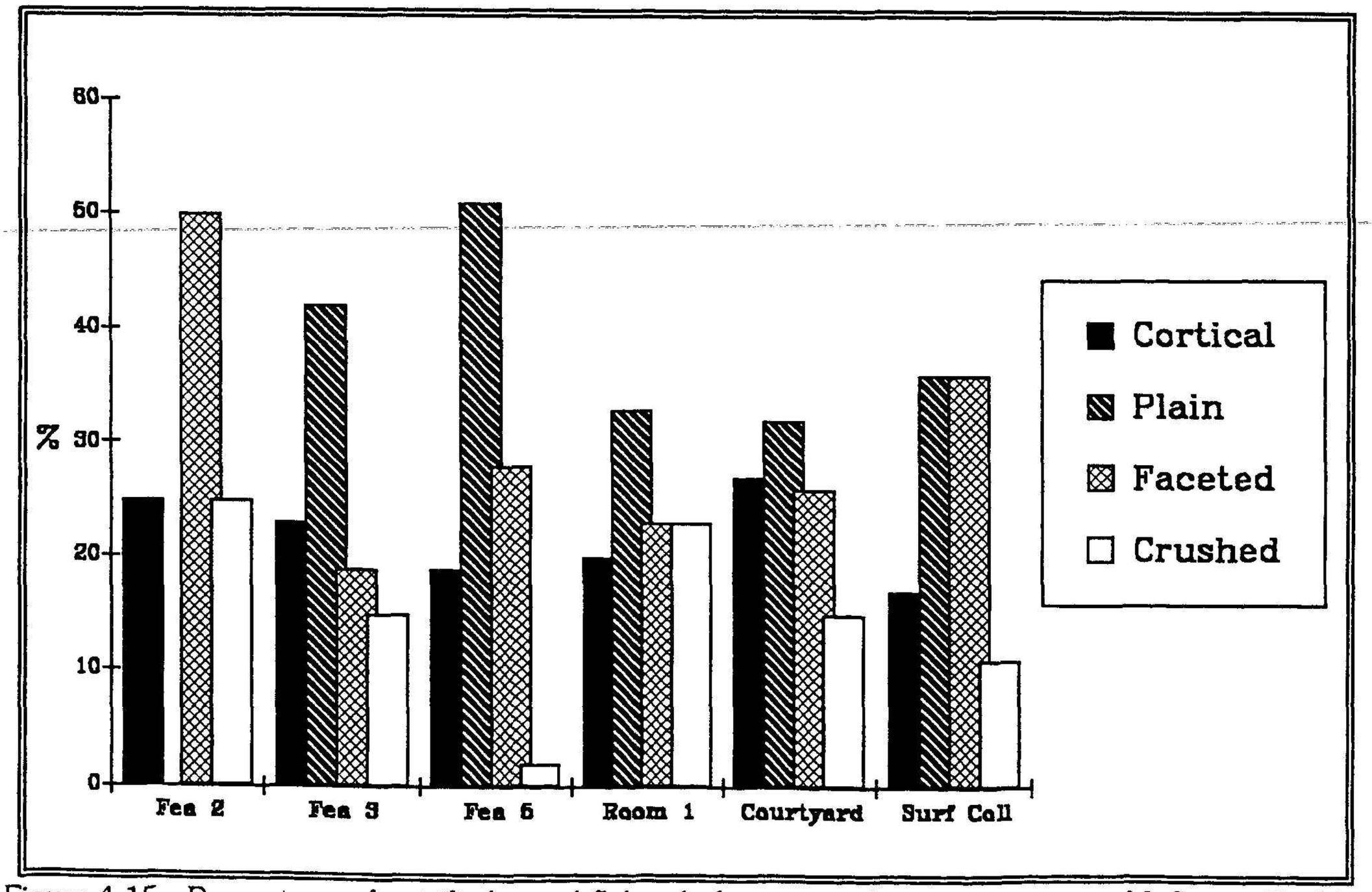

Figure 4.15. Percentage of petrified wood flake platform types by provenience at McCreery Pueblo.

Discussion

McCreery Pueblo exhibits an expedient flake technology, as is common at other excavated pueblo and village sites within Petrified Forest National Park. The flaked-tool assemblage is dominated by utilized flakes; few retouched pieces and only four formal tools were recovered. Of the formal tools, two or three reflect reuse of scavenged material. Debitage analysis indicates intensive secondary reduction of petrified wood and primary reduction of chert and quartzite. Intensive reduction of petrified wood is also indicated by the abundance of exhausted petrified-wood cores. Nearly all of the lithic material at the site could have been procured in the immediate area. The only unquestionably exotic material was an obsidian point fragment.

Besides variability in the reduction stages and intensity for different materials, there is also variability in the intrasite spatial patterning. In most areas of the site tested evidence of secondary reduction was prevalent, however primary reduction was indicated at Features 2, 3, and 5.

Within the last eight years debitage from a variety of site types at Petrified Forest National Park has been analyzed using the same or comparable methods. These sites include Puerco Ruin, a large Pueblo IV site, with over 125 rooms and four kivas and an adjacent quarry/workshop area (Burton 1990); two small campsites and a small pueblo with midden, located along the park mainline road, dated to the Pueblo II-III period (Jones 1986); Locus 3 of AZ Q:1:42, an artifact scatter dated to the Basketmaker III period (Jones 1983); Sivu'ovi, a Basketmaker II occupation site with over 45 structures, and an Archaic campsite with possible habitation features and a hearth (Tagg 1987). The results of the lithic analysis at these sites and McCreery Pueblo are summarized in Table 4.8.

The general trend in the Southwest is toward a more expedient lithic technology, that is, from formal tools, such as bifaces, to retouched and utilized flakes (Parry and Kelly 1987: 290-292), is apparent in the data from Petrified Forest. The clearest indicator of this trend in the Petrified Forest data is the steady decline in the percentage of formal tools, itself: while the Archaic site had 67 percent formal tools, the Basketmaker II-period Sivu'ovi has only 31 percent, the Basketmaker III period site had 13 percent. The Pueblo II-III Mainline Road sites and McCreery Pueblo had 7 and 0.1 percent formal tools respectively, and the Pueblo IV Puerco Ruin 7 percent. The debitage to tool ratio at McCreery Pueblo is most similar to that at Puerco Ruin, consistent with the general pattern of decline in the ratio from the Archaic period to the Pueblo period.

Usually in the Southwest, the trend toward using a expedient technology also is reflected in the decreasing percentages of flakes with faceted platforms through time (Rozen 1979, 1981). This decline is demonstrated by data compiled by Parry and Christenson (1986) from sites in the northern Southwest: at Archaic sites, 41 percent of flakes had faceted platforms; at Basketmaker II sites, 41 percent; at Pueblo I sites, 34 percent; and at Pueblo II sites, 22 percent. Data from Petrified Forest are not so clear-cut, although the Basketmaker II and Archaic sites have generally more than later Pueblo-period sites. The low percentages of faceted flakes at Petrified Forest sites may be due to differences in raw material as well as technology. Petrified wood, though commonly present at other sites in the region, rarely comprises a significant percentage of lithic assemblages much beyond the Petrified Forest area. Comprising up to 95 percent of flake material at the Petrified Forest sites, petrified wood may have intrinsic characteristics (e.g., brittleness) that make faceted flakes less likely with biface production, or more difficult to recognize in the archeological record.

However, of the analyzed sites McCreery Pueblo has the highest percent of faceted platforms and the lowest complete flake-to-flake fragment ratio. Raw material may have been less abundant in the site vicinity, resulting in more intensive reduction (use) and hence more faceted flakes. Further, petrified wood, which occurs as large logs, was likely initially reduced elsewhere for transport to the site, while smaller chert and quartzite cobbles could be transported without reduction.

Table 4.8. Comparison of Lithic Analysis Results for Sites at Petrified Forest National Park.

	Puerco Ruin (Burton 1990)	McCreery Pueblo (This Report)	Mainline Road Sites (Jones 1986)	AZ Q:1:42[a] (Jones 1983)	Sivu'ovi (Burton 1991)	AZ K:13:60 (Tagg 1987)
Time period	Pueblo IV	Pueblo II/III	Pueblo II/III	Basketmaker III	Basketmaker II	Late Archaic
Sample size	26,763	3,330	603	599	2,632	512
Percent petrified wood	95	88	86	80	95	76
Debitage to tool ratio[b]	134.5	144	19.3	21.7	22.9	28.4
Core to debitage ratio	.01	.06	.05	.10	.08	.02
Core to tool ratio[b]	2.0	10.2	.89	2.2	1.8	.50
Percent formal tools[c]	7	0.1	5	13	31	67
Percent faceted platforms	8	30	4	n/a[d]	19	11
Percent cortical platforms	12	27	37	32	9	18
Cortical to faceted platform ratio	1.5	.91	8.9	n/a	.47	1.6
Percent complete flakes	25	14	38	35	22	44
Percent flake fragments	61	59	33	23	49	55
Percent debris	14	27	39	42	29	3
Complete flake to fragment ratio	.41	.24	1.6	1.5	.45	.83

a. Locus 3 only
b. Excluding utilized flakes
c. Projectile points and bifaces
d. Not tabulated (24% had lipped platforms)

Chapter 5
Ground Stone and Other Artifacts

Fifteen ground-stone artifacts, 18 hammerstones, and a variety of other artifacts and materials were recovered during the 1992 testing at McCreery Pueblo. During the 1985 surface collection six mano fragments, a grinding-slab fragment, and a turquoise bead were collected (Jones 1986). Monitoring in 1987 recovered a petrified-wood hammerstone from the vicinity of Feature 4.

Ground-Stone Artifacts

Recovered ground-stone artifacts consist of nine complete or fragmentary manos, four complete or fragmentary metates, a palette, and a large sandstone disk.

Manos

Two complete and seven mano fragments were recovered (Figure 5.1). The complete manos are generally loaf shaped with unifacial use. They exhibit pecking and grinding around their circumferences and on one well-ground flat working surface. One, of coarse red sandstone, has obvious finger grooves (Figure 5.1b). It was found within the wall fall of Room 1. The other complete mano, of fine-grained gray sandstone, had slight indentations that may have functioned as finger grooves (Figure 5.1c). It was recovered from the 10-20 cm level of Feature 5.

The seven mano fragments consist of one multifaceted, one bifacial, and five unifacial specimens. Three of the unifacial specimens are fine-grained gray sandstone and two are fine-grained brown sandstone. One was recovered from Feature 1 (10-20 cm), three were recovered from Feature 3 (one each from the 0-10 cm, 10-20 cm, and 30-40 cm level), and one was recovered from Feature 5 (20-30 cm). The faceted and bifacial specimens are of coarse red sandstone. The faceted specimen was from Feature 1 (20-30 cm). The bifacial specimen was from the 20-30 cm level of Feature 3.

Measurable attributes of the McCreery Pueblo manos are comparable to those recovered during recent excavations at Puerco Ruin and Sivu'ovi (Table 5.1). Mean length and width are slightly less than that at both sites, while mean thickness falls closer to the Puerco Ruin specimens. Also, as at Puerco Ruin and Sivu'ovi, multifacial manos were rare. Previous research has suggested that at Petrified Forest thickness rather than length or the number of grinding surfaces may be more indicative of the intensity of use and the degree of dependence on agriculture (Burton 1991:78), and the McCreery Pueblo manos appear to fit this pattern.

Metates

One complete metate and three metate fragments were encountered during the excavation. The complete specimen was used in the construction of a slab-lined hearth in the courtyard (Structure 2, Unit 3, Feature 1). It consists of a flat sandstone slab measuring 56 cm by 28 cm by 4 cm thick. One face has a slightly concave ground area. It was photographed and measured in the field but was not collected.

Fragmentary specimens consist of a portion of a slab metate from the courtyard (Unit 3, 20-40 cm), a trough-metate fragment from Feature 3 (0-10 cm), and a small indeterminate fragment from the 5 m by 5 m surface collection unit on the trash mound (Feature 1).

Figure 5.1. Typical manos from the McCreery Pueblo excavations (cat. nos. PEFO-9885-9888).

Table 5.1. Manos from McCreery Pueblo with Two or More Complete Dimensions and Range and Mean Dimensions of Manos from Puerco Ruin and Sivu'ovi.

	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
Room 1, Wall Fall	20.0	12.0	5.2	1921.0
Feature 1, 20-30 cm	(6.0)	7.5	3.0	(133.0)
Feature 3, 30-40 cm	(9.5)	12.0	4.0	(913.0)
Feature 5, 10-20 cm	20.1	9.0	3.0	927.0
Feature 5, 20-30 cm	(23.0)	7.5	5.0	(1098.0)
Puerco Ruin (n=14)[a]	13.0-29.5 $\bar{x}$=21.6	8.5-12.0 $\bar{x}$=10.0	1.0-6.0 $\bar{x}$=3.9	
Sivu'ovi (n=6)[b]	17.5-24.5 $\bar{x}$=21.0	9.8-11.7 $\bar{x}$=10.6	4.4-6.4 $\bar{x}$=5.7	

Note: Incomplete measurements are shown in parentheses.
a. Burton 1990:189; data for complete two-hand manos only.
b. Burton 1991:77.

Other Ground-Stone Artifacts

A unifacial limestone palette was recovered from Feature 3 in the 30-40 cm level. The irregularly shaped stone, apparently complete, measures 9.0 cm by 7.3 cm by 1.9 cm. The central portion of the stone has a slightly concave (dished) ground and polished area (Figure 5.2). A worked sandstone slab fragment was recovered from Feature 3 in the 20-30 cm level. It appears to have been circular, 11.5 cm in diameter and 2.0 cm thick. One face is ground and pitted, suggesting past use as a mano.

Figure 5.2. Unifacial limestone palette from the McCreery Pueblo excavations (cat. no. PEFO-9889).

Miscellaneous Artifacts and Materials

Miscellaneous artifacts and other material recovered during the excavation include 18 hammerstones, 15 beads, a shell fragment, a stone ring fragment, worked pigment, abundant burned daub, and two fossils.

Hammerstones

Hammerstones collected consist of one sandstone, two chert, six petrified wood, and nine quartzite specimens (Figures 5.3 and 5.4). The gray sandstone hammerstone, weighing 923.9 g, was recovered from the wall fall of Room 1. It appears to have been shaped by pecking and grinding to form a cylinder (Figure 5.4e).

Both chert hammerstones were recovered from Feature 5 (surface and 0-10 cm level). One fragmentary specimen has two areas of well defined battering; the complete specimen (weighing 117.1 g) has three areas of battering. Both are of light gray chert.

The six petrified wood specimens are all naturally cylindrical with battering around the circumference of each end. They were recovered from the wall fall and floor fill of Room 1, from Feature 1 (0-10 cm), from Feature 3 (0-10 cm), and from Feature 5 (two in 10-20 cm level). One was fragmentary. The weight of the complete specimens ranged from 231.5 g to 878.7 g, with a mean of 509.2 g. Three are of red petrified wood, and one each is of gray, brown, and whitish/gray petrified wood. All are available in the immediate area.

Three of the nine quartzite hammerstones were recovered from the trash mound (Feature 1; 20-30 cm, 10-20 cm, and 20-30 cm). Two were from Feature 5 (0-10 cm and 20-30 cm). One each was from the wall fall of Room 1, the 20-40 cm level of the Courtyard, Feature 2 (0-10 cm), and Feature 3 (0-10 cm). Two are fragmentary. One of the quartzite hammerstones had two areas of battering and the remainder had three or more areas of battering. Seven are grayish brown, one is brown, and one is reddish brown. The weight of the complete specimens ranged from 63.3 g to 645 g, with a mean of 204.4 g. The much smaller size of the quartzite hammerstones compared to the petrified wood examples suggests the materials were used for different tasks. For example, the smaller quartzite hammerstones may have been used to flake stone tools, and the larger petrified-wood hammerstones may have been used to trim sandstone blocks for construction.

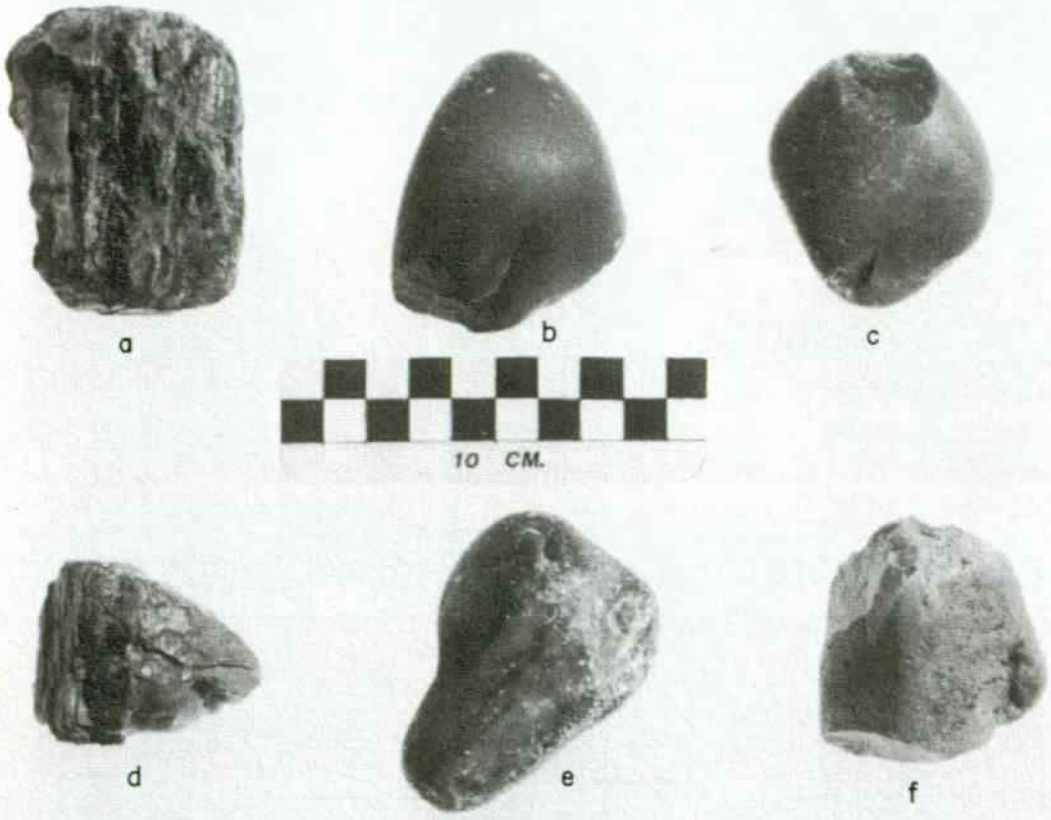

Figure 5.3. Typical small hammerstones from the McCreery Pueblo excavations, a,d. petrified wood, b,c,e. quartzite, f. chert (cat. nos. PEFO-9822-9827).

Figure 5.4. Typical large hammerstones from the McCreery Pueblo excavations, a-c. petrified wood, d. quartzite, e. sandstone (cat. nos. PEFO-9828-9832).

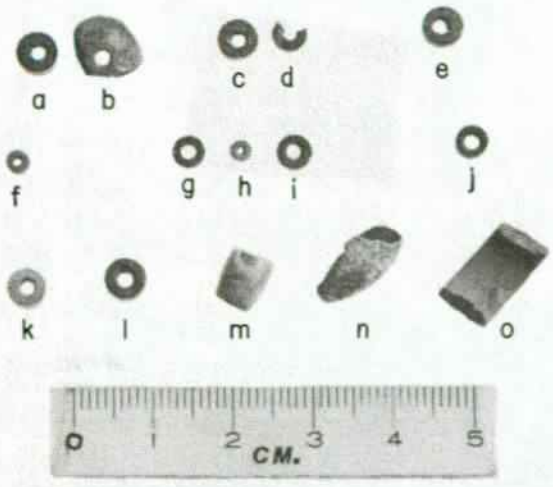

Figure 5.5. Beads and ring fragment from the McCreery Pueblo excavations, a,c-l. siltstone disk beads, b. siltstone bead blank, m-n. *Olivella* beads, o. stone ring fragment (cat. nos. PEFO-9838-9851, -9881, -9882).

Beads

Fifteen beads were recovered, including 10 gray siltstone disk beads, one tan siltstone disk bead, two other gray siltstone beads, and two shell beads.

The disk beads were recovered from: Unit 5, wall fall; 2 from Feature 1, 0-10 cm and 10-20 cm; 3 from ant hill near Feature 4; 2 from ant hill on Feature 2; Feature 5, 20-30 cm; Feature 3, surface; and Room 1, 76-78 cm. The circular beads range from 3 mm to 5 mm in diameter; thickness ranges from 1 mm to 3 mm, with a mean of 2 mm (Figure 5.5a, c-l).

The other stone beads consist of a flat oblong bead from the 10-20 cm level of Feature 1. It measures 10 mm by 8 mm by 2.5 mm thick (Figure 5.5b). Roughly the same thickness as most of the disk beads, it is likely an unfinished one. The other bead is roughly one-third complete, square with rounded corners with a center hole. It measures approximately 19 mm by 10 mm by 3 mm thick. It was from the 10-20 cm level of Feature 3.

The two shell beads are *Olivella* (Figure 5.5m-n). Both have holes ground in their spires for stringing. One is very eroded but complete. It was found in Feature 1 of the courtyard (Unit 3, 50-60 cm). The other specimen was from the trash mound (Feature 1, 0-10 cm).

Other Shell

A very small fragment of *Glycymeris* shell was recovered from the trash mound (Feature 1, 20-30 cm). The fragment is too small to tell its original size or if it is a portion of a worked artifact or debris.

Worked Stone

A ring fragment, 7 mm in diameter (Figure 5.5o), was recovered from the trash mound (Feature 1, 10-20 cm), and a small fragment of worked stone possibly from a pendant was recovered from Feature 3 in the 10-20 cm level. Both are of gray siltstone.

Pigment

A fragmentary piece of worked red hematite with two ground edges was recovered from Feature 5 (10-20 cm). The piece measures 4.0 cm by 2.5 cm by 1.8 cm. Four unmodified pieces of red hematite and seven unmodified pieces of yellow limonite were collected from the 10 cm to 30 cm levels of excavation units in the trash mound (Feature 1). These range from 6 mm (1/4 inch) to 12 mm (1/2 inch) in size.

Burned daub

Only pieces of daub larger than 12 mm (1/2 inch) were generally collected during excavation. This included several hundred pieces (20.3 kg) from excavation units in Feature 5 and one piece each from Room 1 (195 g), Unit 7 (10 g), and Feature 1 (6 g). The pieces from Feature 5 contain impressions of sticks, but excavation revealed no pattern that would suggest foundations or walls. Therefore, the daub at Feature 5 appears to be burned roofing material deposited as trash from a remodeled room.

Fossils

Two fossils were collected during the excavations. The first, a lungfish tooth plate, was recovered from Unit 7 between a depth of 35 and 45 cm. The second, a bivalve shell, was recovered from the 0-10 cm level of the trash mound (Feature 1). These items may have been collected and brought to the site as curios.

Chapter 6
Faunal Remains

Jennifer A. Waters

Faunal remains were recovered from four features during excavations at McCreery Pueblo (AZ K:13:41). Five features and two structures at the site were sampled. In addition, two extramural units were excavated. Faunal material was recovered from both structures and two of the features. A total of 416 specimens was collected and analyzed. Lagomorphs, cottontails (*Sylvilagus cf. audubonii*) and black-tailed jackrabbits (*Lepus californicus*), represent the majority of the assemblage.

Lagomorphs are the predominate fauna found in assemblages from most of the archeological sites near Petrified Forest National Park (Czaplicki 1981; Gillespie 1990, Olsen 1978; 1991; Szuter 1991). These assemblages also contain artiodactyl and rodent bone, but in fewer numbers. In addition to lagomorph, artiodactyl and rodent bone, the assemblage from McCreery Pueblo contains a few specimens of bird bone, one carnivore element, and one reptile element. Comparisons with other faunal assemblages from sites in the immediate area show basic similarities in the taxa represented. The proportions vary from site to site, but lagomorphs dominate in all cases.

Methods

Archeological material was recovered using 1/4-inch-mesh screen. Two 1 m by 1 m units, one in Feature 1 and one in Feature 5, were screened through 1/8-inch-mesh. Faunal specimens were identified using comparative materials from the mammal and avian collections at the Department of Ecology and Evolutionary Biology at the University of Arizona and from my personal collection.[1] In addition, several references were used for some identifications and to determine modern animal distributions (e.g., Hoffmeister 1986; Lowe 1976; Olsen 1964, 1968, 1972). Specimens were identified to the species level when possible. All mammal bone not identifiable to the order level was considered unidentifiable. Nonmammalian specimens were identified to the class level or below. Mammal bone not identifiable to the order level was put into one of eight unidentifiable categories: small (rodent size), small-medium (rabbit size), medium (carnivore size), medium-large (large carnivore/small ungulate size), large (ungulate size), and mammal (not classified by size). These fragments were sorted according to bone-wall thickness and circumference. Two other categories of unidentified remains include unidentifiable small animal and unidentifiable to class.

Faunal specimens from McCreery Pueblo were counted based on the number of identifiable specimens (NISP). Elements from one provenience that were broken during excavation or through bag clatter were refit when possible so that the number of specimens counted from each provenience represents discrete elements.

The minimum number of individuals (MNI) was calculated for each taxonomic group at the family level or below for each feature. The MNI was figured in the conventional way, i.e., the greatest number of proximal or distal ends of long bones or complete mandibles or maxillae from the same side of the body.

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[1] Many thanks to Yar Petryszyn for access to the mammalogy collections and Tom Huels for access to the avian collections.

In addition to taxonomic identifications, other attributes recorded for the faunal material include skeletal element, portion, symmetry, degree of burning, and modifications, such as gnawing and bone-surface erosion. The lack of epiphyseal fusion for immature specimens also was noted.

Results

Identifiable bone comprises 57 percent (236 specimens) of the faunal material at McCreery Pueblo. The taxa identified are listed in Table 6.1. Ten taxa are represented including eight mammals, one reptile, and one bird (Table 6.2). Lagomorphs comprise 81.4 percent (192 specimens) of the total identifiable remains. Jackrabbits are represented by 96 bone fragments, and cottontails are represented by 95 specimens. Birds make up 10.2 percent (24 specimens) of the identifiable bone. Three of these specimens are turkey (*Meleagris gallopavo*) bone. Rodents comprise 6.4 percent (15 specimens) of the identifiable assemblage with four taxa represented. Artiodacytls represent 1.3 percent (3 specimens) of the identifiable assemblage. Reptiles and carnivores comprise less than 1 percent (1 specimen each) of the identifiable assemblage.

Table 6.1. Taxonomic list of Vertebrate Animals from the McCreery Pueblo Excavations.

Taxon	Common Name
Aves	
Galliformes	
Phasianidae	
Meleagris gallopavo	turkey
Mammalia	
Lagomorpha	
Leporidae	
Sylvilagus cf. *audubonii*	desert cottontail
Lepus californicus	black-tailed jackrabbit
Rodentia	
Sciuridae	
Cynomys gunnisoni	Gunnison's prairie dog
Geomyidae	
Thomomys bottae	Botta's pocket gopher
Cricetinae	
Neotoma sp.	indeterminate woodrat
Carnivora	
Indeterminate medium Carnivora	dog, coyote, fox, bobcat
Artiodactyla	
Indeterminate artiodactyls	deer, pronghorn, bighorn sheep
Reptilia	
Serpentes	
Colubridae	
cf. *Pituophis melanoleucus*	gopher snake

Note: Taxonomic categories include class, order, family, genus, and species.

Forty-three percent (180 specimens) of the faunal material at McCreery Pueblo is unidentifiable (Table 6.2). Small mammal fragments comprise only 3.3 percent (6 specimens) of the unidentified remains. The small-medium sized mammal group makes up 83.3 percent (150 specimens) of the unidentified remains. No medium-sized mammal bone was recorded. The medium-large mammal category represents 1.7 percent (3 specimens) of unidentified remains, and the large-mammal category comprises 1.1 percent (2 specimens) of unidentified remains. Mammals unidentifiable to size class make up 1.7 percent (3 specimens) of unidentified bone, and bone unidentifiable to class comprises 8.3 percent (15 specimens). Unidentifiable small animals comprise less than 1 percent (1 specimen) of the unidentified remains.

Faunal material was recovered from a trash mound (Feature 1), from possible remodeling debris (Feature 5), from a room block (Structure 2), and from a possible Great Kiva (Structure 1). Table 6.3 presents the NISP and MNI by feature for identified specimens and numbers of fragments of unidentified specimens. Sixty-seven percent (279 specimens) of the total faunal bone was collected from Feature 1. Thirty percent (126 specimens) of the total animal bone was found in Structure 2 with nearly half (61 specimens) recovered from Room 1. Feature 5 contained 2 percent (10 specimens) of the faunal bone, and Structure 1 contained less than 1 percent (1 specimen).

Two pieces of worked bone were present in the faunal assemblage from McCreery Pueblo. One medium-large mammal bone fragment exhibits striations on one edge. The burned fragment is shaped to form a dull point at the tip. It measures 15.55 mm in length and 7.00 mm in width. This fragment was recovered from Feature 1. The other worked bone fragment was recovered from Room 1 in Structure 2 and measures 31.80 mm in length and 6.70 mm in width. This piece is from a small-medium mammal (possibly jackrabbit) long-bone fragment. It exhibits striations on the shaft and on both sides of the tip and is slightly root etched. The tip is broken, probably from use.

Lagomorphs

Lagomorphs comprise 81.4 percent (192 specimens) of the identifiable faunal assemblage at McCreery Pueblo (Table 6.2). Ninety-six specimens are from *Lepus californicus*. A minimum of five individuals is present in two features (Table 6.3). The MNI in Feature 1 is based on three right distal femora. Two of these distal femora are from immature individuals. The MNI in Structure 2 is based on two right maxillae.

The cottontail remains were identified as *Sylvilagus cf. audubonii*. The desert cottontail is the only species found in the site area today. The eastern cottontail (*Sylvilagus floridanus*) and Nuttall's cottontail (*Sylvilagus nuttallii*) also occur in Arizona, but they are found primarily at higher elevations (Hoffmeister 1986:127). At least six *Sylvilagus* individuals are represented in three features. The MNI in Feature 1 is based on three right mandibles. The MNI in Structure 2 is based on two left mandibles, two left distal femora, and two left proximal tibiae. One femur and one tibia are from immature individuals. Ten right hind-foot bones from one individual were recovered from Feature 5. One lagomorph specimen was assigned to the order Lagomorpha. This element is either *Sylvilagus* or *Lepus*, but positive identification was not possible. The frequency of lagomorphs by feature is presented in Table 6.3.

Rodents

Rodents comprise 6.4 percent (15 specimens) of the identifiable faunal assemblage at McCreery Pueblo. Two Gunnison's prairie dog (*Cynomys gunnisonii*) bones, a mandible and maxilla, were recovered from Feature 1 and Structure 2. Four elements were recorded as indeterminate squirrel (Sciuridae). A burned pelvis fragment and a lumbar vertebra may be prairie dog. These elements

Table 6.2. Faunal Remains from the McCreery Pueblo Excavations by Number of Identified Specimens (NISP) and Percentages.

	NISP	Percentage of Remains
Lagomorphs		
Order Lagomorphs	1	
Sylvilagus cf. *audubonii*	95	
Lepus californicus	96	
Total lagomorphs	192	81.4
Rodents		
Order Rodentia	2	
Sciuridae	4	
Cynomys gunnisoni	2	
Thomomys bottae	3	
Dipodomys sp.	1	
Cricetinae	1	
Neotoma sp.	2	
Total rodents	15	6.4
Carnivores		
Indeterminate medium carnivore	1	
Total carnivores	1	0.4
Artiodactyls		
Order Artiodactyla	3	
Total artiodactyls	3	1.3
Reptiles		
cf. *Pituophis melanoleucus*	1	
Total reptiles	1	0.4
Birds		
Aves	21	
Meleagris gallopavo	3	
Total birds	24	10.2
Total identified remains	236	100.1
Unidentified remains		
Small mammal	6	3.3
Small-medium mammal	150	83.3
Medium-large mammal	3	1.7
Large mammal	2	1.1
Unidentifiable mammal	3	1.7
Unidentifiable small animal	1	0.6
Unidentifiable remains	15	8.3
Total unidentified remains	180	100.0
Site total	416	

also may belong to the rock squirrel (*Spermophilus variegatus*), another large sciurid that occurs in the site area. The two smaller elements, a tibia and an axis, are in the size range of ground squirrels. The only two species of ground squirrel that occur in the site area today are the spotted ground squirrel (*Spermophilus spilosoma*) and the white-tailed antelope squirrel (*Ammospermophilus leucurus*).

Other rodent specimens include Botta's pocket gopher (*Thomomys bottae*), represented by two maxilla fragments and an immature humerus, and woodrat (*Neotoma* sp.), represented by a broken molar and a distal humerus. Four wood rat species occur in the site area today (Hoffmeister 1986). However, the first upper molar is fairly distinctive between species. Because the tooth recovered from McCreery Pueblo is broken, it is impossible to determine whether it is a maxillary or mandibularmolar. An indeterminate mouse (Cricetinae) femur fragment was recovered from a flotation sample taken from Feature 1. Three rodent specimens are classified as indeterminate rodent. These elements cannot be identified to the family level. They include a humerus shaft, a pelvis fragment, and an immature tibia. The frequency of rodent taxa by feature is presented in Table 6.3.

It is likely that most, if not all, of the rodent remains at McCreery Pueblo represent animals used for food. Nearly all of the rodent bones exhibit surface modifications consistent with the rest of the faunal assemblage. Sixty-six percent of the faunal assemblage is weathered, displaying bone-surface erosion and/or root etching. Only one rodent element is not burned, eroded, or root etched. This indicates that the rodent bones were deposited under the same conditions and at the same time as most of the other animal bones at the site (cf. Gillespie 1990:214; Szuter 1989:134).

Carnivores

One bone fragment (less than 1 percent of the identifiable assemblage) from McCreery Pueblo is identified as an indeterminate medium carnivore radius. The proximal end of the element is missing. Much of the shaft is present, and the specimen is broken just below the ulnar notch at the distal end. This radius was the only faunal material recovered from Structure 1. The element is extremely eroded, but it looks more like a cat (Family Felidae) than a dog or coyote (Family Canidae) and is in the size range of a bobcat (*Felis rufus*).

Artiodactyls

Three artiodactyl specimens were identified in the faunal assemblage. They represent only 1.3 percent of the identifiable assemblage. One fragmentary incisor was recovered from Structure 2. Feature 1 contained a tooth-enamel fragment and a burned long-bone fragment. None of the elements are identifiable to species. The three artiodactyl species most commonly found at sites in this area are mule deer, antelope, and bighorn sheep.

Reptiles

Reptiles account for less than 1 percent (1 specimen) of the identifiable assemblage. One nonpoisonous snake (Family Colubridae) vertebra was recovered from Structure 2. Many species of colubrid snakes occur in the site area. The vertebra resembles that of the gopher snake (cf. *Pituophis melanoleucus*), which occurs at all elevations throughout the state (Lowe 1976:169). Although snakes were probably used as food, this specimen may be a recent intrusion. Much of the faunal material from Structure 2 (almost 66 percent) is either eroded or root etched. The vertebra is not modified and is in relatively good condition, suggesting a more recent deposition.

Table 6.3. Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI) by Feature from the McCreery Pueblo Excavations.

Taxon	Feature 1		Structure 2		Feature 5		Structure 1		Total
	NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI	NISP
Identifiable remains									
Lagomorpha	1	-	-	-	-	-	-	-	1
Sylvilagus cf. *audubonii*	71	3	14	2	10	1	-	-	95
Lepus californicus	67	3	29	2	-	-	-	-	96
Rodentia	3	-	-	-	-	-	-	-	3
Sciuridae	3	-	1	-	-	-	-	-	4
Cynomys gunnisoni	1	1	1	1	-	-	-	-	2
Thomomys bottae	1	1	2	1	-	-	-	-	3
Cricetinae	1	-	-	-	-	-	-	-	1
Neotoma sp.	1	1	1	1	-	-	-	-	2
Indeterminate medium carnivore	-	-	-	-	-	-	1	-	1
Artiodactyla	2	1	1	1	-	-	-	-	3
cf. *Pituophis melanoleucus*	-	-	1	1	-	-	-	-	1
Aves	21	-	-	-	-	-	-	-	21
Meleagris gallopavo	-	-	3	1	-	-	-	-	3
Total identifiable	172		53		10		1		236
Unidentified remains									
Small mammal	3		3		-		-		6
Small-medium mammal	117		33		-		-		150
Medium-large mammal	-		3		-		-		3
Large mammal	2				-		-		2
Unclassified mammal	2		1		-		-		3
Unidentifiable small animal	1				-		-		1
Unidentifiable remains	4		11		-		-		15
Total unidentifiable	129		51		-		-		180
Site total	280		125		10		1		416

Birds

Birds comprise 10.2 percent (24 specimens) of the identifiable assemblage. Three turkey (*Meleagris gallopavo*) elements were recovered from the courtyard area of Structure 2. These include two fragmentary coccygeal vertebrae and fragments of a pelvis composed of several pieces of the synsacrum, the left acetabulum, and several pieces of the pubis. Twenty-one fragments of eggshell comprise the rest of the bird specimens. These eggshell fragments somewhat inflate the proportion of bird bone in the identifiable assemblage because each fragment is counted separately but does not represent one element. The fragments are small and unidentifiable to species, but they do resemble modern turkey eggshell to a degree. The eggshell fragments were recovered in the same excavation unit (Unit 5) as the turkey elements.

Turkey remains are fairly common in Pueblo-period sites. Two other sites dating to the late Pueblo II to early Pueblo III periods in the St. Johns area also contained turkey bone (Czaplicki 1981). However, the largest proportions of turkey remains were recovered at sites dating to the Pueblo IV period and later e.g., Homolovi III (Senior and Pierce 1989) and Arroyo Hondo (Lang and Harris 1984). An attempt to distinguish various subspecies of turkeys at archeological sites based on osteological evidence (Lang and Harris 1984; McKusick 1980) has not been successful with all data sets (Senior and Pierce 1989:253). Senior and Pierce (1989) argue that the differences in turkey size are based on fluctuations in the environment rather than on breeding by humans. They suggest using the criteria formulated at Arroyo Hondo (Lang and Harris 1984:101) for evaluating the presence of turkey domestication at a site in combination with osteological evidence. These criteria include: (1) evidence for turkey pens, e.g., postholes; (2) dung deposits, e.g., yellowish fill; (3) egg clutches, e.g., eggshell and eggs with unhatched poults; (4) healed breaks in turkey elements; and (5) a high incidence of immature turkey remains.

The three turkey elements recovered from McCreery Pueblo is too small of a sample on which to base any conclusions about domestication at the site. The presence of eggshell with the turkey bones suggests that there may have been some turkeys kept at the site. However, there was no evidence of turkey pens in the other two units excavated against the wall in the courtyard, and no other turkey remains were recovered. It is possible that further excavations may reveal more remains or some evidence for turkey pens. However, based on the turkey remains recovered, it does not appear that turkeys were being raised at McCreery Pueblo. The turkey elements and indeterminate bird-eggshell fragments probably represent food refuse from wild birds.

Burning

Ninety-three specimens (22.4 percent) in the faunal assemblage at McCreery Pueblo exhibit some degree of burning (Table 6.4). Sixty-seven percent (62 specimens) of the burned bone is unidentifiable. The degree of burning was ranked according to three color categories (cf. Akins 1987; Grayson 1988). Brown bone is bone that was not exposed to direct heat or was exposed for a short time. Charred bone is black and indicates a longer or direct exposure to heat. Calcined bone is white or gray from long-term exposure to heat or contact with ash. Burned bone also may exhibit more than one color, indicating an uneven exposure to heat. Brown bone comprises 3 percent (3 specimens) of the burned assemblage. Charred bone makes up 13 percent (12 specimens) of the burned assemblage. Twenty-four percent (22 specimens) of the burned assemblage is calcined. Sixty percent (56 specimens) of the burned bones exhibit more than one color or combination burning. Forty-four of these are charred/calcined, and 12 specimens are brown/ charred.

Burned bone was recovered from Feature 1 and Structure 2. Nearly all (91 percent) of the burned bone was collected from Feature 1. The majority of the bone (66 specimens) in Feature 1 is either calcined or charred/calcined. Calcined bone results from high heat or long periods of burning and is usually related to incineration rather than food preparation. The calcined bone in this feature probably resulted from one or more episodes of intensive burning, such as trash burning.

Only eight burned specimens were recovered from Structure 2. Seven burned bones were collected from Room 1, and one bone was collected from Unit 7 (courtyard area). Four bones were recovered from the floor of Room 1, and three bones were recovered from the level above the floor. All the burned bones are from small-medium mammals with two positively identified as cottontail. Six bones are charred, and one is both brown and black in color. These bones may be refuse from the informal hearth noted in the floor of Room 1.

Modification

Almost all of the visible modifications on the bone from McCreery Pueblo were caused by natural processes. Modifications due to weathering were the most frequently observed. These include bone surface erosion and root etching. Bone-surface erosion indicates that the bone was exposed on the surface for a time before being buried. Root etching results when plant rootlets grow around bones leaving marks where the roots have been (cf. Gillespie 1990; Schiffer 1987; Szuter 1989). The erosion and root etching on the bones in the assemblage varied in degree from slight erosion or root staining, rather than etching, to extreme erosion with the cortical bone surface worn away, or fairly deep root etching.

Few cultural modifications, except for burning, were observed on the faunal material. No cut marks were identified. Two bone fragments exhibit striations (see Results, above, for a complete description).

Sixty-six percent (275 specimens) of the faunal assemblage is modified. Erosion, and/or root etching comprise 83 percent (227 specimens) of the observed modifications. Other modifications include caliche coating (34 specimens), rodent gnawing (8 specimens), and possible carnivore digestion (2 specimens). Many of the specimens exhibit two modifications. The most frequent are erosion and root etching (74 specimens).

Three elements are probably modern intrusions based on their sun-bleached and weathered condition. These specimens, including one jackrabbit element and two small-medium mammal-bone fragments, were recovered from the surface and were probably never buried. In addition, 19 cottontail elements from one provenience in Feature 1 (the trash mound) represent the lower limbs of one individual and may be intrusive. The bones do not appear to be recently deposited, i.e, they are fairly eroded and moderately root etched. However, the skeletal representation is not typical of food refuse from smaller animals, and the bones may represent a postoccupational burrow death or the remains of predation.

Generally, the assemblage is in fair to poor condition. Although rodent and carnivore activity is at a minimum as shown by the low number of bones (10 specimens) displaying gnawing and carnivore digestion, many bones are very weathered. Eighty percent (154 specimens) of lagomorph elements exhibit modifications. Sixty-nine elements are eroded and/or root etched. Modifications are found on 80 percent (12 specimens) of rodent specimens as well. These elements are eroded and/or root etched. The indeterminate medium carnivore element is root etched and extremely eroded. One out of three artiodactyl elements is root etched. Eleven eggshell fragments are slightly root etched. Fifty-three percent (96 specimens) of the unidentifiable remains are modified, not including burning. Most of these bones are weathered, displaying varying degrees of bone surface erosion and root etching.

Discussion

The species represented in the faunal assemblage from McCreery Pueblo are typical of assemblages from other sites in the area. Several of these sites are contemporaneous with McCreery Pueblo while others are from later periods (Czaplicki 1981; Gillespie 1990; Olsen 1978; Szuter 1991). Small mammal remains dominate in all of the faunal assemblages. Cottontail and jackrabbit bones are most prevalent, followed by rodent bones, particularly those of prairie dogs. However, very few (six specimens) prairie dog or large squirrel bones were recovered from McCreery Pueblo. This may be due to the season of site occupation. If the site was inhabited during the winter when prairie dogs supposedly are hibernating, fewer bones should be recovered than if the site was occupied in another

season when prairie dogs are more active (Bayham 1980; Czaplicki 1981). Gillespie (1990:229) discounts this explanation because it is not certain whether prairie dogs in northeastern Arizona actually hibernate. In addition, there are accounts of historic Navajo obtaining the animals by digging up or flooding their burrows (Gillespie 1990:229). This would make them available year-round.

Other evidence exists for a winter occupation at McCreery Pueblo. Few immature or unfused lagomorph elements (three jackrabbit, four cottontail) were recovered. Desert cottontails generally breed from January through August in most parts of Arizona, and the gestation period is 28 days (Hoffmeister 1986:137). Therefore, low numbers of immature cottontail bones (and other species) in a faunal assemblage may be indicative of a winter occupation, especially in an area with colder winters (cf. Gillespie 1990:227). Therefore, it is possible that the trash in Feature 1, where most of the faunal material was recovered, was deposited during the winter. However, the presence of the possible Great Kiva and other extramural features makes a multiple-season occupation more likely than a winter-only occupation (Nelson et al. 1978:193-194). Further excavation may reveal another area at the site where trash from other seasons was deposited.

McCreery Pueblo also is similar to other sites in the area in the small number of artiodactyl (deer, antelope, bighorn sheep) bones that are present in the assemblage. Only three bones were identified as artiodactyl, and six bone fragments were identified as medium-large or large mammal. The paucity of artiodactyl remains at Anasazi and protohistoric sites around Petrified Forest suggests that local herds were either absent or inaccessible. Another explanation is that animals were butchered at the kill site and few bones were returned with the meat to the pueblo (cf. Czaplicki 1981:347; Gillespie 1990:228). In addition, Szuter (1991:106) notes that practices of bone disposal after consumption may account for low numbers of artiodactyl bones at sites. The bones of deer and antelope that were killed by the Hopi received special treatment and were placed in a shrine (Szuter 1991:106). Such specialized disposal would remove bones from the habitation area and with the result that they would not be recovered in domestic trash deposits.

Summary and Conclusions

The excavation of McCreery Pueblo produced 416 faunal specimens. Fifty-seven percent (236 specimens) were identifiable. The species composition of the faunal assemblage is similar to other sites in the area. Small- to medium-sized mammals (cottontails and jackrabbits) dominate with a few other specimens of mammals, including rodents, artiodactyls, and a carnivore. Other fauna, including turkey and snake, also are present. The presence of turkey is not unusual for a site from this time period, although no firm evidence exists to suggest that turkeys were raised at the site. The small number of artiodactyl and large mammal bones is typical of many Pueblo-period sites in the area. It is unclear if the low numbers reflect butchering practices, specialized disposal of artiodactyl bone, or actual consumption. There is some evidence for a winter occupation at the site. Further excavation may recover faunal data that would establish occupations from other seasons as well.

Table 6.4. Proportion of Unburned to Burned (in Parentheses) Faunal Bone and Percentage of Burned Bone by Taxa from the McCreery Pueblo Excavations.

	NISP	Percent Burned
Lagomorphs		
Order Lagomorpha	1 (0)	
Sylvilagus cf. *audubonii*	95 (5)	5.3
Lepus californicus	96 (24)	25.0
Total lagomorphs	192 (29)	15.1
Rodents		
Order Rodentia	2 (0)	
Sciuridae	4 (1)	25.0
Cynomys gunnisoni	2 (0)	
Thomomys bottae	3 (0)	
Dipodomys sp.	1 (0)	
Cricetinae	1 (0)	
Neotoma sp.	2 (0)	
Total rodents	15 (1)	6.7
Carnivores		
Indeterminate medium carnivore	1 (0)	
Total carnivores	1 (0)	0.0
Artiodactyls		
Order Artiodactyla	3 (1)	33.3
Total artiodactyls	3 (1)	33.3
Reptiles		
cf. *Pituophis melanoleucus*	1 (0)	
Total reptiles	1 (0)	0.0
Birds		
Aves	21 (0)	
Meleagris gallopavo	3 (0)	
Total birds	24 (0)	0.0
Total identified remains	236 (31)	13.1
Unidentified remains		
Small mammal	6 (1)	1.7
Small-medium mammal	150 (58)	38.7
Medium-large mammal	3 (0)	0.0
Large mammal	2 (2)	100.0
Unidentifiable mammal	3 (0)	0.0
Unidentifiable small animal	1 (1)	100.0
Unidentifiable remains	15 (0)	0.0
Total unidentified remains	180 (62)	34.4
Site total	416 (93)	22.4

Chapter 7
Archeobotany

Marcia L. Donaldson

The analysis of plant remains from archeological settings offers a route for investigating how prehistoric people interacted with their environment. In particular, it helps to determine what resources were utilized as part of the subsistence base and sometimes the role that the resource played. Three types of botanical samples were recovered from McCreery Pueblo in an effort to gain some insight into Pueblo II-III subsistence practices: flotation, charcoal, and macrobotanical samples. A total of 11 flotation samples representing a variety of tested proveniences were analyzed along with eight charcoal samples and two macrobotanical samples.

At present McCreery Pueblo is situated in the Great Basin Grassland biotic community (Brown 1982) where vegetation is dominated by mixed grasses and small shrubs. Grasses include grama (*Bouteloua* spp.), dropseed (*Sporobolus* spp.), galleta (*Hilaria jamesii*), and Indian ricegrass (*Oryzopsis hymenoides*), while dominant shrubs include saltbush (*Atriplex* spp.), rabbitbrush (*Chrysothamnus nauseosus*), snakeweed (*Gutierrezia sarothrae*), and Mormon tea (*Ephedra viridis*). A riparian vegetation zone can be found along nearby Dead Wash and the Puerco River. Native vegetation found along these seasonal watercourses include cottonwood (*Populus* spp.) and willow (*Salix* spp.). Although grazing and human impact have had an effect on the vegetation of the area, primarily by reducing the presence of palatable grasses and annual forbs, it is highly probable that the same general vegetation composition was present during the occupation of McCreery Pueblo.

Although plant remains serve as evidence of past resource exploitation, the sample they provide is biased toward those taxa having hard seeds and achenes, or those that served as fuel sources. Preservation of softer plant tissues, such as leaves, roots, and tubers, is very rare in open sites where little protection is provided from the effects of bacterial, erosional, and mechanical degradation. Therefore, even though ethnographic sources (e.g. Stevenson 1915; Whiting 1939) indicate a significant role for wild greens, roots, and tubers in aboriginal Southwestern diets, we have very little archeological evidence of this importance. The location of resource processing may also affect the likelihood of its recovery from prehistoric contexts. For example, ethnographically, beans were threshed near the agricultural fields, eliminating the protective cover of pods and all evidence of that processing activity. Because of the problems presented by bacterial and erosional effects on uncharred floral remains, in open sites it is usual to consider only those remains that are charred to be representative of prehistoric deposition (Minnis 1981). If we take these factors into consideration, it can be seen that the plant remains discussed here represent only a fraction of the spectrum of plants that were utilized prehistorically.

Methods

Flotation samples were processed by mixing soil samples with water and collecting the light vegetal contents as they floated to the surface. After drying, the processed samples were bagged for later analysis. In order to facilitate sorting, the samples were gently sifted through a series of nested screens, allowing like-sized particles to be inspected at the same time. Sorting was accomplished through the use of a .67-40X binocular microscope. Identifications were made to the level of genus, where possible, using a comparative botanical collection.

Charcoal specimens were recovered from archeological contexts during excavation. During analysis

they were snapped across the grain of the wood, thus revealing the distinctive characteristics found in cross section that allow identification. A comparative wood and charcoal collection aided in the charcoal determinations at the higher magnification limits (20-40X) of the binocular microscope. The seven charcoal samples were selected for identification because they represented a range of proveniences and contained more than five charcoal specimens each. Macroscopic botanical specimens were also recovered during excavation and identified through comparison to modern comparative collections.

Results

The plant taxa recovered from McCreery Pueblo are summarized in Table 7.1. The results of the flotation analysis are presented in Table 7.2; macrobotanical identifications are included in Table 7.3; and charcoal identifications are detailed in Table 7.4.

Cultigens

Corn (*Zea mays*) was recovered from flotation, charcoal and macrobotanical samples, and is represented by charred cob fragments, cupules, and fragmented kernels. Scattered cupules and occasional kernels were found in the fill of Room 1 (Structure 2), and in a courtyard hearth (Feature 1) as well as in the trash. A greater number of fragmented kernels was recovered from the courtyard pit (Structure 2, Feature 2) accompanied by numerous small charred grass-like elements that may have been part of a basket. It is difficult to determine whether these represent stored kernels that

Table 7.1. Plant taxa from the McCreery Pueblo Excavations.

Scientific Name	Common Name	Occurrence
Artemisia sp.	sagebrush	charcoal
Atriplex sp.	saltbush	charcoal, seed
Bouteloua sp.	grama grass	seed
Chenopodium sp.	goosefoot, pigweed	seed*
Chrysothamnus sp.	rabbitbrush	charcoal
Ephedra sp.	mormon tea	charcoal
Juniperus sp.	juniper	charcoal
Malvaceae	mallow family	seed*
Oryzopsis hymenoides	Indian ricegrass	seed
Phaseolus sp.	bean	seed
Populus sp.	cottonwood	charcoal
Salix sp.	willow	charcoal
Solanaceae	potato family	seed*
Sporobolus sp.	dropseed	seed
Zea mays	corn	kernel, cob

* Includes uncharred specimens.

burned in place, or if they represent a secondary deposit, perhaps the contents of a hearth. Loose and fused corn kernels were found in both flotation and macrobotanical samples from Feature 3 (Unit N22/E25). The fused corn has maintained the configuration of corn on the cob, but the cob has apparently burned away. This suggests that at least some corn was stored "on the cob," as was practiced at Zuni (Cushing 1920), and may have burned while in storage. Feature 3 itself appears to be a pile of construction debris with trash deposits added.

Corn was one of the most ubiquitous plant taxa recovered from flotation, occurring in 64% of the samples. The distorted and fragmented condition of the cupules and kernels precludes meaningful measurement and the assignment of a racial designation to the recovered maize. The globular nature of some kernels may indicate the presence of *Mais Blando*, a Pima-Papago race that was common in the Southwest through most of the Pueblo era, while more angular kernels may represent a variety of Pueblo Flour corn. Regardless of what specific type of corn is present, it seems apparent that corn served as a staple crop that was probably grown locally by the occupants of McCreery Pueblo.

Beans are rarely recovered from open archeological sites, perhaps because they are more vulnerable to deterioration than corn, even when charred. It was surprising to recover one partial cotyledon of a large bean, probably a common bean (*Phaseolus* cf. *vulgaris*), from the courtyard pit (Feature 2) in Structure 2. The prehistoric use of this legume, an important source of protein and essential amino acids, probably far exceeded the relative importance implied by the single occurrence of this taxon, which is often considered to be, along with corn and squash, part of the triumvirate of cultivated plants that supported prehistoric Southwestern populations.

Grasses

Charred remains of grasses were recovered from only three contexts. As mentioned above, small unidentifiable grass-stem fragments were quite numerous in the fill of the courtyard pit (Feature 2) of Structure 2, and may represent the remains of a burned storage basket. A few fragmented seeds of charred Indian ricegrass were recovered from the lower levels of the trash. This species served as an important wild food source for the Hopi, particularly in times of famine (Whiting 1939). Its presence in the trash deposits probably indicates its use prehistorically as well.

Grass remains were most abundant in the flotation sample recovered from pockets of burned material found in the fill of the kiva in Structure 2 (Unit 5). This fill probably contains some roof fall, which seems to be represented by innumerable grass stems as well as quite a few charred grass seeds. Immature specimens of Indian ricegrass were found in addition to probable grama and dropseed, as well as examples of the Paniceae family of grass. The presence of the seeds is probably incidental to the inclusion of the grasses during roof construction, which, judging from the immature ricegrass, must have taken place in the summer. It can be seen that grasses served an important role in building construction in addition to serving as a food resource.

Wild Annual Forbs

This category often comprises the greater part of recovered specimens from flotation samples, but charred annuals are not abundant in the McCreery Pueblo samples. Members of the Chenopodiaceae family dominated the annual forbs recovered, particularly goosefoot (*Chenopodium* sp.) seeds. A few charred goosefoot seeds were encountered in the trash, in Feature 3, and in the roof fall of the kiva (Structure 2, Unit 5), but the majority of *Chenopodium* seeds recovered from McCreery Pueblo samples were uncharred and probably recent contaminants introduced during insect activity. Goosefoot greens and seeds were components of many Southwestern diets (Cushing 1920; Whiting 1939), and it is likely that they served similarly for the occupants of McCreery Pueblo.

Table 7.2. Contents of Flotation Samples from Selected Proveniences.

	Str. 1, Unit 8 floor	Str. 2, Rm. 1 wall fall	Str. 2, Rm. 1 floor	Str. 2, Rm. 1 65-76 cm	Str. 2, Rm. 1 76-78 cm	Str. 2, Unit 3 Fea. 1	Str. 2, Unit 5 136-174 cm	Str 2, Unit 7 Fea. 1	Fea. 1 Unit S15/E19	Fea. 1 Unit S18/E19	Fea. 3 30-40 cm	Total
Plant taxon												
Paniceae	-	-	-	-	-	-	27	-	-	-	-	27
cf. *Bouteloua* sp.	-	-	-	-	-	-	12	-	-	-	-	12
Oryzopsis hymenoides	-	-	-	-	-	-	59	-	-	5	-	64
Chenopodiaceae	-	1	-	-	-	-	1	-	-	1	-	3
Atriplex sp.	-	-	-	-	-	-	62	-	-	-	-	62
Chenopodium sp.	-	-	1	2	17	-	2	2	21	4	5	54
Cycloloma sp.	-	-	-	-	-	-	-	-	2	-	-	2
Malvaceae	-	-	-	-	-	-	7	-	1	-	-	8
Solanaceae	-	-	-	-	-	-	-	-	1	1	-	2
Zea Mays cupule	-	9	2	-	-	5	-	-	5	12	-	33
Zea Mays kernel	-	-	1	-	-	1	-	57	-	-	10	69
Unknown	-	-	-	-	-	-	17	-	-	-	-	17
Plant totals	0	10	4	2	17	6	187	59	30	23	15	353
Other												
Bone fragments	-	1	2	2	7	1	3	2	3	9	1	31
Egg shell	-	1	-	-	-	-	-	-	-	-	-	1
Snail shell	-	-	-	-	-	1	-	-	-	1	7	9
Other totals	0	2	2	2	7	2	3	2	3	10	8	49

Table 7.3. Macrobotanical Remains from the McCreery Pueblo Excavations.

Provenience	Macrobotanical Material
Structure 2, Unit 7	
Feature 2, 65-82 cm	1 fractured *Zea mays* kernel
	1 bean cotyledon, *Phaseolus* cf. *vulgaris*
Feature 3, 20-30 cm	2 clusters of fused *Zea mays* kernels

Atriplex sp.) fruits, endosperms, and charcoal specimens were recovered from the charred pockets of kiva fill (Structure 2, Unit 5). It seems probable that the fruits were inadvertent inclusions with saltbush wood used either as part of the roof construction or as a fuel wood. Though Whiting (1939) notes that the ashes of four-wing saltbush (*A. canescens*) were used in coloring piki bread at Hopi, the context is more suggestive of non-food uses in this case.

A few uncharred specimens of the Mallow (Malvaceae) and Potato (Solanaceae) families were recovered from flotation samples taken from Feature 1 (trash mound). These are probably recent contaminants reflecting insect disturbance of the softer trash deposits. Charred mallow seeds from the kiva fill may have been accidental inclusions during the prehistoric occupation.

Charcoal

Eight charcoal samples selected for identification reflect three of the main areas tested in McCreery Pueblo: Structure 1, Structure 2, and Feature 3 (Table 7.4). In all eight samples cottonwood/willow (*Populus/Salix)* dominated, followed closely by saltbush (*Atriplex* sp.) in six samples. Other shrubs represented by charcoal specimens include sagebrush (*Artemisia* sp.), rabbitbrush (*Chrysothamnus* sp.), Mormon tea (*Ephedra* sp.), and juniper (*Juniperus* sp.). Two vegetation zones are represented by the charred wood identified, the riparian zone along washes and the desert grassland.

The charcoal collected probably reflects wood taxa used for both fuel and construction purposes. Although pine and juniper are generally considered to be superior to cottonwood and willow for architectural purposes, the local availability of the riparian taxa probably made them the material of choice during construction at McCreery Pueblo. Specimens of a diameter less than 0.5 cm were recovered as well as chunks from considerably larger pieces (>2 cm). Cottonwood and willow also served as fuel, perhaps serving as a supplement to the more abundant desert shrubs. The relative abundance of saltbush charcoal and fruits in the apparent roof fall of the kiva fill (Structure 2, Unit 5) suggests the possibility that this taxon may have been used as part of the smaller elements in constructing the roof.

Discussion

Botanical remains recovered from archeological strata can often aid in determining the function of a structure, feature, or occupational surface. This is particularly true if the strata are relatively undisturbed and include primary or "de facto" deposits. In many cases, however, the deposits

Table 7.4 Types of Charcoal from the McCreery Pueblo Excavations.

	Artemisia	*Atriplex*	*Chrysothamnus*	*Ephedra*	*Juniperus*	*Populus/Salix*	*Zea*[a]
Structure 1							
N22/E12, 0-60cm	1	-	-	-	-	9	1
Structure 2,Room 1							
Unit 1, wall fall		1	1	-	-	-	10-
Unit 1, floor fill	-	8	1	-	-	11	-
Structure 2, Kiva fill							
136-174 cm[b]	-	7	-	-	-	13	-
100-136 cm	-	4	-	-	1	5	-
136-174 cm	-	3	1	-	-	5	-
Feature 3							
20-30 cm	-	7	2	1	-	9	2
30-40 cm	-	10	-	-	-	10	-
Total	2	40	4	1	1	72	3

a. Includes kernels.
b. From flotation sample.

originated from another context and have accumulated as part of secondary trash accumulation. In this case, the contextual information is more obscure, but information about the botanical resources can still be retrieved.

No plant remains were recovered from the flotation sample taken from the Structure 1 occupational surface. Numerous root hairs indicate that the deposits were disturbed and within the root zone of overlying plants. Charcoal from the fill of Structure 1 was sparsely distributed and heavily dominated by cottonwood/willow. The low frequency of charcoal within the fill suggests that it was not part of the structure but may have been deposited as part of accumulating trash and erosional debris.

Flotation samples from Room 1, Structure 2 contained a few charred botanical specimens, and most of these consisted of corn cupules accompanied a single burned corn kernel and a goosefoot seed. A number of uncharred goosefoot seeds in the lower levels of Room 1 suggest some insect disturbance and contamination to these strata. Charcoal from the fill of Room 1 consisted almost entirely of cottonwood/willow and saltbush, probably reflecting an emphasis on these sources for fuel.

The small courtyard hearth (Unit 3, Feature 1) of Structure 2 contained several burned corn cupules, but the general dearth of botanical remains suggests this was not a locus of plant processing activities. Feature 2 (Unit 7), a pit in the courtyard of Structure 2 adjacent to the kiva, contained relatively abundant charred, fragmented corn kernels accompanied by numerous small grass stems. These charred items may be the remnants of a burned storage basket, or perhaps represent the contents of a hearth dumped into the pit.

The flotation sample taken from the kiva fill (Structure 2, Unit 5) contained the most numerous botanical remains from McCreery Pueblo. Grass seeds and stems were abundant, as were the fruits of saltbush, and charcoal was dominated by cottonwood/willow and saltbush. The nature of this assemblage differs both qualitatively and quantitatively from the other flotation samples. These charred items may represent burned roofing material that collapsed into the kiva, or burned material from another structure.

Feature 3 represents a cluster of sandstone blocks that were initially thought to represent a small storage structure. Testing revealed that this feature is more probably a concentration of construction debris combined with deposited trash. As with other parts of the site, cottonwood/willow charcoal predominated followed closely by saltbush. The fused corn kernels recovered from this feature during excavation were a unique occurrence and seem to represent the burning of stored corn "on the cob," the cob having burned away. If this feature is a concentration of construction debris and trash, it appears that the corn must have burned elsewhere and then been dumped in Feature 3.

Flotation samples from the trash yielded caryopses of charred Indian ricegrass, corn cupules and a scattering of goosefoot and other seeds, most of them uncharred. These taxa represent accumulation from trash deposition as well as more recent contamination by insects and erosional processes.

As noted earlier, the botanical assemblage from McCreery Pueblo contains a surprisingly low variety of wild resources, particularly when considering those taxa found in flotation samples. A similar situation was found in the floral remains from Puerco Ruin, a Pueblo IV community situated not far from McCreery Pueblo (Donaldson and Miksicek 1990). Flotation samples from Puerco Ruin yielded low numbers of wild grass and forb seeds with the exception of *Chenopodium* sp., which was present in quite large amounts in some contexts. The remains of cultigens, on the other hand, were quite abundant at Puerco Ruin, reflecting what was probably a heavy reliance on cultivated resources. The samples examined here indicate that a reliance on domesticated plants was also characteristic of the McCreery Pueblo occupants.

Charcoal from Puerco Ruin was also dominated by the riparian cottonwood and willow, but the shrubs represented showed a greater variety than those comprising the McCreery Pueblo charcoal. At Puerco Ruin rabbitbrush and sagebrush were far more common than saltbush, reflecting either a different availability of, or preference for, local shrubs as fuel sources.

The botanical remains recovered from McCreery Pueblo reflect a group that depended to a large degree on cultivated plant resources, best represented in this open site by corn. Wild plant resources seem to have played a smaller role than expected, or were not preserved as well as the more durable maize components. Most fuel and construction wood appears to have been gathered locally from along the washes and the open plains and mesas. It appears to have been an economy based on the wild and domesticated plant resources that were close at hand.

Chapter 8

Pollen Analysis

Suzanne K. Fish

Ten pollen samples from 1992 excavations at McCreery Pueblo were examined. Proveniences include a great kiva (Structure 1), a room and small kiva within a room block (Structure 2), and a possible trash mound (Feature 5). A sample from the modern surface of the site was also analyzed as an analogue for the prehistoric relationship between vegetation sources and pollen deposition in the area.

Methods

Lycopodium spore tracers were added to 60 cc of sediment in order to monitor the extraction procedure. Dilute hydrochloric acid was used for deflocculation. A swirl technique as described by Mehringer (1967:136-137) initially separated fine and heavy fractions. Heavy liquid flotation with zinc bromide of 2.0 density further reduced the sample matrix. Residual silicates were then removed with hydrofluoric acid. Steps for removal of organic components were deemed unnecessary and omitted in order to avoid damage to pollen. The extract was mounted in glycerol for routine examination at a microscope power of 600X.

A standard sum of 200 pollen grains, exclusive of cultigen types, was identified for each sample, and serves as the basis of percentage calculations in Table 8.1. This sum has been shown to adequately register distributions of representative pollen from Southwestern vegetation (Martin 1963:30-31). Cultigens were tabulated in addition to the standard sum in order to avoid percentage constraint of types more indicative of environmental conditions. Cultigen types are presented in Table 8.1 as the number of grains encountered during completion of the standard sum of all other types, and can be compared among samples on the basis. Corn (Zea) pollen was the only cultigen type identified in this analysis.

After completion of the standard sum, additional material was scanned at a lower magnification to further identify rare types. Pollen types found only by scanning are indicated by a plus sign (+) in Table 8.1. Large aggregates of six or more grains are also noted by an asterisk (*) following the percentage or number of the type. Because clusters would be less efficiently transported by wind than single grains, the presence of aggregates is likely when plant sources are immediate to the sampling locus. Aggregates are therefore useful evidence in evaluating introduction of pollen by human activity.

Results

The modern surface pollen sample from McCreery Pueblo is typical of open, shrubby grasslands in northern Arizona (Gish 1982; Hevly 1968). As a general rule, shrubs have increased in these grasslands at the expense of grasses as result of historic grazing pressures (Brown 1982). In neither the modern nor archeological samples is grass (Gramineae) pollen the most abundant type, however. It is difficult to evaluate either the formerly greater proportion of grasses or the effects of prehistoric residence and associated clearing on local vegetation because the modern and archeological frequencies of grass pollen are similar.

Table 8.1. Pollen Frequencies in Samples from the McCreery Pueblo Excavations.

Pollen Type	Modern Surface	Str. 1 Floor Surface	Str. 1 Below Bench	Str. 2 Kiva Fill	Str. 2 Kiva Floor	Str. 2 Room 1 Floor	Str. 2 Room 1 Floor[a]	Str. 2 Room 1 Fea. 1	Fea. 5 Trash Fill	Fea. 5 Lower Sand
Artemisia	6	5	7.5	7.5	1.5	4.5	3	4.5	12	2.5
Ambrosia-type	22	30.5	17.5	6	13.5	19.5	18	5.5	23.5	12.5
High-spine compositae	3.5	2	8	4.5	2	6.5	3.5	5	7.5	8.5
Cheno-am	19.5	39	33.5	49*	48*	32.5	30.5*	58.5*	8.5	3.9
Gramineae	2	4.5	5	7.5*	7.5*	5	6	3.5	5	9
Sphaeralcea	-	-	0.5	-	-	-	-	4	-	-
Eriogonum	3	6	5.5	9.5	11	9.5	11	1.5	7	2.5
Solanaceae	-	-	-	0.5	-	1.5	1	-	-	0.5
cf. Leguminaoae	1.5	-	-	1	-	-	2	-	1.5	2
Ephedra	+	1	3	-	7.5	2.5	5.5	8*	1	6.5
Pinus	26	5.5	10	7.5	5.5	8	5	5	20	7.5
Quercus	4.5	1	2.5	+	0.5	+	4.5	2	6.5	1.5
Juniperus	3	3.5	4.5	2.5	2	3.5	3	1.5	2.5	1
Onagraceae	-	-	-	-	-	1	-	-	0.5	-
Betula	-	-	-	0.5	-	-	-	-	-	-
Gilia	0.5	-	-	-	-	-	-	-	-	-
Alnus	-	-	-	-	0.5	-	-	-	-	-
Boerhaavia	-	-	-	-	-	0.5	-	-	-	-
Cylindropuntia	-	-	-	-	-	-	1	-	-	-
Cruciferae	-	-	-	-	-	-	0.5	-	-	-
Salix	-	-	-	-	-	-	-	0.5	-	-
Liliaceae	-	-	-	-	-	-	0.5	-	-	-
Indeterminate	2.5	2	2.5	4	0.5	5.5	5	0.5	4.5	7
Zea[b]	-	-	-	-	-	2	3	-	-	-

a. From below sherd concentration.
b. Number of grains; not included in percentage calculations.
* Indicates a pollen type occurring in aggregates of six or more grains.
\+ Indicates a pollen type encountered only in scanning of additional material after completion of 200 grain standards.

A group of pollen types within the large Compositae or Sunflower Family is prominent. These are *Artemisia* (sagebrush), high spine Compositae (a variety of related shrubs and herbaceous species), and *Ambrosia*-type (bur sage, ragweed, and related species). The Cheno-am type encompasses the morphologically similar pollen of chenopods and amaranths. Shrubs such as saltbush (*Atriplex*) and herbaceous chenopods and amaranths produce this sort of pollen. Many species in these plant groups are weedy volunteers in disturbed habitats of the sort that surround human habitations. The higher Cheno-am values in archeological samples probably reflect weedy anthropogenic vegetation, but may also have been elevated in come cases by the introduction of chenopods or amaranths used as resources. Other pollen types of herbaceous and potentially weedy species include *Eriogonum* (wild buckwheat), Solanaceae (Potato Family), *Sphaeralcea* (globe mallow), and *Boerhaavia* (spiderling).

Pinus (pine), *Quercus* (oak), and *Juniperus* (juniper) are the major arboreal pollen types. Frequencies of these types are sufficiently low compared to modern frequencies in areas with substantial numbers of trees to suggest that much of this pollen is windblown from a distance. The mostly lower pine values in the archeological samples may register a drier occupational interval during which pines were reduced regionally or may result from the removal of widely scattered local pinyons for fuel and construction materials. One prehistoric sample from Feature 5 (a possible trash mound) contains nearly as much pine pollen as the modern sample, raising the further possibility that synchronous variability in pine percentages might encompass the entire range of site values. The remaining arboreal types—*Salix* (willow), *Alnus* (alder), and *Betula* (birch)—occur in very low frequencies. willow and alder would grow in riparian settings near the site, but birch is common at higher elevations.

The record of economically interpretable pollen is localized among proveniences furnishing samples. No bias attributable to plant use was apparent in the great kiva samples. Aggregates of Cheno-am and grass occurred in the floor and the trash fill of the courtyard kiva, but highly similar frequencies of each type were recovered in both strata. Thus, it is difficult to distinguish a localized, artificial concentration of these types occasioned by the presence of utilized plants. The absence of corn (Zea) pollen in the two structures is notable in light of its widespread ceremonial use among Puebloan groups. However, corn pollen was also absent in a kiva sampled at the Puerco Ruin (Fish 1990).

The excavated room in the room block, Room 1, yielded the only site instances of cultigen pollen and the greatest diversity of additional resource indicators. Both floor samples contained corn pollen. Cholla (Cylindropuntia), Mustard Family (Cruciferae), and Lily Family (Liliaceae) are also considered resource types on the basis of their rarity among site samples and the widespread use of species by indigenous Southwestern groups. Tansy mustard and wild onions are among the edible plants in the Mustard Family and Lily Family, respectively (Whiting 1939:70, 74). If the cholla pollen reflects use of spring fruits as among the Hopi (Whiting 1939:86), each of these categories are likely to represent a spring gathering season.

A plastered pit in the floor of Room 1 contained aggregates of Cheno-am and *Ephedra* (mormon tea) pollen. The Cheno-am aggregates coincide with the highest site frequencies for this type, suggesting concentration by a plant resource. Edible seeds or greens might introduce the pollen. In the case of mormon tea, frequencies in the general site range do not as clearly indicate a resource bias, but this plant has medicinal uses (Whiting 1939:63).

Feature 5, a possible trash mound, was sampled in a trash-filled level and in a presumably sterile sand level below. In neither case were economic pollen types recognized. The trash fill was marked by unusually low representation of Cheno-am pollen and the highest pine value among prehistoric samples. The pine pollen percentage is similar to that of the modern surface sample, and a linkage with the use of pine products is therefore equivocal.

In Summary, Room 1 is unique among sample proveniences at McCreery Pueblo in its pollen record of corn, additional resources, and greater diversity of herbaceous pollen types that are likely to have originated in weedy vegetation communities. The absence of beeweed (*Cleome*), a commonly gathered weed in Hopi fields (Whiting 1939:77-78) contrasts with its recovery at Puerco Ruin (Fish 1990) and at Sivu'ovi (Fish 1991), also in the Petrified Forest National Park. Pollen of probable spring resources in conjunction with that of corn from a summer growing season suggests an extended annual occupation of the pueblo.

Chapter 9
Summary and Conclusions

Between August 6 and 24, 1992, excavations were conducted at McCreery Pueblo (PEFO Site 236; AZ K:13:41 [ASM]) within Petrified Forest National Park. McCreery Pueblo, a small masonry room block and a great kiva, was occupied around A.D. 1100. The room block and the great kiva, a small kiva, five other features, and three extramural areas were tested. In all, over 65 square meters were manually excavated. The depth of the cultural deposit varied from 10 cm to 175 cm, with an average depth of 60 cm. In addition to the excavation, a 5 m by 5 m area within Feature 1 (trash mound) was surface-collected.

A human burial was encountered just below the surface within the trash mound (Feature 1). As stipulated in the Documentation Plan (Jones 1992), the burial was covered and backfilled immediately. Both the Hopi and Zuni were told of the burial and shown its location during their field visits. In addition, Native American groups with possible cultural affiliation were notified of the discovery in writing.

During the course of the excavation over 470 lots of artifacts and samples were collected. This includes 3,332 flaked-stone artifacts, predominantly petrified wood flakes. Sherds recovered consisted of 5,128 corrugated, smudged, plain, and decorated wares. The decorated wares are predominantly black-on-white types with some black-on-red. Two partially restorable ceramic vessels, both from the floor of a room, were recovered. Other artifacts recovered include 15 ground-stone artifacts, 18 hammerstones, and 18 ornaments. Numerous floral and faunal remains were also recovered. Other samples collected include pollen, flotation, charcoal, pigment, and burned daub.

The main objective of the 1992 excavation at McCreery Pueblo was to enhance the nomination of the site to the National Register under Criterion D (the potential to yield significant data) and determine if the site is eligible under other criteria as well. However, the excavation also yielded data to address the research questions posed in Chapter 1 regarding: preservation, site chronology, site structure, and economic and political affiliation. The following discussion is organized around each of these research domains.

Preservation

One of goals of the present project was to assess the preservation of both architecture and perishable material important in the study of subsistence and other activities at the site. Surface evidence had suggested McCreery Pueblo and the outlying features were constructed of crumbly, fine-grained sandstone. However, the crumbly sandstone in the outlying features is apparently construction debris, rather than structural remains. The pueblo wall rock exposed in Room 1 is in good condition with rocks unweathered and walls intact. Structure 1 (the great kiva) is also in fair condition, considering its less formal construction. Significant portions of both the slab-reinforced earthen berm and the uncoursed masonry remain intact.

Abundant floral and faunal remains were encountered in the excavation. In addition, the testing also determined that normally perishable material was present. For example, egg shell, grass fragments, and possible basket remains were recovered from the small kiva and courtyard.

Deflation, dune movement, and alluviation are major problems at sites in the Petrified Forest, and the present shallowness of the burial discovered within the trash mound at McCreery Pueblo suggests

soil deflation may be a factor at the site. Additional evidence for deflation comes from the surface collection at Feature 1, which yielded 265 flaked-stone artifacts, 241 sherds, 6 bone fragments, and a ground-stone fragment. The density of 513 artifacts in this 5 m by 5 m area is especially noteworthy considering that all surface artifacts were collected in 1985 (Jones 1986). In 1985, this same area contained 496 artifacts. The slightly higher density in 1992, seven years after a complete surface collection, suggests erosion is accelerating, at least episodically. The erosion may be due to heavy rains just prior to fieldwork; alternatively, the sherds and flakes removed during the 1985 surface collection may have had a protective, "desert pavement"-like effect.

Site Chronology

Previous surface collections indicated a relatively short occupation span for the site, between A.D. 1075 and 1125 (Jones 1986). However, the excavation data suggest a slightly longer occupation span, from about A.D. 1000 to 1200.

The ceramic assemblage contains types that range from as early as A.D. 850 to as late as A.D. 1325. Over 80 percent of these types have date ranges that fall within the late Pueblo II and early Pueblo III periods (A.D. 1000-1200). Calculation of mean ceramic dates yields a late Pueblo II (A.D. 1000-1100) assignment to Features 1, 2, 3, and 5, and a late Pueblo II-early Pueblo III (A.D. 1000-1200) assignment to Structures 1 and 2 (the great kiva and the room block).

Early Pueblo III occupation of the site is also supported by the radiocarbon analysis (see Appendix A). The calibrated radiocarbon dates (following Stuiver and Pearson 1986:Figure 1B) of the samples from Room 1 and the courtyard kiva (both within the room block [Structure 1]) overlap at two standard deviations between A.D. 1160 and 1270 (Figure 9.1).

The absence of St. Johns Polychrome and St. Johns Black-on-red, common at other Pueblo III sites in the Petrified Forest area (Burton 1993), indicates that McCreery Pueblo was abandoned by A.D. 1200.

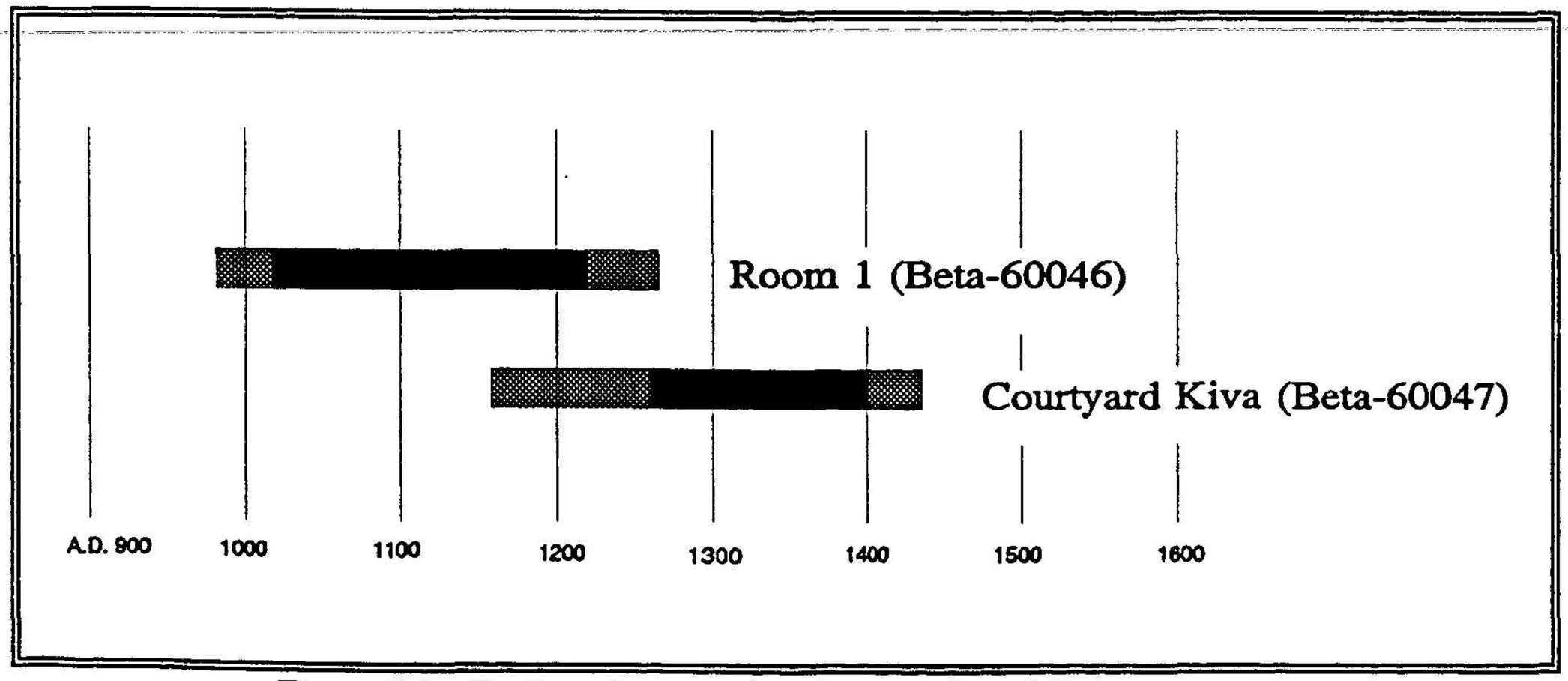

Figure 9.1. Radiocarbon results, showing 1 and 2 sigma ranges.

Site Structure

The original intent of the investigations in this research domain was to determine the construction sequence for the site, which could provide evidence on whether there existed a small local community ancestral to the Chaco-like features (i.e., the great kiva and possibly the pueblo itself).

The outlying features at the site (Features 2, 3, and 5) were considered the most likely candidates for pre-Chaco-era structures. However, these features were determined to be concentrations of construction and remodeling debris and trash, not the in situ remains of structures. No postholes, coursed rocks, floors, or other evidence of structures were encountered. The features do not appear to represent long-used trash dumps or general domestic trash, since they date only to the Pueblo II period and contain none of the bone common in the trash mound. The burned daub in Feature 5 appears to have been roofing material that was deposited outside the pueblo with other debris from a burned room. Further excavation in the pueblo would likely encounter a burned room. Features 2 and 3, with abundant sandstone slab fragments, probably represent construction debris, resulting from the trimming of rock for walls. Chronological data are consistent with a single building episode.

Excavation results indicate that contrary to surface suggestions, there are no truly Chaco-like features at McCreery Pueblo, as described below.

When is a Great Kiva?

Past researchers (Fowler et al. 1987; Jones 1986; Stewart 1980) have described the large depression at McCreery Pueblo as a Chacoan great kiva, as well as an amphitheater and a dance court. And recently, visiting Hopi suggested it may have been a cistern. However, the soils within Structure 1 are not water laid as would be expected if the feature were a cistern. The masonry style and construction exposed in the excavation does not fit the classic Chacoan great-kiva form. According to Lekson (1984:51):

> At their peak (about 1120) Chacoan Great Kivas were very large, round, masonry-lined semi-subterranean structures, containing a set of highly formalized interior features, such as a low bench, four posts or masonry roof supports, raised floor vaults, raised fire box and deflector, an antechamber on the plaza level north of the subterranean structure, and, frequently, peripheral rooms on the plaza surface surrounding the Great Kiva.

No evidence of any of these features was found at McCreery Pueblo.

So just what is Structure 1? The ceramics clearly indicate some kind of functional difference from the rest of the site, in that the high bowl to jar ratio does not indicate a normal domestic assemblage. Its size also suggests it represents public monumental architecture, more than needed for a six room site. Fowler et al. (1987:102), in their great-kiva typology, point out that "[d]uring the 700 years that this building form was in use it underwent significant morphological change." Prior to the Chaco era (pre-A.D. 1050) great kivas were large shallow, circular earthen structures ringed by a low inner bench. During the Chaco era (A.D. 1050-1150) great kivas were formalized, as Lekson describes. But later, during what Fowler et al. term the Transitional period (A.D. 1150-1250), great kivas return to the large circular open court form:

> The kivas are shallow to deep semi-subterranean structures, ringed by a low masonry wall or in some cases bermed with rubble. ... ringed on the interior by a low bench. Entry varies, although a consistent feature is the southern "ramp." ... [A]pparently unroofed structures, their most conspicuous attribute is their diameter.

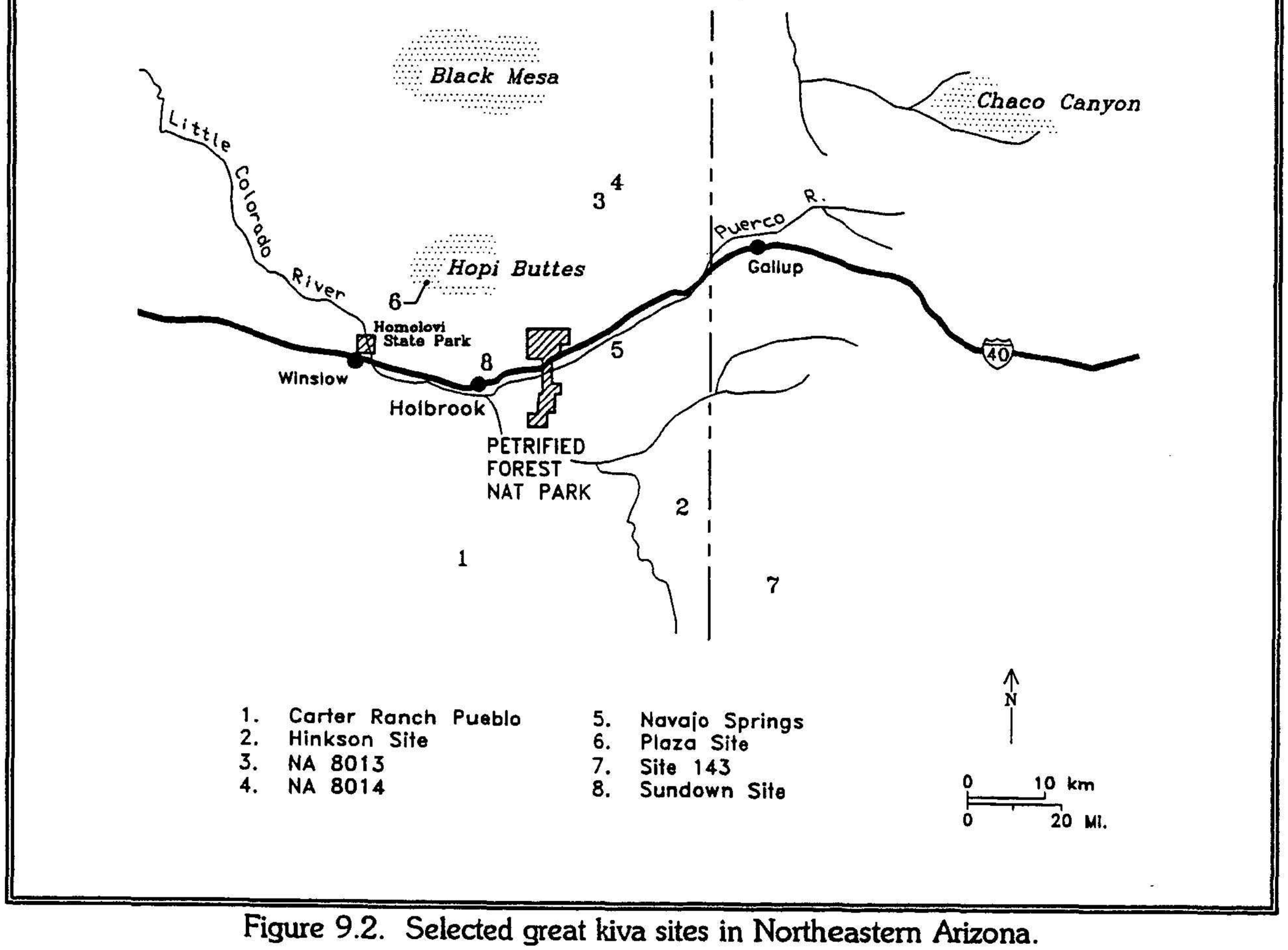

Figure 9.2. Selected great kiva sites in Northeastern Arizona.

Although the McCreery Pueblo Great Kiva does exhibit most of the Transitional period great kiva attributes, its most conspicuous discrepancy is its diameter. In Fowler et al.'s sample (1987:Table 14.2) transitional great kivas tend to be larger than Chaco era great kivas, which are 14 m to 22 m in diameter, with a mean of 18.5 m. Transitional great kivas are 24 m to 34 m in diameter, with a mean of 27.2 m. McCreery Pueblo's great kiva (which Fowler et al. consider to be Chaco era), measures 18 m in diameter. However, many structures similar to the one at McCreery Pueblo, not all included in Fowler et al.'s analysis, have been reported in the region. A few of these are summarized below to provide comparative data.

Carter Ranch Pueblo (Martin et al. 1964)

This site consists of a 40-room pueblo, small kiva, and plaza. A circular great kiva lies 10 m northwest of the pueblo (opposite the plaza). The site had a relatively short occupation, from A.D. 1100 to 1250 (Longacre 1970:1). The great kiva has a diameter of 17.3 m and a depth of 1.6 m. It has a 3-m-wide by 5.5-m-long entry ramp to the southeast. Walls are masonry with rock chinking and mud mortar. The floor consisted of unprepared native soil. Interior features include a bench and five masonry pillars that were apparently roof supports. Longacre (1970) suggests the structure is a local variant of the traditional great kiva.

Hinkson Site (Kintigh 1992)

The Hinkson Site consists of a cluster of 26 room blocks (440 rooms in all) dating between A.D. 1150 and 1275. In the central portion of the cluster is a compact two-story great house and a great kiva. The great kiva is shallow (60 cm), measures 34 m in diameter, and has an entry to the southeast. Limited testing revealed no floor features, and the structure was apparently not roofed. The floor consisted of native soil. Walls were masonry-reinforced berms. The berm likely formed a platform or possibly a bench.

NA 8013 (Olson 1971)

This site consists of a 14-room pueblo with a small and great kiva dating to between A.D. 1100 and 1200. As at Carter Ranch Pueblo the great kiva is 10 m northwest of the pueblo opposite the plaza or courtyard. It is 12 m in diameter and less than 2 m deep. A recess in the southeast, 2.5 m wide by 3 m long, may have been an entryway. In its center was a burned area, apparently an informal hearth. The floor consisted of native soil. While no postholes were found, roofing material noted in the fill suggests the structure may have been roofed. The plastered walls consisted of a berm reinforced with coursed masonry. The interior was ringed by a bench.

NA 8014 (Olson 1971)

NA 8014, located 30 m south of NA 8013, consists of an eight-room pueblo and a small kiva dating to between A.D. 900 and 975. Adjacent to the east side of the pueblo is a great kiva dating to between A.D. 975 and 1075. The 11.5-m-diameter great kiva was dug partly into the small kiva associated with the pueblo. The walls and floors of the great kiva were of native soil, and no entrance or postholes were found. A burned area in the center of the structure may have been an informal hearth. Olson suggests that the great kiva was either unfinished or unroofed.

Navajo Springs (Warburton and Graves 1992)

In addition to a great kiva, this site contains a great house with as many as 40 rooms, two enclosed courtyards, a plaza, a surrounding berm, a large trash mound, and at least one road. No scientific excavation has yet been conducted at the site. The great kiva measures approximately 18 m in diameter. Occupation of the site is postulated to have been between A.D. 1000 and 1125. Analysis of surface-collected ceramics and architecture exposed by looters indicates the site was an early frontier outlier of the Chaco Canyon system. Dating and the location of the great kiva adjacent to the plaza suggests it is likely a full-fledged Chaco-era great kiva.

Plaza Site (Gumerman 1988)

This site consists of a five-room pueblo dating to between A.D. 1100 and 1200, with an enclosed plaza and two small kivas, and a partially subsurface great kiva to the southwest. The great kiva is 8.5 m square with rounded corners. Of coursed masonry construction, the great kiva contained a well-defined hearth and four large postholes that still contained remnants of wood, but no entry or bench. Gumerman (1988:184) noted a resemblance to two great kivas at the Pershing site near Flagstaff and postulated a Sinagua affiliation.

Site 143 (McGimsey 1980)

This site consists of five room blocks of from 12 to 50 rooms. Only the great kiva was excavated. Based on ceramics from the fill of the great kiva (Tularosa Black-on-white, St. Johns Polychrome),

the site was dated to the A.D. 1200s. A trace amount of Red Mesa Black-on-white was attributed to a brief earlier occupation. The great kiva, located centrally in relation to the surrounding room blocks, measures 20 m in diameter and 0.5 m to 1 m deep. The walls consisted of rough interior and exterior masonry courses around an earthen berm. McGimsey suggested the berm may have served as a grandstand for spectators. There is a 3 m wide ramp entry to the southeast and a stairway of coursed sandstone blocks and two small rooms to the northwest. The floor consisted of native soil. The structure was apparently unroofed; the only floor features found were four cists and 50 small unpatterned postholes.

Sundown Site (Gumerman and Skinner 1968)

This site consists of a six-room pueblo with two small kivas, a great kiva, and a possible enclosed plaza, dating to between A.D. 1100 and 1250. The circular great kiva measures 12 m in diameter. No further description of the great kiva is provided, but from a photograph in Gumerman and Skinner (1968:Figure 8) the great kiva appears shallow with a possible bench. Small postholes are visible, but none large enough to suggest the structure was roofed. Gumerman (1988:184) indicates that the structure is in no way similar to Sinagua structures or the great kiva at the Plaza Site.

All of the above examples of great kivas, with the exception of the unexcavated one at Navajo Springs, are clearly different from the Chacoan great kiva form. In addition the great kiva at the Plaza Site appears to be distinctively different, possibly a Sinagua form. The remaining great kivas can be summarized as large, semisubterranean, circular structures, more likely unroofed than roofed. Most have an entry to the southeast and an interior bench. They are shallow (less than 1.6 m deep), with walls at all but one (site NA 8014) constructed of masonry reinforced earthen walls. The great kivas occur at the largest site in the vicinity, but the size of that site (and probably the size of the "vicinity") varies greatly. With some as small as 12 m in diameter, the range of the great kivas would encompass the McCreery Pueblo example. These date from A.D. 1075 to the late 1200s, with most between A.D. 1100 and 1250. The sole example dating to before A.D. 1100 (NA 8014) is of earthen construction and contains no rock at all.

Therefore, the McCreery Pueblo great kiva and others in the Petrified Forest vicinity do appear to fit the physical description of Fowler et al.'s (1987) typology for Transitional period great kivas. However the Petrified Forest vicinity sample includes earlier examples: occupation at McCreery Pueblo may have begun as early as ca. A.D. 1000. Although the McCreery Pueblo great kiva may have been built after the initial occupation of the site, it seems at least as plausible that the so-called Transitional form dates earlier than previously thought, with McCreery Pueblo and the great kiva at NA 8014 early examples. No conclusive data to support or refute either proposition were obtained during the excavations. However, the lack of later ceramics in the debris piles, possibly from the great kiva construction, may indicate the kiva was built near the beginning of the McCreery Pueblo occupation.

Economic and Political Affiliation

Floral remains and pollen indicate the inhabitants of McCreery Pueblo relied heavily on cultigens, with little evidence of wild plant use. The faunal assemblage is dominated by cottontail and jackrabbit, in about equal proportions. The snaring and trapping of both species is congruent with the practice of agriculture (Szuter and Gillespie 1990). Pollen indicates spring and summer occupation, while faunal evidence indicates winter occupation of the site. Turkey remains (shell and bone) suggests that turkey may have been raised at the site. The abundant food remains at McCreery Pueblo, especially

compared to the nearby excavated Pueblo II-III site AZ Q:1:58 (Jones 1986), suggests intensive use.

Lithic analysis indicates an expedient flake technology, typical of other Pueblo-period sites in the region. The dearth of projectile points and other hunting-related tools also points to the predominance of agriculture. There is no evidence of local production for trade. However, the inhabitants did participate in the regional trade networks. Shell from coastal waters and obsidian from the Flagstaff area were recovered during the excavations and a turquoise bead was surface collected in 1985.

The ceramic assemblage manifest in the surface collection was predominantly Little Colorado white and gray wares. However, there was a large proportion of Cibola White Ware, and some White Mountain Red Ware, Mogollon Brown Ware, and Tusayan white and gray wares (Jones 1986). In contrast, the ceramics from the 1992 excavation are dominated by Mogollon and undifferentiated brown wares (44.5 percent of the total ceramics collected; Figure 9.3). Little Colorado white and gray wares account for 42 percent.

In the excavation, Cibola White Ware comprised only 5 percent of the ceramics recovered. This pattern is consistent with recent survey data that indicate at Petrified Forest Little Colorado White Ware is more common at Pueblo II period sites and Cibola White Ware is more common at Pueblo III period sites (Burton and Goetze 1993:156-160). McCreery Pueblo dates to late Pueblo II-early Pueblo III times; the surface collection is likely skewed to the latter part of the site occupation, simply due to superpositioning. During the surface collection most ceramics would have been recovered from the trash mound, where the upper levels would be the most recent.

The predominance at McCreery Pueblo of Little Colorado white and gray wares contrasts with the pattern of decorated wares exhibited at the Chaco outlier of Navajo Springs, only 30 km (18 miles) northeast (Warburton and Graves 1992). There, Cibola White Wares predominate, comprising 75 percent of the decorated wares collected from the surface (Figure 9.4). McCreery Pueblo exhibits

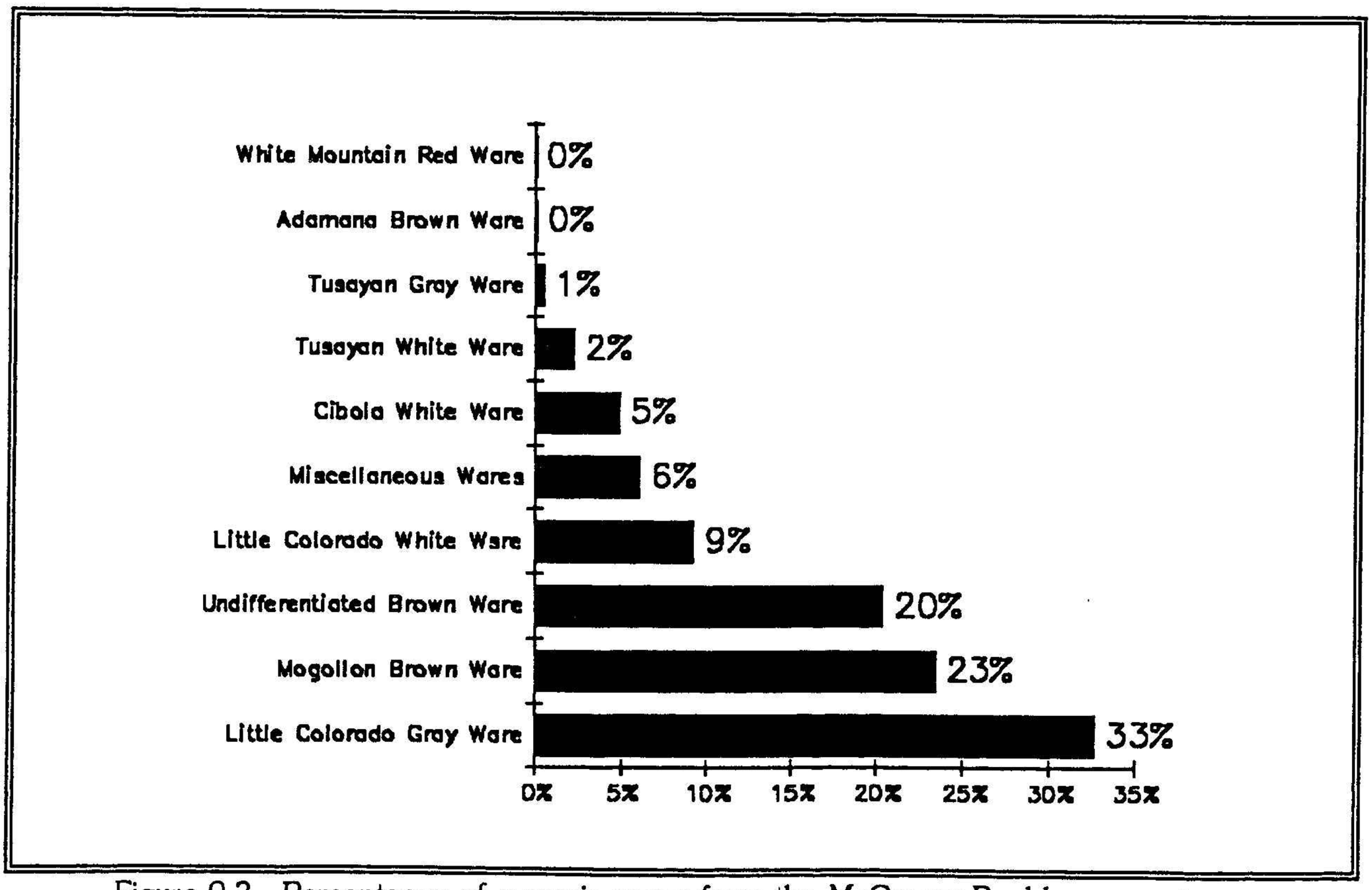

Figure 9.3. Percentages of ceramic wares from the McCreery Pueblo excavations.

more influence from the west (Little Colorado white and gray wares) and south (Mogollon Brown Wares), than the east. But perhaps the increasing frequency of Cibola White Ware in the latter part of the McCreery Pueblo occupation (as reflected in the 1985 surface collection) may reflect an increasing eastern influence.

Examination of the masonry style of the great kiva indicates that the site was not part of the Chaco Anasazi network. Room 1 of the pueblo also exhibits no Chacoan traits: while large and well-made, it is not of the core-veneer masonry characteristic of Chaco architecture. Room 1, 28 square meters in size, is much larger than any other excavated room at Petrified Forest (Burton 1990; Cosgrove 1934; Jennings 1980; Schroeder 1961). For example, the rooms at Puerco Ruin ranged from 4 to 10 square meters in size. Only the largest kiva at Puerco Ruin, at 25 square meters, approaches the size of Room 1 at McCreery Pueblo (Burton 1990). Room 1 also exhibits finer construction than that at the nearby Pueblo IV Puerco Ruin, with triple-wythe walls of well-trimmed and shaped slabs.

As discussed above, the McCreery Pueblo great kiva form appears to have a widespread distribution throughout the region. However, the McCreery Pueblo great kiva is the only one of its kind at Petrified Forest. The great kiva may have integrated a number of smaller villages (Lekson 1989). Although McCreery Pueblo is a small site, its location near the Puerco River, a likely trade and travel route in prehistoric times, may have enhanced its importance. Or McCreery Pueblo may have served as a winter residence for several scattered family groups. In support of this possibility, there are numerous small one- to three-room field houses in the surrounding area, which contains one of the denser site distributions in the park (Wells 1989).

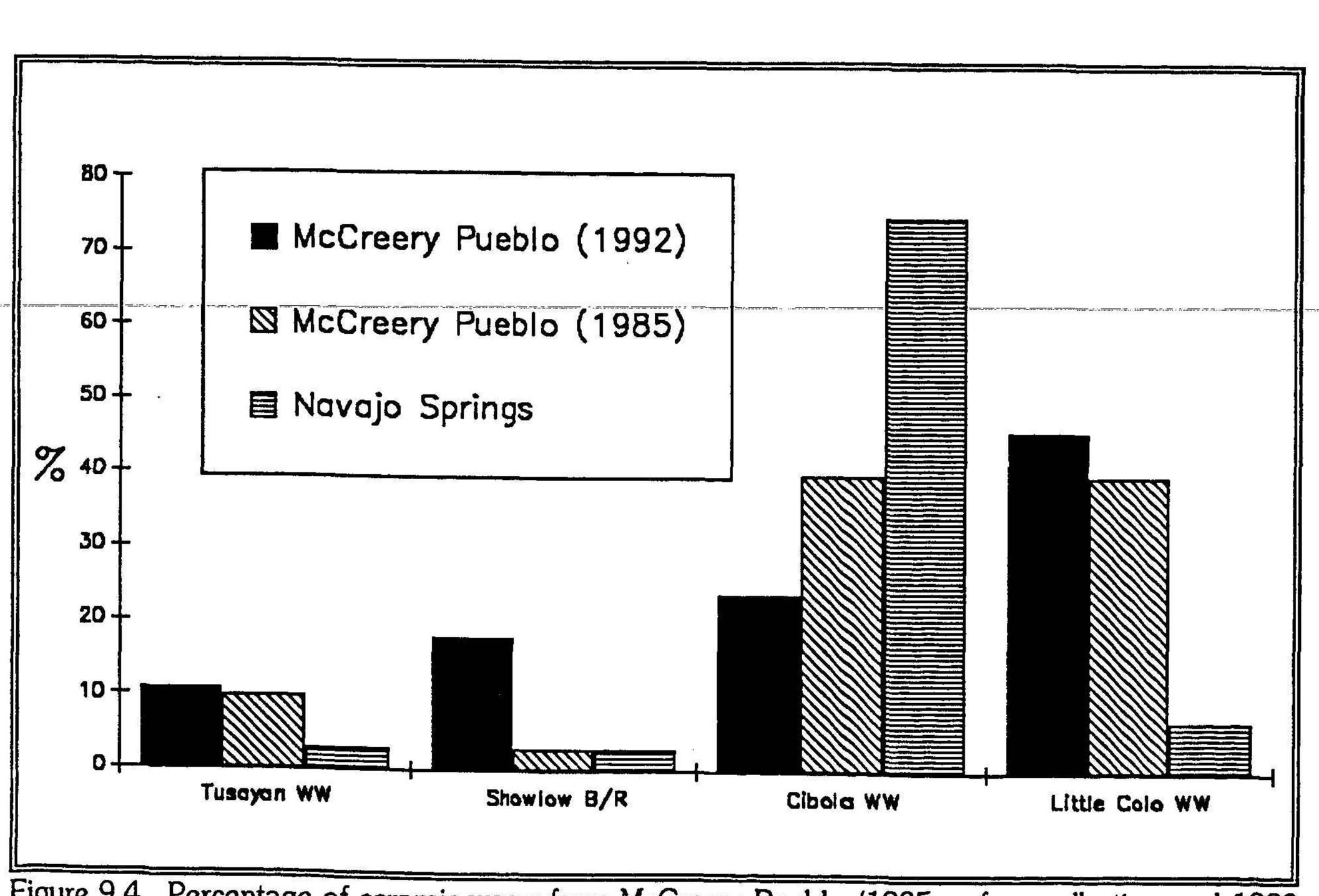

Figure 9.4. Percentage of ceramic wares from McCreery Pueblo (1985 surface collection and 1992 excavations) and the Navajo Springs Great House (Warburton and Graves 1992)

Summary

McCreery Pueblo was occupied sometime between A.D. 1000 and 1200. Subsistence data indicate that McCreery Pueblo was a farming hamlet. Although the pueblo is near the boundary of the Chaco area, the site shows little Chacoan influences. Ceramics, shell, obsidian, and possibly turquoise exhibit ties mostly to the west and south.

Although a small site, McCreery Pueblo is notable for the presence of a great kiva. The McCreery Pueblo great kiva appears to fit the "Transitional period"-style described by Fowler et al. (1987) and interpreted as transitional between Chacoan great kivas and later Puebloan plazas. However, McCreery Pueblo is partially contemporary with Chaco, and the great kiva may have been built a century before Fowler et al.'s Transitional period examples. Therefore, the McCreery Pueblo great kiva probably represents a local tradition that began earlier in time and continued through the Transitional period. The great kiva probably served as a ceremonial center for nearby farmsteads, and the pueblo itself may have been used by a number of these villages for winter residence and food storage.

The 1992 excavation has demonstrated that McCreery Pueblo has substantial research potential. However, at this time no further work is recommended at McCreery Pueblo itself. Other sites in what may be termed the "McCreery Community" may be in greater need of salvage excavation due to ongoing erosion (Burton 1993). Further information on the dating of these nearby sites and seasonality of occupation could provide important clues about the role and function of McCreery Pueblo in Petrified Forest prehistory.

References Cited

Adams, E. Charles

1981 The View from the Hopi Mesas. In "The Protohistoric Period in the North American Southwest A.D. 1450-1700," edited by David R. Wilcox and W. Bruce Masse. *Arizona State University Anthropological Research Papers* 24: 321-335. Tempe.

1991 *The Origin and Development of the Pueblo Katsina Cult.* Tucson: University of Arizona Press.

Adams, E. Charles, and Kelley Ann Hayes

1991 Homol'ovi II: Archaeology of an Ancestral Hopi Village, Arizona. *Anthropological Papers of the University of Arizona* 55. Tucson: University of Arizona Press.

Akins, Nancy J.

1987 Faunal Remains From Pueblo Alto. In *Investigations at the Pueblo Alto Complex*, edited by Frances J. Mathien and Thomas C. Windes, pp. 445-649. Publications in Archeology, Chaco Canyon Studies. National Park Service, U.S. Department of the Interior, Santa Fe.

Ambler, J. Richard

1985 Northern Kayenta Ceramic Chronology. In "Archaeological Investigations near Rainbow City, Navajo Mountain, Utah," edited by Phil R. Geib, J. Richard Ambler, and Martha M. Callahan. *Northern Arizona University Archaeological Report* 576: 28-68. Flagstaff.

Basgall, Mark E.

1983 Archaeology of the Forest Service Forty Site (CA-MNO-529), Mono County, California. MS, Inyo National Forest, Bishop, California.

Bayham, Frank E.

1980 Animal Exploitation and Seasonality: Inferences from the Faunal Data. In "Prehistory in Dead Valley: The TG&E Springerville Report," edited by David E. Doyel and Sharon S. Debowski. *Arizona State Museum Archaeological Series* 144: 389-399. Tucson: University of Arizona.

Berry, Claudia

1984 A Description of Lithic Collections from the Railroad and Transmission Line Corridors. *Museum of Northern Arizona Research Paper* 29. Flagstaff.

Bettinger, Robert L., Michael Delacorte, and Kelly R. McGuire

1984 *Archaeological Excavations at the Partridge Ranch Site (CA-INY-2146), Inyo County, California.* Sacramento: California Department of Transportation.

Breternitz, David A.

1966 An Appraisal of Tree-Ring Dated Pottery in the Southwest. *Anthropological Papers of the University of Arizona* 10. Tucson: University of Arizona Press.

Brown, David E.

1982 Biotic Communities of the American Southwest—United States and Mexico. *Desert Plants* 4(1-4).

Burton, Jeffery F.

1986 Archaeological Investigations at Bajada Camp (CA-INY-2596), Inyo County, California. MS, Baxter Ranch, Independence, California, and CAI, University of California, Riverside.

1990 Archeological Investigations at Puerco Ruin, Petrified Forest, Arizona. *Western Archeological and Conservation Center Publications in Anthropology* 54. Tucson: National Park Service.

Burton, Jeffery F. (continued)
1991 The Archeology of Sivu'ovi: The Archaic to Basketmaker Transition at Petrified Forest National Park. *Western Archeological and Conservation Center Publications in Anthropology* 55. Tucson: National Park Service.

1992 Dating Adamana Brown Ware: Implications for the Archaic to Basketmaker Transition in Northeastern Arizona. Paper presented at the 57th Annual Meeting of the Society for American Archaeology, Pittsburgh.

1993 Days in the Painted Desert and the Petrified Forests of Northern Arizona: Contributions to the Archeology of Petrified Forest National Park, 1988-1991. *Western Archeological and Conservation Center Publications in Anthropology* 62. Tucson: National Park Service.

In press An Overview of Archeological Research in the Middle Little Colorado River Area. In "Middle Little Colorado River Archaeology: From the Parks to the People," edited by A. Trinkle Jones. *Arizona Archaeologist.* Phoenix: Arizona Archaeological Society.

Burton, Jeffery F., and Mary M. Farrell
1993 Projectile Points. In "Days in the Painted Desert and the Petrified Forests of Northern Arizona: Contributions to the Archeology of Petrified Forest National Park, 1988-1991," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 62: 125-146. Tucson: National Park Service.

Burton, Jeffery F., and Christine E. Goetze
1993 Ceramics. In "Days in the Painted Desert and the Petrified Forests of Northern Arizona: Contributions to the Archeology of Petrified Forest National Park, 1988-1991," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 62: 147-160. Tucson: National Park Service.

Burton, Jeffery F., and Richard Hughes
1990 Obsidian Source Analysis. In "Archeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 54: 283-286. Tucson: National Park Service.

Carlson, Roy
1970 White Mountain Redware: A Pottery Tradition of East-Central Arizona and West-Central New Mexico. *Anthropological Papers of the University of Arizona* 19. Tucson: University of Arizona Press.

Christenson, Andrew L., and Marilyn J. Bender
1985 A Method for the Chronological Classification of Black Mesa Sherd Assemblages. In "Functional and Technological Studies of Anasazi Containers from Black Mesa, Arizona," edited by Marion F. Smith, Jr. *Center for Archaeological Investigations Occasional Paper.* Carbondale: Southern Illinois University.

Collins, Michael B.
1975 Lithic Technology as a Means of Processual Inference. In *Lithic Technology, Making and Using Stone Tools*, edited by Earl Swanson, pp. 15-34. Paris: Mouton.

Colton, Harold S.
1939 Prehistoric Cultural Units and Their Relationships in Northern Arizona. *Museum of Northern Arizona Bulletin* 17. Flagstaff.

1943 A Review and Analysis of the Flagstaff Culture. *Medallion Papers* 31. Gila Pueblo, Globe, Arizona.

Colton, Harold S. (continued)
1955 Pottery types of the Southwest. *Museum of Northern Arizona Ceramic Series* 3. Northern Arizona Society of Science and Art, Flagstaff.

Cosgrove, C. Burton, Jr.
1934 Report on Excavation, Repair, and Restoration of Agate House and Other Sites. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Crabtree, Don E.
1982 An Introduction to Flintworking, 2nd edition. *Occasional Papers of the Idaho Museum of Natural History* 28. Pocatello.

Crown, Patricia L.
1981 The Ceramic Assemblage. In "Prehistory of the St. Johns Area, East-Central Arizona: The TEP St. Johns Project," edited by Deborah Westfall. *Arizona State Museum Archaeological Series* 153: 233-290. Tucson: University of Arizona.

Cushing, Frank H.
1920 Zuni Breadstuff. *Indian Notes and Monographs 8, Museum of the American Indian.* New York: Heye Foundation.

Czaplicki, Jon S.
1981 Faunal Analysis. In "Prehistory of the St. Johns Area, East-Central Arizona: the TEP St. Johns Project," edited by Deborah A. Westfall. *Arizona State Museum Archaeological Series* 153: 339-348. Tucson: University of Arizona.

Donaldson, Marcia L., and Charles Miksicek
1990 Floral Remains. In "Archeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 54: 231-254. Tucson: National Park Service.

Douglass, Amy A.
1988 Prehistoric Exchange and Sociopolitical Development: The Little Colorado Whiteware Production-Distribution System. MS, doctoral dissertation, Department of Anthropology, Arizona State University, Tempe.

Fish, Suzanne K.
1990 Pollen analysis. In "Archeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona," by Jeffery F. Burton. *Western Archaeological and Conservation Center Publications in Anthropology* 54: 255-260. Tucson: National Park Service.

1991 Pollen analysis. In "The Archeology of Sivu'ovi: The Archaic to Basketmaker Transition at Petrified Forest National Park," by Jeffery F. Burton. *Western Archaeological and Conservation Center Publications in Anthropology* 55: 91-94. Tucson: National Park Service.

Fowler, Andrew P.
1991 Brown Ware and Red Ware Pottery: An Anasazi Ceramic Tradition. *Kiva* 56(2): 123-144.

Fowler, Andrew P., John R. Stein, and Roger Anyon
1987 An Archaeological Reconnaissance of West-Central New Mexico: The Anasazi Monuments Project. MS, Office of Cultural Affairs, Historic Preservation Division, Santa Fe, New Mexico.

Gillespie, William B.
1990 Faunal Remains. In "Archeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 54: 205-230. Tucson: National Park Service.

1991 Vertebrate Remains. In "The Archeology of Sivu'ovi: The Archaic to Basketmaker Transition at Petrified Forest National Park," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 55: 95-96. Tucson: National Park Service.

Gish, Jannifer W.
1982 Pollen Results. In "The Specialist's Volume: Biocultural Analyses." The Coronado Project Archaeological Investigations, Coronado Series 4, compiled by Robert Gasser. *Museum of Northern Arizona Research Paper* 23: 96-224. Flagstaff.

Goetze, Christine E.
In press Introduction and Methods of Analysis. In *Interpretation of Ceramic Artifacts*, Vol. 16, edited by Barbara J. Mills. University of New Mexico: Office of Contract Archaeology.

Goetze, Christine E., and Barbara J. Mills
In press Classification Criteria for Wares and Types. In *Interpretation of Ceramic Artifacts*, Vol. 16, edited by Barbara J. Mills. University of New Mexico: Office of Contract Archaeology.

Goldberg, Susan K., Elizabeth J. Skinner, and Jeffery F. Burton
1990 *Archaeological Excavations at Sites CA-MNO-574, -577, -578, and -833: Stoneworking in Mono County, California.* Sacramento: California Department of Transportation.

Gomolak, Andrew R.
1988 Probable Effects Assessment for Oil and Gas Leasing in Section 16, T19N, R7W, NMPM. McKinley County New Mexico. *Report AG-001*. Santa Fe, New Mexico: Commissioner of Public Lands.

Grayson, Donald K.
1988 Danger Cave, Last Supper Cave, and Hanging Rock Shelter: The Faunas. *Anthropological Papers of the American Museum of Natural History*, Vol. 66, Pt. 1. New York.

Gumerman, George J.
1988 The Archaeology of the Hopi Buttes District, Arizona. *Center for Archaeological Investigations Research Paper* 49. Carbondale: Southern Illinois University.

Gumerman, George J., and Alan P. Olson
1968 Prehistory in the Puerco Valley, Eastern Arizona. *Plateau* 40(4): 113-127.

Gumerman, George J., and S. Alan Skinner
1968 A Synthesis of the Prehistory of the Central Little Colorado Valley, Arizona. *American Antiquity* 33(2): 185-199.

Hammack, Nancy S.
1979 Archeological Road Corridor Survey, Petrified Forest National Park, 1978 and 1979. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Harrell, Bruce G.
1972 Archaeological Salvage in a Prehistoric Campsite, Petrified Forest National Park. *Plateau* 44(4): 163-175.

1973 The Dobell Site: Archaeological Salvage near the Petrified Forest. *Kiva* 39(1): 35-67.

Haury, Emil W.
1985 *Mogollon Culture in the Forestdale Valley*. Tucson: University of Arizona Press.

Hevly, Richard H.
1968 Studies of the Modern Pollen Rain in Northern Arizona. *Journal of the Arizona Academy of Science* 6: 116-125.

Hoffmeister, Donald F.
1986 *Mammals of Arizona*. Tucson: University of Arizona Press.

Hough, Walter
1902 Ancient Peoples of the Petrified Forest of Arizona. *Harper's Monthly Magazine* 105: 897-901.

1903 Archaeological Fieldwork in Northeastern Arizona: The Museum-Gates Expedition of 1901. *Annual Report of the Smithsonian Institution, 1901*. Washington.

Huckell, Bruce B.
1982 The Distribution of Fluted Points in Arizona. *Arizona State Museum Archaeological Series* 145. Tucson: University of Arizona.

Jennings, Calvin H.
1980 Further Investigations at the Puerco Site, Petrified Forest National Park, Arizona. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Jepson, Carl E.
1941 Dwelling Places of the Prehistoric Indians in the Petrified Forest National Monument. MS, Petrified Forest National Park, Arizona, and Western Archeological and Conservation Center, Tucson.

Jones, Anne Trinkle
1983 Patterns of Lithic Use at AZ Q:1:42, Petrified Forest National Park, Arizona. *Western Archeological and Conservation Center Publications in Anthropology* 25. Tucson: National Park Service.

1986 Pueblo Period Archeology at Four Sites, Petrified Forest National Park. *Western Archeological and Conservation Center Publications in Anthropology* 38. Tucson: National Park Service.

1987 Contributions to the Archeology of Petrified Forest National Park, 1985-1986. *Western Archeological and Conservation Center Publications in Anthropology* 45. Tucson: National Park Service.

1992 Documentation Plan, Data Recovery at McCreery Pueblo, Petrified Forest National Park, Arizona. MS, Western Archeological and Conservation Center, National Park Service, Tucson.

Kinkaid, Chris
1983 *Chaco Roads Project, Phase I: A Reappraisal of Prehistoric Roads in the San Juan Basin*. Department of Interior, Bureau of Land Management, New Mexico State Office and Albuquerque District Office, Santa Fe and Albuquerque.

Kintigh, Keith W.
1992 Post-Chacoan Organizational Developments as Evidenced at the Hinkson Site, New Mexico. Paper presented at the 57th Annual Meeting of the Society for American Archaeology, Pittsburgh.

Lang, Richard W., and Arthur H. Harris
1984 The Faunal Remains from Arroyo Hondo Pueblo, New Mexico: A Study in Short-term Subsistence Change. *Arroyo Hondo Archaeological Series*, Vol. 5. Santa Fe, New Mexico: School of American Research Press.

Lekson, Stephen H.
1984 *Great Pueblo Architecture of Chaco Canyon, New Mexico.* Albuquerque: University of New Mexico Press.

1989 Kivas? In "The Architecture of Social Integration in Prehistoric Pueblos," edited by William D. Lipe and Michelle Hegmon. *Crow Canyon Archaeological Center Occasional Paper* 1: 161-168. Cortez, Colorado.

Lightfoot, Kent G.
1981 Prehistoric Political Development in the Little Colorado Region, East-Central Arizona. MS, doctoral dissertation, Department of Anthropology, Arizona State University, Tempe.

Longacre, William A.
1964 A Synthesis of Upper Little Colorado Prehistory, Eastern Arizona. In "Chapters in the Prehistory of Arizona, II," by Paul S. Martin and others. *Fieldiana: Anthropology* 55: 201-215. Chicago: Field Museum of Natural History.

1970 Archaeology as Anthropology: A Case Study. *Anthropological Papers of the University of Arizona* 17. Tucson: University of Arizona Press.

Lowe, Charles H.
1976 The Amphibians and Reptiles of Arizona. In *The Vertebrates of Arizona*, edited by Charles H. Lowe, pp. 153-174. Tucson: University of Arizona Press.

McGimsey, Charles R. III
1980 Mariana Mesa: Seven Prehistoric Settlements in West-Central New Mexico. *Papers of the Peabody Museum of Archaeology and Ethnology* 72. Cambridge: Harvard University.

McKenna, Peter J., and H. Wolcott Toll
1984 Ceramics. In "The Architecture and Material Culture of 29SJ1360," by Peter J. McKenna. *Reports of the Chaco Center* 7: 103-222. Division of Cultural Research, National Park Service, Santa Fe, New Mexico.

McKusick, Charmion R.
1980 Three Groups of Turkeys from Southwest Archaeological Sites. Papers in Avian Paleontology Honoring Hildegarde Howard, edited by Kenneth E. Campbell, Jr. *Contributions to Science* 30: 225-235. Los Angeles: Natural History Museum of Los Angeles County.

Martin, Paul S.
1963 *The Last 10,000 Years: A Fossil Pollen Record of the American Southwest.* Tucson: University of Arizona Press.

Martin, Paul Sidney, John B. Rinaldo, William A. Longacre, Leslie G. Freeman, Jr., James A. Brown, Richard H. Hevly, and M.E. Cooley
1964 Chapters in the Prehistory of Eastern Arizona II. *Fieldiana: Anthropology* 55. Chicago: Field Museum of Natural History.

Mehringer, Peter J.
1967 Pollen Analysis of the Tule Springs Area, Nevada. In "Pleistocene Studies in Southern Nevada," edited by H. M. Wormington and D. Ellis. *Nevada State Museum Anthropological Papers* 13: 130-200. Carson City.

Mera, Harry Percival
1934 Observations on the Archaeology of the Petrified Forest National Monument. *New Mexico Laboratory of Anthropology Technical Series Bulletin* 7. Santa Fe.

Mills, Barbara J.
1987 Ceramic Analysis. In *Archaeological Investigations at Eight Small Sites in West-Central New Mexico: Data Recovery at the Fence Lake Mine No. 1*, edited by Patrick Hogan, pp. 83-131. University of New Mexico: Office of Contract Archaeology.

1988 Chronological, Distributional, and Functional Analyses of the Ceramic Assemblages from the Casemero and Pierre's Outliers. In *The Casemero and Pierre's Outliers Survey: an Archaeological Class III Inventory of the BLM Lands Surrounding the Outliers*, by R.A. Harper and others, pp. 59-98. University of New Mexico: Office of Contract Archaeology.

1989 Integrating Functional Anaylses of Vessels and Sherds through Models of Ceramic Assemblage Formation. *World Archaeology* 21(1): 133-147.

1990 Temporal and Functional Analyses of Ceramic Assemblages, NZ Survey Project. In *The NZ Project Archaeological Survey Report*, by J. Elyea, pp. 89-117. University of New Mexico: Office of Contract Archaeology.

Minnis, Paul E.
1981 Seeds in Archaeological Sites: Sources and Some Interpretive Problems. *American Antiquity* 46(1): 143-151.

Nelson, Ben A., Margaret C. Rugge, and Steven A. LeBlanc
1978 LA 12109: A Small Classic Mimbres Ruin, Mimbres Valley. In "Limited Activity and Occupation Sites," edited by Albert E. Ward. *Center for Anthropological Studies Contributions to Anthropology* 1: 191-206.

Olsen, Stanley J.
1964 Mammal Remains from Archaeological Sites: Part I, Southeastern and Southwestern United States. *Papers of the Peabody Museum of American Archaeology and Ethnology* 56(1). Cambridge: Harvard University.

1968 Fish, Amphibian and Reptile Remains from Archaeological Sites: Part I, Southeastern and Southwestern United States. *Papers of the Peabody Museum of American Archaeology and Ethnology* 56(2). Cambridge: Harvard University.

1972 Osteology for the Archaeologist: No. 4, North American Birds. *Papers of the Peabody Museum of American Archaeology and Ethnology* 56(4). Cambridge: Harvard University.

1978 The Faunal Analysis. In "Bones from Awatovi, Northeastern Arizona," by Stanley J. Olsen and Richard P. Wheeler. *Papers of the Peabody Museum of American Archaeology and Ethnology* 70(1):1-35. Cambridge: Harvard University.

Olson, Alan P.
1971 Archaeology of the Arizona Public Service Company 345KV Line. *Museum of Northern Arizona Bulletin* 46. Flagstaff.

Parry, William J., and Andrew L. Christenson
1987 Prehistoric Stone Technology on Northern Black Mesa, Arizona. *Center for Archaeological Investigations Occasional Paper* 12. Carbondale: Southern Illinois University.

Parry, William J., and Robert L. Kelly
1987 Expedient Core Technology and Sedentism. In *The Organization of Core Technology*, edited by Jay K. Johnson and Carol A. Morrow, pp. 285-304. Boulder, Colorado: Westview Press.

Patterson, Leland W.
1983 The Importance of Flake Size Distribution. *Contract Abstracts and CRM Archaeology* 3: 70-72.

1990 Characteristics of Bifacial-Reduction Flake-Size Distribution. *American Antiquity* 55(3): 550-558.

Plog, Fred T.
1983 Political and Economic Alliance on the Colorado Plateaus, A.D. 400-1450. In *Advances in World Archaeology*, Vol. 2, edited by Fred Wendorf and A. E. Close, pp. 289-230. New York: Academic Press.

1984 Exchange, Tribes, and Alliances: The Northern Southwest. *American Archaeology* 4(3):217-223.

Reed, Erik K.
1980 Special Report on Review of Archeological Survey Potsherd Collections (1947). Reprinted 1980 in "An Archeological Overview of Petrified Forest National Park," by Yvonne G. Stewart. *Western Archeological and Conservation Center Publications in Anthropology* 10: 191-221. Tucson: National Park Service, Tucson.

Rinaldo, John B., and Elaine A. Bluhm
1956 Late Mogollon Pottery Types of the Reserve Area. *Fieldiana: Anthropology* 36(7). Chicago: Field Museum of Natural History.

Rozen, Kenneth C.
1979 Lithic Analysis and Interpretation. In "The TEPCO Project, Vol. 2: Dos Condado to Apache Survey and Data Recovery of Archaeological Resources," by Deborah A. Westfall, Kenneth C. Rozen, and Howard Davidson. *Arizona State Museum Archaeological Series* 144: 209-321. Tucson: University of Arizona.

1981 Patterned Associations Among Lithic Technology, Site Content, and Time: Results of the TEP St. Johns Lithic Analysis. In "Prehistory of the St. Johns Area, East-Central Arizona: The TEP St. Johns Project," edited by Deborah Westfall. *Arizona State Museum Archaeological Series* 153: 157-232. Tucson: University of Arizona.

1984 Flaked Stone. In "Habitation Sites in the Northern Santa Rita Mountains," by Alan Ferg, Kenneth C. Rozen, William L. Deaver, Martyn D. Tagg, David A. Phillips, Jr., and David A. Gregory. *Arizona State Museum Archaeological Series* 147: 421-604. Tucson: University of Arizona.

Rozen, Kenneth C., and Alan P. Sullivan III
1989 Measurement, Method, and Meaning in Lithic Analysis: Problems With Amick and Mauldin's Middle-Range Approach. *American Antiquity* 54(1): 169-175.

Schiffer, Michael B.
1976 *Behavioral Archeology*. Academic Press, New York.

1985 Is There a "Pompeii Premise" in Archaeology? *Journal of Anthropological Research* 41(1): 18-41.

1987 *Formation Processes of the Archaeological Record*. Albuquerque: University of New Mexico Press.

Schroeder, Albert H.
1961 Puerco Ruin Excavations, Petrified Forest National Monument, Arizona. *Plateau* 33(4): 93-104.

1979 Prehistory: Hakataya. In *Southwest*, edited by Alfonso Ortiz, pp. 100-107. Handbook of North American Indians: Vol. 9, W. C. Sturtevant, general editor. Smithsonian Institution, Washington.

Senior, Louise M., and Linda J. Pierce
1989 Turkeys and Domestication in the Southwest: Implications From Homol'ovi III. *Kiva* 54(3): 245-259.

Sims, Jack R., Jr., and D. Scott Daniel
1962 A Lithic Assemblage near Winslow, Arizona. *Plateau* 39(4): 175-188.

South, Stanley
1977 *Method and Theory in Historical Archaeology*. New York: Academic Press.

Stahle, David W., and James E. Dunn
1982 An Analysis and Application of the Size Distribution of Waste Flakes from the Manufacture of Bifacial Stone Tools. *World Archaeology* 14(1): 84-97.

Stevenson, Matilda Coxe
1915 Ethnobotany of the Zuni Indians. In *30th Annual Report of the Bureau of American Ethnology*, pp. 31-102. Washington.

Stewart, Yvonne G.
1980 An Archeological Overview of Petrified Forest National Park. *Western Archeological and Conservation Center Publications in Anthropology* 10. Tucson: National Park Service.

Stuiver, Minze, and Gordon W. Pearson
1986 High-Precision Calibration of the Radiocarbon Time Scale, AD 1950-500 BC *Radiocarbon* 28(2B):805-838.

Sullivan Alan P.
1984 Design Styles and Cibola Whiteware: Examples from the Grasshopper Area, East-Central Arizona. In "Regional Analysis of Prehistoric Ceramic Variation: Contemporary Studies of Cibola Whitewares," edited by Alan P. Sullivan and Jeffery L. Hantmann. *Arizona State University Anthropological Research Papers* 31: 74-94. Tempe.

Sullivan, Alan P., and Kenneth C. Rozen
1985 Debitage Analysis and Archaeological Interpretation. *American Antiquity* 50(4): 755-779.

Szuter, Christine R.
1989 Spatial and Temporal Intrasite Variability in the Faunal Assemblage from Las Colinas. In *The 1982-1984 Excavations at Las Colinas: Environment and Subsistence*, Vol. 5. Arizona State Museum Archaeological Series 162: 117-149, Tucson: University of Arizona.

1991 Faunal Remains. In "Homol'ovi II: Archaeology of an Ancestral Hopi Village, Arizona," edited by E. Charles Adams and Kelley A. Hays. *Anthropological Papers of the University of Arizona* 55: 103-111. Tucson: University of Arizona Press.

Szuter, Christine R.
1990 Recent Trends in the Interpretation of Animal Resource Use in the Southwest. Paper presented at the 2nd Southwest Symposium, Albuquerque.

Tagg, Martyn D.
1987 Excavations at AZ K:13:60: Utilization of Corn at a Late Archaic Site in Petrified Forest National Park. In "Contributions to the Archeology of Petrified Forest National Park, 1985-1986," by Ann Trinkle Jones. *Western Archeological and Conservation Center Publications in Anthropology* 45: 161-196. Tucson: National Park Service.

Toll, H. Wolcott
1991 Material Distributions and Exchange in the Chaco System. In *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest*, edited by Patricia L. Crown and W. James Judge, pp. 77-108. Santa Fe: School of American Research Press.

Vint, James M.
1990 Ceramic Materials Analysis. In "Archeological Investigations at Puerco Ruin, Petrified Forest, Arizona," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 54: 289-300. Tucson, National Park Service.

Vint, James M., and Jeffery F. Burton
1990 Ceramics. In "Archaeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona," by Jeffery F. Burton. *Western Archeological and Conservation Center Publications in Anthropology* 54: 97-126. Tucson: National Park Service.

Warburton, Miranda, and Donna K. Graves
1992 Navajo Springs, Arizona: Frontier Outlier or Autonomous Great House. *Journal of Field Archaeology* 19(1): 51-69.

Wells, Susan J.
1987 Trip Report: Installation of Monitoring Device at McCreery Pueblo (PEFO-1987C). MS, Western Archeological and Conservation Center, National Park Service, Tucson.

1988 Archeological Survey and Testing at Petrified Forest National Park, 1987. *Western Archeological and Conservation Center Publications in Anthropology* 48. Tucson: National Park Service.

1989 Petrified Forest National Park Boundary Survey, 1988: The Final Season. *Western Archeological and Conservation Center Publications in Anthropology* 51. Tucson: National Park Service.

Wendorf, Fred
1948 Early Archaeological Sites in the Petrified Forest National Monument. *Plateau* 21(2): 29-32.

1953 Archaeological Studies in the Petrified Forest National Monument. *Museum of Northern Arizona Bulletin* 27. Flagstaff.

Wendorf, Fred, and Tully H. Thomas
1951 Early Man Sites near Concho, Arizona. *American Antiquity* 17(2): 107-114.

Whiting, Alfred F.
1939 Ethnobotany of the Hopi. *Museum of Northern Arizona Bulletin* 15. Flagstaff.

Wilson, Dean C., and Eric Blinman
1991 Early Anasazi Ceramics and the Basketmaker Transition. Paper presented at the Anasazi Symposium, Mesa Verde National Park, Colorado.

Windes, Thomas C.
1984 A View of the Cibola Whiteware From Chaco Canyon. In "Regional Analysis of Prehistoric Ceramic Variation: Contemporary Studies of Cibola Whitewares," edited by Alan P. Sullivan and Jeffery L. Hantmann, pp. 94-119. *Arizona State University Anthropological Research Papers* 31. Tempe.

Windes, Thomas C., and Peter J. McKenna
1989 Cibola Whiteware and Cibola Grayware: The Chaco Series. Paper presented at the New Mexico Archaeological Council Ceramics Workshop, Northwestern New Mexico Region. MS, National Park Service, Santa Fe.

Appendix A

Radiocarbon Dating

Murry Tamers, Beta Analytic, Inc.

BETA ANALYTIC INC.

MURRY A. TAMERS, PH.D.
JERRY J. STIPP, PH.D.
CO-DIRECTORS

4985 S.W. 74 COURT
MIAMI, FLORIDA
33155 U.S.A

February 4, 1993

Mr. Jeff Burton
National Park Service
Western Archaeological and Conservation Center
PO Box 41058
Tucson, Arizona 85717

Dear Mr. Burton:

Please find enclosed the results on the two charcoal samples recently submitted for radiocarbon dating analyses. We hope these dates will be useful in your research.

Your charcoals were pretreated by first examining for rootlets. The samples were then given a hot acid wash to eliminate carbonates. They were repeatedly rinsed to neutrality and subsequently given a hot alkali soaking to take out humic acids. After rinsing to neutrality, another acid wash followed and another rinsing to neutrality. The following benzene syntheses and counting proceeded normally.

We are sending our invoice under separate cover. If there are any questions or if you would like to confer on the dates, my direct telephone number is listed below. Please don't hesitate to call us if we can be of help.

Sincerely yours,

Murry Tamers

Murry Tamers
Co-director

TELEPHONE: 305-667-5167 / FAX: 305-663-0964 / BITNET: XNRBET22@SERVAX

BETA ANALYTIC INC.

DR. J.J. STIPP and DR. M.A. TAMERS

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964

REPORT OF RADIOCARBON DATING ANALYSES

FOR: Jeff Burton
National Park Service

DATE RECEIVED: January 11, 1993

DATE REPORTED: February 4, 1993

SUBMITTER'S PURCHASE ORDER #

OUR LAB NUMBER	YOUR SAMPLE NUMBER	C-14 AGE YEARS B.P. ± 1σ	
Beta-60046	PEFO-210	910 +/- 80 BP	(charcoal)
Beta-60047	PEFO-362	650 +/- 80 BP	(charcoal)

These dates are reported as RCYBP (radiocarbon years before 1950 A.D.). By international convention, the half-life of radiocarbon is taken as 5568 years and 95% of the activity of the National Bureau of Standards Oxalic Acid (original batch) used as the modern standard. The quoted errors are from the counting of the modern standard, background, and sample being analyzed. They represent one standard deviation statistics (68% probability), based on the random nature of the radioactive disintegration process. Also by international convention, no corrections are made for DeVries effect, reservoir effect, or isotope fractionation in nature, unless specifically noted above. Stable carbon ratios are measured on request and are calculated relative to the PDB-1 international standard; the adjusted ages are normalized to -25 per mil carbon 13.

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National Park Service ♦ 1415 North Sixth Ave. ♦ P.O. Box 41058 ♦ Tucson, Arizona ♦ 85717

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29. None.
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48. Archeological Survey and Testing at Petrified Forest National Park, 1987, *by Susan J. Wells.*
49. An Archeological Overview of Great Basin National Park, 1988, *by Krista Deal.*
50. Archeological Survey and Architectural Study of Montezuma Castle National Monument, 1988, *by Susan J. Wells and Keith M. Anderson.*
51. Petrified Forest National Park Boundary Survey, 1988: the Final Season, *by Susan J. Wells.*
52. None.
53. Archeological Survey and Site Assessment at Great Basin National Park, *by Susan J. Wells.*
54. Archeological Investigations at Puerco Ruin, Petrified Forest National Park, Arizona, *by Jeffery F. Burton.*
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