IMPLICATIONS OF EARLY BOW USE IN GLEN CANYON

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ABSTRACT

*The concept of a Proto-Fremont, terminal Archaic culture is proposed to distinguish **in situ** populations occupying portions of the northern Colorado Plateau from contemporaneous, but culturally unrelated, Basketmaker II populations of the southern Colorado Plateau. One key difference between these groups was early (ca. A.D. 100) use of the bow by the ancestral Fremont, while the ancestral Anasazi continued to employ the atlatl. The time lag for diffusion of bow technology to the Anasazi could be attributable to competitive relationships. The bow might have been the competitive advantage that allowed local ancestral Fremont populations to maintain occupancy of their traditional territories in the face of expanding Basketmaker II agriculturalists. In order to understand the Archaic-Formative transition on the northern Colorado Plateau, it is important to know whether local Archaic populations existed at the time that agriculture was introduced. The processes involved in this transition and the particular nature of its historical expression depends on whether farming was transferred to Archaic populations or involved the spread of cultural systems already somewhat dependent on agriculture.*

INTRODUCTION

In the spring of 1986, archaeologists from Northern Arizona University test excavated a site known as Sunny Beaches (42KA2751) in the Glen Canyon National Recreation Area (Bungart and Geib 1987). Rose Spring Corner-notched arrow points were recovered from a buried cultural stratum radiocarbon dated to the first few centuries A.D. This find clearly presents an anomaly since traditional culture history has the Glen Canyon region occupied until about A.D. 400 by Basketmaker II populations who used the atlatl-and-dart; only during the seventh century A.D., during Basketmaker III, did the Anasazi start using the bow (cf. Lipe 1978:368-369). Evidence from Unit V of Cowboy Cave is reviewed and shown to corroborate that the bow was used in portions of southeast Utah contemporaneous with Basketmaker II use of the atlatl. The concept of a Proto-Fremont, terminal Archaic culture is proposed to distinguish *in situ* populations of the northern Colorado Plateau from contemporaneous but culturally unrelated Basketmaker II populations of the southern Colorado Plateau.

SUNNY BEACHES (42KA2751)

Location and Setting

Sunny Beaches is located in the northeast portion of Kane County, Utah, in the heart of the Glen Canyon National Recreation Area (Figure 1). It is situated in a canyon that drains the extreme southwestern portion of the Waterpocket Fold and empties into the Colorado River. The canyon has vertical walls of Navajo Sandstone and is floored by the Kayenta Formation at an average elevation of 4000 feet. Groundwater discharged from the Navajo provides a permanent water supply and supports a lush riparian community. The canyon has been partially filled and flushed of alluvium several times during the past millennia (Agenbroad et al. n.d.; Anderson 1988).

The main portion of Sunny Beaches (Locus A) is situated on a peninsula of alluvium on the west side of the canyon. The peninsula was formed by the erosive action of the main drainage on the east and an intermittent wash on west (Figure 2). Arroyo cutting exposed a single cultural stratum in profile, and deflation of this stratum deposited a variety of lithic artifacts, burned bone, and fire-cracked rock across the surface of the peninsula (Figure 3). Two other artifact loci (B and C) occur 15-30 m west of Locus A; both are severely deflated and probably lack buried remains. The focus of our testing program and the point of departure for this paper is the buried cultural stratum of Locus A.

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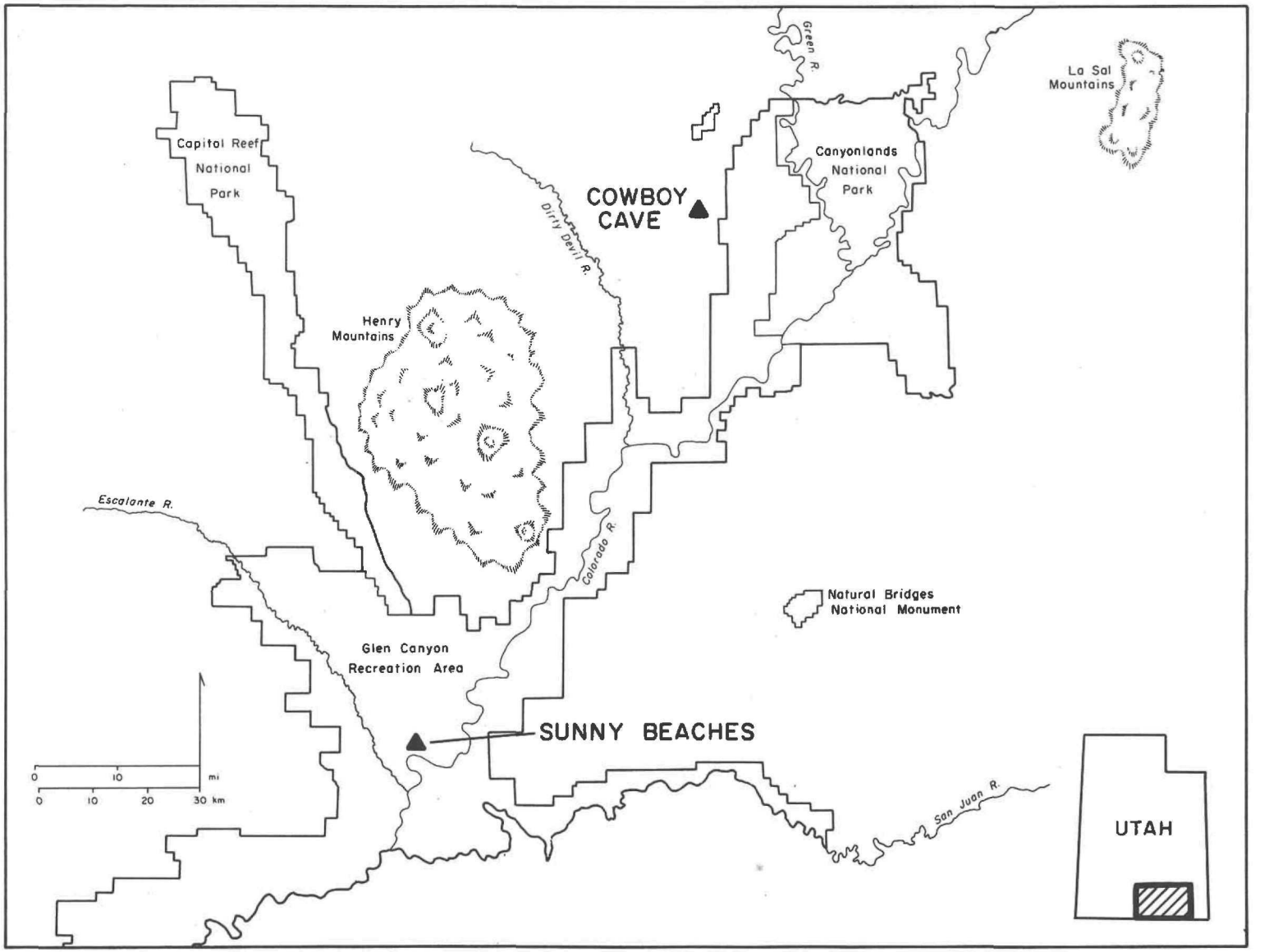

Figure 1. General location of Sunny Beaches in the Glen Canyon National Recreation Area of Southeast Utah, and location of Cowboy Cave.

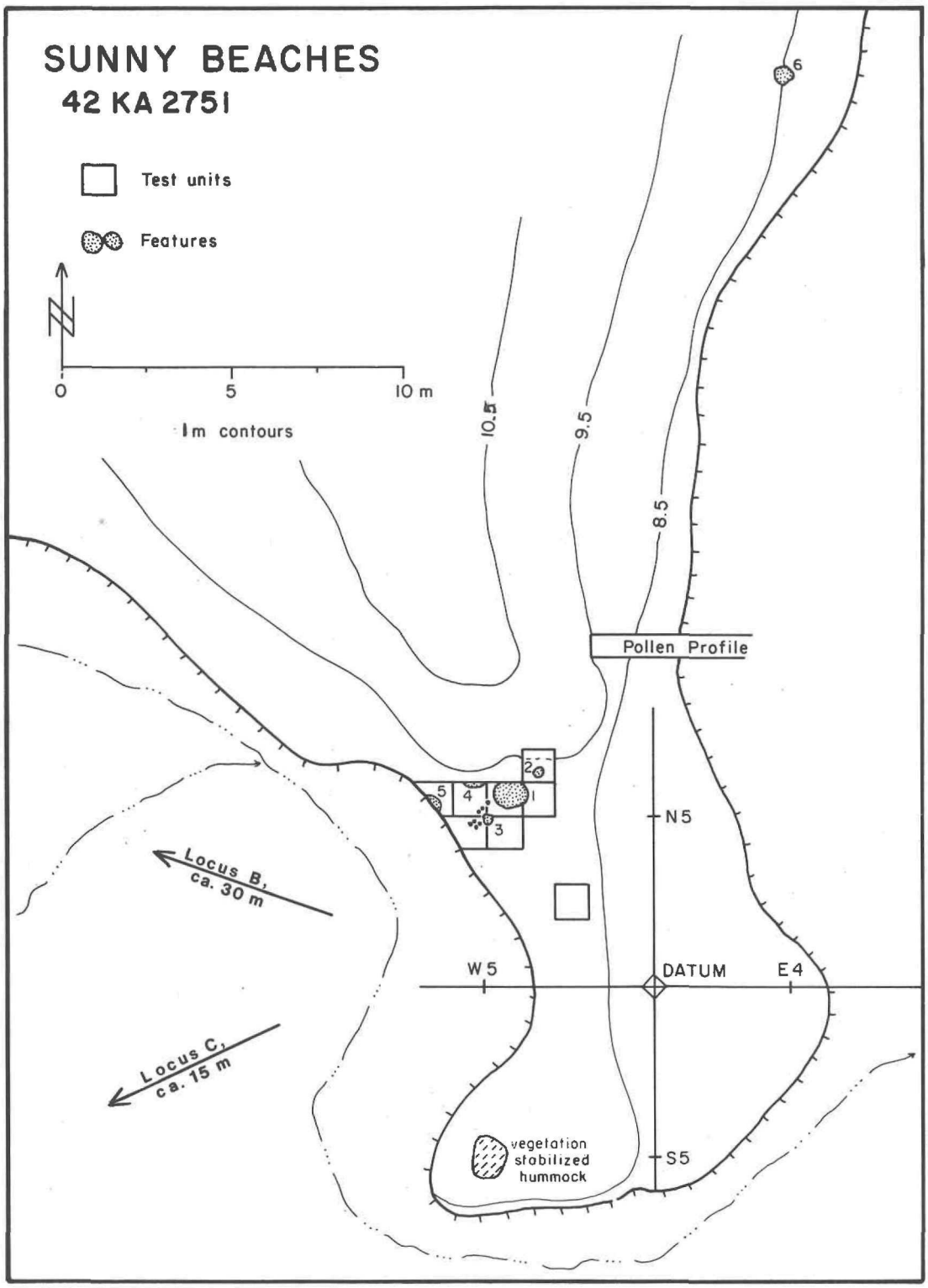

Figure 2. Plan map of Sunny Beaches (42KA2751). All features but number 3 are hearths.

Figure 3. View of the deflated surface of Locus A at Sunny Beaches (42KA2751) prior to excavation. Alluvial entisol covering the cultural stratum is clearly evident along left edge. Arrow in upper left corner marks location of the Basketmaker III site 42KA2752 that overlays the dune sand covering the entisol and the cultural stratum.

Stratigraphy and Features

After establishing stratigraphic control, excavation was done by natural levels, and all fill, aside from pollen and flotation samples, was sieved through one-eighth inch screens. Four noncultural strata and one cultural stratum were recorded during the excavation (Figure 4). Stratum 1 was an entisol about 20 cm thick, consisting of fine sand stained dark gray from the decay of vegetation (Anderson [1988] presents a detailed discussion of canyon alluvium and soils). Stratum 2 was culturally sterile yellow-red alluvial sand approximately 30-35 cm thick. Stratum 3 is the cultural layer consisting of charcoal-stained fine sand 20-60 cm thick. Numerous lithic artifacts and bone fragments, as well as five hearths, were found in this layer. Below this was Stratum 4, a culturally sterile alluvial sand followed by a series of noncultural strata exposed in the arroyo cut but not excavated. Strata 1-3 are deflated across most of the peninsula, while Stratum 4 forms the surface of this peninsula. Strata 1-3 are intact to the north and become progressively buried beneath a substantial layer of eolian sand--part of a large falling dune. Immediately below Stratum 4 is a relatively well-cemented layer known as the gray clay unit that represents a ponding event and is a marker bed near the top of most alluvial deposits throughout the canyon (Anderson 1988:74, 91). It will be important to later discussion of Sunny Beaches chronology.

Five unlined, basin-shaped hearths, oval to circular in plan, were found buried in the cultural stratum. They ranged from 35 to 80 cm in diameter and from 8 to 25 cm deep, and were filled with charcoal-stained sediment and small pieces of charcoal. All but one contained small lithic artifacts and most contained burned bone fragments. A few carbonized seeds of Indian ricegrass (*Oryzopsis hymenoides*), hackberry (*Celtis reticulata*), and goosefoot (*Chenopodium* sp.) were recovered from

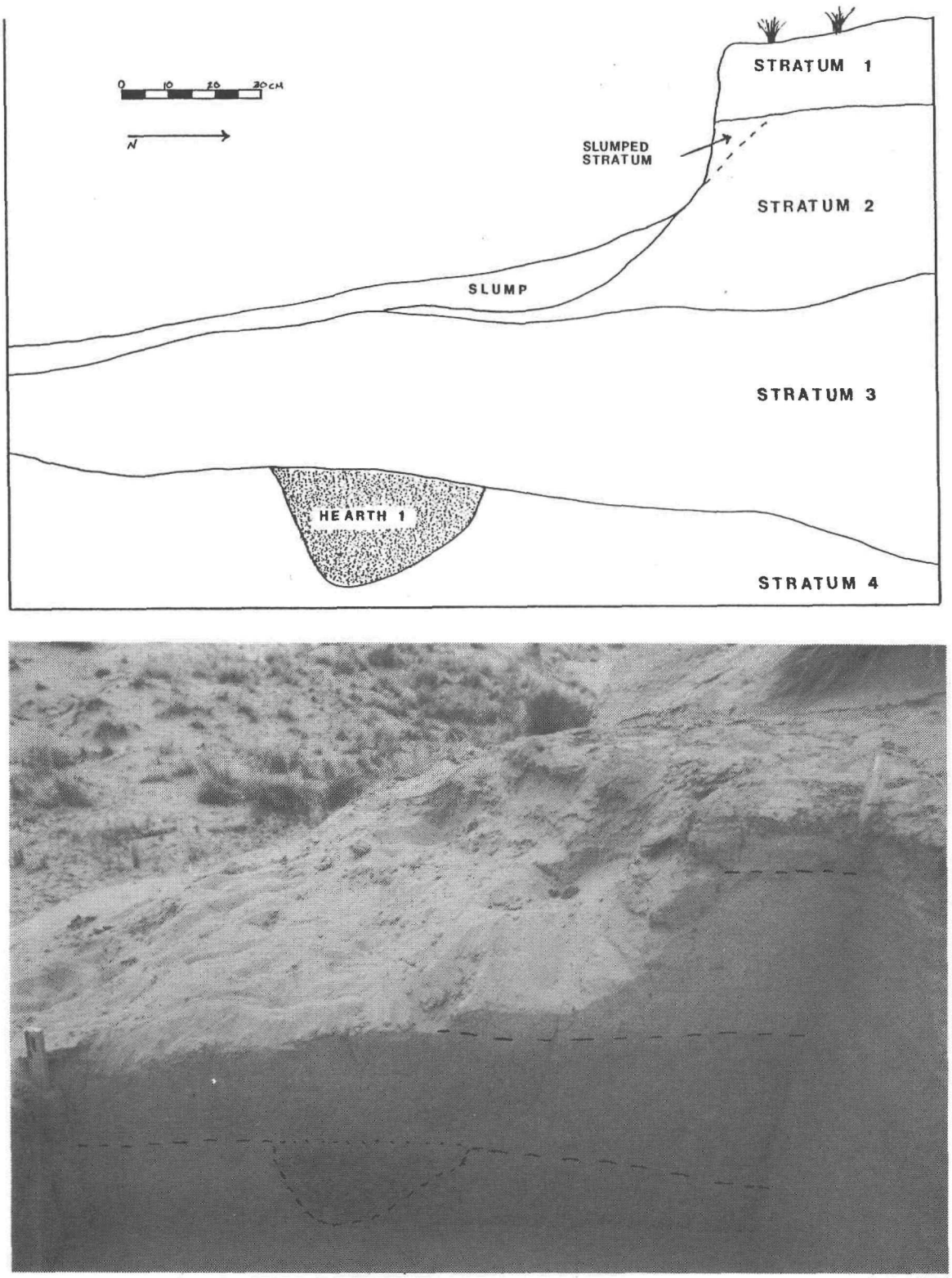

Figure 4. Stratigraphic profile of Sunny Beaches strata encountered in the first test unit, and photo of the same. A small portion of Hearth 1 is seen in section.

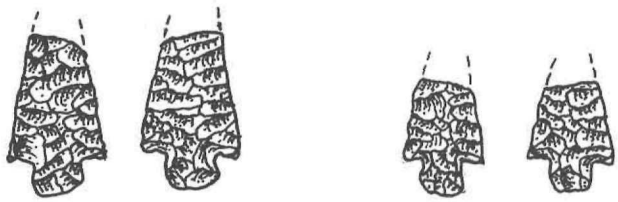

Figure 5. The two most complete specimens of Rose Spring Corner-notched projectile points from Stratum 3 of Sunny Beaches (42KA2751). Points are shown actual size.

these features (Van Ness 1987). A cluster of fire-cracked sandstone adjacent to one hearth might represent heating stones. A sterile pit found next to these rocks is of unknown function.

Lithic Artifacts

No ceramics were found at Sunny Beaches. The subsurface sample of lithic artifacts from Locus A includes 21 chipped stone tools and 806 pieces of debitage, predominantly from late-stage biface reduction, including pressure flaking. Other remains were found on the surface of Locus A, but to avoid any question of association only subsurface remains are considered here. Nine small projectile points of chert were recovered from the cultural stratum: two nearly complete points (Figure 5), three distal portions, and four proximal portions. Both of the nearly complete points are readily classifiable as Rose Spring Corner-notched (e.g., Holmer and Weder 1980:56-59, Figure 9). All of the proximal fragments are clearly stems from Rose Spring points that broke across the notches. The distal fragments are similar in size to the nearly complete specimens, and of similar morphology and flaking quality--small and narrow, finely pressure flaked, with relatively straight blade margins that converge to form a sharp tip. The arrow points, along with a quantity of pressure flakes, were found around and in the hearths. No dart points were recovered from the stratum or from the deflated surface of Locus A.

Other flaked lithic tools recovered from Stratum 3 include: three fragmentary items classified as projectile point blanks, five fragments of percussion flaked chert bifaces from late reduction stages, and five used flakes. The point blanks are small, bifacially worked, and well suited for making arrow points.

Dating

The Sunny Beaches cultural stratum is buried by two layers of alluvium, then by a variable amount of eolian sand. This sand is part of a large falling dune formed along the western wall of the canyon. About 300 m north of Sunny Beaches there is an open sherd and lithic scatter (42KA2752) on the surface of this dune were it meets and overlies the alluvial terrace containing the Sunny Beaches deposit (see Figure 3). Basketmaker III sherds from this site are identical to pottery fragments from site 42KA2756 further up canyon (Geib and Fairley 1986:121, 131). This latter site has a radiocarbon date of 1290±75 (Agenbroad et al. n.d.), which gives a calibrated two sigma age range of A.D. 620-890 (Stuiver and Reimer 1986). This age range corresponds quite well with the tree-ring dated Basketmaker III occupation of Cedar Mesa

Table 1. Radiocarbon Dates for Sunny Beaches (42KA2751). Calibrated Calendrical Ages Based on the 1987 CALIB Program and 20 Year Data Set (Stuiver and Reimer 1986).

	Hearth 1	Hearth 2
Sample ID	Beta-16272	Beta-21235
Years B.P. ± 1σ	1800 ± 100	2260 ± 230
Uncalibrated Midpoint	A.D. 150	310 B.C.
Uncalibrated 2σ Age Range	50 B.C. - A.D. 250	770 B.C. - A.D. 150
Calibrated Midpoint	A.D. 227	379 B.C.
Calibrated 2σ Age Range	A.D. 0-430	892 B.C. - A.D. 230

east of Glen Canyon (A.D. 650-725, Matson et al. 1988:247). Since Sunny Beaches is stratigraphically below the Basketmaker III site and separated from it by two alluvial strata and an unknown amount of dune sand, the cultural stratum must predate the Basketmaker III occupation by at least several hundred years.

Radiocarbon samples were collected from each of the hearths and from the cultural stratum. Wood charcoal from hearths 1 and 2 was submitted to Beta Analytic for radiocarbon analysis. Results are given in Table 1. Averaging the dates might appear justified in light of the apparent stratigraphic contemporaneity, but contextual association aside, these dates appear anomalously disparate. Despite a 230 year overlap between the calibrated two sigma age ranges, the probability for such an overlap appears remote and seems due to the large error factor associated with the Hearth 2 sample. Because of greatly unequal variances, a t-test to statistically evaluate contemporaneity is not appropriate (Long and Rippeteau 1974). If the error factor of the Hearth 2 date was similar to that of Hearth 1, then the t-value would support non-contemporaneity.

Two plausible alternative explanations for the difference between the two dates are: (1) the site was occupied on several occasions during a span of 500 years or so and the dates correspond to early and late episodes of site use; or (2) the Hearth 2 date vastly overestimates the age of site use due to the "old wood" problem (e.g., Schiffer 1986; Smiley 1985). Contamination can be discounted except for inclusion (through bug activity) of more recent organics from the overlying entisol. This would bias the dates towards underestimation and would not change the argument of this paper.

The alluvial chronology (Agenbroad et al. n.d.; Anderson 1988) was examined to see if it could help resolve which alternative presented above might be more correct. Key in this regard is the gray clay unit which underlies the cultural stratum of Sunny Beaches. A charcoal sample obtained from this unit further up canyon produced a radiocarbon date of 1970±90 B.P. (Anderson 1988:25, Table 25). This date is consistent with two older dates (3000±145 B.P. and 2510±80 B.P.) that come from strata immediately below the clay unit (Anderson 1988:91). The clay unit has a calibrated two sigma age range of 190 B.C. - A.D. 230, revealing that the Hearth 1 date is chronostratigraphically consistent, but that the Hearth 2 date is well out of line. We conclude, therefore, that the Hearth 1 date most accurately represents the time of site occupation, and that old wood was burned in Hearth 2.

DISCUSSION

The Timing of Bow Use on the Colorado Plateau

The dating of bow-and-arrow introduction to the eastern Great Basin and Utah has been an issue of

debate (Aikens 1976; Madsen and Berry 1975; Madsen 1978; Webster 1980). Much of the discussion has centered around the origins of the Fremont, specifically, whether or not a developmental relationship exists between Archaic and Fremont cultures. In support of an Archaic-Fremont hiatus, Madsen and Berry (1975:393-394) maintained that the adoption of bow-and-arrow technology was contemporaneous with the introduction of pottery at about A.D. 450. Evidence for earlier use of the bow-and-arrow from Danger and Hogup Caves was discounted on the premise of stratigraphic mixture. In the larger context of criticizing Madsen and Berry's concept of a hiatus, Aikens (1976:548) cited evidence from the excavation of Dirty Shame Rockshelter that supported bow use in extreme southwestern Oregon by about 800-600 B.C. Webster (1980:64) raised doubts about the Dirty Shame evidence, but substituted his own findings from Dry Creek Rockshelter in western Idaho that supported bow-and-arrow use by 2090±80 B.P. (140 B.C., uncalibrated) (Webster 1980:65, Table 1). Based on findings from Cowboy Cave, Holmer and Weder (1981:60) maintained that Rose Spring Corner-notched (or Rosegate) points date as early as A.D. 300. Holmer (1986:106) repeated this conclusion in a later report, stating that "The replacement of the atlatl-and-dart by the bow-and-arrow apparently began in the Intermountain West at about A.D. 300 and was complete by A.D. 600." Cowboy Cave is clearly the essential site that supports Holmer's position; as shown below, the evidence from this cave supports even earlier bow-and-arrow use.

There seems little doubt about when the bow-and-arrow was adopted by the Anasazi of southern Utah and adjacent states. Considerable excavation evidence (Guernsey and Kidder 1921; Kidder and Guernsey 1919; Lindsay et al. 1968; Nusbaum 1922) has shown that Basketmaker II populations used the atlatl-and-dart, and there has never been any suggestion that they used the bow-and-arrow. Radiocarbon and tree-ring age determinations indicate that the Basketmaker II occupation of Cedar Mesa lasted until about A.D. 400 (Matson et al. 1988:247), an age that is undoubtedly applicable to the Basketmaker II occupation of the Red Rock Plateau (see Lipe 1967:112-152, White Dog Phase) and the Rainbow Plateau (Lindsay et al. 1968:101-102,364; Schilz 1979)[1]. In other words, the atlatl-and-spear was being used until about A.D. 400 across a broad region immediately south and east of the Sunny Beaches site. Not until almost A.D. 600, during Basketmaker III, did the Anasazi adopt the bow-and-arrow (Cordell 1984:102; Plog 1979:114). This was contemporaneous with their first use of ceramic technology. Dating of bow use by the Anasazi is highly accurate since Basketmaker III chronology is based on numerous tree-ring samples from structures (e.g., Berry 1982:35-89). The Basketmaker III occupation of Cedar Mesa is tree-ring dated A.D. 650-725 (Matson et al. 1988:247), while the Basketmaker III occupation of the canyon where Sunny Beaches is located has a calibrated radiocarbon age range of A.D. 620-890. Thus, Anasazi use of bow technology in the Glen Canyon region did not begin until about A.D. 650.

Sunny Beaches is markedly anomalous with respect to current conceptions of regional culture history. Rose Spring Corner-notched points, which are accepted markers of bow-and-arrow technology, were found in a buried, single component, cultural stratum radiocarbon dated to what is customarily considered the Basketmaker II period in Glen Canyon. Treatment of dating anomalies depends in part upon how wedded a person is to the existing chronological frameworks. Anomalies can engender productive evaluation of existing constructs, including their reformulation to account for the new evidence, or the anomalous evidence can be dismissed. Dismissal is certainly valid if potential errors in chronometric technique have not been adequately controlled for, including the overestimation bias inherent in radiocarbon dating of wood charcoal. If problems and biases have been controlled, then flat dismissal of new evidence is a sterile approach. We have attempted to evaluate critically the radiocarbon dates from Sunny Beaches, and have marshalled additional chronological evidence that corroborates the Hearth 1 date and supports concluding that the bow-and-arrow was indeed used at Sunny Beaches during the first few centuries after Christ. While the evidence is provocative, it is a single case. Other aceramic sites with Rose Spring points are known from Glen Canyon, but chronometric dates are not available from them. Fortunately, a critical comparative data base is available from the excavation of Cowboy Cave (Jennings 1980).

Unit V of Cowboy Cave

In comparing the findings from Sunny Beaches with those from the upper levels of Cowboy Cave, we must evaluate how the Cowboy Cave data compare with Jennings' interpretive statements. Unit V, the uppermost cultural component of this

Table 2. Radiocarbon Determinations for Unit V of Cowboy Cave as Presented in Table 3 of Jennings (1980:24).

Lab Number	FS Number	Material Assayed	B.P.	B.C. or A.D.	Unit or Stratum	Comment
S12425	1940	Charcoal	1495±60 B.P.	A.D. 455	Va	From pit (F183) in red windblown sand layer.
UGa1548	1517-1*	Corn	1555±70 B.P.	A.D. 395	Prob. V	Cached in skin bag.
SI2426	1683	Bark of *Juniperus* sp. and stalks of *Artemisia* cf. *dracunculus*	1580±60 B.P.	A.D. 370	Vc	Associated with semicircular arc of stones and small stone cist in stratum of Unit V, marking terminal occupation of the cave.
SI3012R**	1517*	Corn	1670±70 B.P.	A.D. 280	Prob. V	Cached in skin bag found in a shallow pit in ashy midden layer. dC^{13} estimated as -12.0%.
SI3172	1517-1*	Corn	1855±70 B.P.	A.D. 95		
SI2423**	1516	*Sporobolus* cf. *giganteus*	1840±65 B.P.	A.D. 110	Prob. V	From a fiber pad overlying the cache of shelled corn, FS1517. dC^{13} = -15.6%.
UGa1053		Charcoal	1890±65 B.P.	A.D. 69	Vb? (NP)	
SI2422	1517*	Corn	2075±70 B.P.	125 B.C.		Shelled corn cache. Same as UGa1548, SI3012R, and SI3172.

*Assays from same shelled corn cache.

**These ages are corrected for C^{13} fractionation.

cave, is ". . . marked by the introduction of Rose Spring points and the bow-and-arrow at about 1600 B.P. The unit ends at an unknown time after 1500 B.P." (Jennings 1980:148). The unit is interpreted as ". . . literally a terminal Archaic transition or base out of which the classic Basketmaker II as defined finally developed" (Jennings 1980:147).

Radiocarbon determinations for lower units at Cowboy Cave are quite consistent and fairly easy to use for chronological inferences, but the dating of Unit V is not straightforward. Eight determinations are available for this unit (Table 2), but only two of these have secure provenience. The two dates selected to delineate the duration of the cultural

occupation for the unit are 1495±60 and 1890±65 (Jennings 1980:19). The uncalibrated one sigma deviations are given as representing the "extreme" range of occupation: A.D. 5 to 515. The more recent date is from the bottom of Unit V, while the older date is unprovenienced but suspected to be from Stratum Vb. The magnitude of the date reversal, plus the lack of secure provenience for one of the dates, raises serious doubts about their utility as the temporal brackets for the unit.

The two Unit V dates with provenience control (SI2425 and SI2426) also occur in reverse order, but this might not be significant since it could be due to statistical error. A test for contemporaneity using calibrated dates (Long and Rippeteau 1974) yielded a t-value of 1.46, which is greater than a 10% probability. This could mean that the strata of Unit V accumulated at a fast rate, and that radiocarbon dating is too coarse a chronometric technique to adequately differentiate the fine temporal intervals that separate the strata. As such, an average of the two dates would perhaps best represent the occupation span, and averaging is statistically appropriate in this case ($t=1.46<1.96$; $f=2.4<3.84$). The pooled date is 1538±42, with a calibrated two sigma age range of A.D. 417-610 (mean age is A.D. 540). It could be concluded, therefore that Unit V was deposited sometime in the sixth century A.D. This would accord well with traditional Basketmaker III dating for bow introduction to the Anasazi or with Madsen and Berry's (1975:393-394) proposed date of bow introduction to the Fremont.

Since the SI2425 date is on wood charcoal while the SI2426 date is on juniper bark and sage twigs, the problem of old wood must be considered. Extrapolating from Smiley's (1985:386) research, there could be an 80% chance that the SI2425 date applies to a cultural event over 200 years more recent, and about a 20% probability that it is over 500 years more recent. This highly likely possibility would make stratigraphic reversal unacceptable. In which case, either one of the dates is in error, or the pit from which sample SI2425 was obtained actually originated from the top of Unit V, and the charcoal of this feature is associated with the last use of the cave.

The corn cache dates can help resolve the issue of Unit V chronology because there is a clear link between the dated event and the cultural event (see Dean 1978:245). Four of these dates were on the corn itself and one date is on a grass pad that covered the bagged corn; these five dates should provide a relatively tight date cluster. What should be true in theory is not apparent in the five radiocarbon determinations as reported; they range from 1555±70 to 2075±70. Various authors (Smiley 1985:377-378; Wilde and Newman 1989) have grappled with this confounding series of dates but could not reach any firm conclusion as to the corn's age. In order to clarify the situation, we tracked down the original radiocarbon results. William Cox of the Smithsonian Institution Archives located the original data for the samples processed by the Smithsonian Radiocarbon Laboratory (Accession 87-035) and sent us photocopies. Upon receipt of these data it became clear that the confusion stems from Jennings' failure to report all of the dates that were corrected for C^{13} fractionation and laboratory application of different correction factors. All of the Smithsonian corn dates had been corrected for isotopic fractionation based on an assumed delta C^{13} value of -12.0%; 220 years was added to two dates, but 310 years were added to SI2422. The only corndate not corrected was UGa1548; this was confirmed by Stan De Filippis (personal communication 1989) of the Center for Applied Isotope Studies, University of Georgia.

The five corn dates are summarized in Table 3 and corrected dates are plotted in Figure 6; 220 years have been added to each date to provide a standard correction factor for isotopic fractionation. There is a clear discrepancy between the earliest and latest dates (SI3012R and SI2422), while the other three are clustered between the extremes. The five dates were pooled, resulting in a mean of 1826±31. The criterion of Chauvenet (Long and Rippeteau 1974:208) allows rejection of dates that are greater than 1.65 times the pooled sigma, which in this case means dates outside the range 1877 to 1775 B.P. Thus, SI3012R and SI2422 are deleted, and the mean is recalculated as 1824±39. The calibrated one sigma age range for this mean date is A.D. 126 to 237 and the two sigma age range is A.D. 84 to 320. There is a 97% probability that the two sigma age range is A.D. 86-255.

Two chronological conclusions can be drawn from this mean date, one bearing on the timing of agriculture in the region and the other on the dating of Unit V. As concerns the first conclusion, it is inappropriate to use the earliest corn date from Cowboy Cave to support a ca. 200 B.C. introduction of agriculture to the region (cf. Berry 1982:28, Table 6; Berry and Berry 1986:285, Table 2). The corn at this cave probably does not date earlier than

Table 3. Radiocarbon Determinations on the Cowboy Cave Corn Cache.

Sample Number	Uncorrected Date[1]	Corrected Date[2]	Standard Correction[3]
SI3012R	1450±70	1670±70	1670±70
SI2422	1765±70	2075±70	1985±70
SI3172	1635±70	1855±70	1855±70
UGa1548	1555±70	none	1775±70
SI2423	1595±65	1840±65	1840±65

1. Uncorrected dates are the radiocarbon counts obtained by the laboratories; only the UGa1548 value was reported in Jennings (1980:24).

2. Corrected dates are how the Smithsonian determinations were revised by the laboratory to compensate for C^{13} fractionation. These values were reported by Jennings, although SI3012R was the only one specified as having been corrected, leaving the impression that the other corn dates were uncorrected. Note that the Smithsonian Laboratory added 220 years to two of the corn dates, but that 310 years were added to SI2422.

3. Two hundred-twenty years were added to each of the corn dates to provide a standard correction factor for purposes of statistically evaluating the dates.

100 A.D. This is not to imply that corn was not being used in the Fremont region by about 200 B.C. (Wilde and Newman 1989), just that the Cowboy Cave corn cache does not support such early use.

The bearing of the mean corn date on the chronological placement of Unit V is more problematical since a stratum association for the corn is unknown. There is a similarity between UGa1053 (1890±65) and the corn mean, but since the former sample was obtained during the 1973 test trenching of the cave, only a probable provenience (Stratum Vb) is known. The corn has to be associated with either strata Vb or Vc rather than the sterile Stratum Va. As a present best guess, supported by the 1580±60 date for the top of Stratum Vc, we assign the corn date to Stratum Vb; if the corn actually derives from Stratum Vc, this would not alter the argument presented here. The occupation of Strata Vb and Vc is bracketed by 1824±39 (the corn mean) and 1580±60 (SI2426). Taking the two sigma deviations on the calibrated ages of these dates to represent the probable range of occupation, we conclude that Unit V was first used around A.D. 84 and abandoned around A.D. 610. Ironically, this is hardly different from the A.D. 5 to 515 range that Jennings gives based on the clearly bad SI2425 date and the poorly provenienced UGa1053 date.

Strata Vb and Vc both contain Rose Spring Corner-notched points (Holmer 1980:34 35, Table 6); consequently, there is a high probability that the bow-and-arrow was used at the cave by the start of the second century A.D. The early dating of bow use at Sunny Beaches is consistent, therefore, with the findings from Cowboy Cave.

The proposal that Unit V represents the Archaic base out of which the Basketmaker II developed (Jennings 1980:147) is not supported by the chronology or material culture of this unit. Dates on classic Basketmaker II remains from sites such as White Dog Cave and Kin Biko Caves I and II have shown that Basketmaker II populations were occupying the Kayenta Anasazi region at least by about 550 B.C. (Smiley et al. 1986). Dates on Basketmaker II remains from the southern portion of Glen Canyon document that this region was occupied by about 400 B.C. (Geib 1989; Nickens

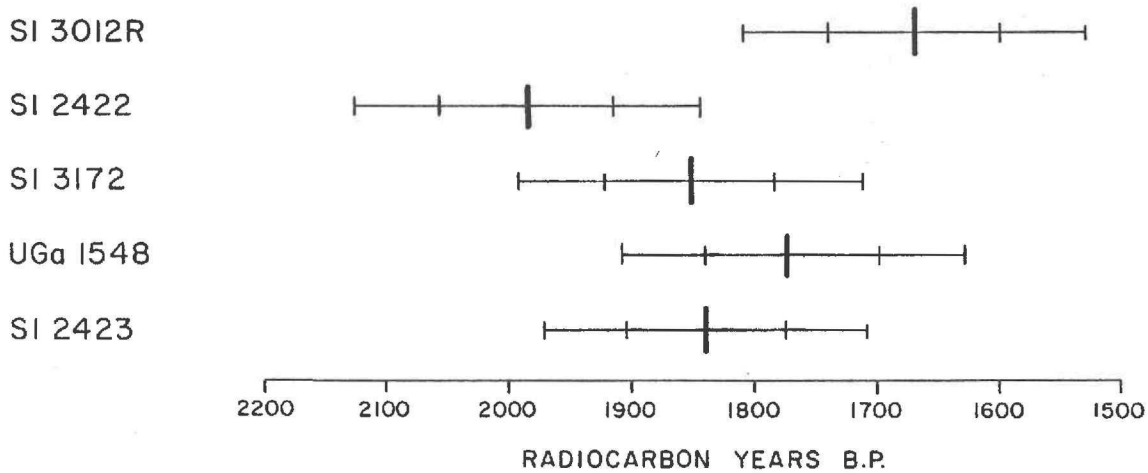

Figure 6. Plot in years B.P. of the five radiocarbon dates from the Cowboy Cave corn cache; dates have been corrected for C^{13} fractionation using an assumed delta value of -12 percent and the addition of 220 years.

et al. 1988). Besides the bow-and-arrow, which is clearly not a Basketmaker II trait, the basketry technology from Unit V is dominated by variations on a one-rod foundation (Hewitt 1980:50, Table 12). Typical Basketmaker II basketry is characterized by a two-rod-and-bundle foundation (e.g., Guernsey and Kidder 1921:55-58; Kidder and Guernsey 1922:90). The Unit V basketry is directly comparable with basketry from earlier deposits of the cave, and the sequence of construction techniques mirrors the developmental sequence of Archaic-Fremont basketry technology for Utah (Hewitt 1980:57; see Adovasio 1970). Indeed, Hewitt (1980:57) speculates that the occurrence of one-rod-and-bundle basketry at the cave may ". . . represent the transition to the Fremont culture". Given the continuity of material culture between Unit V and later remains classified as Fremont, and the chronological placement of this unit at least half a millennia after Basketmaker II populations were living on the southern Colorado Plateau, we maintain that Unit V does not represent a base out of which Basketmaker II culture developed as originally proposed, but rather represents a base out of which the Fremont developed.

CONCLUSIONS

In their concluding statements to the Elsinore Burial in central Utah where corn was dated to about 175 B.C. (calibrated), Wilde et al. (1986:33-34) propose a series of hypothetical questions. One query relates to the present discussion:

"If Berry [1982] is correct in proposing that corn was introduced by Formative people moving into the northern Plateau area from the southern Basin and Range province, then their associated lithic industries should be significantly different than those of the indigenous Archaic folk" (Wilde et al. 1986:33).

Based on the findings presented here, we would not hesitate to say that indeed there was a significant difference, at least during the first half of the Christian era, between the lithic technologies of *in situ* Archaic populations on the northern Colorado Plateau and the Basketmaker II populations of the southern Colorado Plateau. The former used the bow-and-arrow while the latter used the atlatl-and-dart. Additional distinctions are seen in other aspects of material culture, such as basketry. Berry and Berry (1976:33) have argued that the only real difference between early agricultural populations of the southern and northern Colorado Plateau is the labels that archaeologists apply to them. That is, Basketmaker II populations are preceramic groups in areas where Anasazi remains occur and terminal Archaic populations are preceramic groups where Fremont remains occur. We have tried to demonstrate that this issue can not be reduced to such an argument since there are important material culture

differences that are difficult to reconcile with the concept of a unified cultural entity.

We propose that certain portions of the northern Colorado Plateau were occupied by bow-and-arrow using ancestral Fremont populations who were contemporaneous with Anasazi Basketmaker II populations occupying the southern Colorado Plateau. Along the Colorado River of southeastern Utah there was a broad boundary zone between these two groups. Further to the west, sites such as Cave du Pont (Nusbaum 1922), Heaton Cave (Judd 1926), and Antelope Cave (Janetski and Hall 1983) reveal that this boundary was north of the Colorado River. Sunny Beaches provides an example of a site in the heart of Glen Canyon that was occupied by terminal Archaic, Proto-Fremont populations. Unit V of Cowboy Cave provides an example of a site further north that was occupied by this same culture.

The Cowboy Cave corn cache reveals that the Proto-Fremont were growing this domesticate, although the extent of agricultural dependency is unknown. Theories about the introduction of agriculture to the Colorado Plateau include transmission of crops and concepts to *in situ* Archaic populations or territorial expansion of horticulturalists. Each involves different processes and has different ramifications concerning the nature of the Archaic-Formative transition and the particular historical expression of Formative cultures. It is therefore important to identify which mechanism of agriculture introduction applies to a particular study area. Corn could have been introduced to the northern Colorado Plateau by Basketmaker II populations, but the crop was transferred to local Archaic populations who adopted it. Wilde and Newman (1989) suggest that the transition to agriculture in central Utah preceded by many centuries the arrival of ceramics and that, besides pottery, there are few remains that differentiate the Fremont from their ancestral populations. In addition to corn agriculture, pithouse architecture, and storage, which Wilde and Newman highlight, the bow is another aspect of the Proto-Fremont lifeway on the northern Colorado Plateau. Contrary to the Anasazi sequence of cultural development, bow technology clearly predates the arrival of ceramic technology for the Fremont.

One might reasonably question why the bow was not adopted by the Anasazi at an earlier time since it was being used in portions of southeast Utah by about 100 A.D. In a recent review of the timing of bow-and-arrow introduction for North America, Blitz (1988:135-137) proposes that the pattern of transmission of this technological innovation must be understood in the context of intergroup contact and competition. In such a light, the time lag for diffusion of bow technology to the Anasazi could be attributed to competitive relations between different ethnic groups. If Basketmaker II represents an influx of horticultural populations (Berry and Berry 1986:319) who spread across the Colorado Plateau filling in agricultural niches, then the bow might have been the competitive advantage that allowed local Proto-Fremont populations to maintain occupancy of their traditional territories.

As a final comment, Rose Spring Corner-notched points at aceramic sites in Utah might well indicate preceramic occupation. Such sites need to be investigated to test the culture history propositions presented here. In so doing, additional light will be shed on the mechanisms, processes, and consequences of agricultural introduction.

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NOTE

1. Lindsay et al. (1968:102) have proposed that the Basketmaker II period lasted until about A.D. 700 on the Rainbow Plateau immediately south of Glen Canyon. This suggestion was based on the numerous tree-ring dates on hearth charcoal at Sand Dune Cave, the latest being A.D. 701+ +vv (Harlan and Dean 1968:381). Michael Berry (personal communication 1985) questions associating the tree-ring dates with the Basketmaker II materials from the cave. Given the presence of Kana-a Black-on-white pottery at the cave and sizeable Pueblo I habitations on the southern margin of the Rainbow Plateau (Fairley 1989), the hearth charcoal is more than likely associated with a temporary Pueblo I use of the site. We concur with Berry and find it highly doubtful that a Basketmaker II lifeway lasted until A.D. 700 on the Rainbow Plateau.

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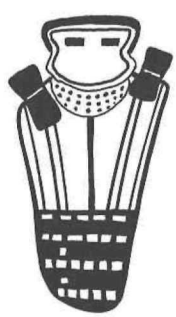

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