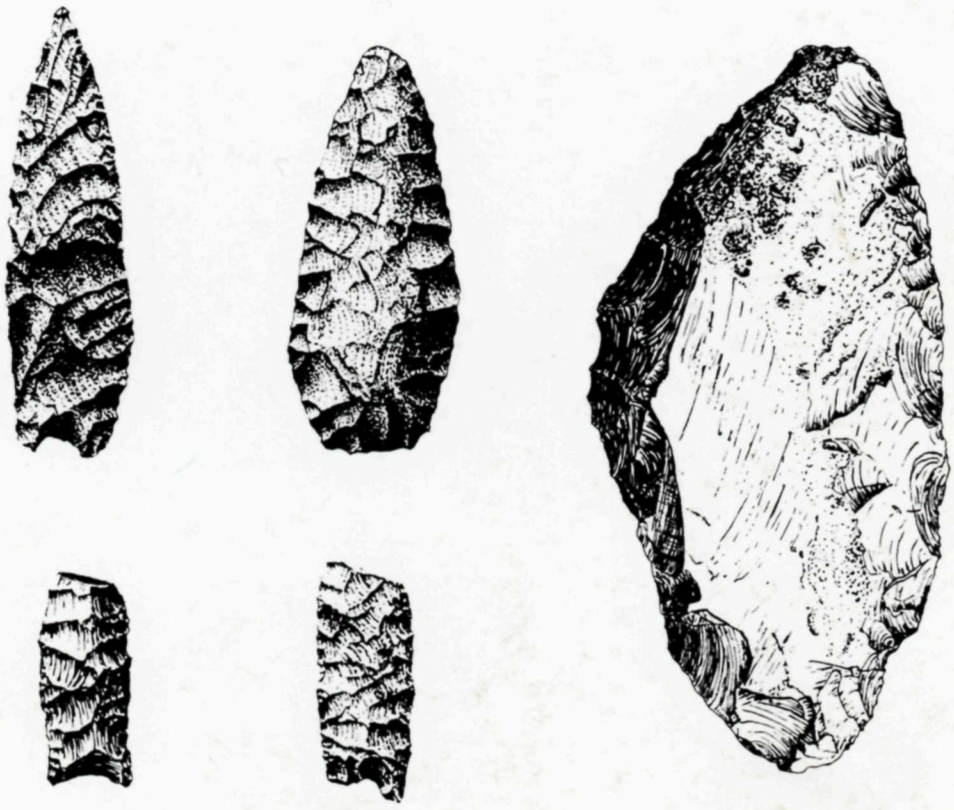
The Archeology of Beaver Creek Shelter (39CU779):

A Preliminary Statement

by

Lynn Marie Alex



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The Beaver Creek Shelter (39CU779) is a north-facing rock shelter in Wind Cave National Park. Excavations were conducted by the South Dakota School of Mines and Technology in 1985 and, again by that institution and the South Dakota Archaeological Research Center in 1985 and 1987. This work penetrated 4.77 m of vertical rock shelter sediments. The excavations defined 22 stratigraphic horizons, many of which contain archeological materials, and produced a sequence of 12 radiocarbon dates covering most of the Holocene. The archeological specimens, the stratifications, and the radiocarbon dates indicate the shelter has the potential of providing information on the transition from the Early to the Middle Archaic Periods, and of elucidating the interrelationship between climatic trends and human prehistory throughout the Holocene.

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The Archeology of the Beaver Creek Shelter (39CU779), Wind Cave National Park, South Dakota
A Preliminary Statement

by

Lynn Marie Alex

with contributions by
Mark D. Fahrenbach

Submitted in partial fulfillment of Contract PX-1242-9-1123

to

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P.O. Box 25287

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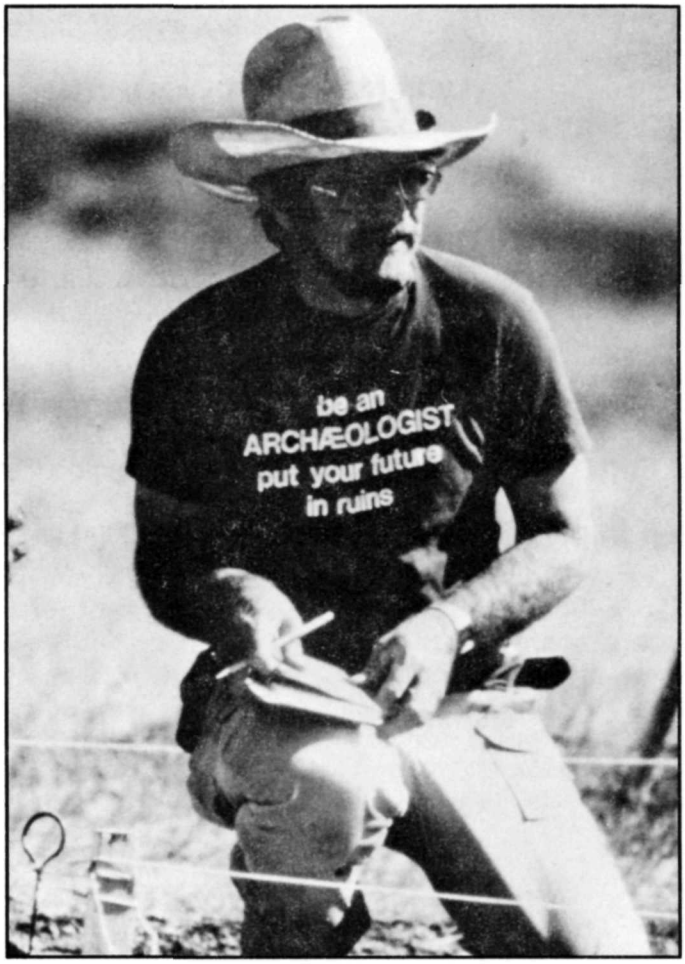

This volume is dedicated to Robert A. Alex.

FOREWORD

When Dr. James Martin discovered archeological materials in his paleontological excavations in Wind Cave National Park, he contacted South Dakota State Archeologist Robert Alex. Little did he know that their subsequent, joint test excavations would reveal at least 8,000 years of continuous human occupation and reflect a major part of the Holocene environmental record. The archeological materials, stratification, and radiocarbon dates indicate that the site has the potential of providing significant information on the transition from the Early to Middle Archaic periods, particularly in the environmental arena. This is a record presently unknown from elsewhere in the Black Hills.

As part of the National Park Service mission to protect and interpret its resources, it is important to make valuable, new scientific information readily available. As a step towards that obligation, I am pleased to present this volume in our occasional series of publications on the Rocky Mountain Region's past. While the work discussed is limited in nature because of the small excavation, the significance and uniqueness of the continuous environmental and cultural record warrants dissemination of the results.

This report was prepared, with support and assistance from the South Dakota School of Mines and Technology, by archeologist Lynn Marie Alex after the tragic death of her husband. It is being printed by the National Park Service in the memory of Dr. Robert A. Alex.

Lorraine Mintzmyer

Lorraine Mintzmyer
Regional Director
Rocky Mountain Region

Mission: As the Nations's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of or national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration. NPS-D-32A.

Beaver Creek Shelter, Wind Cave National Park, 1985.

ACKNOWLEDGEMENTS

This report was undertaken as an attempt to synthesize two years of archeological research conducted at the Beaver Creek Shelter by Robert A. Alex, following his death on April 21, 1988. The initial fieldwork was funded by the National Park Service (NPS) and a faculty research grant through the South Dakota School of Mines and Technology (SDSMT). Students enrolled in classes in field paleontology and archeology sponsored by the Black Hills Natural Sciences Field Station and volunteers from the Northern Hills Chapter, South Dakota Archeological Society assisted in site excavation in 1986 and 1987.

The NPS, upon the advice of Adrienne Anderson, Regional Archeologist, Rocky Mountain Region, and Bill Swift, Chief Naturalist, Wind Cave National Park, offered to provide funding for the completion of this report. Additional Support was forthcoming through the generosity of the Black Hills Parks and Forests Association. James Haug, the current State Archeologist for South Dakota, and Bill Green, Iowa State Archeologist, kindly extended use of the facilities at their respective offices for the preparation of the report. Steve Lensink of the Office of the State Archeologist, Iowa City, offered constructive insight in the interpretation of archeological data and volunteered many hours of computer assistance.

The principal investigator of the Beaver Creek research, James Martin of the SDSMT, and other colleagues on the project were invaluable in the preparation of this manuscript. Martin, Jane Abbott of the South Dakota Archeological Research Center (SDARC), and Mark Fahrenbach and Rachel Benton of the SDSMT, offered assistance in the interpretation of site data, original field records and paleontological and geological information. This report relies extensively on the work of these individuals for the data presented on site stratigraphy and paleoenvironmental reconstruction. Mark Fahrenbach was also hired to assist in the analysis of site debitage and the identification of lithic raw materials. Roger williams of the SDARC was employed to illustrate the patterned artifacts.

The author wishes to thank all these individuals as well as the NPS, Wind Cave National Park, the SDSMT and the SDARC for their support of the Beaver Creek research.

Although the original archeological research at the Beaver Creek Shelter was planned and executed by the co-principal investigator, Robert Alex, the author takes full responsibility for the manuscript presented here and hopes that it in no way detracts from nor contradicts his very capable endeavors. While this synthesis has at times been a lesson in frustration it has also been a labor of love and respect.

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PREFACE

The Beaver Creek Shelter (39CU779) is located in a concavity in the Pahasapa limestone on the south side of the Beaver Creek Valley in Wind Cave National Park, South Dakota (Abbott 1989). Erosion during the past is responsible for exposing layers of charcoal and bone that first alerted Wind Cave National Park research biologist, Richard Klukas, to the existence of the shelter. As a result, excavations conducted by the South Dakota School of Mines and Technology, Rapid City, South Dakota in 1985 and that institution and the South Dakota Archeological Research Center (SDARC) in 1985 and 1987, penetrated 4.77 m of rockshelter sediments consisting of interbedded and poorly consolidated breccias formed largely by rockfalls, sandstones and siltstones. These excavations defined 22 stratigraphic horizons (units), many containing anthropogenic materials, and produced a sequence of 12 radiocarbon dates indicate the shelter has the potential of providing information on the transition from the Early to the Middle Archaic periods, a poorly known interval on the northern Great Plains, and of elucidating the interrelationship between climatic trends and human prehistory throughout the Holocene.

At the time of his death on April 12, 1988, Robert A. Alex, co-principal investigator of the Beaver Creek project, was in the process of preparing a report on the archeology of the Beaver Creek Site. While progress reports and several short articles and presentations on the shelter had been completed, most of the information on the archeology of the site was still contained within the paper records of the excavation (field notes, plans, profiles, etc.). None of the patterned artifacts had been completely analyzed and described, and both the modified flakes and debitage were still being extracted from soil samples.

The following report is an attempt to synthesize this information in order to present the archeology of the Beaver Creek Shelter and to affirm its importance to our understanding of the prehistoric sequence on the northern Plains.

INTRODUCTION

The following is a preliminary statement on the archaeology of the Beaver Creek Site. While initial research at the site by James Martin of the South Dakota School of Mines and Technology (SDSMT) was paleontological in nature, the discovery of cultural remains in 1985 identified the archaeological potential of the site. As a result, Robert Alex, Director of the South Dakota Archaeological Research Center (SDARC) and South Dakota State Archaeologist, joined Martin in a joint investigation of the shelter in 1986 and 1987. The author took over Robert Alex's research following his death in April 1988. Artifactual material included in this analysis represents all known patterned artifacts recovered to date from the site, as well as modified flakes and stone debitage from a single excavation unit (2-3S/0-1W). Although approximately 6729 kg (6 tons) of soil removed from all units excavated between 1985-1987 were returned to the laboratory at SDSMT, not all of the soil had been processed nor was the information available at the start of this project. In consulting with Adrienne Anderson of the National Park Service (NPS), it was decided that a lithic sample from XU 2-3S/0-1W would be examined for this study since soil removed from that unit had been thoroughly cleaned of both artifactual and ecofactual remains. In addition, the faunal material from this same unit is the object of a current Master's degree thesis study by Rachel Benton, a graduate student in paleontology at SDSMT. Thus the potential of eventually correlating two sets of data from the same location seemed desirable. In the end, all of the flake material from this excavation unit was included in the analysis.

The author would like to emphasize that the current report was compiled with the following limitations:

1. First and foremost, is the absence of the co-principal investigator, Robert Alex, whose familiarity with the site and insight into its contents cannot be reconstructed from the extant site records.

2. The climatic/environmental data are still being analyzed and the inability to fully correlate this information with the archeology is a major problem.

3. The debitage analysis utilized material from an excavation unit largely excavated in 1986 before the nature of stratification at the site was thoroughly understood. For this reason, the vertical location of lithic debitage (as recorded by arbitrary levels) cannot always be precisely correlated with the 22 defined stratigraphic horizons (units) at the site nor with features.

4. While individual features are described where possible, the content of these features has not been analyzed and is not included in this report.

With these qualifications in mind, the following statement is presented. Information on site location, geology, site stratification and site history is largely extracted from previous reports by the principal investigators and personnel of the Beaver Creek project.

SITE LOCATION

The Beaver Creek Site is located in a concavity in the Pahasapa Limestone on the south side of Beaver Creek in Wind Cave National Park, Custer County, South Dakota (Figure 1) (Abbott 1989). The Mississippian Pahasapa Limestone is a major component of the limestone plateau, a flat escarpment surrounding the Black Hills. The limestone plateau also contains formations of Englewood Limestone and sandstone and dolomitic shales of the Deadwood and Minnelusa formations (Abbott 1989:6).

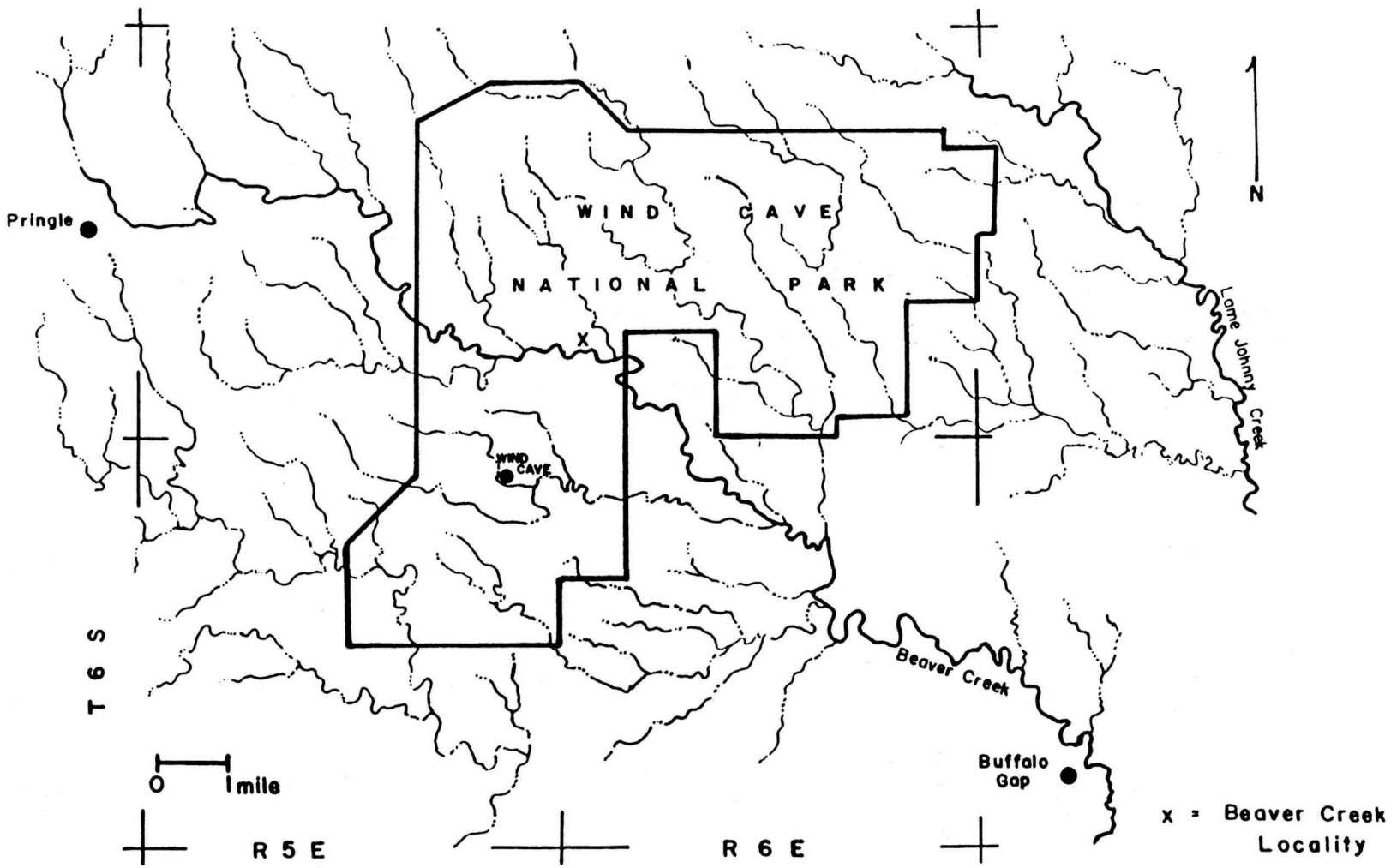

Figure 1. Location of the Beaver Creek Shelter in Wind Cave National Park.

Identification of stone materials used in lithics at the site (Appendix 2) indicates that cherts and quartzites from these local sources of these formations found within a few miles radius of the site were utilized.

The rockshelter may be a remnant of an ancient cave system, but no actual cave is evident at the site. The shelter consists of a 23-m long undercut section of the valley wall. The protective overhang projects out a maximum of 8 m beyond the base of the bluff (Figure 2) (Alex 1987b). Beaver Creek does not flow past the shelter at the present time, but surface water disappears in the ground about a kilometer up the valley and reappears several kilometers downstream from the site (Abbott 1989:7). In the past, the creek may have drained into other fissures or caves in the valley or remained on the surface as far downstream as the shelter (Alex 1987b). At present, the stream reappears several kilometers downstream from the site (Abbott 1989:9).

The Beaver Creek site is composed largely of Holocene sediments deposited as the result of overbank alluvial deposition in a rockshelter created in Mississippian-age Pahasapa Limestone (Abbott 1989). A 3-m section of deposits currently exists above the original stream channel. The age of these sediments indicates that near the end of the Pleistocene, the stream had down cut to at least the level of the present stream. At that time, the period of downcutting ceased and deposition of Holocene sediments began. The stream deposited silty sand layers across the valley floor. The silty sand sediments preserved in the site are a remnant of these materials. Rockfall from the limestone cliff formed the breccia layers at the site which alternate with the silty sand. Sometime after about 1,750 B.P. (the uppermost dated Horizon at the site), the stream began to down cut the valley once again (Abbott 1989). Occasional flooding under present environmental conditions continues to remove the shelter deposits through erosion. This downcutting and erosion in the western portion of the site is responsible for exposing layers of charcoal and bone that led to the site's discovery. The eastern portion of the shelter has not been subjected to the erosion that exposed the cultural deposits in the western portion, and is believed to contain extant and possibly well preserved cultural deposits beneath a substantial layer of rockfall.

HISTORY OF RESEARCH

1985 Excavations

The exposure by erosion of charcoal and bone in the western portion of the Beaver Creek Shelter led to its discovery in 1985 by Richard Klukas, research biologist at Wind Cave National Park. His recognition of the site resulted in a survey of Beaver Creek Valley and test excavation of the shelter by paleontologist James E. Martin and personnel from the SDSMT. In the summer of 1985, over a cubic meter was excavated along and to the back (south) wall of the shelter in order to test a surviving 1.5-m thick erosional remnant. This area (Figures 2-4) later included in the grid of the site as XU 3-4S/ 0-1E and the northern 20 cm of XU 4-5S/ 0-1E revealed 11 stratified natural and cultural horizons of varying thickness and extent (Figure 3 and section on stratigraphy below). Each of these horizons, and those 11, subsequently encountered (Figures 3-5), represented distinct, sometimes interbedded, layers of natural and cultural origin. Silty sand sediments, the result of alluvial deposition such as Horizons 1-3, were

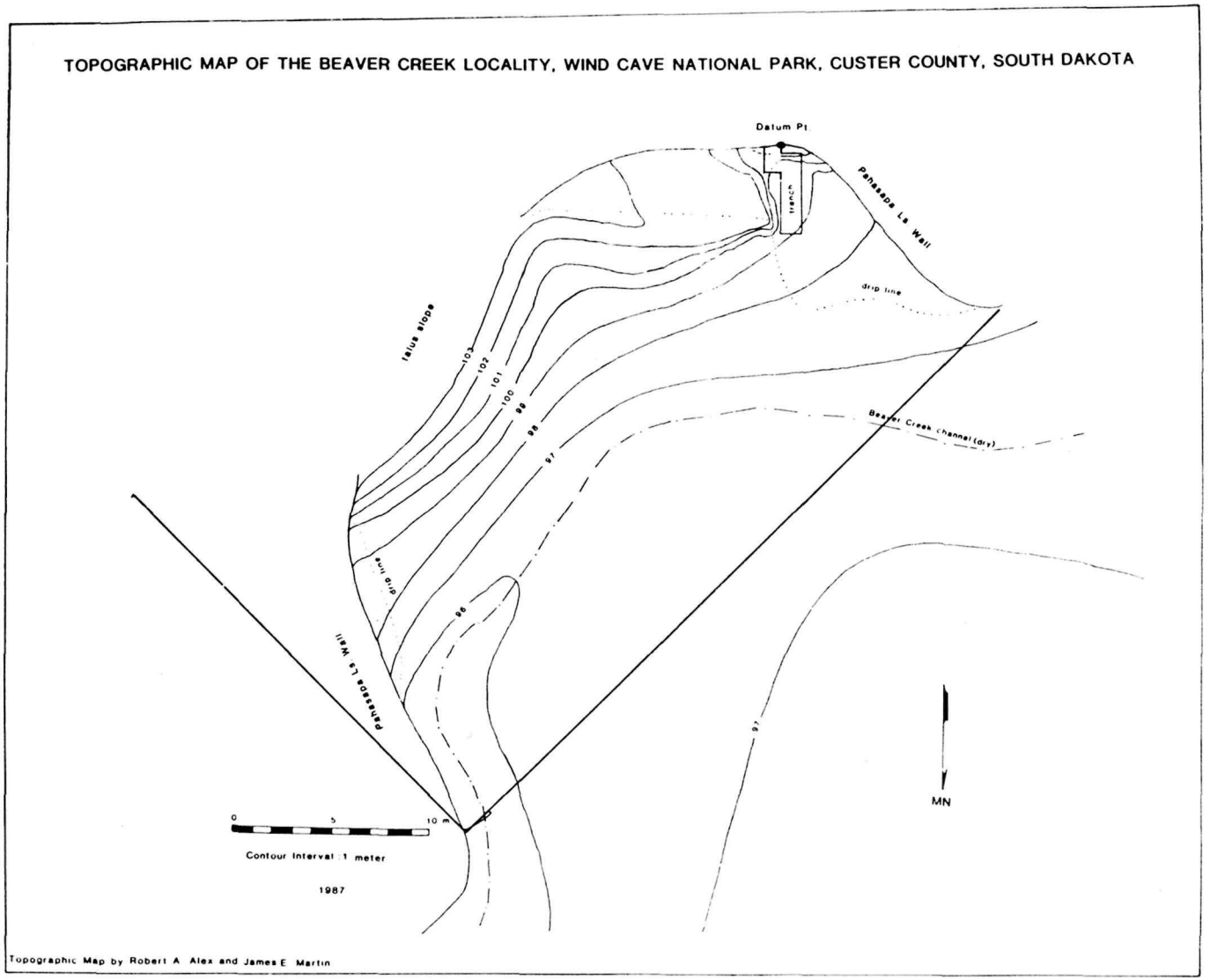

Figure 2. Map of Beaver Creek Shelter showing area excavated in 1985, 1986, and 1987. From original by Robert A. Alex and James E. Martin.

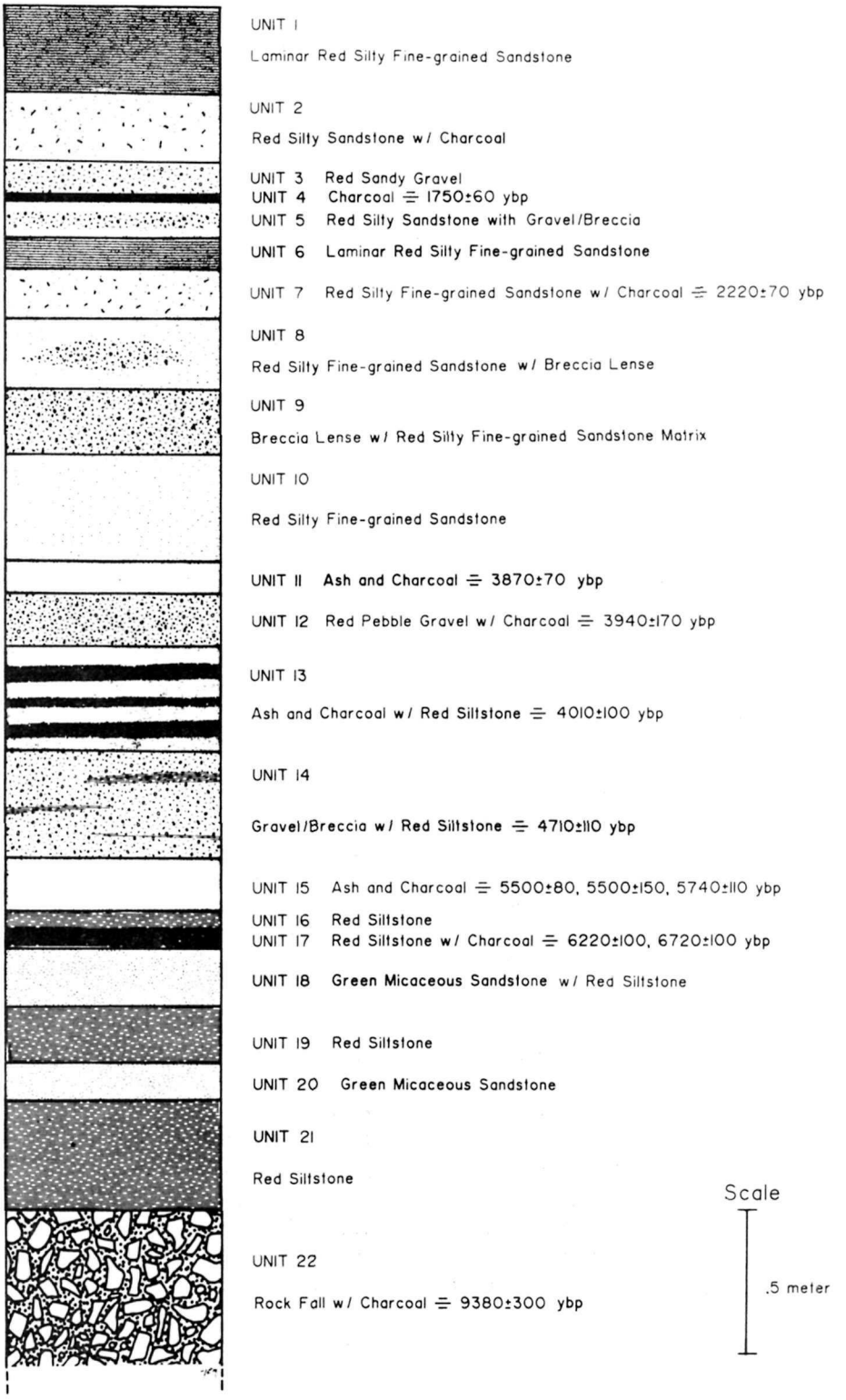

Figure 3. Stratigraphic section of Beaver Creek locality Wind Cave National Park, Custer County, South Dakota. From Martin et al. (1988).

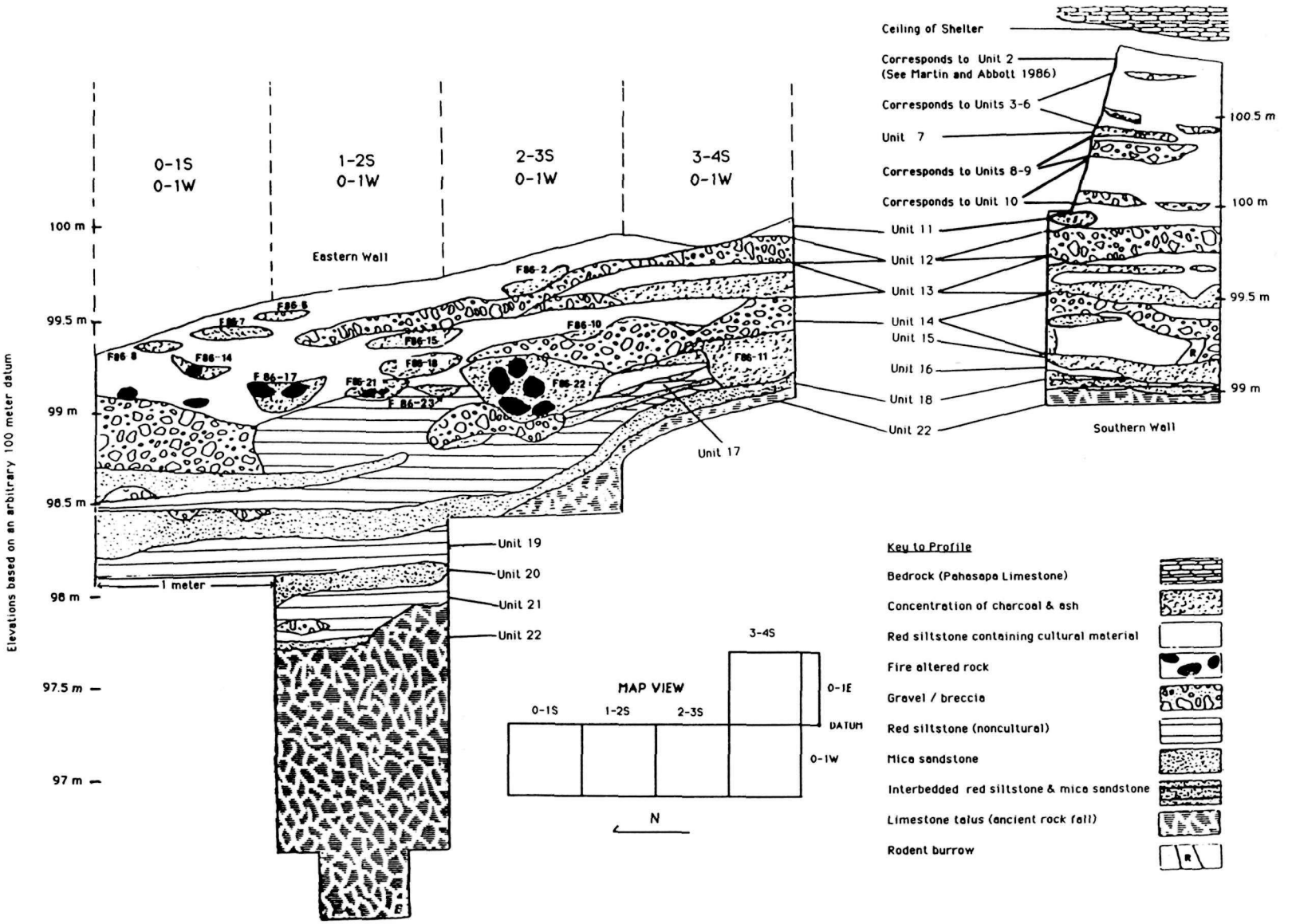

Figure 4. Profiles of the south and east walls of the excavation.

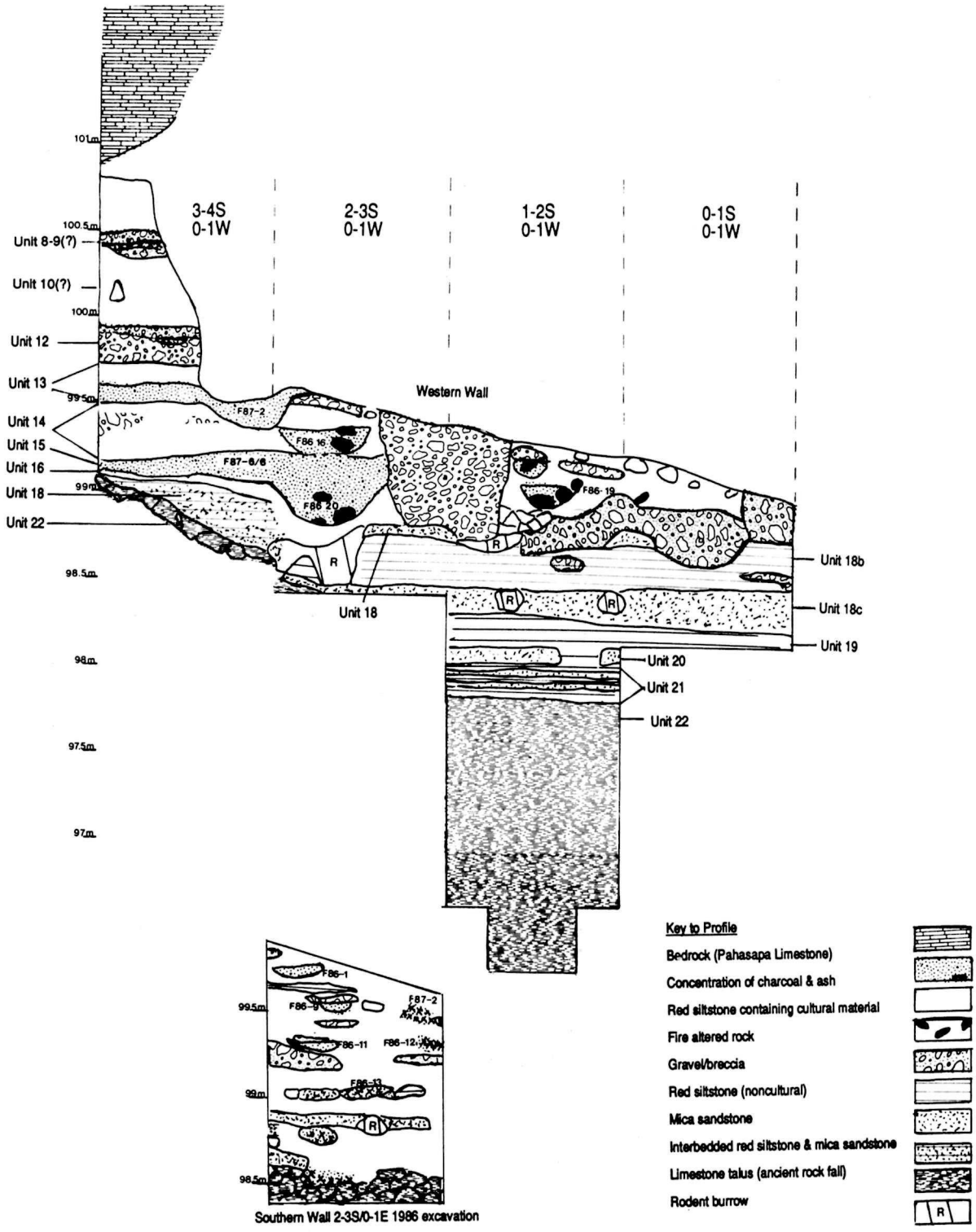

Figure 5. Profiles of the south and west walls of the excavation.

interrupted by layers of breccia such as Horizon 5, the result of shelter rock fall. In many of these horizons charcoal, artifacts, vertebrate remains and features attested to the human presence. Layers such as Horizons 4 and 7, comprised of deposits of charcoal and ash, were almost exclusively of human origin (anthropogenic).

Three samples from interbedded charcoal horizons were dated and produced stratigraphically consistent ages (Table 1, 1-3). The vertebrate remains recovered from this section resulted in a Master's degree thesis by Jane Abbott (1989) of the SDSMT.

The discovery of chert debitage and burned and splintered bone in all but one of the horizons (Horizon 3), and a hearth (Feature 85-1) and chert biface (Catalog 6, WICA-1300) at the base of Horizon 11 alerted the paleontological crew to the archeological potential of the site. As a result, Robert A. Alex, South Dakota State Archaeologist, was enlisted to help in designing a research plan for further testing of the site's archeological as well as paleontological potential.

1986 Excavations

In 1986, three additional 1 by 1 m excavation units (0-3S/0-1W) were excavated under the joint supervision of the SDARC and the SDSMT. These units were located adjacent to and just west of the area sampled the previous year (Figures 2, 4). The opening elevation of the 1986 excavation corresponded to the base of the 1985 excavation due to the eroded and sloping nature of the western portion of the shelter, and was designated an arbitrary 100 m. An expansion bolt was placed at this elevation on the back wall of the shelter as a bench mark and became the origin of the north-south base line (Alex 1987c). The bench mark was 4.2 m south of the east-west base line.

The three units excavated in 1986 (XU 0-1S/0-1W, 1-2S/0-1W, and 2-3S/0-1W) were dug by troweling to a maximum depth of 97.3 m (XU 1-2S/0-1W) by arbitrary 10-cm thick levels which cross-cut the stratigraphic horizons. Soil from each 10-cm level in each 1 m square was placed in plastic bags and removed from the site to be water screened

Table 1. Radiocarbon Dates from the Beaver Creek Shelter.

Date	Beta Analytic No.	Age (R.C.Y.B.P.)	Corrected Date[a]	Horizon	XU	Location	Depth (m)
1	13825	1750 ± 60	278 ± 81 A.D.	4	3-4S/0-1E		100.67
2	13826	2220 ± 70	296 ± 91 B.C.	7	3-4S/0-1E		100.51
3	13827	3870 ± 70	2363 ± 109 B.C.	11	3-4S/0-1E	Feature 85-1	100.00
4	19059	3940 ± 170	2452 ± 239 B.C.	12	2-3S/0-1W	south wall	99.71
5	19060	4010 ± 100	2551 ± 149 B.C.	13	2-3S/0-1W	south wall	99.53
6	19061	4710 ± 110	3486 ± 143 B.C.	14	2-3S/0-1W	south wall	99.37
7	19066	5500 ± 150	4354 ± 160 B.C.	15	1-2S/0-1W	Feature 86-17 east wall	99.03
8	23712	5500 ± 80	4357 ± 80 B.C.	15	2-3S/0-1W	Feature 86-20	98.90
9	24068	5740 ± 110	4614 ± 133 B.C.	15	3-4S/0-1W	Feature 87-8	99.10
10	23715	6220 ± 100	5195 ± 113 B.C.	17			99.10
11	24067	6720 ± 100	5605 ± 85 B.C.	17	1-2S/0-1W	Feature 86-23	99.10
12	22271	9380 ± 300		22	1-2S/0-1W		97.60-96.90

[a]Corrected dates calculated with a computer progam developed by Robinson (1989) which uses the correction curve of Stuiver and Pearson (1986).

through 1 mm mesh at the Museum of Geology laboratory, SDSMT. Thousands of charred seeds, gastropods, and small vertebrates resulted from screening of over 2,000 kg (4 tons) of matrix. Samples for pollen analysis were also removed from the deposits. Funding from The Black Hills Parks and Forests Association made available four additional radiocarbon dates from the upper strata exposed during the 1986 excavation (Tables 1, 4-7). Three charcoal samples were removed from the south wall of XU 2-3S/0-1W and one from the east wall of XU 1-2/0-1W. All occurred above a level of green micaceous sand (see Figures 3-5).

While Alex's (1986) field notes and profiles indicate the designation of 23 individual features uncovered in the 1986 excavation, it is apparent that most of these were recognizable only after excavation, when observed in profile. In the progress report to the NPS he commented:

> Between 100 and 99 m elevation, the floor of the excavation units looked like a patchwork of charcoal and ash lenses, gravel lenses and areas of red silt containing variable amounts of charcoal, ash and gravel. Distinguishing a hearth from the material which had been cleaned out of a hearth was sometimes difficult and this distinction was often evident only after the feature had been partly excavated and observed in profile. In some areas the deposit was mainly composed of charcoal and ash and it was almost impossible to distinguish individual features which had been dug into this type of matrix (Alex 1987c).

As a result, descriptions of the features uncovered in 1986 are much less complete than those from 1987 (Figures 4, 5, and section on features below).

The 1986 excavation increased the known number of stratigraphic horizons to 22. The lowest of these, Horizon 22, was encountered in the basal portions of XU 1-2S/0-1W and XU 2-3S/0-1W. It consisted of fragments and slabs of limestone representing an ancient rockfall or buried talus slope (Alex 1987a). Mica sand, probably carried into the talus slope by the creek filled the spaces between the limestone slabs and fragments and contained a substantial quantity of ecofactual data though little evidence of human activity (Alex 1987a).

Three distinctive artifacts recovered in 1986 (Figures 6, 7) included a worked antler tine (Catalog 2, WICA-1312), found in XU 2-3S/0-1W at a depth of 99.1 m; a side-notched projectile point (Catalog 1, WICA-1296), which occurred in the same excavation unit at a depth of 99.2-99.1 m elevation; and a second projectile point (Catalog 3, WICA-1297) which was found in XU 1-2S/0-1W at an elevation of 99.45-99.3 m. All three specimens were believed by Alex to have been intrusive, the result of a more recent channel filling within the shelter (designated by the letter "a" on the original west wall profile for the 1986 project) (Figure 5). This gravel fill was believed to have been associated with erosion in the western portion of the shelter that probably occurred during the last 2 millennia (Alex 1987c). Alex's (1986) notes indicate that a grinding stone "metate" was found lying "face down" in the center of XU 1-2S/0-1W at an elevation of 99.2 m.

The most intensive period of human occupation at the shelter as revealed in the 1986 field work, occurred during the Early Archaic and Middle Archaic periods represented in Horizons 15 and 16 and 11 through 14, respectively. The presence of an Early Archaic component at the site, representing a little known time period in the region, was significant in itself. The occurrence of a series of Middle Archaic horizons superimposed on the Early Archaic increased the potential importance of the site for understanding a critical transitional period in both human and paleoclimatic history on the northern Plains. The possibility of the existence of a relatively complete Holocene

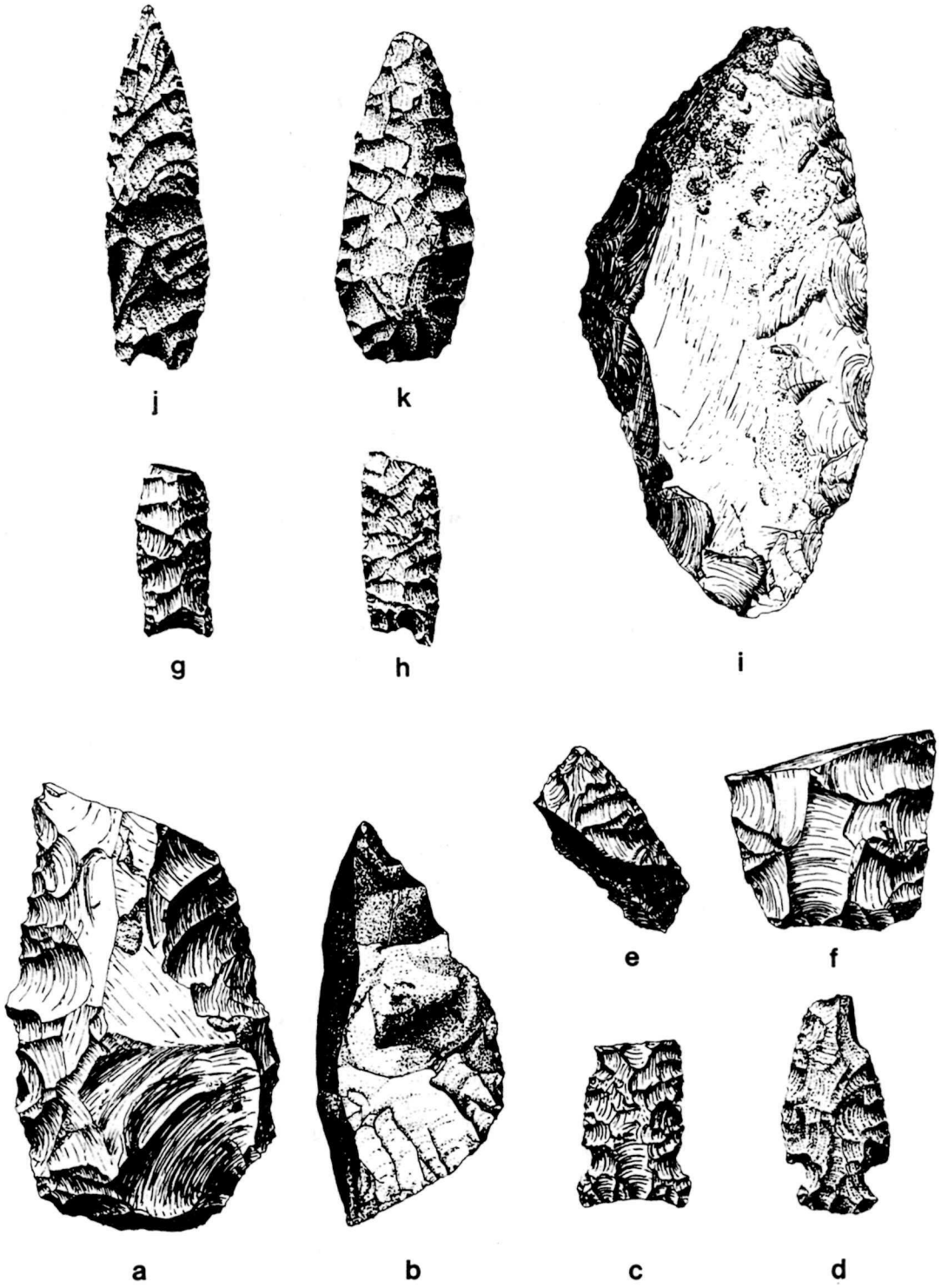

Figure 6. Chipped stone artifacts recovered from the excavations: (a) Catalog 46 (WICA-1334), (b) Catalog 22 (WICA-1303), (c) Catalog 1 (WICA-1296), (d) Catalog 3 (WICA-1297), (e) Catalog 44 (WICA-1305), (f) Catalog 28 (WICA-1304), (g) Catalog 5 (WICA-1299), (h) Catalog 4 (WICA-1298), (i) Catalog 7 (WICA-1301), (j) Catalog 8 (WICA-1302), (h) Catalog 6 (WICA-1300).

(post-Pleistocene) sequence of the past 10,000 years at the shelter was also recognized. The enthusiasm felt by the principal investigators for the site's potential is reflected in their 1987 project abstract (Martin and Alex 1987a).

> After years of searching for a stratified succession of Holocene rocks, faunas, and floras in the Black Hills, such a site, the Beaver Creek Shelter, has recently been discovered in Wind Cave National Park. By documenting the succession of animals and plants that accumulated during the last 10,000 years, the local environmental and climatic changes in the southern Black Hills may be determined. This study may then be integrated into the overall picture of climatic change though the Holocene now being pieced together for the northern Great Plains. This site may provide evidence for the resolution of such paleoenvironmental questions as: what was the climate like after the Wisconsin Ice Age, did the mesic climate documented at the Lange/Ferguson mammoth kill site in the Badlands extend into the Black Hills 10,000 years ago, how severe was the Altithermal (extremely arid) Period which may have begun about 5,000 years ago in western South Dakota, when did the Altithermal Period end in the Black Hills, and when did conditions begin to resemble the present climate?

Overall, the Beaver Creek shelter represents the first site with information concerning the peoples, plants, and animals of the last 10,000 years. The post-Ice Age changes in peoples and environments may be documented for the first time in the Black Hills area, and these conclusions may be added to other regional investigations, resulting in a composite view of the northern Great Plains during the Holocene.

As a result, a third season of test excavations was planned.

1987 Excavations

The 1987 project at the site had several major goals (Alex 1987c). The first was to extend the depth of the excavation in order to determine if the deposition in the shelter included early Holocene sediments. A second goal was to obtain an uncontaminated sequence of sediment samples beginning from the uppermost exposed strata (believed to date to about 1,500 B.P.) to a depth that was believed to represent the early Holocene. This was necessary since a portion of the samples collected in 1986 had been contaminated by the later erosional channel "a" (Figure 5). A third goal was to date the initial intensive human occupation of the site in order to determine if it would be possible to compare the environment and economy of the Early Archaic period with that of the Middle and Late Archaic (Alex 1987c).

In order to test for the presence of early Holocene deposits, the previous year's excavation unit 1-2S/0-1W was excavated 3.77 m in depth to an elevation of 96.23 m within the ancient talus (Horizon 22). After

Figure 7. Antler artifact from the Beaver Creek Shelter, Catalog 2 (WICA-1312).

proceeding through more than a meter of unconsolidated rock and sand it was considered unsafe to continue any deeper. Although the bedrock floor of the deposit was not reached, it seemed unlikely that deeper levels containing evidence of human occupation existed (Alex 1987a). Charcoal encountered at an elevation of 96.9 to 97.6 m in Horizon 22 in this excavation unit produced a radiocarbon date of 9,380 ± 300 B.P. This was the oldest date recovered at the site and confirmed that an unbroken stratigraphic record of the Holocene existed at the shelter.

To further the goal of obtaining an uncontaminated sequence of sediment samples from the entire stratigraphic column, a portion of the erosional remnant along the south wall of the shelter, first excavated in 1985, was further excavated, and an additional excavation unit 3-4S/0-1W was opened, thus extending the previous season's trench 1 m to the south. When a large feature (F87-6, F87-7, and F87-8) was encountered stratigraphically below Horizon 14, dated the previous year at 4,710 ± 100 B.P., and disrupting the stratification in this portion of the shelter, the excavation was extended an additional .25 m to the east (XU 3-4S/0-1E).

Additional charcoal samples from deep features or horizons believed to belong to an Early Archaic component at the site were submitted for dating through the courtesy of Wind Cave National Park. Five new dates were obtained from the 1987 fieldwork (Table 1, dates 8-12). The 1987 project produced a clearer understanding of the complex stratification at the Beaver Creek Shelter largely exemplified in the stratigraphic section exposed that year in XU 3-4S/0-1W and its .25-m extension into XU 3-4S/0-1E (Figures 4, 5, and the following description of stratigraphy).

The 1987 excavation also resulted in the recovery of 1,000 kg (2 tons) of relatively uncontaminated soil samples representing the 22 horizons. By October of that year, over 90 percent of this material had been washed through fine mesh (1 mm) at the SDSMT Museum laboratory. Vertebrate remains from a half meter thick section (100.95 m elevation of XU 2-3S/0-1W) were analyzed and presented in an unpublished report by Louise Miller (n.d.).

Some 11 new features consisting of ash lenses, shallow basin-shaped hearths, and roasting pits were identified. The previous season's experience had provided insight into the nature of the features, thus it was possible to better define the outline and extent of those encountered during the 1986 excavation. Each was outlined by troweling, frequently pedestalled, mapped, photographed, and then removed as a single entity for water screening. Charcoal extracted from three features was submitted for radiocarbon assay.

The walls of the excavation units were also cleaned and prepared for the extraction of sediments for pollen analysis. These samples along with those collected during 1986 were ultimately examined by Fred Rich, paleobotanist at the SDSMT. Rich's preliminary work indicates an absence of recoverable pollen.

Two projectile points (Catalog 5, WICA-1299, and 8, WICA-1302) were found during the 1987 excavation, and another (Catalog 4, WICA-1298) was ultimately discovered as soil samples were processed (Figure 6). These included (1) a concave-based specimen (Catalog 5, WICA-1299) found in Horizon 11 in XU 3-4S/0-1W at an elevation of 99.97 m; (2) a parallel-sided, basal-notched point (Catalog 4, WICA-1298) found in Upper Horizon 13 (presumably from XU 3-4S/0-1W) at an elevation of 99.72-99.54 m; and (3) a reworked, concave-based point (Catalog 8, WICA-1302) which occurred at the top of Horizon 14 in the same excavation unit at an elevation of 99.6-99.45 m. Alex (1987b) believed that these projectile points suggested a Middle Archaic McKean complex affiliation for Horizons 11-14, which was supported by the radiocarbon dates from these strata as well.

The pre-5,000 B.P. ages produced by charcoal from all horizons lying stratigraphically below Horizon 14 suggested that this horizon marked the boundary between Early Archaic and Middle Archaic materials. This is an important observation when attempting to compare other cultural remains and paleoenvironmental data below and above this stratum within the shelter.

Actual fieldwork at the site was concluded on September 9, 1987. In an effort to deter further stream erosion, cement blocks and rock were used to backfill the site on September 24, 1987. Only rock was used to fill the upper 20-30 cm of the excavation in order not to detract from the natural appearance of the shelter floor.

STRATIGRAPHY

Beaver Creek, like other rockshelter sites, exhibits a complex stratigraphy due to the effects of natural and cultural events (Abbott 1989, Benton 1990). The 22 horizons identified were not continuous across the area of the site tested nor were they uniform in thickness where extant (see stratigraphic profiles in Figures 3-5). The erosional remnant was the only area of the shelter that contained the upper 10 horizons. Over most of the western portion of the site these horizons had been removed by erosion. Minor amounts of debitage (unanalyzed to date) occurring in Horizons 1-10 indicate that in the eastern part of the shelter where these horizons may be intact, evidence of cultural activity might be more substantial and could help to complete the Upper Holocene prehistory of the site. This is suggested in particular by Horizon 7 which consists of a matrix of silty, very fine grained, noncalcareous quartz sand (Abbott 1989:26) that included a continuous band of charcoal dating to the Late Archaic period, 2,200 B.P. This layer was not only continuous in the erosional remnant along the south wall but also along the eroded edge of the well preserved portion of the shelter to the east.

The portion of the erosional remnant excavated in 1985 (XU 3-4S/0-1E) was excavated in stratigraphic horizons. Excavation in 1986 and 1987 was according to 10-cm levels. Although it was not possible to accurately correlate all of the arbitrary levels with the horizons, it would appear that the upper Levels 1-4 are associated with Horizons 11-14, and that Levels 7-15 are associated with Horizons 15-17. The relationship of Levels 5-6 is less certain, as they seem to derive from Horizon 14 which appears to be the transition from the Early to the Middle Archaic components at the site. In the following summary, elevations represent readings for the highest and lowest points of each horizon in the stratigraphic column exposed in XU 3-4S/0-1E and 3-4S/0-1W (for Horizons 1-18) and in XU 1-2S/0-1W (for Horizons 19-22).

Horizon 1

Horizon 1 (24.1 cm thick in XU 3-4S/0-1E) is a silty, very fine-grained, laminated, noncalcareous, unconsolidated quartz sand containing small pieces of charcoal (Abbott 1989:24). This horizon was absent from the rest of the site area excavated.

Horizon 2

Horizon 2 (100.97-100.74 m in XU 3-4S/0-1W) is a silty, fine-grained, laminated, noncalcareous, unconsolidated quartz sand containing charcoal fragments. The contact between Horizons 1 and 2 was gradational.

Horizon 3

Horizon 3 (100.80-100.47 m in XU 3-4S/0-1W) is a reddish brown breccia with a silty, very fine-grained quartz sand matrix that contained little charcoal. The contact between Horizons 2 and 3 was well defined. (Abbott 1989). Horizons 3-6 were compressed together in XU 3-4S/0-1W and removed as a single unit.

Horizon 4

Horizon 4 represents a charcoal layer with some angular rock fragments. A charcoal sample removed from this horizon in 1985 produced a radiocarbon age of 1,750 ± 60 years B.P. (Beta-13825).

Horizon 5

Horizon 5 is a second breccia layer with rounded to angular clasts of limestone containing little charcoal (Abbott 1989:23).

Horizon 6

Horizon 6 is a silty, fine-grained, laminated, noncalcareous, unconsolidated quartz sand with charcoal fragments. Its contact with Horizon 7 is well defined.

Horizon 7

Horizon 7 (100.51-100.44 m in XU 3-4S/0-1W) is a radiometrically dated charcoal layer (Beta-13826, 2,220 ± 70 B.P) with a matrix of silty, very fine-grained, noncalcareous quartz sand. Its contact with Horizon 8 was well defined (Abbott 1989:26).

Horizon 8

Horizon 8 (100.49-100.33 m in XU 3-4/0-1W) is a reddish brown, silty, very fine-grained, laminated, noncalcareous quartz sand. A lens of limestone fragments 7-cm thick were scattered throughout. Its contact with Horizon 9 was well defined.

Horizon 9

Horizon 9 (100.36-100.25 m in XU 3-4S/0-1W) is a reddish brown breccia with a matrix of silty, very fine-grained, unconsolidated quartz sand that contained little charcoal. (Abbott 1989:23, 27).

Horizon 10

Horizon 10 (100.27-99.98 m in XU 3-4S/0-1W) is a reddish brown silty, very fine-grained, laminated, noncalcareous, unconsolidated sand with charcoal fragments. Its contact with the overlying Horizon 9 was well defined and with Horizon 11 was gradational (Abbott 1989:23, 27).

Horizon 11

Horizon 11 (100.00-99.85 m in XU 3-4S/0-1W) is a mottled gray and reddish brown, silty, very fine-grained, noncalcareous, laminated, unconsolidated sand with abundant charcoal and micaceous ash produced by Feature 85-1 radiometrically dated at 3,870 ± 70 B.P. (Beta-13827) (see feature description below). The base of the horizon is marked by a light red laminated sandstone (Abbott 1989:23, 27).

Horizon 12

Horizon 12 (99.85-99.65 m in XU 3-4S/0-1W) occurs as a gravel layer averaging 10-15 cm in thickness.

Horizon 13

Horizon 13 (99.73-99.49 in XU 3-4S/0-1W) is a reddish brown, unconsolidated sand interbedded with lenses of ash and charcoal (Benton 1990). In a few areas, it is composed of a 10-15 cm thick layer of

charcoal and ash, and nearly everywhere it contained at least 5 cm of ash, charcoal and cultural debris. This horizon was subdivided into Upper Horizon 13 (99.73-99.45 m), composed of a red, silty, sandy matrix, and Lower Horizon 13 (99.6-99.45 m), composed of charcoal and ash with some narrow red silt bands. A charcoal

Horizon 14

Horizon 14 (99.50-99.43 m in XU 3-4S/0-1W) is a red unconsolidated sand interbedded with gravel, breccia, and charcoal layers complex stratigraphic unit. Several episodes of flooding are represented by deposits of thick layers of gravel (marked by "a" and "b" on the west wall profile, Figure 5). Alex (1987c) believed that these two gravel deposits, although they looked similar, had different origins. Gravel area "b" was believed to be part of the original formation of sediments in the shelter and dated prior to the Middle Archaic occupation. Gravel area "a" was believed to be more recent and associated with erosion of the western portion of the shelter that had occurred during the past two millennia. Charcoal recovered from the interface between Horizons 13 and 14, and intruded into Horizon 14, produced a radiometric age of 4,710 ± 110 years B.P. (Beta-19061). All radiocarbon age determinations from below Horizon 14 produced ages past 5,000 years.

Horizon 15

Horizon 15 (99.25-99.06 m in XU 3-4S/0-1W) is a granulated silty, coarse, unconsolidated sand with considerable amounts of charcoal, ash and fired features (Alex 1987; Benton 1990). Near the center of the unit it was evident that rodent activity had mixed Horizons 14 and 15 to some degree. A charcoal/ash sample was removed from the Horizon 15/16 interface at an elevation of 99.10 m. Radiocarbon ages of 5,500 ± 80 B.P. (Beta-23712), 5,500 ± 150 B.P. (Beta-19066), and 5,740 ± 110 B.P. (Beta-24068) resulted from samples taken from features in this horizon.

Horizon 16

Horizon 16 (99.21-99.10 m in XU 3-4S/0-1W) occurs in small patches as a granulated, silty medium unconsolidated sand (Benton, n.d.). Substantial amounts of green micaceous sand were first detected in this horizon.

Horizon 17

Horizon 17 (99.15-99.00 m in XU 3-4S/0-1W) occurs as a hard, red silt covering most areas of the southeastern part of this excavation unit and exists in patches in other areas. It is similar to several red silt layers that exist below it. In XU 3-4S/0-1W, a piece of charred wood encountered at the interface between Horizon 16 and 17 produced an age of 6,220 ± 100 B.P. (Beta-23715) Two grid units to the north (XU 1-2S/0-1W) a small hearth (F86-23) was found in a similar stratigraphic position and produced an age of 6,720 ± 100 B.P. (Beta-24067).

Horizon 18

Horizon 18 (99.00-98.86 m in XU 3-4S/0-1W) represents a zone of finely, interbedded layers of red silt and green micaceous sand which in all excavation units covers the ancient talus slope (Horizon 22). In XU 3-4S/0-1W, downslope to the north, Horizon 18 occurred only in the northern half of the square and subdivided into well defined layers of mica sand and red silt which were separated into Horizons 18a-c.

Horizons 19, 20 and 21

Horizons 19, 20 and 21 (98.25-97.75) represent alternate red silt and green micaceous sand layers best preserved in XU 1-2S/0-1W. Like Horizon 18, none of

these horizons contained more than a few isolated pieces of cultural material, but they do contain important paleoenvironmental data in the form of gastropods, vertebrate bones, seeds, and charcoal. None of these horizons was continuous over the buried talus slope.

Horizon 22

Horizon 22 (just below 98.00-96.23 m in XU 1-2S/0-1W) is the ancient talus slope at the base of the shelter, consisting of fragments and slabs of limestone presumably derived from the shelter ceiling. Micaceous sand probably carried into the talus slope by the creek filled the spaces between the limestone. No cultural materials occur but paleo-environmental remains were common. Charcoal encountered 60 cm above the lowest part of the excavation in XU 1-2S/0-1W resulted in a radiocarbon date of 9,380 ± 300 years B.P.(Beta-22271), the earliest at the site.

FEATURES

The extant documentation on the Beaver Creek Shelter indicates that thirty-six (36) individual feature numbers (F85-1, F86-1 to F86-23, and F87-1 to F87-12) were assigned to features uncovered at the site between 1985 and 1987 (see stratigraphic profiles, Figures 4, 5). One of these, F87-10, was later determined to be a rodent disturbance. F85-1 and F87-1 represent the same feature, portions of which were uncovered in both XU 3-4S/0-1E and XU 3-4S/0-1W in 1985 and 1987, respectively. In at least two other instances, single features were later subdivided into multiple features and distinguished by lower case letters (F87-2 and F87-2b, F87-6a and F87-6b). F87-6, F87-7 and F87-8, originally separate, were later seen as one large feature.

As mentioned previously, it was difficult to distinguish these remains, particularly in the first year of archaeological research at the site when the nature of the site's stratigraphy was unknown. Mixing of stratigraphic zones as the result of the reuse of living floors and intrusion of features from one horizon into another had combined with the effects of alluvial activity to create problems for interpretation. In addition, as Alex (1987c) states "In some areas the deposit was mainly composed of charcoal and ash, and it was almost impossible to distinguish individual features which had been dug into this type of matrix."

All of the features with the exception of F87-5, appear to represent lenses or shallow basins with varying amounts of ash, charcoal, burned soil and fire-fractured rock fill, or deeper roasting pits containing similar materials. Information on 33 features (including both portions of the single feature designated F85-1 and F87-1) was located in the extant documentation on the shelter. This information when extant is summarized in Table 2 and illustrated on the stratigraphic profiles (Figures 4, 5) and individual plan drawings (Figure 8).

Since the areal extent of the excavation at 39CU779 was fairly limited, it is impossible to infer too much about activity areas in the shelter as revealed by the location of features. While features were first encountered as high in the stratification as Horizon 11, the largest number occurred in Horizons 13-15. The abundance of features and evidence of anthropogenic activity in Horizon 13 led Alex (1987a, 1987b) to suggest that this horizon represented the period of most intense human occupation in the shelter.

The following is an attempt to summarize the relationship of features to stratigraphic

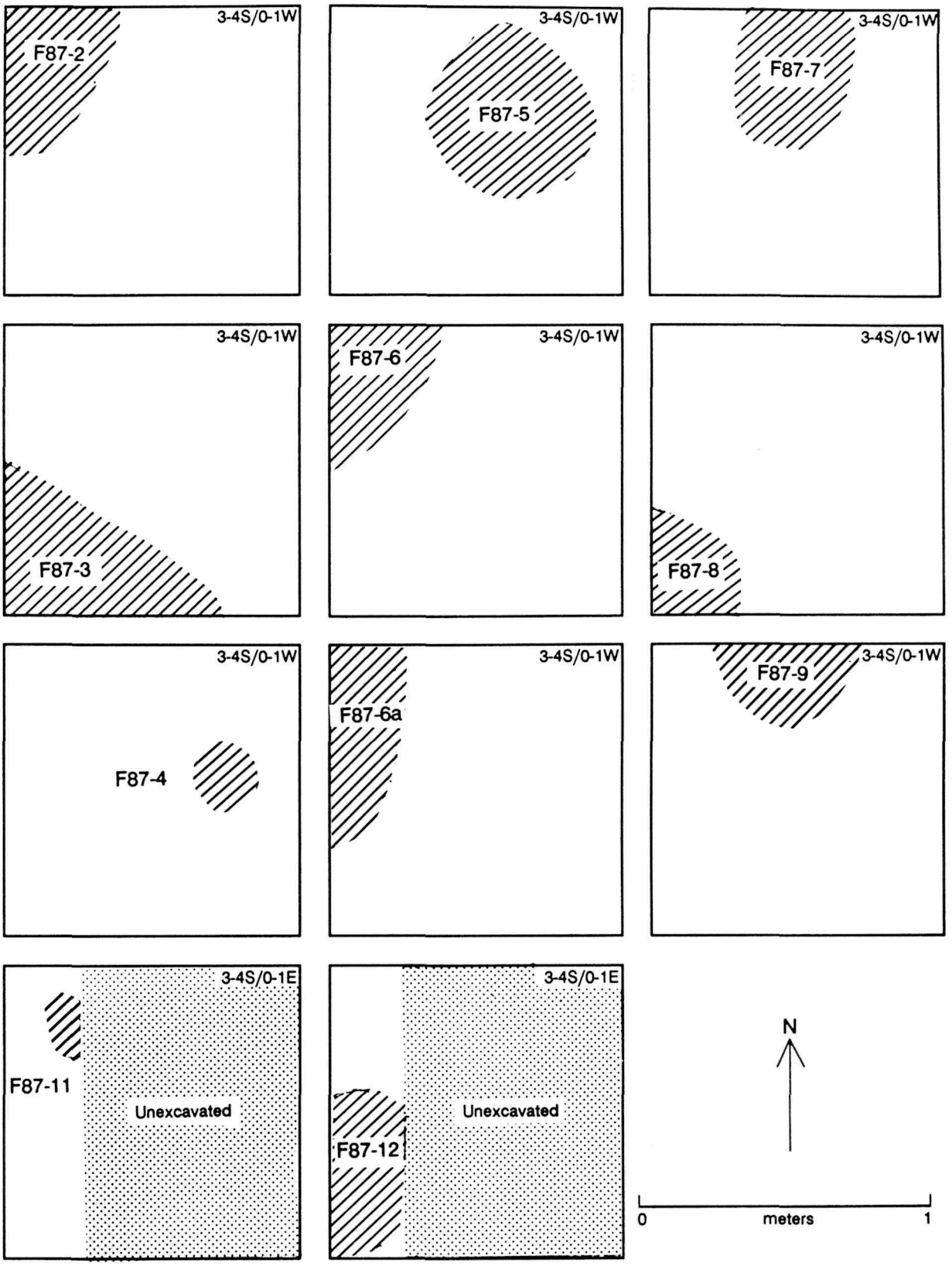

Figure 8. Plan view of features.

units at the sites. Horizon 11 represents the uppermost level in the excavated area of the shelter which contained substantial amounts of archaeological data and the first feature (F85-1/F87-1) recognized at the site. Middle Archaic remains from this strata were separated from older Middle Archaic materials found in Horizon 13, by the thick gravel layer of Horizon 12 which apparently represented a filled channel cut.

Horizon 13 provided evidence of the most intensive human occupation of the shelter and dated between 4,000 and 4,700 B.P. Interbedded lenses of ash and charcoal and superimposed features representing hearths and roasting pits make interpretation of this horizon difficult. In XU 3-4S/0-1W, F86-1, a pocket of white/gray ash occurred in the northeast corner of the square and was partially superimposed over F87-2. F87-2, concentrated in the northwest corner, was later subdivided into an upper portion (F87-2) and an underlying ash layer (F87-2a). Both of these features were associated with the "Upper" red, silty portion of Horizon 13. Underlying F87-2a was F87-2b, a roasting pit apparently intruded through the ashy layer of Lower Horizon 13. Two other fired features (F87-3 and F87-4) also occurred in Lower Horizon 13 in this same excavation unit, and F87-11 was later removed from Lower Horizon 13 in XU 3-4S/0-1E. At least five features uncovered in the 1986 excavation were also associated with this horizon (Table 2).

Horizon 14 likewise was a complex but important stratigraphic unit, and the cultural remains found here are believed to represent the earliest Middle Archaic materials at the site. This stratum contained a considerable amount of bone, small patches of charcoal and ash, and numerous flakes. Interbedded layers of gravel appear to represent separate episodes of flooding. Cultural features originated at various levels in the gravels (Figures 4, 5) and there appears to have been considerable cultural mixing and churning of the gravels (Alex 1987a, 1987b). A concentration of fist-sized limestone cobbles designated F87-5 appeared at the base of Horizon 14 and intruded in Horizon 15 in XU 3-4S/0-1W. All radiocarbon age determinations from below this horizon were pre-5,000 years B.P., suggesting that it marks the transition between the Middle and Early Archaic at the site.

Horizon 15 contained considerable amounts of charcoal, ash, and fired features (Figures 4, 5 and Table 2). Several centimeters into the horizon in XU 3-4S/0-1W, what appeared previously as a thick ash layer began to separate into three laterally distinct features (F87-6, F87-7, and F87-8). Later, as seen in the profile, these features were judged to be part of a single large feature that extended into Horizon 17. As a result of the disturbance to the stratification created by this complex, XU 3-4S/0-1W was ultimately extended .25 m to the east. Three radiocarbon dates from this horizon (Table 1) placed it firmly within the 5,000-6,000 year old range.

Horizon 16 was discontinuous over the portion of the shelter excavated. It contained a number of features (F86-21, F86-22, and F86-23) which originated in the horizon but which intruded into the underlying Horizon 17. Horizon 17 itself, was not anthropogenic but was dug into by the occupants of the site responsible for the formation of Horizon 16. As such it represents the surface upon which the initial intensive human occupation of the shelter began (Alex 1987a, 1987b). C-14 dates at Horizon 16/Horizon 17 interface substantiated a 6,000-7,000 year range.

None of the underlying horizons (18-22) showed evidence of human occupation although paleontological evidence was substantial. The green micaceous sand layer which was virtually continuous across the shelter floor in Horizon 18 proved to be one of the most useful marker beds at the site.

Table 2. Features from the Beaver Creek Shelter.

Feature	Location XU	Location Profile	Stratigraphic Horizon	Depth (m)	Size (cm)	Thickness (cm)	Fill Type	Fill Sample Volume (liters)	Fill Sample Weight (kg)	Description
85-1[a]	3-4S/0-1E 3-4S/0-1W		11	99.99-99.92	30 nw-se 12 sw-ne	7	white/gray ash	.5	.5	circular alignment of fire-fractured limestone, red sand, gray ash interior; C-14 date: 1750 ± 60 B.P.
86-1	2-3S/0-1W south edge se quadrant	south	11 (?)	99.78	10 x 20	5	white/gray ash	—	—	hearth burned in place; near C-14 date: 3940 ± 170 B.P.
86-2	2-3S/0-1W	east	11 (?)	ca. 99.80	42 wide	9	dark gray ash	—	—	hearth burned in place; limestone slab at base
86-3	1-2S/0-1W		12 (?)	Level 3(?)			white ash, charcoal, and fire-fractured rock	—	—	"fire-pit" (Alex 1986)
86-4	no data									
86-5	no data									
86-6	1-2S/0-1W 0-1S/0-1W	 east	12 (?)	99.60-99.50	—	—		—	—	shallow, charcoal/ash lens
86-7	0-1S/0-1W	east	12 (?)	99.40-99.30	—	—		—	—	shallow, charcoal/ash lens
86-8	0-1S/0-1W	east	12 (?)	99.40-99.30	—	—		—	—	shallow, charcoal/ash lens
86-9	2-3S/0-1W	south	Upper 13	99.40-99.30	—	—		—	—	shallow, charcoal/ash concentration; below C-14 date: 4010 ± 100 B.P.
86-10	2-3S/0-1W	east	14 (?)	99.45-99.30	—	—		—	—	charcoal/ash concentration in basin-shaped depression; fire-fractured rock at base
86-11	2-3S/0-1W	south	Lower 13	99.30-99.20	—	—		—	—	charcoal/ash lens; near C-14 date: 4710 ± 110 B.P.
86-12	2-3S/0-1W	south	Lower 13	99.30-99.20	—	—		—	—	charcoal/ash lens
86-13	2-3S/0-1W	south	15	99.20-99.10[b]	—	—		—	—	charcoal/ash lens
86-14	0-1S/0-1W	east	14 (?)	99.30-99.15	—	—		—	—	small, charcoal/ash concentration with basin-shaped base; fire-fractured rock internally
86-15	1-2S/0-1W	east	14 (?)	99.40-99.30	—	—		—	—	shallow, basin-shaped depression
86-16	2-3S/0-1W	west	13 (?)	99.30-99.20	—	—		—	—	charcoal/ash concentration
86-17	0-1S/0-1W 1-2S/0-1W	east	below 14	99.20-99.00	—	—	ash, charcoal, fire-fractured rock	—	—	basin-shaped pit; well mixed fill; 5500 ± 150 B.P.
86-18	1-2S/0-1W 2-3S/0-1W	east	14 (?)	99.30-99.25	—	—		—	—	charcoal/ash concentration in basin-shaped depression

Table 2. Continued.

Feature	Location XU	Profile	Stratigraphic Horizon	Depth (m)	Size (cm)	Thickness (cm)	Fill Type	Fill Sample Volume (liters)	Fill Sample Weight (kg)	Description
86-19	1-2S/0-1W	west	15 (?)	99.00–98.85	—	—		—	—	charcoal/ash concentration fire-fractured rock at base
86-20	2-3S/0-1W	west	15	98.90–98.80	—	—		—	—	charcoal lens; 5500 ± 80 B.P.
86-21	1-2S/0-1W	east	intrudes into 17	99.20–99.05	—	—		—	—	charcoal/ash concentration; some fire-fractured rock internally
86-22	2-3S/0-1W	east	16 intrudes into 17	99.25–98.95	—	—		—	—	large pit; ash/charcoal, fire-fractured rock fill.
86-23	1-2S/0-1W 2-3S/0-1W	east	16 (?) intrudes into 17	99.15–99.00	—	—		—	—	small, basin-shaped pit; well mixed charcoal/ash fill; 6720 ± 100 B. P.
87-1	See 85-1									
87-2	3-4S/0-1W nw quadrant		12	99.72–99.66	50 n–s 40 e–w	— —	hard-baked reddish brown silt, charcoal, flakes, debitage, and bone			
87-2a	3-4S/0-1W nw quadrant		Upper 13	99.66–99.60	—	—	gray ash layer containg small charcoal fragments	—	—	ash lens underlying 87-2
87-2b	3-4S/0-1W nw quadrant		Lower 13	99.60–99.35	—	—	powdery red soil with ash and large charcoal fragments	—	—	conformed to the shape of a firepit
87-3	3-4S/0-1W south edge sw quadrant		Lower 13	99.57–99.47	52 n–s 74 e–w	—	charcoal and ash	.8 42	.9 10	roasting pit; probably represents two features
87-4	3-4S/0-1W ne quadrant		Lower 13	99.54–99.48	20 n–s 25 e–w	6	charcoal and ash	.5	.7	small, shallow oval basin
87-5	3-4S/0-1W ne quadrant extending into se & nw quadrants		base of 14 top of 15	99.37–99.27	48 n–s 55 e–w	—	limestone cobbles and soil	4.75	6.3	concentration of fist-size limestone cobbles and soil
			upper rock fill	99.37–99.34	—	—		6.5	8.25[c]	
87-6[d]	3-4S/0-1W nw quadrant		15	99.24[b]–99.09	50 n–s 40 e–w	—	ash	3.0 9.25	3.2 9.95[c]	semicircular area along wall of excavation unit subdivided into three parts; section represents the central portion

Table 2. Continued.

Feature	Location XU	Location Profile	Stratigraphic Horizon	Depth (m)	Size (cm)	Thickness (cm)	Fill Type	Fill Sample Volume (liters)	Fill Sample Weight (kg)	Description
87-6a	3–4S/0–1W west edge & nw quadrant		15	99.24[b]–99.09	—	—	ash	.9	1.0	semicircular area along west wall of the excavation unit; overlaps to the north with Feature 87-6; extends into the southwest quadrant
87-6b	3–4S/0–1W nw corner north edge		15	99.24–99.09 99.10[f]	—	—	ash	.75	.9[c]	semicircular area along north edge of excavation unit in northwest corner
87-7	3–4S/0–1W ne quadrant		15	99.12–99.11	50 n–s 40 e–w	—	ash	2	2.7	
87-8	3–4S/0–1W sw corner		15	99.17–99.04	35 n–s 30 e–w	—	ash	1.25	1.8	appears to be superimposed for about 5 cm over Feature 87-6c; dated 5740 ± 110 B.P.
87-9	3–4S/0–1W north-central edge		16	99.12–99.00	29 n–s 50 e–w	—	rock and ash	4	5.4	semicircular area along northern edge of square; C-14 Sample D taken from this feature
87-10	3–4S/0–1W		18	—	—	—		1.75	2.0	rodent disturbance
87-11[g]	3–4S/0–1E ne quadrant	east	Lower 13	99.44–99.45	10 n–s 22 e–w	—	charcoal	.2	.25	semicircular area of thick charcoal "apears to represent 2 sticks burned in place" (Alex 1987d)
87-12	3–4S/0–1E		underlying 14 (?)	99.33–99.11	55 n–s 25 e–w	—	hard red silt containing ash and charcoal	20	26.3	

[a]Feature 85-1 and Feature 87-1 represent the same feature

[b]Elevations are uncertain.

[c]Fill sample was taken from an elevation of 99.24–99.14 m.

[d]Features 87-6, probably 87-7, and 87-8 once seen in profile were judged by Alex (1987d) to be part of a single huge feature, cut through north-south by a rodent disturbance. He suggested that this feature probably extended horizontally across the entire excavation unit and vertically into Horizon 16.

[e]Fill sample was taken from an elevation of 99.14–99.00

[f]Elevation of base of feature.

[g]There is some confusion surrounding the identity of features 87-11 and 87-12. The location of F87-11 on the stratigraphic profile (Figure 4) corresponds to the location of F87-12 as described in field records. A sketch of a feature which does appear to correspond to the description of F87-11 is shown on the original stratigraphic profile drawn of the east wall of the excavation. It may be that later on in reconsidering the nature of features Alex no longer considered F87-11 as a feature and reassigned its number to what he had originally labeled as F87-12. This author has taken the liberty of describing both of these two features as they were first indicated on the stratigraphic profiles and of labeling them with the feature designations Alex appears to have initially assigned them. The reader should keep in mind that F87-11 may have been eliminated as a feature by Alex .

ARTIFACTS

Methodology

All of the known artifacts from the Beaver Creek Shelter consist of lithics except for one antler tine described below. Artifacts here are defined as the portable items of human workmanship whose form is modified or wholly created by human activity (Ashmore and Sharer 1988:30). Features are considered nonportable items that cannot be removed from their place of discovery without altering or destroying their original form (Ashmore and Sharer 1988:31), and ecofacts as nonartifactual natural remains that have cultural relevance (Ashmore and Sharer 1988:32).

The analysis of artifacts from 39CU779 was designed to address several basic questions. These included (1) the nature of patterned to nonpatterned items throughout the sequence at the site, (2) the nature of raw materials utilized in tool manufacture and their source as a reflection of local or nonlocal procurement activities, (3) the nature and abundance of debitage throughout the sequence as this related to lithic technology, (4) the characteristics of the lithic industry found in each level including the identification of potentially temporally diagnostic artifacts, and (5) the comparison of the assemblage from this site to other regional sites.

Lithic artifacts at the Beaver Creek Shelter included chipped stone, ground stone and fire-fractured rock classes. The chipped stone artifacts subdivided into at least four general categories--patterned items, nonpatterned modified flakes, debitage, and shatter. Patterned artifacts refer to items with a regular (presumably) deliberately executed morphology and attributes of use/wear that allow inferences to be made as to their possible function. Modified flakes while possibly having been selected for an existing morphology that lent themselves to the task at hand, do not exhibit recognizable signs of regularity but appear to have been altered through deliberate retouch, resharpening or use wear. The author found that for both patterned artifacts and modified flakes the use of the concept of the "employable unit" or "EU" as defined by Knudson (1979, 1983:10) and discussed by Frison and Todd (1987) was particularly applicable as a demonstration of tool function. Employable unit is "that implement segment or portion (continuous edge or projection) deemed appropriate for use in performing a specific task (eg., cutting, scraping, perforating, drilling, chopping)" (Knudson 1983:10). It was not always possible to determine if the flake scars observable on the "EUs" of some modified flakes were deliberate (ie., the result of retouch or resharpening) or the result of use. Debitage represents unaltered flakes (primary, secondary, tertiary, bifacial reduction) that exhibit no additional signs of alteration by either retouch and/or use. Debitage is separated from shatter in that the former generally suggests material with the characteristic attributes of a flake--striking platform, bulb of applied force, or compression rings. Shatter is composed of generally irregular, often angular or blocky stone debris that does not exhibit the attributes of a flake. Since the site is composed of material (Pahasapa Limestone) which may itself have provided the source of stone utilized in lithic production, the author did not always feel comfortable distinguishing shatter produced through presumably human activities from that which resulted from certain natural processes in the rockshelter itself such as freeze/thaw and weathering. In addition, some very small (G-4-G-5) pieces of shatter may have been included among the debitage.

The presence of both ground stone artifacts and fire-fractured rock is documented in the site records. Two (n = 2) items believed to be ground stone artifacts were located and are described in Appendix 1. This number did not seem to account for all those referred to in

field notes (Alex 1986, 1987d) although a few items initially identified at the site as ground stone artifacts could not be confirmed as such on closer examination. In a visit to the rockshelter in April 1990, a number of what appeared to be grinding slabs were seen lying on the surface of the eastern (unexcavated) portion of the shelter. Their presence confirms that ground stone artifacts were part of the artifactual complement at the site. Only a few small fragments of fire-fractured rock were encountered during the course of the present analysis and are not reported here. Other larger fire-fractured rock fragments are present in the unanalyzed portion of the Beaver Creek collection at the SDSMT.

Some of the artifacts recovered from the Beaver Creek Shelter were encountered during the excavation and recorded in situ. Most material particularly debitage, was retrieved from soil samples as these were processed in the lab at the SDSMT. Artifacts, particularly patterned items, were washed only to the extent necessary to observe their color, stone material type and flake scar pattern.

Patterned items and modified flakes were marked with the tripartite site designation (39CU779) and given individual catalog numbers. Debitage and shatter from a single provenience (excavation unit and level) were given the same catalog number. Each patterned artifact and modified flake was examined individually several times, both macroscopically through the use of a 10x hand lens, and under the binocular microscope (maximum magnification 4.5x). Color as observed on dry specimens was defined according to the Rock Color Chart of the Geological Society of America (1984). Stone material type was initially identified by the author. Subsequent to this, Mark Fahrenbach, a graduate student in geology at SDSMT, was hired to conduct a more precise study of the raw material types and their sources. His findings are reported in Appendix 2.

Patterned artifacts were initially classified into descriptive categories based on their morphology, flake scar pattern, and formal measurements (Table 3). A series of metrical measurements adapted from Ahler (1971) was applied to those items believed to represent projectile points. In order to make such measurements, artifacts were oriented in such a way so that the haft element may be taken to represent the proximal portion of the flake as distinguishable from the blade by some form of modification (notching, constriction, edge dulling etc.) presumably for the purpose of attachment (Ahler 1971:21). The blade represents the distal portion of the flake. In taking length and width measurements, two axes, again described by Ahler (1971:21) were utilized. These include the longitudinally oriented center line that bisects the artifact into two symmetrical halves, and the baseline which is perpendicular to the center line and tangent to the basal or proximal edge of the artifact. Length measurements are perpendicular to the baseline, and widths are parallel to the baseline (Ahler 1971:21). Definitions of each measurement are as follows as suggested by Ahler (1971:21-24):

1) Total maximum length: The maximum distance measured perpendicular from the baseline to the distal blade tip. In instances of fractured specimens, this measurement is incomplete.

2) Blade length: The maximum distance measured perpendicular from the distal haft element points to the distal tip of the blade. Again, with incomplete specimens, this measurement does not reflect whole artifacts.

3) Maximum width: The greatest distance, measured parallel to the baseline, between any two points on the artifact.

4) Midpoint width: The distance measured parallel to the baseline, between the two points on the artifact halfway between the baseline and the distal blade tip.

5) Basal contact width: The maximum distance between points of tangency on the baseline.

6) Neck width (distal haft element width): The distance between two points, one on each lateral haft element margin, which are more distally located than the proximal haft element points, and at which the orientation of the lateral haft element margin is most nearly parallel to the center line, measured parallel to the baseline.

7) Notch depth: Distance measured perpendicular from the point of maximum constriction of the haft element to the midpoint between the proximal and distal haft element points.

8) Notch width at orifice: Distance measured parallel between the proximal and distal haft element points.

9) Distal haft element length: The average perpendicular distance from the baseline to the two points on the lateral haft element margins.

10) Blade base width: The distance between the two points one on each lateral blade margin, nearest the baseline, measured parallel to the baseline.

11) Maximum width length: The average perpendicular distance from the baseline to the two points defined under maximum width.

12) Maximum thickness: The greatest distance, measured perpendicular to the baseline and center line, between any two points on the artifact.

Table 3. Patterned Artifacts

Catalog Number[a]	Excavation Unit	Level or Horizon	Elevation (m)	Description	Material	Proposed Taxonomic Placement
1	2-3S/0-1W	Horizon 15	99.20–99.01	projectile point	chert	Early Archaic
44	3-4S/0-1W[b]	Lower Horizon 14	99.27	distal portion biface	chert	Early Archaic (?)
28	2-3S/0-1W	Horizon 15	99.20–99.10	proximal portion biface	quartzite	Early Archaic (?)
2	2-3S/0-1W	Horizon 14	99.10	antler	antler	Early Archaic (?)
22	2-3S/0-1W	Level 7	99.25–99.20	bifacially worked flake	quartzite	Early Archaic (?)
3	1-2S/0-1W	Horizon 14	99.45–99.30	projectile point	quartzite	Early Archaic (?)
46	0-1S/0-1W	Level 8	98.70	preform	chalcedony	Early Archaic (?)
8	3-4S/0-1W	Horizon 14	99.60–99.45	projectile point	quartzite	Middle Archaic
4	3-4S/0-1W	Upper Horizon 13	99.72–99.54	projectile point	quartzite	Middle Archaic
7	3-4S/0-1W	Upper Horizon 13	99.72–99.54	biface	chert	Middle Archaic
5	3-4S/0-1W	Horizon 11	99.97–99.86	projectile point	quartzite	Middle Archaic
6	3-4S/0-1E[c]	Horizon 11	>100.00	biface	quartzite	Middle Archaic

[a]Catalog numbers listed were those assigned at the SDARC. The equivalent NPS catalog numbers are: 1 = WICA-1296, 44 = WICA-1305, 28 = WICA-1304, 2 = WICA-1312, 22 = WICA-1303, 3 = WICA-1297, 46 = WICA-1334, 8 = WICA-1302, 4 = WICA-1298, 7 = WICA-1301, 5 = WICA-1299, 6 = WICA-1300. The NPS accession number for this collection is 133.
[b]Southwest of F87-5.
[c]Near F85-1

13) Maximum thickness length: The average perpendicular distance from the baseline to the two points defined under maximum thickness.

14) Basal dulling width: The extent of the haft element margin between the two points defined under proximal half element width (below), which shows evidence of dulling, measured parallel to the baseline.

15) Lateral haft element dulling length: The average extent of dulling of the two lateral haft element margins, measured perpendicular to the baseline.

16) Basal thinning length: The greatest length of any flake struck from the haft element margin between the two points described under proximal haft element width.

17) Proximal haft element width: The distance between the two points, one on each lateral haft element margin, most proximally positioned and at which the orientation of the lateral haft element margin is most nearly parallel to the center line, measured parallel to the baseline.

18) Proximal haft element length: The average perpendicular distance from the baseline to the two points on the lateral haft element margins as defined under (17).

The following additional measurements were also made:

19) Maximum blade width: The maximum distance measured parallel to the baseline between any two points on the blade.

20) Weight: The weight of the artifact as measured on an electronic digital balance.

21) Flake scar pattern: Pattern of flake scars on the surfaces (faces) of the artifact as suggested by Crabtree (1972:87).

22) Shape of the transverse section of the blade.

23) Shape of the longitudinal section of the blade.

24) Shape of the blade outline as defined by Binford (1963:201-203).

An abbreviated version of these same attributes (where applicable) were used on the remaining patterned artifacts not believed to represent projectile points.

Functional categories for patterned items were suggested by overall morphology, the more traditional approach among Plains archeologists, and by a basic examination of use wear attributes. The latter approach follows the guidelines established over the past two decades by Ahler (1971, 1975, 1977, 1979). While the author does not have the expertise to duplicate most of these studies, an examination of each artifact was made for the presence of wear types including grinding, blunting, polishing, step flaking, hinge flaking, pitting, notching, and nicking. As the lithic industry at 39CU779 was characterized by artifacts with multiple EUs, it was the individual EU on each item that was examined microscopically for use wear.

Non-patterned, modified flakes were subjected to a descriptive analysis which included a series of formal measurements, and examined for use wear of EUs (Appendix 1). Flakes were oriented so that the striking platform (the proximal end or edge) was

towards the analyst, the dorsal face up. The opposite end/edge was considered the distal portion. On incomplete specimens, if a portion of the striking platform or bulb of applied force could be determined, it was taken to represent the proximal end/edge. Based on this orientation, the shape of the flake was determined by considering the position of the lateral edges relative to the longitudinal axis with the proximal end as a reference point (Montet-White 1962). Flakes were classified as (1) *expanding*: flake margins are wider, expand outward from the proximal end/edge; (2) *contracting*: flake margins are narrower, contract from the proximal end/edge; (3) *rectangular*: flake margins are fairly parallel; and (4) *irregular*: flake margins do not show one of the above patterns.

As with debitage, each flake was also classified according to whether it represented a primary decortication flake, or a secondary, tertiary, or bifacial reduction flake. These classes are defined as (1) *primary decortication*: a flake which contains 100 percent cortex and no flake scars on the dorsal surface; (2) *secondary*: a flake that has some cortex (less than 100 percent) and shows evidence of at least one flake scar on the dorsal surface; and (3) *tertiary*: a flake which lacks cortex and has flake scars on the dorsal surface; (4) *bifacial reduction*: relatively small, thin, expanding flakes, curved in longitudinal cross section. The exterior surface of a bifacial reduction flake is marked by scars from previous flake removals, whereas the interior surface retains the characteristic, small, lenticular platform with lipping at the inner edge. They demonstrate diffuse bulbs of percussion and generally lack prominent ripples or bulbar scars. Their greatest dimension is nearly always less than 20 mm (Hemmings 1987).

As with the bifacial reduction flakes discussed by Hemmings (1987), a number of those identified in the Beaver Creek assemblage may represent flakes removed by the pressure technique. They are small, thin, parallel-sided, and long in relation to width. Hemmings (1987:438) suggests that they were likely removed from a biface at about the fourth or fifth production stage. In the sample from Beaver Creek, a number of bifacial reduction flakes were identified based upon the above criteria. Others are also believed to be present in the assemblage but lacked one or more of the characteristic attributes which made them readily identifiable. For this reason, the frequency of this class of artifact is considered to represent a minimum number.

Most of the lithics from 39CU779 represent debitage, flakes that lack any evidence of modification or use. This material was analyzed by size grading or mass analysis (Ahler 1975; Ahler and Christiansen 1983) by sample recovered from each level in XU 2-3S/0-1W, for the reasons discussed previously. Debitage from each level, largely recovered through processing of soil samples, was sorted into different size categories through the use of a series of screens of different size meshes. The size grades utilized for the Beaver Creek sample were: G-1, 1 inch; G-2, ½ inch; G-3, ¼ inch; G-4, 1/8 inch; and G-5, 1/16 inch. Once debitage from each level was size graded, it was weighed (to the nearest .1 g) and counted. Each grade, except for the G-5 which was considered too small for accurate identification, was identified to material type by Mark Fahrenbach (Appendix 2), and for G-1-G-3 flakes, sorted into the flake categories described above. Tabulation of different classes of flakes by material type and grade were then made (Tables 4-7).

As stated by Patterson (1980), mass analysis of lithic debitage is believed "to reveal patterns of lithic manufacture at sites. Differing amounts of debris in various size categories tend to reflect different stages of lithic artifact manufacture. Large frequencies of small flakes without cortex indicate resharpening or maintenance, while higher frequencies of large flakes with cortex suggest primary reduction and early stages of lithic manufacture." In general, the larger number

Table 4. Debitage Counts by Level, Raw Material Type, and Flake Category[a].

	Flake Category by Size Grade																		
	G1					G2					G3								
Raw Material	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 2, 99.80–99.70 m																			
Quartzite	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	10	0	12	23.1
Chert	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	17	0	19	36.5
Chalcedony	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	3.8
Calcite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	3.8
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17	32.7
Subtotal	0	0	0	0	0	0	0	2	0	0	0	0	4	0	0	29	17	52	99.9
Level 3, 99.70–99.60 m																			
Quartzite	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2.9
Chert	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	19	0	23	65.7
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	11	31.4
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	19	11	35	100.0
Level 4, 99.60–99.50 m																			
Quartzite	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	25	0	28	29.2
Chert	0	0	0	0	0	0	0	2	0	0	0	1	6	0	0	31	0	40	41.7
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	7	7.3
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	21	21.9
Subtotal	0	0	0	0	0	0	0	2	0	0	0	1	11	0	0	61	21	96	100.1
Level 5, 99.50–99.40 m																			
Quartzite	0	0	0	0	0	0	1	16	0	0	0	0	50	0	2	180	0	249	27.3
Chert	0	0	5	0	0	0	5	28	0	2	0	0	62	0	3	219	0	324	35.5
Chalcedony	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	.4
Limestone	0	0	0	0	0	0	0	1	0	0	0	0	11	0	0	2	0	14	1.5
Quartz	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	4	.4
Shale	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	.2
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	316	316	34.6
Subtotal	0	0	5	0	0	0	6	49	0	2	0	0	125	0	5	405	316	913	99.9

Table 4. Continued.

Raw Material	Flake Category by Size Grade																		
	G1					G2					G3								
	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 6, 99.40–99.30 m																			
Quartzite	0	0	7	0	0	0	0	8	0	0	0	0	13	0	1	29	0	58	13.0
Chert	2	0	4	0	0	0	2	32	0	1	0	0	77	0	0	70	0	188	42.4
Chalcedony	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	3	.7
Limestone	0	0	0	0	0	0	0	1	0	0	1	0	3	0	0	8	0	13	2.9
Quartz	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181	181	40.7
Subtotal	2	0	12	0	0	0	2	42	0	1	1	0	94	0	1	109	181	445	100.1
Level 6, 99.40–99.25 m[b]																			
Quartzite	1	1	1	0	0	0	0	12	0	0	0	0	15	0	0	57	0	87	14.2
Chert	0	1	1	0	0	0	0	18	0	2	0	5	51	0	0	241	0	319	52.1
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	6	0	10	1.6
Quartz	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	.2
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	195	195	31.9
Subtotal	1	2	2	0	0	0	0	30	0	2	0	5	71	0	0	304	195	612	100.0
Level 7, 99.25–99.20 m																			
Quartzite	0	0	2	0	0	0	11	0	0	0	0	1	13	0	0	20	0	47	6.6
Chert	0	0	5	0	0	0	3	35	0	0	0	0	86	0	0	204	333	46.9	
Chalcedony	0	0	0	0	0	0	1	0	0	0	0	0	6	0	0	1	0	8	1.1
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	8	0	10	1.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	312	312	43.9
Subtotal	0	0	7	0	0	0	15	35	0	0	0	1	107	0	0	233	312	710	99.9
Level 8, 99.20–99.10 m																			
Quartzite	0	0	3	0	0	0	0	2	0	0	0	2	11	0	0	14	0	32	3.1
Chert	0	3	12	0	0	0	9	51	0	0	0	10	138	0	0	374	0	597	57.8
Chalcedony	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	4	0	8	.8
Limestone	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	0	4	.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	392	392	37.9
Subtotal	0	3	15	0	0	0	9	55	0	0	0	12	153	0	0	394	392	1033	100.0

Table 4. Continued.

Raw Material	Flake Category by Size Grade																		
	G1					G2					G3								
	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 9, 99.10–99.00 m																			
Quartzite	0	0	1	0	0	0	0	6	0	0	0	0	10	0	0	28	0	45	7.7
Chert	0	0	5	0	1	0	0	32	0	5	0	3	59	0	0	155	0	260	44.7
Chalcedony	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	.2
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	.5
Quartz	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	.3
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	271	271	46.6
Subtotal	0	0	6	0	1	0	0	39	0	5	0	3	74	0	0	183	271	582	100.0
Level 10, 99.00–98.90 m																			
Quartzite	0	0	0	0	0	0	0	2	0	1	0	0	1	0	0	11	0	15	7.1
Chert	0	0	0	1	0	0	0	4	0	1	0	0	9	0	1	41	0	57	26.9
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	3	1.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137	137	64.6
Subtotal	0	0	0	1	0	0	0	6	0	2	0	0	11	0	1	54	137	212	100.0
Level 10, 99.00–98.00 m[c]																			
Quartzite	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	8.3
Chert	0	1	0	0	0	0	0	6	0	0	0	0	4	0	0	0	0	11	91.7
Subtotal	0	1	0	0	0	0	0	7	0	0	0	0	4	0	0	0	0	12	100.0
Level 11, 99.00–98.90 m[b]																			
Chert	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	100.0
Level 11, 98.90–98.80 m[b]																			
Quartzite	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	3	8.1
Chert	0	0	0	0	0	0	0	1	0	0	0	0	3	0	0	15	0	19	51.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	40.5
Subtotal	0	0	0	0	0	0	0	1	0	0	0	0	4	0	0	17	15	37	100.0
Level 11, 98.88–98.80 m																			
Quartzite	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	2	0	5	5.7
Chert	0	2	0	0	1	0	1	9	0	0	0	1	19	0	0	18	0	51	58.6
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2.3
Quartz	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.1
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	28	32.2
Subtotal	0	2	3	0	1	0	1	10	0	0	0	1	19	0	0	22	28	87	99.9

Table 4. Continued.

	Flake Category by Size Grade																		
	G1					G2					G3								
Raw Material	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 12, 98.80–98.70 m																			
Quartzite	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	8	11.1
Chert	0	0	0	0	0	0	1	4	0	0	0	0	4	0	0	30	0	39	54.2
Chalcedony	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1.4
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	24	33.3
Subtotal	0	0	0	0	0	0	1	8	0	0	0	0	4	0	0	35	24	72	100.0
Level 13, 98.70–98.60 m																			
Quartzite	0	0	0	0	0	0	0	3	0	0	0	0	5	0	0	0	0	8	44.4
Chert	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0	0	0	10	55.6
Subtotal	0	0	0	0	0	0	0	8	0	0	0	0	10	0	0	0	0	18	100.0
Level 14, 98.60–98.50 m																			
Chert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	100.0
Level 15, 98.50–98.40 m																			
Chert	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	50
Limestone	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	50
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	100.0
Lower Horizon 14, 99.35–99.25 m																			
Quartzite	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	10	0	11	29.7
Chert	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	4	10.8
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	22	59.5
Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	12	22	37	100.0
Cut-fill channel																			
Chert	0	1	0	0	0	0	1	3	0	0	0	0	2	0	0	4	0	11	100.0

[a]Flake categories are P = primary flake, S = secondary flake, T = tertiary flake, I = inconclusive identification, BR = bifacial reduction flake.

[b]In some cases more than one set of elevations are given for the same level. This would appear to represent instances when an excavator overshot the elevation for that level in a particular portion of an excavation unit.

[c]Field notes (Alex 1987d) indicate elevation in error.

Table 5. Debitage Weights (in grams) by Level, Raw Material Type, and Flake Category[a].

	Flake Category by Size Grade																		
	G1					G2					G3								
Raw Material	**P**	**S**	**T**	**I**	**BR**	**P**	**S**	**T**	**I**	**BR**	**P**	**S**	**T**	**I**	**BR**	**G4**	**G5**	**Total**	**Percent**
Level 2, 99.80–99.70 m																			
Quartzite	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	.3	—	.4	28.6
Chert	—	—	—	—	—	—	—	—	—	—	—	—	.3	—	—	.5	—	.8	57.1
Chalcedony	—	—	—	—	—	—	—	.2	—	—	—	—	—	—	—	—	—	.2	14.3
Calcite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	—	<.1	0
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	<.1	0
Subtotal	—	—	—	—	—	—	—	.2	—	—	—	—	.4	—	—	.8	<.1	1.4	100.0
Level 3, 99.70–99.60 m																			
Quartzite	—	—	—	—	—	—	—	—	—	—	—	—	.3	—	—	—	—	.3	25
Chert	—	—	—	—	—	—	—	—	—	—	—	—	.5	—	—	.4	—	.9	75
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	<.1	0
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	.8	—	—	.4	<.1	1.2	100.0
Level 4, 99.60–99.50 m																			
Quartzite	—	—	—	—	—	—	—	—	—	—	—	—	.3	—	—	.8	—	1.1	25.6
Chert	—	—	—	—	—	—	—	1.2	—	—	—	.2	.8	—	—	.7	—	2.9	67.4
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	.1	—	.2	4.7
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.1	.1	2.3
Subtotal	—	—	—	—	—	—	—	1.2	—	—	—	.2	1.2	—	—	1.6	.1	4.3	100.0
Level 5, 99.50–99.40 m																			
Quartzite	—	—	—	—	—	—	.5	9.2	—	—	—	—	5.7	—	.4	5.3	—	21.1	24.0
Chert	—	—	18.1	—	—	—	6.7	17.8	—	1.1	—	—	9.1	—	.3	7.2	—	60.3	68.6
Chalcedony	—	—	—	—	—	—	—	.4	—	—	—	—	—	—	—	—	—	.4	.5
Limestone	—	—	—	—	—	—	—	1.1	—	—	—	—	1.8	—	—	.1	—	3.0	3.4
Quartz	—	—	—	—	—	—	—	—	—	—	—	—	.20	—	—	.2	—	.4	.5
Shale	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	<.1	—	.1	.1
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.6	2.6	3.0
Subtotal	—	—	18.1	—	—	—	7.2	28.5	—	1.1	—	—	16.9	—	.7	12.8	2.6	87.9	100.1

Table 5. Continued.

Raw Material	Flake Category by Size Grade																		
	G1					G2					G3								
	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 6, 99.40–99.30 m																			
Quartzite	—	—	114.0	—	—	—	—	7.4	—	—	—	—	1.8	—	.2	.8+	—	124.2	50.1
Chert	11.7	—	19.5	—	—	—	4.2	25.4	—	1.4	—	—	10.5	—	—	4.3	—	77	31.0
Chalcedony	—	—	—	—	—	—	—	1.3	—	—	—	—	.1	—	—	<.1	—	1.4	.6
Limestone	—	—	—	—	—	—	—	1.6	—	—	.2	—	.7	—	—	.3	—	2.8	1.1
Quartz	—	—	41.7	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	41.8	16.9
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.8	.8	.3
Subtotal	11.7	—	175.2	—	—	—	4.2	35.7	—	1.4	.2	—	13.1	—	.2	5.5	.8	248.0	100.0
Level 6, 99.40–99.25 m[b]																			
Quartzite	92.6	1.6	3.6	—	—	—	—	9.9	—	—	—	—	2.4	—	—	1.2	—	111.3	77.1
Chert	—	.5	1.8	—	—	—	—	15.4	—	1.0	—	1.0	6.3	—	—	15.4	—	31.4	21.7
Limestone	—	—	—	—	—	0	—	—	—	—	—	—	.6	—	—	.1	—	.7	.5
Quartz	—	—	—	—	—	—	—	—	—	—	—	—	<.1	—	—	—	—	<.1	<.1
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.0	1.0	.7
Subtotal	92.6	2.1	5.4	—	—	—	—	25.3	—	1.0	—	1.0	9.3	—	—	6.7	1.0	144.4	100.0
Level 7, 99.25–99.20 m																			
Quartzite	—	—	9.0	—	—	—	19.9	—	—	—	—	.1	1.8	—	—	.7	—	31.5	25.5
Chert	—	—	26.2	—	—	—	3.8	41.5	—	—	—	—	12.3	—	—	4.9	—	88.7	71.9
Chalcedony	—	—	—	—	—	—	.3	—	—	—	—	—	.6	—	—	<.1	—	.9	.7
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	.4	—	—	.3	—	.7	.6
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.5	1.5	1.2
Subtotal	—	—	35.2	—	—	—	24	41.5	—	—	—	.1	15.1	—	—	5.9	1.5	123.3	99.9
Level 8, 99.20–99.10 m																			
Quartzite	—	—	9.5	—	—	—	—	2.1	—	—	—	.4	2.3	—	—	.4	—	14.7	8.9
Chert	—	23.9	33.9	—	—	—	17.1	39.8	—	—	—	2.2	21.4	—	—	9.7+	—	148	89.5
Chalcedony	—	—	—	—	—	—	—	.4	—	—	—	—	.4	—	—	<.1	—	.8	.5
Limestone	—	—	—	—	—	—	—	.4	—	—	—	—	.1	—	—	.1	—	.6+	.4
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.2+	1.2+	.7
Subtotal	—	23.9	43.4	—	—	—	17.1	42.7	—	—	—	2.6	24.2	—	—	10.2	1.2+	165.3	100.0

Table 5. Continued.

Raw Material	Flake Category by Size Grade																		
	G1					G2					G3								
	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 9, 99.10–99.00 m																			
Quartzite	—	—	17.0	—	—	—	—	3.1	—	—	—	—	1.3	—	—	.8	—	22.2	27.9
Chert	—	—	14.3	—	1.8	—	—	22.5	—	3.2	—	.6	6.8	—	—	4.5	—	53.7	67.5
Chalcedony	—	—	—	—	—	—	—	—	—	—	—	—	.2	—	—	—	—	.2	.3
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	.5	—	—	—	—	.5	.6
Quartz	—	—	—	—	—	—	—	1.3	—	—	—	—	.3	—	—	—	—	1.6	2.0
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	1.3	1.6
Subtotal	—	—	31.3	—	1.8	—	—	26.9	—	3.2	—	.6	9.1	—	—	5.3	1.3	79.5	99.9
Level 10, 99.00–98.90 m																			
Quartzite	—	—	—	—	—	—	—	1.1	—	.9	—	—	.2	—	—	.4	—	2.6	5.4
Chert	—	—	—	39.2	—	—	—	1.4	—	1.2	—	—	1.9	—	.2	1.1	—	45	93.2
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	<.1	—	.1	.2
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.6	.6	1.2
Subtotal	—	—	—	39.2	—	—	—	2.5	—	2.1	—	—	2.2	—	.2	1.5	.6	48.3	100.0
Level 10, 99.00–98.00 m[c]																			
Quartzite	—	—	—	—	—	—	—	.2	—	—	—	—	—	—	—	—	—	.2	2.2
Chert	—	2.7	—	—	—	—	—	5.5	—	—	—	—	.6	—	—	—	—	8.8	97.8
Subtotal	—	2.7	—	—	—	—	—	5.7	—	—	—	—	.6	—	—	—	—	9.0	100.0
Level 11, 99.00–98.90 m[b]																			
Chert	—	—	1.8	—	—	—	1.7	1.5	—	—	—	—	—	—	—	—	—	5.0	100.0
Level 11, 98.90–98.80 m[b]																			
Quartzite	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	.1	—	.2	13.3
Chert	—	—	—	—	—	—	—	.5	—	—	—	—	.3	—	—	.4	—	1.2	80.0
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.1	.1	6.7
Subtotal	—	—	—	—	—	—	—	.5	—	—	—	—	.4	—	—	.5	.1	1.5	100.0
Level 11, 98.88–98.80 m																			
Quartzite	—	—	8.1	—	—	—	—	.3	—	—	—	—	—	—	—	.1	—	8.5	20
Chert	—	14.3	—	—	3.2	—	.8	10.1	—	—	—	.3	3.1	—	—	.6	—	32.4	76.2
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.2	—	.2	.5
Quartz	—	—	1.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.4	3.3
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	<.1	0
Subtotal	—	14.3	9.5	—	3.2	—	.8	10.4	—	—	—	.3	3.1	—	—	.9	<.1	42.5	100.0

Table 5. Continued.

Raw Material	Flake Category by Size Grade																		
	G1					G2					G3								
	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	G5	Total	Percent
Level 12, 98.80–98.70 m																			
Quartzite	—	—	—	—	—	—	—	1.8	—	—	—	—	—	—	—	<.1	—	1.8	33.3
Chert	—	—	—	—	—	—	1.4	1.2	—	—	—	—	.4	—	—	.5	—	3.5	64.8
Chalcedony	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	.1	1.9
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	<.1	0
Subtotal	—	—	—	—	—	—	1.4	3.0	—	—	—	—	.4	—	—	.6	<.1	5.4	100.0
Level 13, 98.70–98.60 m																			
Quartzite	—	—	—	—	—	—	—	3.1	—	—	—	—	.7	—	—	—	—	3.8	51.4
Chert	—	—	—	—	—	—	—	2.6	—	—	—	—	1.0	—	—	—	—	3.6	48.6
Subtotal	—	—	—	—	—	—	—	5.7	—	—	—	—	1.7	—	—	—	—	7.4	100.0
Level 14, 98.60–98.50 m																			
Chert	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	.4	100.0
Level 15, 98.50–98.40 m																			
Chert	—	—	—	—	—	—	—	—	—	—	—	—	.3	—	—	—	—	.3	60
Limestone	—	—	—	—	—	—	—	—	—	—	—	—	.2	—	—	—	—	.2	40
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	.5	—	—	—	—	.5	100.0
Lower Horizon 14, 99.35–99.25 m																			
Quartzite	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	.1	—	.2	50
Chert	—	—	—	—	—	—	—	—	—	—	—	—	.2	—	—	<.1	—	.2	50
Unknown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	<.1	0
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	.3	—	—	.1	<.1	.4	100.0
Cut-fill channel																			
Chert	—	8.6	—	—	—	—	2.00	1.6	—	—	—	—	.3	—	—	.1	—	12.6	100.0

[a]Flake categories are P = primary flake, S = secondary flake, T = tertiary flake, I = inconclusive identification, BR = bifacial reduction flake.
[b]In some cases more than one set of elevations are given for the same level. This would appear to represent instances when an excavator overshot the elevation for that level in a particular portion of an excavation unit.
[c]Field notes (Alex 1987d) indicate elevation in error.

Table 6. Summary of Debitage Counts and Weights for Raw Material Types by Flake Category[a].

	Flake Category by Size Grade																
	G1					G2					G3						
Raw Material	P	S	T	I	BR	P	S	T	I	BR	P	S	T	I	BR	G4	Total
Count																	
Quartzite	1	1	16	0	0	0	12	55	0	1	0	3	126	0	3	392	610
Chert	2	8	33	1	2	0	23	231	0	11	0	20	538	0	4	1440	2313
Chalcedony	0	0	0	0	0	0	2	7	0	0	0	0	11	0	0	7	27
Limestone	0	0	0	0	0	0	1	2	0	0	1	0	29	0	0	35	68
Quartz	0	0	2	0	0	0	0	1	0	0	0	0	3	0	0	4	10
Calcite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Shale	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
Total	3	9	51	1	2	0	38	296	0	12	1	23	708	0	7	1881	3032
Weight (g)																	
Quartzite	92.6	1.6	161.2	—	—	—	20.4	38.2	—	.9	—	.5	17.1	—	.6	11.0	344.1
Chert	11.7	50	115.6	39.2	5.0	—	37.7	188.0	—	7.9	—	4.3	76.5	—	.5	40.3	576.7
Chalcedony	—	—	—	—	—	—	.7	1.9	—	—	—	—	1.3	—	—	.1	4.0
Limestone	—	—	—	—	—	—	.4	2.7	—	—	.2	—	4.5	—	—	1.2	9.0
Quartz	—	—	43.1	—	—	—	—	1.3	—	—	—	—	.5	—	—	.3	45.2
Calcite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<.1	—
Shale	—	—	—	—	—	—	—	—	—	—	—	—	.1	—	—	<.1	.1
Total	104.3	51.6	319.9	39.2	5.0	—	59.2	232.1	—	8.8	.2	4.8	100	—	1.1	52.9	979.1

[a]Flake categories are P = primary flake, S = secondary flake, T = tertiary flake, I = inconclusive identification, BR = bifacial reduction flake.

Table 7. Size Grading of Debitage.

	Elevation (m)	Count[a] G1	G2	G3	G4	G5	Total	Weight (g)[a] G1	G2	G3	G4	G5	Total
Debitage by level or statum													
Level 2	99.80–99.70	0	2 (4)	4 (8)	29 (56)	17 (33)	52	—	.2 (14)	.4 (29)	.8 (57)	>.1 (0)	1.4
Level 3	99.70–99.60	0	0	5 (14)	19 (54)	11 (31)	35	—	—	.8 (67)	.4 (33)	>.1 (0)	1.2
Level 4	99.60–99.50	0	2 (2)	12 (12)	61 (64)	21 (22)	96	—	1.2 (28)	1.4 (33)	1.6 (37)	.1 (2)	4.3
Level 5	99.50–99.40	5 (1)	57 (6)	130 (14)	405 (44)	316[b] (35)	913	18.1 (21)	36.8 (42)	17.6 (20)	12.8 (15)	2.6 (3)	87.9
Level 6	99.40–99.25	5 (1)	32 (5)	76 (12)	304 (50)	195 (32)	612	100.1 (69)	26.3 (18)	10.3 (7)	6.7 (5)	1.0 (1)	144.4
Level 6	99.40–99.30	14 (3)	45 (10)	96 (22)	109 (25)	181 (41)	445	186.9 (76)	41.3 (17)	13.5 (5)	5.5 (2)	.8 (0)	248
Level 7	99.25–99.20	7 (1)	50 (7)	108 (15)	233 (33)	312 (44)	710	35.2 (29)	65.5 (53)	15.2 (12)	5.9 (5)	1.5 (1)	123.3
Level 8	99.20–99.10	18 (2)	64 (6)	165 (16)	394 (38)	392 (38)	1033	67.3 (41)	59.8 (36)	26.8 (16)	10.2 (6)	1.2 (1)	165.3
Level 9	99.10–99.00	7 (1)	44 (8)	77 (13)	183 (31)	271 (47)	582	33.1 (42)	30.1 (38)	9.7 (12)	5.3 (7)	1.3 (2)	79.5
Level 10	99.00–98.00	1 (8)	7 (58)	4 (33)	0	0	12	2.7 (30)	5.7 (63)	.6 (7)	—	—	9.0
Level 10	99.00–98.90	1 (0)	8 (4)	12 (6)	54 (26)	137 (65)	212	39.2 (81)	4.6 (51)	2.4 (26)	1.5 (3)	.6 (1)	48.3
Level 11	99.00–98.90	1 (33)	2 (67)	0	0	0	3	1.8 (36)	3.2 (64)	—	—	—	5.0
Level 11	98.90–98.80	0	1 (3)	4 (11)	17 (46)	15 (41)	37	—	.5 (33)	.4 (27)	.5 (33)	.1 (7)	1.5
Level 11	98.88–98.80	6 (7)	11 (13)	20 (23)	22 (25)	28 (32)	87	27 (64)	11.2 (26)	3.4 (8)	.9 (2)	<.1 (0)	42.5
Level 12	98.80–98.70	0	9 (12)	4 (6)	35 (49)	24 (33)	72	—	4.4 (81)	.4 (7)	.6 (11)	<.1 (0)	5.4
Level 13	98.70–98.60	0	8 (44)	10 (56)	0	0	18	—	5.7 (77)	1.7 (23)	—	—	7.4
Level 14	98.60–98.50	0	0	3(100)	0	0	3	—	—	.4(100)	—	<.1 (0)	.4
Level 15	98.50–98.40	0	0	4(100)	0	0	4	—	—	.5(100)	—	—	.5
Lower Horizon 14	99.35–99.25	0 0		3 (8)	12 (32)	22 (59)	37	—	—	.3 (75)	.1 (25)	—	.4
Cut-fill channel		1 (9)	4 (36)	2 (18)	4 (36)	0	11	8.6 (68)	3.6 (29)	.3 (2)	.1 (1)	—	12.6
Total		66	346	739	1881	1942[b]	4974	520.0	300.1	106.1	52.9	9.2+	988.3
Debitage by category													
Primary		3	0	1	—	—	4	104.3	—	.2			
Secondary		9	38	23	—	—	70	51.6	59.2	4.8	—	—	104.5
Tertiary		51	296	708	—	—	1055	319.9	232.1	100.0	—	—	115.6
Bifacial reduction		2	12	7	—	—	21	5.0	8.8	1.1	—	—	652.0
Inconclusive identification		1					1	39.2	—	—	—	—	14.9
Subtotal		66	346	739	—	—	1151	520.0	300.1	106.1	—	—	39.2
Total					1881	1942	4974				—	—	926.2

[a]Values in parenthesis are the percent of total for that level.
[b]Approximate count.

of small grade debitage lacking cortex at the Beaver Creek Shelter would lead to the interpretation that primary lithic artifact manufacture was not as important an activity as resharpening or maintenance during any prehistoric period, at least as represented in the area excavated. As Fahrenbach's (Appendix 2) assessment of the lithic sources utilized at the Beaver Creek Shelter indicates, all material could have been acquired from a few miles radius of the site. It may be that the primary stage of lithic manufacture was carried out at these locations. It is also possible that some products of this activity (i.e., primary flakes and cores) were discarded in front (north) of the shelter and have been removed by Beaver Creek.

Patterned Artifacts

The analysis of patterned artifacts from the Beaver Creek site (as described in the section on methodology) attempted to determine morphological, metrical and technological attributes as a means to (1) infer the processes related to both the production and use of such items and (2) identify potentially diagnostic types that might aid in the definition of cultural components at Beaver Creek and be comparable to those from other regional sites. All of the patterned lithic artifacts (n = 11) from the Beaver Creek site were bifaces that seem to have served a number of functions (Table 3). Five of these items are believed to have been projectile points (Catalog 1, WICA-1296; Catalog 3, WICA-1297; Catalog 8, WICA-1302; Catalog 4, WICA-1298; Catalog 5, WICA-1299), a number of which exhibit EUs that were reutilized for cutting, perforating, and/or possibly graving. Five are bifaces that also have EUs suggestive of various functions including cutting, boring or perforating, chopping, and possibly scraping. One item appears to be a preform. Table 3 summarizes the information on the patterned artifacts from the site including tentative taxonomic placement. Metrical attributes are listed in Appendix 1.

There are three lithic items which seem at this time to represent the earliest patterned items at the site. These are Catalog 1 (WICA-1296), a projectile point; Catalog 44 (WICA-1305), a biface fragment (a distal portion) that may also represent a projectile point; and Catalog 28 (WICA-1304), a basal portion of a large biface. In addition, the one antler artifact, Catalog 2 (WICA-1312), may also represent one of the earliest patterned items at the site, and Catalog 3 (WICA-1297) was also believed by Alex (1987c) to have a potentially early affiliation.

Catalog 1 (WICA-1296). This point is an elongate-bladed biface of white chert, with shallow side-notches set close to a slightly concave base. The blade edges from just above the notches to the break are parallel. The distal end is impact fractured transversely. The widest portion of the specimen is at the basal corners. The base is thinned but no grinding is evident. Basal corners are rounded and slightly diagonally positioned relative to the long axis of the artifact. The notches also appear dulled. The point is lenticular in cross section. The thickest portion is just above the center of the extant blade, thinning towards proximal and distal ends. Small, short flake scars are confined to the extreme margin of the blade, otherwise, flaking appears random. A fracture which extends onto one face of the specimen occurs on the lateral edge where it intersects the transverse break at the distal end of the tool. This has created a small notch on the tool edge near the distal end. A small, beaked projection occurs at the intersection of the notch with the transverse distal edge. Wear on this projection suggests possible use as a graver. The tip is slightly worn and rounded.

One edge of the transverse break appears worn and rounded. A small, thin semi-lunar flake scar extends 3.5 mm from

this rounded edge onto one face. Another flake scar occurs on the opposite face and extends from the edge of the transverse break 7 mm proximally, ending in a step fracture. Its removal has exposed the original compression rings from the bulb of applied force.

The lateral edges of the specimen on one side exhibit some step flaking that extends onto the face. The fractured distal end and adjoining damage to both faces appear to be the result of impact shock and subsequent snapping. The rounded margin and end of the transverse break and the rounding on the small projection may be evidence of secondary use. This item would appear to have been a projectile point that was reutilized after breakage had occurred. Several EUs exhibit use wear as described.

In overall morphology, metrical dimensions and even fracture pattern, this artifact compares favorably with those illustrated and described by Frison (1976) from the Hawken site. The metrical dimensions resemble those of the Hawken sample (Frison 1976:42). As the basal width of Catalog 1 from 39CU779 is wider than the blade, it may indicate as Frison has suggested for some of the examples from Hawken, that reworking of the point forward of the notches to restore functional utility had occurred (Frison 1976:45-56).

This point was found in 1986 in Horizon 15 (99.2-99.1 m) in XU 2-3S/0-1W. Field notes (Alex 1986) indicate that it may have been intruded into this level as result of recent channel filling.

Catalog 44 (WICA-1305). This specimen appears to be the distal portion of a rather broad, triangular chert biface which has broken diagonally, partially spalling away a portion of the ventral face. Flake scars appear random on both surfaces. Both lateral edges (where extant) exhibit regular retouch.

The distal tip has a small (probable) impact fracture which appears slightly rounded. The lateral margins exhibit considerable step fracturing on one side, particularly in the case of the longer, more complete edge. It may be that this edge was more heavily utilized once the item had broken.

This specimen was found in 1987 and is believed to have come from lower Horizon 14 in XU 3-4S/0-1W at an elevation of 99.27 m. Field notes (Alex 1987d:75) indicate that it occurred just southwest of Feature 87-5. The specimen is too incomplete to be of diagnostic value.

Catalog 28 (WICA-1304). This specimen appears to be a transversely fractured biface (basal portion ?) of fine-grained Inyan Kara quartzite, with an irregular flake scar pattern on both faces. The lateral edges appear to be expanding outward from the extant end of the flake. The lateral edges are somewhat sinuous. The lateral and basal edges appear rounded and worn. If this represents the basal portion of an artifact, it may be that these edges have been deliberately dulled, possibly for hafting. The specimen was found in 1987 in XU 2-3S/0-1W in Level 8 at an elevation of 99.2-99.1 m.

Catalog 2 (WICA-1312). This artifact is made from an antler tine of Odocoileus sp. (James E. Martin, personal communication 1989) which has been cut or snapped off from the main shaft (Figure 7). The proximal end was subsequently bifurcated into two relatively even segments which were rounded and smoothed at the ends. Polish occurs along most of the length of the dorsal surface of one of the segments beginning at the end. Polish is present on the dorsal surface of the other segment for only about half of its length. Cancellous bone is exposed at the tips of the segments and on their ventral surface. Very slight burning seems present at the terminal ends of the bifurcation on both sides of the artifact.

The distal tip is also rounded and smoothed and bears a small area of polish. What appear to be very fine, short, parallel

scratches occur at the tip, oriented perpendicular to the long axis of the tool. Use wear is also present at the tip in the form of small pitting on one edge. Use wear also occurs in the presence of shallow, linear to slightly diagonal scratches along one edge of the tine parallel to the long axis.

Five rows of short, parallel, incised lines oriented at a right angle to the long axis occur along the length of the artifact beginning just forward of the bifurcation and extending at a maximum of 47.3 mm. The largest number of incisions in any one row appear to be 17, the smallest number 6. These are regularly spaced with a maximum distance between any two of 3.7 mm and a minimum distance of about .6 mm. They vary in length from a maximum of about 7.5 mm to a minimum of about 1.8 mm.

Alex (1987c) originally suggested that this artifact may have functioned as a possible haft for a biface or scraper, and that the incisions if not decorative in function, may have been placed to help anchor the binding. Apparent use wear on other parts of the artifact suggest the possibility of other functions. No comparable artifact is known from other regional sites.

This artifact was found in the west wall of excavation unit 2-3S/0-1W at a depth of 99.1 m. It occurred in an unsorted gravel layer which apparently represents a filled channel cut.

Catalog 3 (WICA-1297). This point is an excurvate-bladed biface of Inyan Kara quartzite with broad, shallow corner notches, set diagonally to the long axis. The haft element (stem) contracts below the notches making it narrower in width than the blade. The widest part of the blade is just forward of the notches. Shoulders are distinct. The notches appear dulled. The basal edge is slightly convex and the basal corners slightly flared. The base is thinned. The point is lenticular in cross section. The thickest portion is on the blade just forward of the notches.

The point has fractured unevenly across the distal end. A shallow flake scar also extends onto one face of the specimen from the distal end terminating in an hinge fracture. A second, longitudinal sliver has broken along one lateral edge from just behind the distal tip for about one third the blade length. The distal tip of this fracture appears slightly rounded or worn as do the edges of the flake scar itself. Flake scars along the remaining length of this side are short, shallow, and extend fairly regularly from the extreme margin. The opposite edge of the tool displays considerable step flaking along its length. This occurs on the face of the item rather than at the extreme margin. The margin itself is very regular, possibly worn or dulled.

Use wear is suggested by impact fracture damage to the distal tip and adjoining lateral margin. Rounding of the distal tip and fractured edge suggests secondary utilization, perhaps as a result of use on soft materials (Tratebas 1985:64), following the breakage of what had been a projectile. This point was found in 1986 in XU 1-2S/0-1W at an elevation between 99.45-99.3 m. It would appear to have been intruded into this position as a result of relatively recent channel cutting and filling which occurred in Horizon 14.

As noted above, three of these artifacts (Catalog 1, WICA-1296; Catalog 44, WICA-1305; and Catalog 2, WICA-1312) may be associated with Horizon 15 although the possibility that they were intruded into this horizon cannot be dismissed. Catalog 44 (WICA-1305) would seem to occur at the basal portion of Horizon 14 (Lower Horizon 14) or possibly at the upper portion of Horizon 15 since it was noted just southwest of Feature F87-5 which seems to have intruded into Horizon 15. Horizon 15 represents a complex intermixture of anthropogenic material and includes a number of features such as Feature F87-5 (XU 3-4S/0-1W) which originated in the overlying Horizon 14, as well as features

F87-6 (later subdivided), F87-7 and F87-8 (XU 3-4S/0-1W) all of which were later judged to be part of a single large feature that extended into Horizon 17. Alex noted that a rodent disturbance near the center of XU 3-4S/0-1W had partially mixed Horizons 14 and 15, and it may be that the gravel deposits first recorded in Horizon 14 which represented episodes of flooding in the shelter, were responsible for the intrusion of some materials. Alex (1987c) cautioned that Catalog 1, 2 and 3 might represent intruded items. Although found in Horizon 14, Alex (1987c) suggested an Early Archaic affiliation for Catalog 3.

All of the radiocarbon dates from this Horizon and below represent ages of 5,000 B.P. and older. Alex suggested that Horizon 15 contained material representing the youngest Early Archaic component at the site. Early Plains Archaic components have been dated between 7,700-4,400 B.P. (Frison 1978:41) thus the carbon 14 evidence from Beaver Creek is in agreement with his hypothesis. In addition, the possible association of the Hawken-like projectile point (Catalog 1, WICA-1296) with this Horizon strengthens this argument. The diagnostic value of the distal biface fragment, Catalog 44 (WICA-1305) is less certain. Catalog 28 (WICA-1304), while not diagnostic itself, could represent an Early Archaic item, as could Catalog 2 (WICA-1312). Catalog 22 (WICA-1303), and Catalog 46 (WICA-1334) are also tentatively assigned to the Early Archaic horizon based on their stratigraphic location.

Catalog 22 (WICA-1303). This specimen is a bifacially worked flake of quartzite broken across the thickest portion of the flake. Flake scars are fairly broad (particularly on the ventral face) and random. The straight, broken edge runs the length of the flake and is unworked except where it intersects with the convex edge forming a narrow projection. The convex edge is sinuous and has been retouched along its length.

The edges of the narrow projection show use wear in the form of step flaking, rounding, and possible margin crushing. The convex edge likewise exhibits small nicks, step fractures and extreme margin crushing. This artifact is a good example of a flake that has more than one EU, and probably a compound function providing both a cutting edge and boring end. This specimen was found in 1987 in XU 2-3S/0-1W in Level 7 (99.25-99.2 m).

Catalog 46 (WICA-1334). This item is a large parallel-sided, chalcedony flake, obliquely fractured across the distal end. Flake scars are irregular, and cortex still exists on the platform end and a small portion of the dorsal surface. Questionable use wear in the form of step flaking is present along the lateral margins near the distal end. This artifact appears to represent a preform. It was found in XU 0-1S/0-1W at an elevation of 98.7 m.

The remaining patterned items at the site would seem to ally with the McKean Complex of the Middle Plains Archaic (Frison 1978) on the basis of stylistic grounds (Catalog 4, WICA-1298; Catalog 5, WICA-1299, and possibly Catalog 8, WICA-1302), due to their occurrence within levels/horizons containing artifacts believed diagnostic of that complex (Catalog 6, WICA-1300 and 7, WICA-1301), and/or because of associated radiocarbon evidence indicative of a Middle Archaic age.

Catalog 8 (WICA-1302). This artifact is an elongate, excurvate biface of quartzite with an irregular cross section through both axes due to reworking. The base is thinned and appears ground. The distal tip is intact, thin and pointed, although microscopic rounding is observed. Original flake scars appear to have been parallel but the specimen has been reworked on alternate edges producing beveling.

Lateral edges appear worn in the presence of slight rounding of the extreme margins. The distal tip is also slightly rounded

from use. If this item were a projectile point, it appears to have been reworked and served a secondary function perhaps as a graver or perforator.

This item was found in 1987 in XU 3-4S/0-1W at the top of Horizon 14 (99.6-99.45 m). Metrical dimensions and technological attributes fall within the range for the McKean lanceolate type (Wheeler 1952).

Catalog 4 (WICA-1298). This point is an elongate biface of quartzite, diagonally fractured across the distal end. The lateral margins are parallel but contract slightly across the proximal end. The base is notched and thinned by the removal of flakes from the proximal edge onto both faces. The edges of these flake scars form a smooth, relatively even juncture with the tool face. The basal edge and a portion of the proximal lateral edges (hafting element?) may be slightly dulled. One basal corner is diagonally fractured, the other is prominent.

The point is lenticular in cross-section, thin, with the thickest portion close to the proximal end. Flake scars are shallow and the pattern is irregularly oblique across the face of the point.

Use wear seems present in the transverse distal fracture and diagonal fracture of the basal corner, both possibly from impact. Small, step flaking occurs along both edges of the specimen just behind the extreme margins, the result of manufacture or use. One margin of the tool appears slightly more regular than the other. The item is assumed to have been a projectile point. No clear evidence for reuse of this item is present.

This artifact was found in 1987 in Upper Horizon 13 of XU 3-4S/0-1W an ashy, red silt and sand with an elevation of 99.72-99.54 m. Radiocarbon sample "A" was derived from this horizon.

This artifact would seem to ally stylistically with certain McKean type points although the metrical dimensions are smaller than those originally proposed by Wheeler (1952) for the type.

Catalog 7 (WICA-1301). This specimen is a large, thick, chert biface with sinuous, excurvate margins that narrow slightly to rounded, fractured ends. The thickest portion of the tool occurs along one side. Irregular flake scars are generally confined to the margins of both faces.

Use wear would appear present in edge crushing and fracturing on both ends. Step flaking and some crushing also occurs along both lateral edges. The lower third of the thicker edge may have been deliberately dulled or blunted. This item may have had several "heavy duty" functions including chopping, cutting, and scraping.

The artifact was found in 1987 in Upper Horizon 13 which had an elevation of 99.73-99.54 m, in XU 3-4S/0-1W.

Catalog 5 (WICA-1299). This point is a small, parallel-ovate specimen of chert with a concave proximal margin. The distal end is diagonally fractured. The basal edge expands slightly producing distinct basal tangs both of which exhibit very slight diagonal fractures. The base is thinned by the removal of short flakes which extend from the proximal edge onto both faces of the specimen. The edges of these flake scars form a smooth, relatively even juncture with the tool face. The basal margin seems dulled. The point is thickest about midsection. The flake pattern appears irregularly parallel to slightly oblique. Both lateral edges are rather irregular, and a longitudinal fracture along one edge has resulted in a flat flake scar on the extreme margin about midsection. Small areas of step flaking occur on both lateral margins. Use wear is also present in the diagonal fracture of the distal end and proximal tangs, possibly the result of impact. This item is assumed to have been a projectile point, possibly reworked.

The specimen was found in 1987 in

XU 3-4S/0-1W in Horizon 11, a red silt containing anthropogenic material, at an elevation of 99.97-99.86 m. It would seem stylistically similar to certain McKean type points.

Catalog 6 (WICA-1300). This artifact is a small, slightly plano-convex biface of Inyan Kara quartzite with a rounded proximal end. The distal tip is also rounded and worn and displays a shallow, diagonal fracture on its ventral face. This fracture also appears to have been subsequently worn. Short, parallel flake scars occur along all margins of the tool bifacially, but are more prominent on the dorsal surface. A small area of cortex exists on the lower third of the artifact on the dorsal face. Use wear seems particularly evident in the rounding and smoothing of the distal tip and adjacent surfaces and in the slight rounding of the extreme lateral margins along their entire length. Both the end and edges would appear to exhibit the type of use wear that results from their application to soft materials (Tratebas 1986:64). This artifact was discovered in 1985 in Horizon 11 in the vicinity of a hearth in XU 3-4S/0-1E, the first excavation unit opened at the site. The hearth (F85-1) was radiocarbon dated at 3,870 ± 70 B.P.

Modified Flakes

The flake tool assemblage from the Beaver Creek Shelter is represented by 28 modified flakes, most of which exhibit more than one EU on each item, suggesting composite tools. As stated previously, it was not always possible to determine if the flake scars on the EUs were the result of deliberate retouch or use.

Modified flakes were identified within the debitage extracted from soil samples removed from XU 2-3S/0-1W and came to light during its analysis (Figure 4). None were recognized from levels lying stratigraphically above Level 5 (99.4-99.5 m) (Table 8) Although it was not always possible to accurately correlate the arbitrary levels with the stratigraphic horizons in the shelter, it would appear that most, if not all of the modified flakes came from arbitrary levels associated with Horizons 15-16--the period of Early Archaic occupation. While the association of items from Level 5 is somewhat questionable, and Level 6 to a lesser extent, the fact that the highest incidence of these items occurs below these levels and drops off completely above them would suggest that they also come from the Early Archaic. The frequency of debitage shows a similar pattern. The significance of this is discussed below. A detailed description of the flake tool assemblage is included in Appendix 1. The vertical distribution of this class of artifact is provided in Table 8.

Overall, the entire modified flake tool assemblage from Beaver Creek exhibited minimal deliberate alteration of EUs, and this, primarily in the form of extreme edge retouch. Perhaps as Frison (1987:235) has suggested elsewhere, flakes of a desired size and shape were selected that required little further modification. Use wear alteration included light polish, rounding and smoothing, nicking, minute crushing, and step flaking. Tiny U-shaped notches or irregular nicks along the extreme margins were a common occurrence. As stated previously, most flakes exhibited more than one EU suggesting multiple functions on a single tool (Frison 1987:235). Frequently, both the platform end/edge and one or both lateral edges displayed use wear of more than one kind.

In order to gain some sense of the functional nature of the EUs on the flake assemblage, edge angles were measured. To this end the modified edge of the artifact was positioned on a piece of polar graph paper and the angle of retouch estimated. As others have cautioned (Frison 1987:235), for a variety of reasons, this is not always a straight forward process and should be taken as something of a best effort. Nevertheless, it

may provide one more line of evidence to suggest function.

The results suggest that for the sample as a whole, a slight bimodal distribution occurs with a higher frequency in both the 30° and 60°-70° ranges (Figure 9). Following the suggestions of more than one experienced lithic analyst (Frison 1987; Ahler 1975), this would seem to indicate that tools having discrete functions for both cutting (low angle) and scraping (high angle) are present. While the measurements suggest that some modified flakes served one or the other of these purposes, a number of specimens (Catalog 34, WICA-1330; Catalog 36, WICA-1336; and Catalog 40, WICA-1340) seem to reflect composite tools with both functions. This is supported by the general morphology and thickness of these items as well.

Although artifacts in this group are categorized as "modified flakes" because of their minimal patterning, there were a number whose morphology and deliberate modification of specific edges ally them more closely with patterned, functional types. These include what could be termed "end scrapers" (Catalog 15, WICA-1319; Catalog 16, WICA-1316; Catalog 38, WICA-1338; and Catalog 45, WICA-1333), "side-scrapers" (Catalog 23, WICA-1323; Catalog 29, WICA-1327; and Catalog 38, WICA-1338), and heavy duty cutting/scraping tools (Catalog 14, WICA-1318 and Catalog 35, WICA-1331). The decision to place these within the modified flake category was somewhat arbitrary and based largely on the degree of patterning or lack thereof.

Debitage

Debitage, or the unmodified flaking debris resulting from stone tool manufacture,

Table 8. Modified Flakes by Level.

Level	Elevation (m)	Count	Percent
Level 2	99.80–99.70	0	0.0
Level 3	99.70–99.60	0	0.0
Level 4	99.60–99.50	0	0.0
Level 5	99.50–99.40	3	10.7
Level 6	99.40–99.30	2	7.1
Level 6	99.40–99.25	2	7.1
Level 7	99.25–99.20	6	21.4
Level 8	99.20–99.10	8	28.6
Level 9	99.10–99.00	1	3.6
Cut/fill	99.00	1	3.6
Level 10	99.00–98.90	0	0.0
Level 10	99.00–98.80	0	0.0
Level 11	99.00–98.90	0	0.0
Level 11	98.90–98.80	0	0.0
Level 11	98.88–98.80	5	17.9
Level 12	98.80–98.70	0	0.0
Level 13	98.70–98.60	0	0.0
Level 14	98.60–98.50	0	0.0
Level 15	98.50–98.40	0	0.0
Lower Horizon 14	99.35–99.25	0	0.0
Total		28	100.0

repair, or resharpening, represents the largest class of artifactual remains from the Beaver Creek Shelter. A total of 4,974 individual flake items (988.3 g) or 99.2 percent of all chipped stone material (excluding shatter) was recovered and analyzed from a depth of 99.8 to 98.4 m which effectively spans the known range of horizons containing anthropogenic materials excluding that from the erosional remnant along the south wall of the shelter. One again there is a significantly higher per cent of debitage from levels probably associated with the Early Archaic occupation at the site. As stated previously, this sample largely consists of material recovered from water-screened matrix extracted from XU 2-3S/0-1W. Comparable amounts of debitage are expected from the remaining soil samples removed from the site.

As described in the section on methodology, this class of data was analyzed by size grading or mass analysis using a series of different size meshes in the initial sorting. Each grade was then weighed, counted, and for flakes in the G1-G3 range, sorted into four different categories (primary decortication, secondary, tertiary, bifacial reduction). Flakes in the G1-G4 range were identified as to raw material type (Tables 4-6, and 10). Once these data were tabulated by level, the vertical and horizontal distribution and frequency of different categories of debitage were examined in order to attempt to draw inferences about intra-site activities related to lithic production and use. Objectives here included an assessment of the relative importance of primary production as opposed to maintenance of lithic items, the location of possible knapping loci as suggested by flake clusters, and the determination of specific raw materials utilized in lithic production.

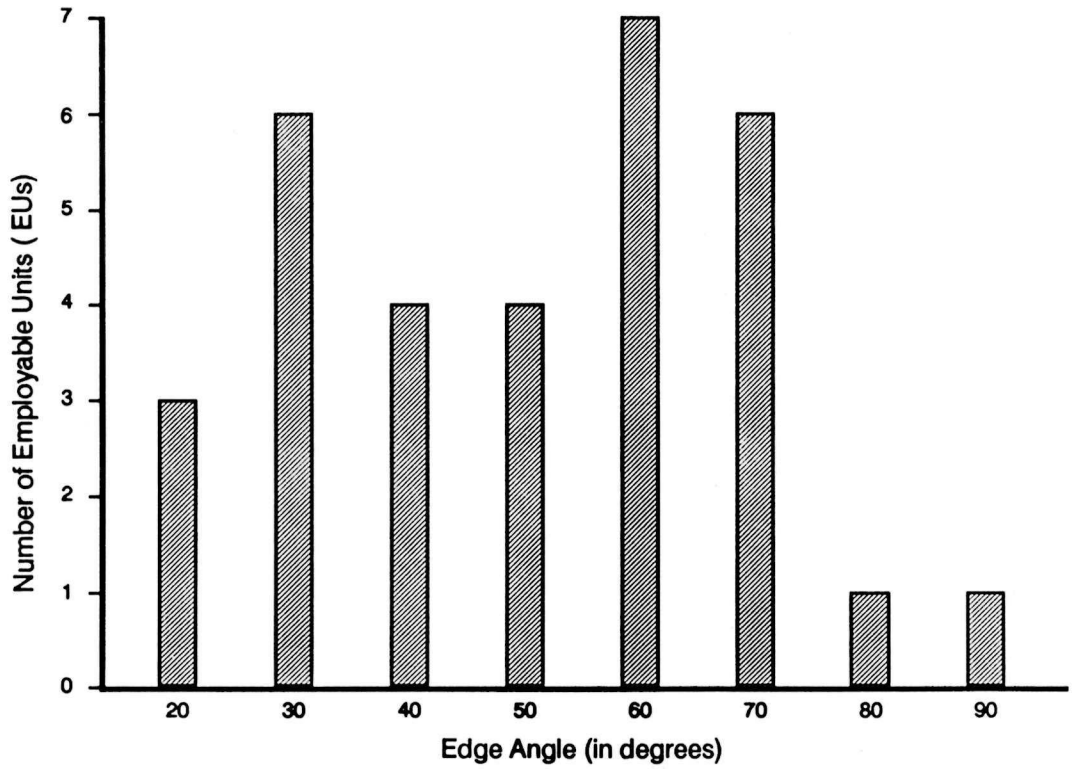

Figure 9. Angle of employable units (EUs) on modified flakes.

Table 9. Chert and Quartzite Modified Flakes and Debitage.

Level	Quartzite		Chert	
	Debitage	Modified flakes	Debitage	Modified flakes
Level 2	12	0	19	0
Level 3	1	0	23	0
Level 4	28	0	40	0
Level 5	249	1	324	2
Level 6	145	0	507	4
Level 7	47	1	333	5
Level 8	32	1	597	6
Level 9	45	0	260	1
Level 10	16	0	68	0
Level 11	8	0	73	0
Level 12	8	0	39	4
Level 13	8	0	10	0
Level 14	0	0	3	0
Level 15	0	0	2	0
Cut/fill	0	0	11	1
Lower Horizon 14	11	0	4	0
Total	610	3	2313	23

Table 10. Debitage and Shatter by Level.

Level	Elevation (m)	Debitage			Shatter		
		Weight (g)	Percent	Count	Weight (g)	Percent	Count
Level 2	99.80–99.70	1.4	.1	52	0.0	0.0	0
Level 3	99.70–99.60	1.2	.1	35	50.1	3.0	5
Level 4	99.60–99.50	4.3	.4	96	3.7	.2	1
Level 5	99.50–99.40	87.9	8.9	913	34.7	2.1	24
Level 6	99.40–99.25	144.4	14.6	612	518.3	31.4	23
Level 6	99.40–99.30	248.0	25.1	445	93.7	5.7	36
Level 7	99.25–99.20	123.3	12.5	710	133.8	8.1	19
Level 8	99.20–99.10	165.3	16.7	1033	294.9	17.8	29
Level 9	99.10–99.00	79.5	8.0	582	83.6	5.1	22
Level 10	99.00–98.90	48.3	4.9	212	102.5	6.2	15
Level 10	99.00–98.00	9.0	.9	12	186.6	11.3	11
Level 11	99.00–98.90	5.0	.5	3	14.5	.9	3
Level 11	98.90–98.80	1.5	.2	37	30.6	1.9	3
Level 11	98.88–98.80	42.5	4.3	87	54.5	3.3	9
Level 12	98.80–98.70	5.4	.5	72	8.5	.5	3
Level 13	98.70–98.60	7.4	.7	18	6.1	.4	7
Level 14	98.60–98.50	.4	.0	3	34.3	2.1	67
Level 15	98.50–98.40	.5	.1	4	2.0	.1	15
Cut/fill	99.00	12.6	1.3	11	0.0	.0	0
Lower Horizon 14	99.35–99.25	.4	.0	37	0.0	.0	0
Total		988.3	99.8	4974	1652.4	100.1	292

Shatter

A total of 1,652.4 g (or 292 individual pieces) of shatter were weighed and counted from the soil removed from XU 2-3S/0-1W (Table 9). As defined previously, shatter represents generally irregular, often angular or blocky stone debris that does not exhibit the attributes of a flake. As stated, some of this shatter does not have a "human" origin, but probably represents material resulting from natural processes in the rockshelter itself.

The shatter at 39CU779 ranged from large (G1 and larger) blocks to very small (G4 and G5) fragments. Although four specimens (described in Appendix 1) believed to be core fragments were recovered from soil samples, none of the remaining shatter is believed to represent core material, although it is possible that a portion could represent unmodified stone debris (non-debitage) (Hemmings 1987:435) resulting from the initial stages of tool manufacture.

A comparison of the quantity of debitage to shatter (Table 10) shows no strong correlation, although Levels 6, 8, and 11 which produced relatively substantial amounts of cultural remains also produced higher percentages of shatter than levels with fewer materials in general.

All of the shatter from the site represented the same local, raw material types as that found in the debitage with a higher percentage of limestone reflecting the composition of the site itself.

DISCUSSION

The ratio of debitage to worked material at a site and the relative percentage of different flake types of different size grades provides one way to assess the nature of lithic activities related to technology. At the Beaver Creek Shelter, the ratio of debitage to patterned items and modified flakes is high (12:1), indicating activities that produced relatively large amounts of flaking debris within the limited site area excavated. This would seem to suggest the presence of activities associated with the production and/or maintenance of stone artifacts. It might also be an indication, when viewed in light of other evidence, including an abundance of features such as hearths, and large quantities of ecofactual data (fauna and flora) of somewhat stable camps or workshops.

The ratio of small (G3-G5) flakes (n = 4,562) to larger (G1-G2) flakes (n = 412) is also high (11:1) for the excavated area sampled. Among the G3 grade, the smallest grade identified to flake type, tertiary flakes made up the overwhelming percentage (n = 708 or 95.8 percent). The large number of small debitage at the site, and the large percentage of tertiary flake material would tend to indicate that primary lithic production is not well represented by this sample. This would also seem to be supported in the low incidence of identified cores (n = 4), primary decortication flakes (n = 4 or .3 percent of total identified flake types), and of patterned items in general.

Following the suggestions of other researchers (i.e. Michlovic and Schneider 1988), it seems likely that the high percentage of small flakes without cortex at Beaver Creek indicates activities connected with later stages of lithic maintenance such as resharpening and reworking, rather than primary reduction and the early stages of artifact manufacture. If chipped stone tool production was important at this location, as could be inferred from the high frequency of debitage, then it seems to represent the later

stages in the manufacture and maintenance of items that were subsequently removed from the site.

Bifacial reduction flakes were identified in the sample (n = 21 or 1.8 percent) and others are believed to be present. Some of those seen at Beaver Creek likely represent flakes produced by the pressure technique. Core reduction flakes are represented in very low frequency, and those identified were selected for use as tools (see modified flake section in Appendix 1). Again, although the numbers are low, the relatively higher frequency of bifacial reduction flakes and lower frequency of core reduction flakes would support the hypothesis that lithic activities at the site centered around the later stages of production including bifacial reduction. This specific activity, however, would not seem to have been prevalent given the low incidence of bifacial reduction flakes and actual bifaces themselves.

A striking change was noticed in the flake assemblage throughout the sequence. Most, if not all, of the modified flake tools and a higher percentage of debitage were derived from levels lower in the sequence (Table 9). The majority of modified flake items as well as the debitage were recovered from soil samples taken in arbitrary 10-cm levels from XU 2-3S/0-1W. These arbitrary levels cross-cut the stratigraphic horizons at the site (Figures 4, 5). Vertical and horizontal provenience data were not sufficient to determine the exact location within each level (vertically) and across the excavation unit (horizontally) from which flakes were removed. However, it appears that Levels 7-15 correlate with Horizons 15-17, considered to represent the Early Archaic component. Although more difficult to determine Levels 5 and 6 may also be associated with Early Archaic horizons or with the transitional zone between the Early and Middle Archaic. Materials derived from Levels 1-4 are most probably of Middle Archaic affiliation. Modified flake items did not appear until Level 5. While this sample may not be representative of the site as a whole, the differences in the flake assemblage are considered significant and may suggest differential use of the shelter by Early and Middle Archaic residents. These implications are discussed below.

Two modified flake tools produced on blades occurred below elevation 99.2-99.1 m. The presence of small blades in the debitage was also observed and it may be worth reexamining this material to determine the prevalence of blades. Certainly a blade technology is documented in the Beaver Creek sample and in association with the Early Archaic component.

Chert was the preferred material type for the modified flake tool assemblage at the site (n = 23; 85.2 percent). Only 4 modified flake items of quartzite (14.3 percent) and 1 of chalcedony (3.7 percent) were identified. In contrast, 7 of the 11 patterned lithic artifacts were of quartzite, 3 of chert, and 1 of chalcedony (Table 3).

The higher frequency of chert among the modified flake assemblage correlates with the higher frequency of chert debitage in general (Table 9). Of the 3,032 G1-G4 flakes identified, n = 2,313 (76.3 percent) were of chert, n = 610 (20.1 percent) were of quartzite, n = 27 (.9 percent) of chalcedony and n = 68 (2.2 percent) of limestone, with minute amounts of other materials (Tables 5, 6). As the incidence of debitage increases in certain levels, so does the ratio of chert to quartzite. Once again this was particularly striking in the lower levels. In Levels 2-5, the ratio of quartzite (n = 290) to chert debitage (n = 406) is 1:1.4. In Levels 6-11 the percentage of chert increases dramatically (1:6) (n = 320 and 1,907). These patterns in the modified flake and debitage assemblage at the site may suggest that the Early Archaic residents were utilizing the shelter for knapping activities not only more frequently than their Middle Archaic counterparts, but also more frequently in the working of chert.

In the case of both chert and quartzite, G-4 flakes predominated (chert, n = 1,440 or

62.2 percent) (quartzite, n = 392 or 64.3 percent). This is believed to support the hypothesis that later stages of lithic production and maintenance are reflected in the site materials, again, predominantly associated with the early levels. The high incidence of chert and quartzite undoubtedly relates to the abundance of these materials in the immediate site area.

In addition to the higher percentages of flake materials in the lower levels, the presence of dense clusters of similar flaking debris was observed in specific levels. Levels 5-11 produced concentrations of flaking material believed to reflect specific knapping events or, at least, the discard locations of such events. The association among some of these clusters, other artifacts, and features provides the suggestion of particular activity areas at the site. It is recommended that such data as it exists in XU 3-4S/0-1W where 11 features were mapped in situ and more completely documented, be scrutinized in order to provide more concrete statements about specific activity areas throughout the sequence.

SUMMARY AND CONCLUSIONS

The Beaver Creek Shelter is composed of a stratified sequence of deposits containing the remains of human occupation throughout the Holocene that is unique to the Black Hills. The site provides an opportunity for studying the interrelationship between prehistoric cultural and paleoclimatic events over a 6,000-year time span. Although this is not intended as an exhaustive comparative treatment, given the level of prehistoric research in the Black Hills area, it now seems possible to test recent hypothesis proposed by others against the Beaver Creek data.

The Beaver Creek Site includes a sequence of occupations that represent multiple components from successive time periods as well as what appears to be a series of reoccupations by both Early and Middle Archaic residents. At least 17 stratified horizons containing human cultural remains dating between 2,000 and 6,000 years ago are present. All of the materials to date fall within the Archaic period. According to the most recent cultural/chronological scheme proposed for the northern Plains (Frison 1978), the analyzed materials from the site belong to the Early and Middle Archaic periods specifically. The most intense occupation as evidenced by features and superimposed living areas occurred during the Middle Archaic. The highest density of lithic remains is associated with Early Archaic levels.

Middle Archaic materials are represented by diagnostic projectile points (Catalog 4, WICA-1298; Catalog 5, WICA-1299; and Catalog 8, WICA-1302) of the McKean Complex and associated lithics, features, and ecofactual data found in Horizons 11 to and including part of Horizon 14. The radiocarbon dates from these horizons support such an interpretation.

The Early Archaic seems to be documented by lithics, features and ecofactual material and corresponding C-14 dates associated with Horizons 14 to 17. Although diagnostic projectile points found in these horizons are equivocal, a large side-notched form (Catalog 1, WICA-1296) appears to represent an Early Archaic type.

The upper horizons (1-10) at the shelter, known only from a small erosional remnant extant along the back (south) wall, have produced a small amount of lithic debris (unanalyzed to date) and no diagnostics. However, the radiometric evidence from these levels would suggest a Late Archaic assignment. Substantial deposits in the

unexcavated eastern portion of the shelter lie in a higher stratigraphic position than any others at the site and could contain materials more recent than those of the Late Archaic.

Although spanning a long time period, the site where excavated shows a continuity in use throughout its sequence. It appears that this location was occupied repeatedly on a seasonal basis throughout the Archaic for purposes related to hunting, food preparation, and tool maintenance. The location of the site, facing north, the presence of large quantities of charred seeds, the high incidence of small-sized hearths, and the presence of immature ungulates[1] would suggest warm season occupations.

The primary function of the site appears to have been related to hunting. This is suggested in the presence of projectile points and by the remains of game animals[2]. Post-hunt food preparation is likewise indicated by the faunal remains, by the predominance of small, fired features and the occasional deeper pit containing fire-fractured rock and bone, and by the lithic industry. Many of the lithic items exhibit EUs suggestive of a cutting function. The lack of true end scrapers in the assemblage would tend to indicate the absence of hide working. Some modified flakes do show EUs suggestive of scraping so perhaps this conclusion is premature. Others have EUs indicating functions related to boring or graving. On several of the patterned items wear suggestive of application to softer materials is implied. A large number of the modified flakes have edges bearing a series of small notches. While some of these would not qualify as true spokeshaves or small saws, it is possible that some function related to shaft preparation or application to wood is reflected.

The flake debitage from all levels points to knapping activities focused on the secondary and tertiary phases of tool manufacture and maintenance. The low incidence of cores and large cortical flakes, and the high incidence of very small tertiary flake material suggest that finishing, resharpening and maintenance of lithic implements predominated. Likewise the low tool to debitage ratio and the relatively high incidence of modified and utilized flakes with more than one EU characterize an expedient tool kit.

Throughout the sequence the source for lithic raw material was local, from the site area itself or the immediate environs. This again points out the expedient nature of the stone tool industry and perhaps the limited function of the site itself. It might also suggest local populations or groups very familiar with the site locality and its resources.

Very few examples of ground stone tools were identified among the Beaver Creek sample, although a number were known to exist on the surface of the site, and others seem to be documented in field records. The two identified include a possible milling stone from Feature 87-12, underlying Horizon 14, and a mano or hammerstone from a depth of 98.9-98.8 m in XU 0-1S/0-1W, also low in the sequence. The stratigraphic position of these items suggests an Early Archaic affiliation. It seems likely that other ground stone artifacts can be expected as feature material from the site is processed and examined.

In recent syntheses of Black Hills culture history, Cassells et al. (1984), Tratebas (1986) and Sundstrom (1989) examine in some detail the Archaic period and its position in northwestern Plains prehistory. The data from

1. Indicated be preliminary analysis.
2. Chiefly deer.

the Beaver Creek Shelter are particularly pertinent to hypotheses and research questions posed by these and other authors.

From the time that the Beaver Creek Site was recognized as containing both paleontological and archaeological components belonging to the early Holocene, its potential for testing the effects of climatic change on human occupation during the Altithermal was a major impetus to research at the site. The climatic intervals originally established by Antevs (1955) and Bryson et al. (1970) are encompassed in radiometrically dated deposits in the shelter (Martin et al. 1988). Although the paleoclimatic data from all levels are abundant, their evaluation is incomplete, and any characterization of Holocene climate based on Beaver Creek research must await the results. Nevertheless, archaeological data do allow some preliminary suggestions with regard to this important topic.

The shelter represents the first stratified site dating to the Altithermal in the Black Hills and confirms the presence of Early Archaic populations during this time period. This may support a long held hypothesis (Beckes and Keyser 1983; Benedict and Olson 1973, 1978; Frison 1973, 1975, 1976, 1978; Frison and Wilson 1975; Hurt 1966; Mulloy 1958; Wedel 1978) that the open Plains were largely abandoned by communal bison hunters during the initial phases of the Altithermal except in refuges along the eastern periphery and well watered areas such as the Black Hills (Sundstrom 1989:42). The location of the Beaver Creek site may have provided a more protected, better watered setting with favorable access to game animals for Early Archaic residents thus conforming to the notion of a refuge.

It has been suggested by a number of Plains researchers (Sundstrom 1989:43-44), that sites found in a mountain-foothills ecotone on the eastern slopes of the Rockies and its outliers such as the Black Hills and Big Horns, form a western Archaic complex. One pattern in this complex is represented by sites frequently situated on stream terraces or in rockshelters that produce subsistence evidence suggesting varied activities conducted on a seasonal basis. Such sites are believed to have developed out of late Paleo-Indian subsistence patterns occurring in high altitude areas. The simultaneous existence of a communal bison hunting/broad spectrum foraging pattern is suggested at sites elsewhere. The preliminary data from Beaver Creek would indicate its affiliation with the former pattern.

The higher density of Early Archaic sites in the mountain-foothills ecotone and the virtual absence of similar sites on the open Plains may reinforce the suggestion that the latter area was abandoned during the Altithermal. At the same time, it may be that deposits containing Early Archaic evidence on the open Plains have eroded. The paleoclimatic information from Beaver Creek has a direct bearing on this question and has the potential to establish the nature of the Altithermal in the southern Black Hills.

While the Beaver Creek Shelter contributes to the number of known sites of the Early Archaic in the Black Hills, the incidence of such sites is still extremely low (Sundstrom 1989:41). In lieu of the "refugium" hypotheses referred to above, just the opposite would be expected, and researchers have offered several possible explanations. Two methodological factors posed by Sundstrom (1989:45-49) are both supported and contradicted by the Beaver Creek data. Beaver Creek like other sites in the western Archaic complex represents a rockshelter location whose culture-bearing deposits were buried within considerable alluvium. The site's depositional and erosional history are the product of valley filling and downcutting. The exceptional nature of these processes in the region are only now beginning to be understood partially as a result of the Beaver Creek project. As Sundstrom maintains, Early Archaic components similarly situated are unlikely to be discovered except by chance erosion or

construction related activities. Erosion was responsible for exposing the deposits at Beaver Creek.

This same author contends that the low incidence of Early Archaic sites in the Black Hills may result from a failure on the part of archaeologists to recognize lanceolate point forms as local Early Archaic types rather than as members of terminal Paleo-Indian or Middle Archaic assemblages. She hypothesizes that Early Archaic points in the Black Hills were lanceolate varieties representing a direct transition from lanceolate Angostura-like to lanceolate McKean forms (Sundstrom 1989:46). According to this scheme, the more expected Early Archaic side-notched forms, typified by Bitterroot- or Hawken-like types, were introduced relatively late (ie. late Early Archaic or early Middle Archaic) in the Black Hills region (Sundstrom 1989:47).

At least one side-notched projectile point (Catalog 1, WICA-1296) was found in the Beaver Creek deposits in Horizon 15, believed to represent an Early Archaic component dating between 5,000-6,000 B.P. Although this artifact was recovered near an intrusive erosional channel making its context suspect (Alex 1987c), it would seem to conform to side-notched forms as known from the Hawken sites about 100 miles northwest of the Beaver Creek site on the Wyoming side of the Black Hills (Frison et al. 1976). Projectile points in a surface collection from the Andoni Site in the Black Hills were also reported (Tratebas 1986) to be similar to Early Archaic side-notched points such as Hawken. Should the side-notched form be confirmed as typical of the Early Archaic at Beaver Creek and other localities in the region, it would suggest the existence of the side-notched tradition at least alongside Sundstrom's postulated lanceolate tradition. No lanceolate point forms occurred within the Early Archaic horizons at Beaver Creek as a corollary type, although they predominate in successive horizons. Catalog 3 (WICA-1297) which Alex (1987b) believed might also date to the Early Archaic, is a large, corner-notched form.

The Early Archaic at Beaver Creek is similar to the Early Archaic as known from surface collections elsewhere in the Black Hills in reflecting warm season, hunting and knapping locations (Tratebas 1986; Sundstrom 1989). The density of lithic remains, the frequency of features and thickness of anthropogenic deposits would suggest fairly intense occupations by Early Archaic residents. Knapping activities in the Early Archaic component represent later-stage production, resharpening, and tool maintenance of locally available raw materials.

Until the subsistence data have been completely evaluated, it is impossible to reach conclusions about economic orientation at the site. However, preliminary identification of faunal and floral remains suggests that the pattern at Beaver Creek is unlike that reflected by the Hawken sites, the only other excavated Early Archaic components in the Black Hills region. Here, activities focusing on bison trapping and processing were documented (Frison et al. 1976). The animal bone at Beaver Creek is well preserved and very little bison has been identified. A broader range of resources including deer, small mammals, possibly fish, and plants seem to be in evidence. Thus it appears that the shelter had both a different function and subsistence base than Hawken. This may give support to the suggestion that two separate subsistence patterns occurred within the western complex of Archaic sites during this early period. At the same time, the similarity in projectile points between Beaver Creek and the Hawken sites could indicate that they represent seasonal locations of related populations.

If and when additional sites of the Early Archaic are found and excavated in the Black Hills region, it may be possible to delineate patterning in site location and function, as has been outlined for the Middle Archaic (Tratebas 1985 and 1986). Only then will it be

possible to attempt to define local Early Archaic traditions and populations.

Middle Archaic data from the Beaver Creek Shelter confirm a number of hypothesis suggested by other researchers and provides a unique body of information resulting from a stratified setting. The Middle Archaic represents the most intense period of occupation in the Black Hills as evidenced by sites of the McKean Complex. This complex is well represented in both surface collections and excavated sites throughout the region (Beckes and Keyser 1983; Keyser 1985; Keyser and Davis 1985; Keyser et al. 1984; Kornfeld and Todd 1985; Sundstrom 1989; Tratebas 1985, 1986 for recent discussions of the McKean in the Black Hills and vicinity). Not surprisingly, the Middle Archaic levels at Beaver Creek seem best interpreted as a series of reoccupations by McKean inhabitants. The projectile points found in Horizons 11 to 14 conform to the McKean lanceolate type (Wheeler 1952) or related forms.

The radiocarbon dates from Beaver Creek provide the first such sequence for a stratified archaeological site in the Black Hills. They suggest possible McKean occupation between 3,870 and 4,710 B.P. (Table 1). The earliest of these aligns with the earliest McKean dates from the Bighorn Mountains (Frison 1978:47, 53), and is earlier than others reported from North and South Dakota (Keyser and Davis 1985:125). Such chronological information taken within the context of a stratified sequence has the potential to aid an understanding of local McKean cultural development.

In many respects the Middle Archaic horizons at Beaver Creek suggest a continuation in the way of life established during the Early Archaic (Alex 1987b). Preliminary analysis of ecofactual data and archaeological evidence point to warm season occupations by people engaged in activities related to hunting and food processing. The large number of features and superimposed living areas are also similar to those documented in the Early Archaic horizons, and suggest fairly intense occupations. The use of immediately available lithic raw materials is a pattern repeated throughout the site's history.

The greatest differences documented thus far, appear to be in the change in artifact styles, chiefly projectile points, and the limited evidence for the use of flake tools and for lithic production in general. The McKean component at Beaver Creek reflects the presence of the lanceolate point form which is believed to be derived from lanceolate Plano forms such as Angostura (Sundstrom 1989:46) and not from Early Archaic side-notched varieties such as Hawken. If it can be demonstrated that a change in projectile point form equals a change in population, something highly questionable at present, then the evidence from Beaver Creek would suggest a new element in the southern Black Hills region by Middle Archaic times. The continuity in other lines of evidence at the site, however, seems to contradict this.

The very few examples of modified flake tools and the low frequency of debitage associated with the Middle Archaic component is in contrast to the Early Archaic situation, and would indicate that site function may have been reduced during Middle Archaic times. While pre-hunt weapon preparation and post-hunt food processing continues to be reflected by Middle Archaic horizons, other activities are less in evidence. Debitage as it exists would seem to indicate resharpening and maintenance of items brought to the site.

Tratebas (1985, 1986) has presented a substantive argument for patterning in McKean occupations in the Black Hills. Her research suggests differences in site function and location in two major zones: the heavily wooded, higher elevation interior, and the sandstone Hogback on the southern periphery. The Beaver Creek Site is in the interior where the heaviest occupation occurred during the McKean (Tratebas

1985:138). The shelter would appear to conform most closely to a residence type found in this region at sites concentrated at low discharge springs. Assemblages reflect hunting, post-hunt food processing, and tool maintenance as primary activities. There is little evidence of primary tool production, preforms were brought in as part of a mobile tool kit, and the high incidence of resharpening flakes indicate tool repair but not replacement. End scrapers are not in evidence, nor are grinding stones. Tratebas (1985:135-140) suggests that the limited number of activities inferred at such locations and the small size of sites indicates restricted numbers of occupants, not multiple groups or families. No sites of this pattern were reported to have been excavated. The Middle Archaic levels at Beaver Creek may provide the first excavated evidence of a site of this pattern.

The low frequency of grinding stones at Beaver Creek and other evidence of its warm season occupation may reinforce Tratebas' contention that grinding stones are a major feature only in the assemblages from hypothesized winter camps. The long-held correlation between grinding stones and McKean assemblages as a reflection of wider spread plant utilization in the Archaic appears to be more complicated than first thought (Kornfeld and Todd 1985). It now appears that grinding stones are not a standard complement of all McKean sites. The absence of non-local lithics at Beaver Creek is in contrast to Tratebas' contention that interior McKean sites exhibit the highest incidence of exotic lithics for any prehistoric time period. This may reflect the limited lithic activity indicated in the Middle Archaic levels in general.

At this time the McKean occupation as known from the Beaver Creek Site reflects what might be viewed as one aspect of a broader subsistence-settlement system. The limited number of activities, the tentative evidence for a seasonal occupation, and the emphasis on immediate raw materials for lithic utilization, would indicate the site was repeatedly (and possibly frequently) inhabited by McKean residents who left evidence of other aspects of their cultural system at Black Hills sites elsewhere. Given the prevalence of McKean sites in the Black Hills and the greater level of chronological control derived from the increasing number of dated sites, it would now seem possible to conduct detailed comparisons between McKean collections with the goal of defining local traditions, and delineating the nature of specific aspects of the cultural systems. Toward these goals the Beaver Creek Shelter could serve as an important baseline.

REFERENCES CITED

Abbott, Jane P.
1989 *The Paleoecology of the Late and Post-Archaic Section of the Beaver Creek Shelter (39CU779), Wind Cave National Park, Custer County, South Dakota.* Unpublished Master's thesis. Department of Geology, South Dakota School of Mines and Technology, Rapid City.

Ahler, Stanley A.
1971 *Projectile Point Form and Function at Rodgers Shelter, Missouri.* Missouri Archaeological Society Research Series, No. 8., edited by W. Raymond Wood. Columbia.

1975 *Pattern and Variability in Extended Coalescent Lithic Technology.* Unpublished Ph.D. dissertation. Department of Anthropology, University of Missouri, Columbia.

1977 *Archaeological Reconnaissance and Test Excavations at the Jake White Bull Site, (39CO6), Oahe Reservoir, South Dakota.* Department of Anthropology and Archaeology, University of North Dakota, Grand Forks. Submitted to the U.S. Army Corps of Engineers, Omaha District, Nebraska.

1979 Functional Analysis of Non-obsidian Chipped Stone Artifacts: Terms, Variables and Quantification. In *Lithic Use-Wear Analysis*, edited by Brian Hayden, pp. 301-328. Academic Press, New York.

Ahler, Stanley A., and Robert C. Christensen
1983 *A Pilot Study of Knife River Flint Procurement and Reduction at Site 32DU508, A Quarry and Workshop Location in Dunn County, North Dakota.* Department of Anthropology and Archaeology, University of North Dakota, Grand Forks. Submitted to the Dickinson Office, Bureau of Land Management and the State Historical Society of North Dakota, Bismark

Alex, Robert A.
1986 Field notes on file. South Dakota Archaeological Research Center, Rapid City.

1987a Letter to Lorraine Mintzmeyer, Regional Director, Rocky Mountain Regional Office, National Park Service, Denver, Colorado. Ms on file. South Dakota Archaeological Research Center, Rapid City.

1987b National Register of Historic Places Registration Form. U.S. Department of the Interior, National Park Service. Ms on file. National Park Service, Denver.

1987c Progress Report on Excavations at the Beaver Creek Shelter, 39CU779. Ms on file. National Park Service, Denver.

1987d Field notes on file. South Dakota Archaeological Research Center, Rapid City.

1988 *Excavation of the Beaver Creek Shelter (Archaeological Site 39CU779).* Investigators Annual Report. U.S. Department of the Interior, National Park Service, Denver.

Alex, Robert A., and James E. Martin
1986 Potential Importance of Three Recorded Western South Dakota Sites. *Program and Abstracts*, pp. 21-22. 44th Annual Plains Conference, Denver.

Antevs, Ernst
1955 Geologic-Climate Dating in the West. *American Antiquity* 20:317-335.

Ashmore, Wendy, and Robert J. Sharer
1988 *Discovering Our Past*. Mayfield Publishing, Mountain View, California.

Beckes, Michael R., and James D. Keyser
1983 *The Prehistory of the Custer National Forest: An Overview*. U.S. Department of Agriculture, Forest Service, Custer National Forest. Billings, Montana.

Benedict, James B.
1981 *The Fourth of July Valley: Glacial Geology and Archaeology of the Timberline Ecotone*. Center for Mountain Archaeology Research Reports, 2. Ward, Colorado.

Benedict, James B. and Bryon L. Olson
1973 Origin of the McKean Complex: Evidence from Timberline. *Plains Anthropologist* 18:323-327.

1978 The Mount Albion Complex: A Study of Prehistoric Man and the Altithermal. *Center for Mountain Archaeology Research Reports, 1*. Ward, Colorado.

Benton, Rachel C.
1990 The Paleoecology of the Early and Middle Archaic Section of the Beaver Creek Rock Shelter (39CU779), Wind Cave National Park, Custer County, South Dakota. Ms. in possession of author.

Binford, Lewis R.
1963 A Proposed Attribute List for the Description and Classification of Projectile Points. In *Miscellaneous Studies in Typology and Classification*, pp. 193-221. Anthropological Papers, No. 19. Museum of Anthropology, University of Michigan, Ann Arbor.

Bryson, Reid A., David A. Baerreis, and Wayne M. Wendland
1970 The Character of Late-Glacial and Post-Glacial Climatic Changes. In *Pleistocene and Recent Environments of the Central Great Plains*, edited by Wakefield Dort Jr. and J. Knox Jones, pp. 53-74. Special Publication No. 3. Department of Geology, University of Kansas.

Cassells, E. Steve, David B. Miller, and Paul V. Miller
1984 *Paha Sapa: A Cultural Resources Overview of the Black Hills National Forest, South Dakota and Wyoming*. U.S. Department of Agriculture, Forest Service, Custer, South Dakota.

Crabtree, Donald E.
1972 *An Introduction to Flintworking*. Occasional Papers of the Idaho State University Museum, No. 28. Pocatello.

Frison, George C.
1973 Early Period Marginal Cultural Groups on the Plains. *Plains Anthropologist* 25:27-46..

1975 Mans Interaction with Holocene Environments on the Plains. *Quaternary Research 5*: 298-300.

1976 The Chronology of Paleo-Indian and Altithermal Cultures in the Bighorn Basin, Wyoming. In *Cultural Change and Continuity: Essays in Honor of James Bennett Griffin*, edited by Charles E. Cleland, pp. Academic Press, New York.

1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Frison, George C., and Lawrence C. Todd (editors)
1987 *The Horner Site: The Type Site of the Cody Cultural Complex*. Academic Press, New York.

Frison, George C., and Michael Wilson
1975 *An Introduction to Bighorn Basin Archaeology*. Wyoming Geological Association Guidebook, 27th Annual Field Conference. City, State

Frison, George C., Michael Wilson, and Diane J. Wilson
1976 Fossil Bison and Artifacts from an Early Altithermal Period Arroyo Trap in Wyoming. *American Antiquity 4*:28-57.

Geological Society of America
1984 Rock Color Chart. Geological Society of America, Boulder, Colorado.

Hemmings, E. Thomas
1987 The Horner Site Debitage. In *The Horner Site: The Type Site of the Cody Cultural Complex*, edited by George C. Frison and Lawrence C. Todd, pp. 435-442. Academic Press, New York.

Hurt, Wesley R.
1966 The Altithermal and the Prehistory of the Northern Plains. *Quaternia* 8:101-113.

Keyser, James D.
1985 The Archaeological Identification of Local Populations: A Case Study from the Northwestern Plains. *Plains Anthropologist* 30:85-102.

1986 The Evidence for McKean Complex Plant Utilization. *Plains Anthropologist* 31:225-235.

Keyser, James D., and Carl M. Davis
1985 Lightening Spring and Red Fox: McKean Research in the Grand River Drainage. In *McKean/Middle Archaic: Current Research*, edited by Marcel Kornfeld and Lawrence C. Todd, pp. 123-136. Occasional Papers on Wyoming Archaeology, No. 4. Laramie.

Keyser, James D., Carl M. Davis, Robert A. Alex, Therese Chevance, and Thomas W. Haberman.
1984 Lightening Spring: 4000 Years of Pine Parkland Prehistory. *Archaeology in Montana* 25(2-3):1-64.

Knudson, Ruthann
1979 Inference and Imposition in Lithic Analysis. In *Lithic Use-Wear Analysis*, edited by Brian Hayden. pp: 269-281. Academic Press, New York.

1983 *Organizational Variability in Late Paleo-Indian Assemblages*. Reports of Investigations, No. 60. Laboratory of Anthropology, Washington State University, Pullman.

Kornfeld, Marcel, and Lawrence C. Todd (editors)
1985 McKean/Middle Plains Archaic: Current Research. *Occasional Papers on Wyoming Archaeology, No. 4*. Laramie.

Martin, James E., and Jane P. Abbott
1986 New Discovery of an Archaeological and Paleontological Site in Wind Cave National Park, South Dakota. *South Dakota Academy of Sciences* 65:28-30.

Martin, James E., and Robert A. Alex
1987a Investigations of the First Stratified Holocene Succession in the Black Hills. Project Proposal Abstract for a faculty research grant, South Dakota School of Mines and Technology. Ms. on file. Museum of Geology, South Dakota School of Mines and Technology, Rapid City.

1987b A Holocene Succession from Wind Cave National Park, Black Hills, South Dakota. Abstract of Papers. *Journal of Vertebrate Paleontology* 7(3) Suppl:20A.

1987c Prehistory of Wind Cave National Park. *Investigators Annual Report*. U.S. Department of the Interior, National Park Service. Ms. on file. National Park Service, Denver.

n.d. Investigations of the Beaver Creek Shelter, Wind Cave National Park. Ms. on file. National Park Service, Denver.

Martin, James E., Robert A. Alex, and Rachel C. Benton
1988 Chronology of the Beaver Creek Shelter, Wind Cave National Park, South Dakota. *Proceedings of the North Dakota Academy of Sciences* 46:16.

Michlovic, Michael, and Fred Schneider
1988 *The Archaeology of the Shea Site, 32CS101*. Moorehead State University, Moorehead Minnesota. Submitted to the State Historical Society of North Dakota, Bismark.

Miller, Louise
1989 The Beaver Creek Site, Preliminary Faunal List, 100.0-99.5 Meter Interval. Ms. on file. Museum of Geology, South Dakota School of Mines and Technology, Rapid City.

Montet-White, Anta
1963 Analytic Description of the Chipped Stone Industry from Snyders Site, Calhoun County, Illinois. In *Miscellaneous Studies in Typology and Classification*, pp. 1-70. Anthropological Papers, No. 19. Museum of Anthropology, University of Michigan, Ann Arbor.

Mulloy, William T.
1958 *A Preliminary Historical Outline for the Northwestern Plains*. University of Wyoming Publications in Science, 22(1). Laramie.

Patterson, L. W.
1980 *The Owen Site, 41HR315: A Long Occupation Sequence in Harris County, Texas. Report No. 3*. Houston Archeological Society, Houston.

Picha, Paul R., and Michael L. Gregg
1987 Chipped Stone Flaking Debris from the Naze Site. In *Archaeological Excavation at the Naze Site (32SN246)*, edited by Michael L. Gregg, pp. 184-230. Department of Anthropology and Archaeology, University of North Dakota, Grand Forks. Prepared for the U.S. Department of Reclamation, Missouri Basin Region, Billings, Montana.

Roberts, William L., and G. Rapp, Jr.
1965 *Mineralogy of the Black Hills*. Bulletin No. 18. South Dakota School of Mines and Technology, Rapid City.

Robinson, Stephen W.
1898 The Probabilistic Calibration of Radiocarbon Ages. Paper presented at the 54th Annual Meeting of the Society for American Archaeology, Atlanta.

Schneider, Fred
1977 Debitage Analysis. In *Archaeological Investigations of the Hendrickson III Site, 32SN403, LaMore-Oakes Project Area, Garrison Diversion Units, North Dakota*, by K. Good, J. Dahlberg, T. Larson, B. Benz, and Fred. Schneider. pp. 79-106. Department of Anthropology and Archaeology, University of North Dakota, Grand Forks. Submitted to the U.S. Bureau of Reclamation, Billings, Montana.

Sinkankas, J.
1964 *Mineralogy*. Van Nostrand Reinhold, Cincinnati, Ohio.

Stuiver, Minze, and Gordon W. Pearson
1986 High-Precision Calibration of the Radiocarbon Time Scale, A.D. 1950-500 B.C. *Radiocarbon* 28:805-838.

Sundstrom, Linea
1989 Culture History of the Black Hills with Reference to Adjacent Areas of the Northern Great Plains. *Reprints in Anthropology* 40. J. & L. Reprint, Lincoln, Nebraska

Toom, Dennis L.
1983 Chipped Stone Flaking Debris. In *Archaeological Excavations at the Mondrian Tree Site (32MZ258), McKenzie County, North Dakota*, edited by Dennis L. Toom and Michael L. Gregg, pp. 11.1-11.93. Department of Anthropology and Archaeology, University of North Dakota, Grand Forks. Submitted to the Northern Border Pipeline Co., Omaha, Nebraska.

Tratebas, Alice M.
1985 McKean Settlement Patterns in the Black Hills: Suggestions for Future Research. In *McKean/Middle Plains Archaic: Current Research*, edited by Marcel Kornfeld and Lawrence C. Todd, pp: 137-145. Occasional Papers on Wyoming Archaeology, No. 4. Office of the Wyoming State Archaeologist and the Wyoming Recreation Commission, Laramie.

1986 *Black Hills Settlement Patterns: Based on a Functional Approach*. Unpublished Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington.

Tratebas, Alice M., and Kristi Vagstad
1979 *Archaeological Test Excavations of Four Sites in the Black Hills National Forest, South Dakota*. Contract Investigation Series, No. 6. South Dakota Archaeological Research Center, Ft. Meade.

Wedel, Waldo
1978 The Prehistoric Plains. In *Ancient Native Americans*, edited by Jesse D. Jennings, pp. +. W. H. Freeman, San Francisco

Wheeler, Richard P.
1952 A Note on the "McKean Lanceolate Point." *Plains Archaeological Conference Newsletter* 4(4): 39-44.

APPENDICES

Appendix 1

Artifacts

Patterned Artifacts

PROJECTILE POINTS AND BIFACES

Specimen: projectile point

Catalog number: 1 (WICA-1296)
Provenience: XU 2–3S/0–1W, Horizon 15, 99.20–99.10 m
Specifications:
Total maximum length: 27.6 mm (specimen incomplete)
Blade length: 19.7 mm (incomplete)
Maximum width: 18.4 (base)
Maximum base width 16.6 mm
Midpoint width: 14.6 mm
Basal contact width: 14.7 mm
Width at notches (neck width or distal haft element width): 13.8 mm
Notch depth: 1.6 mm / 1.0 mm
Notch width at orifice: 3.6 mm / 4.0 mm
Distal haft element length: 6.5 mm
Blade base width: 16.3 mm
Maximum width length: 13.2 mm
Maximum thickness: 4.8 mm
Maximum thickness length: 22.5 mm
Basal dulling width: 14.6 mm
Lateral haft element dulling length: 3.7 mm / 4.1 mm
Basal thinning length: 7.8 mm
Weight: 3.1 g
Transverse section: biconvex
Longitudinal section: probably slightly biconvex (distal end fractured)
Material type and color: chert, pinkish gray (5YR8/1)
Blade outline: probably parallel-ovate (distal end fractured)
Proximal haft element width: 14.1 mm
Proximal haft element length: —
Flake pattern: random
Edge angle: 40°–50°

Specimen: projectile point

Catalog number: 3 (WICA-1297)
Provenience: XU 1–2S/0–1W, Horizon 14, within cut and fill channel, 99.45–99.30 m
Specifications:
Total maximum length: 35.4 mm (specimen incomplete)
Blade length: 27.5 mm
Maximum width: 17.3 mm
Midpoint width: 17.1 mm
Basal contact width: —
Width at notches (neck width or distal haft element width): 9.3 mm
Notch depth: 2.3 mm / 2.3 mm
Notch width at orifice: 5.6 mm / 5.8 mm
Distal haft element length: 5.4 mm
Blade base width: 17 mm
Maximum width length: 12.4 mm
Maximum thickness: 6.5 mm
Maximum thickness length: 6.3 mm
Basal dulling width: 12.9 mm
Lateral haft element dulling length: 5.6 mm / 5.8 mm
Basal thinning length: 6.1 mm
Weight: 4 g
Transverse section: biconvex
Longitudinal section: biconvex
Material type and color: quartzite, grayish orange pink (5YR7/2)
Blade outline: ovate (distal end fractured)
Proximal haft element width: 13 mm
Proximal haft element length: 1.8 mm
Edge angle: 60°

Specimen: projectile point

Catalog number: 4 (WICA-1298)
Provenience: XU 3–4S/0–1W, Upper Horizon 13, 99.73–99.54 m
Specifications:
Total maximum length: 31.5 mm
Blade length: —
Maximum width: 12.7 mm
Midpoint width: 12.5 mm
Basal contact width: one lateral basal corner fractured, the other slightly fractured
Width at notches (neck width or distal haft element width): —
Notch depth: —
Distal haft element length: 5.8 mm (?)
Blade base width: —
Maximum width length: —
Maximum thickness: —
Maximum thickness length: —
Basal dulling width: —
Lateral haft element dulling length: —
Basal thinning length: 3 mm
Weight: 2.2 g
Transverse section: biconvex
Longitudinal section: biplano
Material type and color: quartzite, pale yellowish brown (10YR6/2)

Blade outline: probably parallel ovate (distal tip fractured)
Proximal haft element width: —
Proximal haft element length: —
Edge angle: 35°

Specimen: projectile point

Catalog number: 5 (WICA-1299)
Provenience: XU 3–4S/0–1W, Horizon 11, 99.97–99.86 m
Specifications:
Total maximum length: 28.2 mm (specimen incomplete)
Maximum width: 11.5 mm
Midpoint width: 5.5 mm
Basal contact width: 9.2 mm
Width at notches (neck width or distal haft element width): 9.6 mm
Notch depth: —
Notch width at orifice: —
Distal haft element length: 6.5 mm
Blade base width: 10.9 mm
Maximum width length: 20 mm
Maximum thickness: 5.5 mm
Maximum thickness length: 14.4 mm
Basal dulling width:
Lateral haft element dulling length:
Basal thinning length: 2.3 mm
Weight: 2.2 g
Transverse section: biplano
Longitudinal section: biconvex
Material type and color: Chert, variable white (N9), light gray (N7) to pale purple (5P6/2)
Blade outline: probably parallel ovate
Proximal haft element width: 10.3 mm
Proximal haft element length: .3 mm
Edge angle: 35°

Specimen: biface

Catalog number: 6 (WICA-1300)
Provenience: XU 3–4S/0–1E, Horizon 11
Specifications:
Total maximum length: 54 mm
Blade length: 54 mm
Maximum width: 22.1 mm
Midpoint width: 21.5 mm
Basal contact width: —
Maximum width length: 20.2 mm
Maximum thickness: 8.2 mm
Maximum thickness length: 21.1 mm
Basal dulling width: —
Lateral haft element dulling length:
Basal thinning length: 6.8 mm
Weight: 10.6 g
Transverse section: plano-convex
Longitudinal section: asymmetrically ovate
Material type and color: quartzite, grayish orange pink (5YR 7/2) to pale yellowish brown (10YR6/2)
Blade outline: excurvate

Specimen: biface

Catalog number: 7 (WICA-1301)
Provenience: XU 3–4S/0–1W, Upper Horizon 13, 99.73–99.54
Specifications:
Total maximum length: 95.5 mm
Blade length: 95.5 mm
Maximum width: 46.6 mm
Midpoint width: 46.4 mm
Maximum thickness: 15.5 mm
Weight: 83.4 g
Transverse section: irregularly plano-convex
Longitudinal section: irregularly plano-convex
Material type and color: chert, pale brown (5YR5/2)
Blade outline: excurvate
Edge angle: 40°(thin edge), 70°–80° (thick edge)

Specimen: projectile point

Catalog number: 8 (WICA-1302)
Provenience: XU 3–4S/0–1W, top of Horizon 14, 99.60–99.45 m
Specifications:
Total maximum length: 58.9 mm
Blade length: 58.9 mm
Maximum width: 16.7 mm
Midpoint width: 14.6 mm
Maximum thickness: —
Basal contact width: 7.9 mm
Distal haft element width: 15.5 mm
Distal haft element length: 13.6
Blade base width: 15.2 mm
Maximum width length: 18.9 mm
Basal dulling width: 7 mm
Lateral haft element dulling length:
Basal thinning length: 3.6 mm
Weight: 6.1 g
Transverse section: plano-convex
Longitudinal section: irregular, approaches concavo-convex
Material type and color: quartzite, blackish red (5R2/2)
Blade outline: excurvate
Proximal haft element width: 12.8 mm
Proximal haft element length: 2.1 mm
Edge angle: 40°

Specimen: bifacially worked flake

Catalog number: 22 (WICA-1303)
Provenience: XU 2–3S/0–1W, Level 7, 99.25–99.2 m
Specifications:
Length: 64.7 mm
Maximum width: 31.5 mm
Maximum thickness: 15.3 mm
Weight: 25.7 mm
Transverse section: irregularly biplano
Longitudinal section: irregularly biplano
Material type and color: quartzite, pale yellowish brown (10YR6/2)
Edge angle: 60°–70°

Specimen: biface, proximal portion

Catalog number: 28 (WICA-1304)
Provenience: XU 2–3S/0–1W, Level 8, 99.20–99.10 m
Specifications:
Length: 30.5 mm
Maximum width: 35.2 mm
Maximum thickness: 7.8 mm
Weight: 10.7 g
Material type and color: very fine quartzite, moderate reddish brown
Edge angle: 30°–35°

Specimen: biface, distal portion

Catalog number: 44 (WICA-1305)
Provenience: XU 3–4S/0–1W, Horizon 15, 99.27 m
Specifications:
Length: 31 mm
Width: 15 mm (projected width 31.7 mm)
Maximum thickness: 6 mm
Weight: 2.7 g
Material type and color: chert, moderate yellowish brown (10YR5/4)
Edge angle: 30°

Specimen: preform

Catalog number: 46 (WICA-1334)
Provenience: XU 0–1S/0–1W, Level 8, 98.7 m, 62 cm west and 19 cm south
Specifications:
Length: 73.3 mm
Width: 42.4 mm
Thickness: 15.5 mm
Weight: 58.9 mm
Material type and color: chalcedony, grayish orange pink (5YR7/2)

CORES

Catalog number: 18 (WICA-1306)

Provenience: XU 2–3S/0–1W, Level 6, 99.40–99.25 m
Specifications:
Weight: 71.8 g
Length: 48.6 mm
Width: 43.5 mm
Maximum thickness: 25.8 mm
Material type and color: quartzite, pale reddish brown (10R5/4)
Description: This is a small core with multi-directional flake scars. Small flake scars along the platform edge may be the result of preparation or possibly subsequent use.

Catalog number: 26 (WICA-1307)

Provenience: XU 2–3S/0–1W, Level 7, 99.25–99.20 m
Specifications:
Length: 62.3 mm
Width: 78 mm
Maximum thickness: 37.2 mm
Weight: 300.1 g
Material type and color: very fine grained quartzite, banded dark reddish brown (10R3/4) to pale brown (5YR5/2)
Description: This is a square to reddish brown "block" (questionable core) with irregular flake scars on both faces. Cortex is present on both ends.

Catalog number: 24 (WICA-1308)

Provenience: XU 2–3S/0–1W, Level 7, 99.25–99.2 m
Specifications:
Length: 43.3 mm
Width: 24 mm
Maximum thickness: 24 mm
Weight: 19.5 g
Material type and color: chert, variable light brown (5YR6/4)
Description: Small, rectangular blocky core fragment

Catalog number: 32 (WICA-1309)

Provenience: XU 2–3S/0–1W, Level 8, 99.20–99.10 m
Specifications:
Length: 29 mm
Width: 31.1 mm
Maximum thickness: 20 mm
Weight: 20.5 g
Material type and color: chert, dusky red (5R3/4)
Description: Small, blocky core fragment

GROUND STONE ARTIFACTS

Catalog number: 47 (WICA-1310)

Provenience: XU 0–1E/3–4S, Feature 87-12 , 99.30–99.11 m

Specifications:

Maximum thickness: 12.8 mm
Weight: 540.8 g
Material: micaceous schist sandstone

Description: This item is a large square-shaped tabular piece of sandstone. Both faces are regular and flat but an area of one surface feels smooth and a slight polish seems present on areas of higher relief on this same side. What appear to be two parallel lines extending from one edge onto the face of this side are also present. They are short (9.6 and 14.6 mm in length), narrow (1.5 and 2.5 mm) and ca. 2 mm maximum depth. The incisions are "v" shaped in cross section. Although it is difficult to imagine the grinding or milling function an item of this thickness may have served, the attributes described above suggest that in addition to functioning as a milling stone, the artifact may have had an additional function associated with the incised grooves.

Catalog number: 48 (WICA-1311)

Provenience: XU 0–1S/0–1W, Level 7, 98.90–98.90 m

Specifications:

Length: 72.5 mm
Width: 73 mm
Maximum thickness: 52.4 mm
Weight: 390.4 g

Description: This item is an ovoid cobble, flat on the wider end and somewhat rounded on the narrower end. The narrower end may exhibit some small indentations possibly the result of use. The broader, flat end has questionable use wear in the form of shallow indentations. A possible function as an hammerstone or mano is suggested.

BONE ARTIFACTS

Specimen: antler tine

Catalog number: 2 (WICA-1312)

Provenience: XU 2–3S/0–1W, 99.1 m (in the west wall of the excavation unit. In the unsorted gravel layer on the west side of the excavation unit, 20 cm south of the northwest corner stake.)

Specifications:

Total maximum length: 116.8 mm
Maximum width: 14.8 mm
Thickness: 12.5 mm
Maximum thickness length: 31.9 mm
Haft length: 22.3 mm 24.7 mm
Basal contact width of prongs: 4.2 mm 3.1 mm
Weight: 10.4 g
Element: antler tine
Taxon: *Odocoileus* sp.

Modified Flakes by Level

LEVEL 5, 99.50–99.40 m

Catalog number: 11 (WICA-1313)

Provenience: XU 2–3S/0–1W

Specifications:

Length: 25.8 mm
Width: 44.6 mm
Maximum thickness: 5.1 mm
Weight: 3.1 g
Material type and color: quartzite, pale red (10R6/2)

Description: This is an irregularly shaped broken tertiary flake. It appears to exhibit use wear in the form of small flake scars along the platform edge dorsally which creates a slightly beveled edge onto the dorsal face.

Catalog number: 12 (WICA-1314)

Provenience: XU 2–3S/0–1W

Specifications:

Length: 38.7 mm
Width: 25.3 mm
Weight: 4.8 g
Material type and color: chert, moderately yellowish brown (10YR5/2)

Description: This is a thin, slightly expanding secondary flake. The narrow platform end appears battered and step fractured. The opposite, distal edge and one lateral edge are slightly beveled, rounded and smoothed on the ventral side, perhaps deliberately. Small nicks on the edge occurs on the opposite lateral side up to and onto the proximal end.

Catalog number: 13 (WICA-1315)

Provenience: XU 2–3S/0–1W

Specifications:

Length: 32 mm
Maximum thickness: 5.4 mm
Weight: 4.7 g
Material type and color: chert, pale yellowish brown (10YR6/2)
Edge angle: 50°–55°

Description: This is an expanding secondary flake which seems to exhibit questionable edge wear

along a short segment of one lateral side adjacent to the platform in the form of tiny notching and rounding of the extreme margin.

LEVEL 6, 99.250–99.40 m

Catalog number: 16 (WICA-1316)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 32.7 mm
Width: 33.5 mm
Maximum thickness: 12.2 mm
Weight: 13.3 g
Material type and color: chert, moderate yellowish brown (10YR5/4)
Edge angle: 65°–70° (steep edge)
Description: This is a wedge-shaped, contracting tertiary flake with three steeply angled edges. One edge appears retouched and exhibits use in the form of step flaking and crushing of the extreme margin. An adjoining edge terminates in a slightly rounded point and also exhibits tiny flake scars and notching and crushing of its extreme margin dorsally and ventrally.

Catalog number: 17 (WICA-1317)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 13.5 mm
Width: 14.8 mm
Maximum thickness: 3.6 mm
Weight: .8 g
Material type and color: chert, dark reddish brown (10R3/4)
Edge angle: 20°–30°
Description: This is an expanding tertiary flake, transversely fractured along the edge opposite the somewhat rounded striking platform. The dorsal face exhibits irregular flake scars and a potlid fracture. The lateral edges show use wear in the form of small notching, rounding and minute crushing of the extreme margin. One lateral edge also seems to exhibit polish.

LEVEL 6, 99.30–99.40 m

Catalog number: 14 (WICA-1318)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 59.5 mm
Width: 43 mm
Maximum thickness: 22.5 mm
Weight: 49.6 g
Material type and color: chert, moderate red (5R5/4)
Edge angle: 50°
Description: This is a large wedge-shaped contracting, secondary flake of chert, possibly produced in core reduction. Small flake scars and step fractures produced after partial flaking of the dorsal face occur all along the platform edge dorsally. This edge also appears to be somewhat worn and rounded and exhibits some areas of polish dorsally.

Catalog number: 15 (WICA-1319)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 18.8 mm
Width: 25.7 mm
Maximum thickness: 5.5 mm
Weight: 3.3 g
Material type and color: chert, variably colored, moderate yellowish brown (10YR5/4)
Edge angle: thinner edge 30° (thin edge), 60° (thick edge)
Description: This is a secondary, expanding flake transversely fractured in a hinge fracture. The platform edge is battered and step fractured. Irregular flake scarring of the dorsal face is present. The lateral edges exhibit minimal use-notching, rounding and some polish of the extreme margin. One lateral edge adjacent to the platform has tiny flake scars suggestive of heavier use. This portion of the flake is also thickest which may have provided added support to this working portion. Variation in the angle of retouch suggests multiple function of EUs.

LEVEL 7, 99.25–99.20 m

Catalog number: 19 (WICA-1320)

Provenience: 2–3S/0–1W
Specifications:
Length: 25.3 mm
Width: 29.9 mm
Maximum thickness: 3.5 mm
Weight: 2.5 g
Material type and color: chert, pale red (5R6/2) though variable
Description: This is a thin expanding tertiary flake which exhibits small, regular flake scars along its narrow platform edge and one adjoining lateral edge dorsally. The other lateral edge exhibits a few small nicks with subsequent rounding. Two small projections, one on the platform edge and one on a lateral margin represent additional EUs.

Catalog number: 20 (WICA-1321)

Provenience: XU 2–3S/0–1W

Specifications:
Length: 15.5 mm
Width: 33 mm
Maximum thickness: 4.5 mm
Weight: 2.0 g
Material type and color: quartzite, medium reddish brown (10R4/6)

Description: Irregular shaped tertiary flake with questionable use wear along one convex edge in the form of tiny nicking. The platform end is broken away in a transverse fracture.

Catalog number: 21 (WICA-1322)

Provenience: XU 2–3S/0–lW
Specifications:
Length: 48.7 mm
Width: 19.4 mm
Maximum thickness: 7.5 mm
Weight: 5.9 g
Material type and color: chert, grayish orange (10YR7/4)
Edge angle: 35°–40°

Description: This is an irregular tertiary flake broken along the longitudinal axis. One lateral convex edge exhibits use wear along its margin in the form of tiny nicking. The distal portion of this edge including part of the distal tip is smooth and worn producing a slight beveling that seems to exhibit light polish. Use wear extends to the distal tip which is broken.

Catalog number: 23 (WICA-1323)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 46.4 mm
Width: 30.4 mm
Maximum thickness: 9.9 mm
Weight: 12.2 g
Material type and color: chert, variable pale brown (5YR5/2), grayish orange (10YR7/4)
Edge angle: 65°

Description: This item is a large expanding secondary flake with one convex margin that has been retouched along its entire length. Use wear is evident in the form of minute nicking and rounding and smoothing of the extreme margins ventrally and dorsally. A tiny projection on the distal edge is rounded and appears to exhibit minute damage.

Catalog number: 25 (WICA-1324)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 21 mm
Width: 29.9 mm
Maximum thickness: 9 mm
Weight: 8.7 g
Material type and color: chert, grayish red (10R4/2)
Edge angle: 70°

Description: This item is a thick, squarish shaped tertiary flake, probably representing a midsection. One straight lateral edge has tiny, regular flake scars along its extreme margin dorsally and ventrally. Use wear occurs along this entire edge in the form of rounding and polishing of the extreme margin.

Catalog number: 42 (WICA-1325)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 35 x 23.2 mm
Maximum thickness: 9.5 mm
Weight:
Material type and color: chert, grayish red (5R4/2)
Edge angle: 65° (convex edge)

Description: This is a tertiary flake, probably expanding. What appears to be the narrower platform end has small flake scars along its extreme margin and is heavily step flaked onto its dorsal face. An adjoining thick, convex edge also exhibits use wear in the form of a worn, smooth extreme margin and minute nibbling.

LEVEL 8, 99.20–99.10 m

Catalog number: 27 (WICA-1326)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 51.2 mm
Width: 26 mm
Maximum thickness: 8.5 mm
Weight: 13.3 g
Material type and color: Chert, variable pale red (10R6/2)

Description: This item is a long, rectangular flake that expands slightly towards the distal end. It represents a blade. The proximal end is heavily step fractured dorsally. One slightly concavo-convex lateral edge exhibits small, irregular flake scars and notching dorsally. The opposite edge is broken longitudinally but is straight and even, perhaps deliberately so.

Catalog number: 29 (WICA-1327)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 35.6 mm

Width: 24.9 mm
Maximum thickness: 8.5 mm
Weight: 5.2 g
Material type and color: chert, multi-colored, predominantly dusky red (5R3/4)
Edge angle: 70°

Description: This is an irregularly shaped (probably expanding), tertiary flake, diagonally broken. One outcurving lateral edge is fairly steeply retouched dorsally. Use wear would seem evident in the rounded, worn edge of this retouched portion. A projection at the end of this edge may represent another EU.

Catalog number: 30 (WICA-1328)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 13.7 mm
Width: 15.4 mm
Maximum thickness: 2 mm
Weight: .5 g
Material type and color: chert multi-colored, predominantly dusky red (5R 3/4) and very light gray (N-8)
Edge angle: 30°

Description: This item is a triangular shaped, tertiary flake. The lateral edges and platform end exhibit use wear in the presence of minute, irregular notching. This item may represent a bifacial reduction flake.

Catalog number: 31 (WICA-1329)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 24.2 mm
Width: 44.9 mm
Maximum thickness: 9.0 mm
Weight: 9.5 g
Material type and color: chert, dusky red (5R3/4)
Edge angle: 40°

Description: This is an ovate shaped secondary flake that exhibits wide unifacial flake scars dorsally. The long convex edge opposite the platform end shows edge wear in the form of small nicks and minute crushing of the extreme margin at midsection. Slight rounding of the extreme edge occurs in places

Catalog number: 34 (WICA-1330)

Provenience: XU 2–35/0–1W
Specifications:
Length: 66 mm
Width: 34.7 mm
Maximum thickness: 9.9 mm
Weight: 21.2 g
Material type and color: quartzite, medium gray (N-5)
Edge angle: 70° (proximal edge), 20°–30 (lateral edge))

Description: This is a long, expanding to parallel flake that exhibits step fracturing ventrally along the narrow platform end and slight beveling dorsally along the same edge. The wider distal end is slightly beveled. The extreme lateral margins appear nicked and worn ventrally and dorsally. This is a blade that may be the product of bifacial reduction.

Catalog number: 35 (WICA-1331)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 84.6 mm
Width: 72.5 mm
Maximum thickness: 24.9 mm
Weight: 117.8 g
Material type and color: chert, grayish red-purple (5RP4/2) to pinkish gray (5YA8/1)
Edge angle: 50–60°

Description: This is a large, broken triangular-shaped flake. One long edge is slightly sinuous and displays small regular retouch scars along its extreme margin and onto the dorsal face. Use wear seems present on this edge in the form of crushing along the extreme edge, and areas of step fracturing occur on the margin ventrally. The opposite edge does not exhibit regular flake scars but displays nicking along its margin towards the distal, somewhat pointed end. This flake is probably a product of core reduction. The dorsal edge of the platform also exhibits small nicks on its extreme margin.

Catalog number: 33 (WICA-1332)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 35.5 mm
Width: 24.1 mm
Maximum thickness: 6 mm
Weight: 4.3 g
Material type and color: chert, moderate yellowish (10YR5/4)

Description: This is an irregular shaped tertiary flake with previous broad flake scars present along the margins of the dorsal face. Questionable use wear in the form of nicking and some step flaking occurs along the platform edge ventrally and dorsally, and possibly along one lateral edge near the distal end.

Catalog number: 45 (WICA-1333)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 40.6 mm
Width: 21.1 mm
Maximum thickness: 7.3 mm
Weight: 6.9 g
Material type and color: Quartzite Dark reddish brown (10R3/4)
Edge angle: 90° (broader end), 60° (lateral edged)
Description: This item appears to be a rectangular shaped tertiary flake which narrows at one end. The narrower end is broken transversely and diagonally along one lateral edge. A large step fracture extends from the wider end back onto the dorsal face. The flake appears to show fairly steep use wear along the broader end and the unbroken lateral edge on the dorsal side.

LEVEL 9, 99.10–99.00 m

Catalog number: 41 (WICA-1335)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 44.6 mm
Width: 27.8 mm
Maximum thickness: 14.4 mm
Weight: 16.8 g
Material type and color: Minnelusa chert Variable grayish red (5R4/2)
Description: This item is a thick, irregularly broken tertiary flake. One convex edge exhibits questionable use wear in the form of a worn extreme margin.

LEVEL 11, 98.88–98.80 m

Catalog number: 36 (WICA-1336)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 45.7 mm
Width: 20.5 mm
Maximum thickness: 7.7 mm
Weight: 7.0 g
Material type and color: chert, pale yellowish brown (10YR6/2)
Edge angle: 60°–65°(platform end), 40°–50° (convex edge), 50°(concave edge)
Description: This is an irregularly shaped expanding, tertiary flake with one convex and one straight to slightly concave edge. The narrow platform end exhibits extreme battering and step flaking. The adjacent edges appear to have minute crushing along the extreme margin. Flake scars extend at a slight diagonal from the platform end onto the dorsal face.

Catalog number: 37 (WICA-1337)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 35.5 mm
Width: 30 mm
Maximum thickness: 15.6 mm
Weight: 14.8 g
Material type and color: chert, light gray (N-7) or light brownish gray (5YR6/1)
Edge angle: 60°–70°
Description: This item is a round tertiary flake that appears to have been flaked radially on the dorsal surface leaving a high plane in the center. Edge wear may be present in the form of worn areas of minute nicking and some step flaking°of the extreme margin dorsally, and in areas onto the ventral face.

Catalog number: 38 (WICA-1338)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 38.2 mm
Width: 24 mm
Maximum thickness: 12.9 mm
Weight: 12.1 g
Material type and color: Minnelusa chert and quartzite Grayish orange (10YR7/4), 90° (proximal end)
Edge angle: 60° (distal end), 30° (lateral edge)
Description: This is a contracting, tertiary flake that exhibits edge wear on the distal end and adjoining concave lateral edge in the form of a worn margin and minute nicking. One small prominence along this edge near the distal end appears slightly rounded from use. The general conformation of this item is like an end scraper, however, the thick, proximal portion is composed of quartz and it is difficult to determine if this area has actually been retouched/utilized.

Catalog number: 39 (WICA-1339)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 23.7 mm
Width: 18.7 mm
Maximum thickness: 5.5 mm
Weight: 2.2 g
Material type and color: chert, light brownish gray (5YR6/1)
Edge angle: 30°

Description: This is an irregular shaped tertiary flake with use wear along the wider end in the form of small step fractures which extend from the extreme margin onto the dorsal face. A small prominence at this end of the flake also appears to be slightly rounded in use.

Catalog number: 40 (WICA-1340)

Provenience: XU 2–3S/0–1W
Specifications:
Length: 41.7 mm
Width: 26.3 mm
Maximum thickness: 5.9 mm
Weight: 7.0 g
Material type and color: chalcedony, very light gray (N-8)
Description: This is an expanding tertiary flake. The broader, slightly convex distal edge exhibits tiny, regular flake scars and small nicks that appear partially worn and polished. These extend onto the adjacent margins of the lateral edges. One edge is broken longitudinally but appears smoothed-perhaps deliberately. The proximal end is heavily step flaked dorsally.

CUT/FILL, 99.00 m

Catalog number: 43 (WICA-1341)

Provenience: XU 0–1S/0–1W, east wall of excavation unit, 24 cm south
Specifications:
Length: 28 mm
Width: 43 mm
Maximum thickness: 9.5 mm
Weight: 9.0 g
Material type and color: chert, variable pale pink (5RP8/2) to pale red purple (5RP6/2)
Edge angle: 30°–40°
Description: This is an expanding secondary flake. The platform end is heavily step flaked on the dorsal face. One thinner lateral edge and particularly the distal edge shows use wear in the form of small U-shaped nicks which in some cases appear worn and slightly rounded. A projection created by the intersection of the lateral and distal edges also exhibits use wear.

Appendix 2

Lithic Material from 39CU779 and Its Source

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The lithic material from site 39CU779 contains fragments of chert, quartzite, limestone, Badlands plate chalcedony, quartz, muscovite and two pieces of reddish maroon shale. Chert followed by quartzite are the dominant rock types found in the sample material (See Tables 3–5, 10). Specimens were examined under short wave ultraviolet light to check for fluorescence.

The lithic material appears to be derived from within a few miles radius of the site and within the boundaries of Wind Cave National Park. No exotic pieces were found in the archaeological samples.

The abundant chert flakes have the possibility of two sources, the Mississippian age Pahasapa limestone at the site itself, or the Pennsylvanian age Minnelusa Formation from the hills surrounding the site. Brightly colored reddish to yellow or banded chert is common in the Minnelusa Formation, with grayish to brownish and darker colored varieties from the Pahasapa Limestone. The limestone fragments are from the Pahasapa limestone exposed at the site.

There are three types of quartzite 1) a very fine-grained and thinly laminated multicolored variety 2) a homogeneous fine to medium-grained beige and 3) orange brown variety. The thinly laminated quartzite may possibly be from the Lower Cretaceous age Lakota Formation or Fall River Sandstone. The homogeneous type may possibly be from the Lower Cretaceous formations previously mentioned, or from local exposures of Precambrian age quartzite.

The highly fluorescent plate chalcedony is derived from local exposures of the Oligocene age White River group. This lithic material commonly occurs as fracture fillings.

A source for the reddish maroon shale may include the Fall River Sandstone or the Deadwood Formation.

The quartz and "book" muscovite are derived from Precambrian age granitic pegmatites. Fine, small flakes may come from the pegmatites as well as from Precambrian age micaceous schist. Quartz veins in the schist may also be a source for the quartz flakes.

Definitions of the rock types assigned to the Beaver Creek lithics follow:

Chert: contains all other forms of chalcedony except Badlands plate chalcedony. Smooth to granular texture, waxy luster, translucent to opaque, angular to conchoidal fracture. Very wide range of colors. Slightly to non-fluorescent. Source: brightly colored reds, yellows, agate banding, and fusilinid fossils from local exposures of Pennsylvanian age Minnelusa Formation. Many fragments from local exposures of Mississippian age Pahasapa limestone.

Quartzite: beige, brownish orange, multi-colored banded, very fine to medium grained, often silicified, some pieces fluoresce a faint green. Source: finely banded multi-colored possibly from Lower Cretaceous age Fall River sandstone. Beige and brownish orange fragments are possibly Precambrian age, or may possibly be from the Lower Cretaceous age Lakota Formation or Fall River Sandstone.

Badlands Plate Chalcedony: fibrous structure, glassy to vitreous luster, pinkish clay inclusions, translucent to opaque, strong lime-green fluorescence. Source: local exposures of Oligocene age White River group sediments.

Limestone: beige to cream, fine-grained, no distinctive features. Source: local exposures of Mississippian age Pahasapa Limestone.

Shale: reddish maroon, very soft, no distinctive features. Source: possibly Cambrian age Deadwood Formation or Lower Cretaceous Fall River Sandstone.

Quartz: clear to milky, glassy to vitreous luster, irregular to conchoidal fracture, no distinctive feature. Source: from Precambrian age granitic pegmatites or quartz veins in Precambrian schist.

Muscovite: vitreous to pearly luster, silvery, thin and lamellar, flexible. Commonly in lamellar massive "books." Source: "book" variety from Precambrian age granitic pegmatites. Small flakes from Precambrian age pegmatites and micaceous schist.

The following reference were consulted for this analysis Roberts and Rapp (1965) and Sinkankas (1964).

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