United States Department of the Interior
NATIONAL PARK SERVICE
Midwest Archeological Center
Federal Building, Room 474
100 Centennial Mall North
Lincoln, Nebraska 68508-3873

IN REPLY REFER TO:

K14

September 18, 1981

Mr. Brad Vierra
Department of Anthropology
University of New Mexico
Albuquerque, New Mexico 87131

Dear Mr. Vierra:

Enclosed is a copy of Mark Stiger's manuscript report, 1979 Investigations at Seven Archeological Sites in Curecanti National Recreation Area as you requested. This is the most recent report available concerning Curecanti archeology. The report on the 1980 field work is still in progress.

Sincerely yours,

James W. Mueller

James W. Mueller, Ph.D.
Supervisory Archeologist

Enclosure

1979 Investigations at Seven Archeological Sites in Curecanti National Recreation Area

by

Mark A. Stiger, M.A.

United States Department of the Interior
National Park Service
Midwest Archeological Center
Lincoln, Nebraska

1981

"I've heard that the population of Big Sur in those Civil War days was mostly just some Digger Indians. I've heard that the Digger Indians down there didn't wear any clothes. They didn't have any fire or shelter or culture. They didn't grow anything. They didn't hunt and they didn't fish. They didn't bury their dead or give birth to their children. They lived on roots and limpits and sat pleasantly out in the rain."

Richard Brautigan
from A Confederate General
from Big Sur

Preface

This report describes the investigations in Curecanti in 1979 and is one of a series of manuscripts reporting the results of field work beginning in the 1960s and continuing to the present. The remains of wicki-up shelters dated to the seventh and fifth millenia are documented in this report. These shelters constitute a fairly rare occurrence in the archeology of the Western Slope.

The conflicting interpretation of the paleo-environmental record by the field archeologist and the palynological consultant is also interesting. This report contains the Scott's original pollen report (first part of Appendix B), Stiger's interpretation of the pollen record (Chapter V, "Evaluation of Hypothesis I: Environment"), and Scott's rebuttal (Appendix B, "Reply to Stiger's Comments"). The conflict is partly based on different data sets- Stiger's identification of fragments of excavated pinyon pine and Scott's poorly-preserved pollen, partly on changing interpretations of proveniences from the field to the laboratory by the archeologist, partly on economic vs. environmental interpretations, and partly on the range of variability of modern pollen rain. The data and the interpretations are presented so that the reader may decide.

James W. Mueller

Acknowledgements

I would like to take this oportunity to thank Dr. David A. Breternitz for assigning me in 1976 to the University of Colorado Curecanti Survey. Since that time my interest in the area has grown. Dave's insightful comments during that time have continued to help me in understanding the archeology of Curecanti. My appreciation for Dave continues to grow.

The Midwest Archeological Center and its personnel have provided support for the project. Chiefly I would like to thank Dr. Cal Calabrese for giving me free rein and encouragement throughout the varying phases of this work. Dr. James Mueller provided the necessary discussion and help in editing this paper. Tom Megel made the disappointing trek to Curecanti with the magnetometers. Robert Nickel and Tom Thiessen gave helpful advice.

The field crew during 1979 was made up of Paul Williams, Crew Chief; Ron Rood, Sue Vetter, Sloan Williams and Patrice Newman, crew members. Judy Williams volunteered her help during the summer. All of the crew performed well and they made the summer's work very enjoyable.

Several people contributed to the appendices in this report. Steve Emslie identified the bone. Linda Scott did the pollen analysis. Kellie Masterson analyzed the stone artifacts. Paul Minnis and Molly Struever helped in the identification of floral remains. Without the work of these individuals this report would be less complete.

During the writing of this report I had discussions with several people who helped stimulate my thinking. These people are H. W. Toll, Doug Scott, Alan Reed, Robert Kelly, and Tom Euler. Although partially

reponsible for some of the ideas in this report, these people do not necessarily agree with them.

The National Park Service staff at Curecanti provided valuable assistance in terms of logistics and information. It was refreshing that the Park staff took a genuine interest in the archeological resource. Specifically, I would like to thank Superintendent Glen Alexander, Chief Naturalist Don Hill, Chief of Maintenance Ray Frost and Chief Ranger James Riggs.

Rickii Santerelli of Gunnison is to be thanked for his information on the Curecanti area before the Blue Mesa Reservoir covered the area. Additionally, Mr. Santerelli generously donated photos of the now submerged petroglyph site 5GN7.

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CHAPTER I

THE RESEARCH OBJECTIVES

During the summer of 1979 the Midwest Archeological Center conducted archeological excavations in Curecanti Recreation Area, Western Colorado. Funds were provided by the Bureau of Reclamation through the Rocky Mountain Regional Office of the National Park Service to evaluate archeo-logical resources that would be potentially impacted by proposed construction in the Iola and Willow Creek development areas. Additionally two sites that are undergoing severe erosional impacts due to reservoir fluctuations and access roads in the area were minimally investigated. The primary purpose of this work was to determine the extent and research value of the archeological resource and provide recommendations to managers for consideration during planning.

Secondly the opportunity was taken to gather new information specific to several research-oriented questions. Additional data relevant to these questions that was gathered during 1978 (Euler and Stiger 1981) is utilized in this report.

The questions concern several basic assumptions that have been made by some authors about the regional prehistory. Clarification of these issues should generate a better understanding of Curecanti archeology. The two problem areas that will be considered in this study are 1) Environ-mental-Cultural chronology and 2) Site structure and function. The following sections discuss these two problems and generate testable hypotheses for the possible solutions.

Environmental-Cultural Chronology

Environmental Chronology

The Western United States has been a scene for the discussion of past environmental change. The Altithermal has been a central concept to Great Basin-Plateau-Rocky Mountain regional archeological studies. The Althithermal is a climatic period that dates roughly between 7000 to 4000 years ago. Three main schools of thought advance conflicting explanations as to the nature of the Altithermal climate. The first school considers the Altithermal to be a hot dry period climaxing about 6000 B.P. (Antevs 1948). The second school believes that the period between 7000 B.P. and 4000 B.P. was climatically similar to later periods (Jennings 1968). The last school considers the climate shift to be only slightly cooler and moister than today (Martin 1963).

Obviously only one of these models may be correct for any one area. Stiger (1980) and Reed and Scott (1980) believe that little or no prehistoric environmental change has occurred in Curecanti. Based on a stable environment model Stiger (1980) attempted to explain the prehistoric settlement pattern derived from surface archeological material in Curecanti. This prehistoric period will be studied in Curecanti to discern environmental shifts or stability that are assumed to be caused by climatic change or uniformity.

Cultural Chronology

In the Curecanti region most prehistoric sites not yielding diagnostic Paleo-Indian materials or ethnically diagnostic late-prehistoric remains (e.g., ceramics, standing wickiups) are considered to be representative of the Desert Culture (Reed and Scott 1980). The Desert Culture is defined as a long-term foraging adaptation consisting of non-specialized

exploitation of the environment (Jennings 1968:110,111, 137). This adaptation is seen as stable, changing only through accretion of traits (Jennings 1957:297). This chronology and concept of the Desert Culture will be tested using the Curecanti material.

Site Structure and Function

Site Structure

The relationship of subsurface remains to surface material is an important question. Since several of the Curecanti sites consist of more than a hundred acres of surface debris, it would be impractical to intensively excavate all areas of such sites. It has been assumed that surface debris density is a positive indicator of important subsurface remains (Gooding 1978). It has also been stated that there may be no distributional relationship between surface debris density and subsurface features (Euler and Stiger 1981). The nature of this vertical relationship will be examined.

Site Function

The prehistoric activities performed at the sites have left archeological remains. Similarities in behavior should leave similar debris. Distribution of artifacts and features will be compared to investigate the patterning of intersite and intrasite variability.

Hypotheses and Implications

Hypothesis Ia: The environment in Curecanti has not changed since the end of the Pleistocene. The modern environment reflects what the prehistoric environment was like.

Implications: All botanical and faunal remains found in archeological contexts should be representative of only species found in Curecanti Basin today.

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Hypothesis Ib: The environment in Curecanti has changed since the end of the Pleistocene. The modern environment does not reflect what the prehistoric environment was like.

Implications: Botanical and faunal remains found in archeological contexts should represent at least some species not found in the area today. Present distribution of these archeological species should indicate the life zones that occupied prehistoric Curecanti. Dating of associated features should allow us to generate a chronology of environmental change.

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Hypothesis IIa: The cultural chronology of Curecanti will reflect a non-specialized adaptation to the local environment changing only by accretion of traits. The increase in the number of material traits is due to an increase in the available techniques to exploit the environment.

Implications: Archeological features and artifacts should be redundant throughout the time. Any change in extractive techniques should be in addition to existant techniques. These techniques will manifest themselves as site or feature types. The number of extractive techniques should be greatest during the latest occupations. Specifically there should be a constant or increasing distribution of site types and artifacts through time and across environmental zones.

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Hypothesis IIb: The cultural chronology does not represent a "non-specialized unchanging adaptation".

Implications: There will be a non-constant distribution of site types and artifacts through time.

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Hypothesis IIIa: There is no relationship between the density of surface remains and subsurface remains.

Implications: There should be a random distribution of subsurface remains with respect to surface remains.

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Hypothesis IIIb: There is a relationship between the density of surface remains and subsurface remains.

Implications: There should be a non-random distribution of the density of subsurface remains with respect to surface remains.

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Hypothesis IVa: There is no difference in functions between areas within sites and between sites.

Implications: There is a random horizontal distribution of artifacts and features across a site and between sites.

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Hypothesis IVb: There is a difference in functions between areas within sites and between sites.

Implications: There is a non-random distribution and inter-relationship of artifacts and features across a site and between sites. The non-random distribution will allow us to make statements of site function and delineate activity areas within a site.

Therefore, to achieve the management and research goals, techniques were needed to recover data concerning the distribution of cultural and environmental data along horizontal, vertical and temporal dimensions. The following chapter details the field and laboratory techniques.

CHAPTER II

THE RESEARCH STRATEGY

Field Methods

In 1979 archeological work was conducted at seven archeological sites. This work varied from minimal surface collection at one site to excavation of 140 square meters at another site.

Upon arrival at the sites an arbitrary datum was selected. All mapping at the site was then referred to this datum. At a later date these data were "shot in" by stadia rod and transit to a landmark such as a bench marker or areal panel. This allowed accurate mapping of the sites on the existing Park Service topographic maps on which the landmarks had been located.

When sites were excavated a grid system of two meter by two meter squares was super-imposed on the ground. The grid was aligned roughly with magnetic north. This allowed some flexibility to put the grid where it would fit the topography of the site. The exact alignment angle was shot later by transit. Surface collections of cultural material were made except for areas below high water line on 5GN191 and 5GN206 and on 5GN10 Components E and F. Erosion of the deposits at 5GN191 and 5GN206 was obvious and it was felt that wave action had probably destroyed the original context of surface material. Because of the limited amount of flaked stone on Components E and F, 5GN10, the surface material was bagged with the first excavation unit. This practice should not be continued.

Areas were selected for excavation by the following surface criteria: 1) areas of high chipped stone artifact density, 2) areas with few chipped stone artifacts but ground stone, 3) areas of exposed features. Excavation

then proceeded by 5 to 20 centimeter levels until sterile fill, features or natural stratigraphy were encountered. Levels below features were not tested. All soil was screened through quarter inch mesh hardware cloth. Features were cross-sectioned, mapped and profiles drawn. Pollen samples were taken from features with a trowel washed in distilled water. Bulk soil samples were taken after the pollen sample was bagged. Radiocarbon samples were removed with clean tweezers and wrapped in aluminum foil. If large pieces of charcoal were found and contaminated during trowling these were saved for wood identifications. Lithic material and bone recovered were bagged and recorded separately.

Daily field notes were kept by all crew members. Feature forms and maps, photo records, field sample logs, were filled out in the field. Photos were taken during and at the conclusion of excavation. Only at 5GN10, Component E, was a plastic drop cloth placed over the excavation before backfilling. Outside corner stakes at the limits of excavation were left in place.

Proton-magnetometer mapping was attempted at 5GN10 and 5GN206. Magnetic maps were made and several anomalies were specifically tested by excavation. It was determined in the field that the local geology (high iron content rock) prohibited any present archeologically valuable use of this technique in Curecanti.

Laboratory Methods

There were five categories of field specimens collected during the excavations. These categories were radiocarbon, pollen, stone cultural material (lithics), bone, and soil. The radiocarbon samples were sent to Balcones Radiocarbon Laboratory, Austin, Texas for processing and analysis. The results are summarized in Appendix A. The pollen

samples were sent to Palynological Analysts, Montrose, Colorado for processing and analysis. The results are presented here as Appendix B. The lithics were analyzed by Kellie Masterson of the Midwest Archeological Center. A description and summary report on the lithic material are presented in Appendix C. The bone was examined by Steve Emslie, Prescott Center College, Prescott, Arizona. The bone identifications given in Appendix D are from personal communication with Mr. Emslie.

The soil samples were processed by the Midwest Archeological Center. Samples were dry measured in a beaker. The soil was then wet screened through 1/4",1/8" and 1/16" screens. The fine material that passed through was caught on nylon mesh. After the material was air dryed all carbonized organic bone and lithics were sorted out from the material on the screens.

The lithics and bone were given to the respective analysts. The carbonized organic fraction was examined under a 20 power binocular microscope. Larger pieces of wood charcoal were identified by comparison to known charred specimens. Much of the carbonized material was too small or fragmented to be identified. The results of the soil sample analysis are given in Appendix E. Appendix F describes the features and the feature fill in detail. In summary the field and laboratory methods were followed to gather information specific to the hypotheses under consideration.

The following chapter describes the results of the archeological investigations in Curecanti during 1979.

CHAPTER III

The Regional Natural Environment

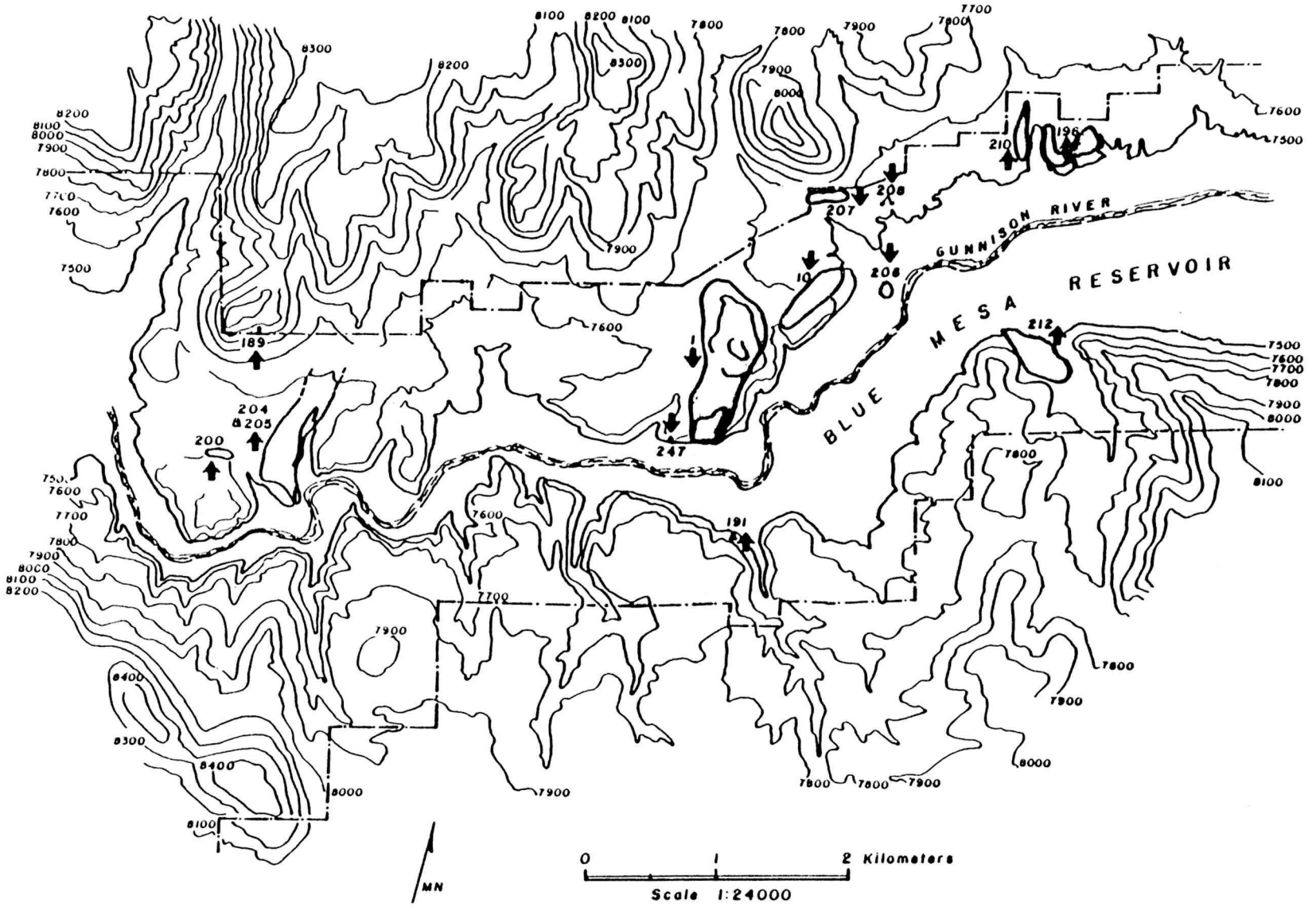
The Curecanti Recreation Area is located in central Colorado. The Recreation Area consists of three contiguous reservoirs and adjacent lands stair-stepped along the Gunnison River. The purpose of these reservoirs is to provide hydroelectric power and recreational opportunities. The Bureau of Reclamation administers the power distribution from the dams while the National Park Service administers recreational, natural, and cultural resources.

All sites testing during the summer of 1979 are located in Sections 29, 30, and 31 of Township 49N, Range 2W (Figure 1). The greatest distance between any two sites (5GN247,5GN212) is two miles. Consequently, the regional environment is generally identical for all sites.

Topography and Geology

Most of the Recreation Area lies within the Gunnison Basin (Figure 2). This basin is broad and has an average elevation of approximately 7,500 feet. This basin is bounded on the north by the Elk Mountains which includes some peaks rise over 14,000 feet in elevation. To the south of the basin are the San Juan Mountains, including peaks higher than 14,000 feet. The eastern basin boundary is the Continental Divide. The western boundary is a series of high mesas rising over 9,000 feet. The Gunnison River runs east to west through the middle of the basin, cutting the Black Canyon through the high mesas. This spectacular canyon is over 2,000 feet deep in places with many sheer cliffs. Unless one comes up the Black Canyon there is no way to enter the Gunnison Basin without attaining the minimum elevation of 8,750 feet at Blue Mesa Pass.

Figure 1. Archeological Sites in Curecanti Tested During 1979.


GUNNISON RIVER
BLUE MESA RESERVOIR
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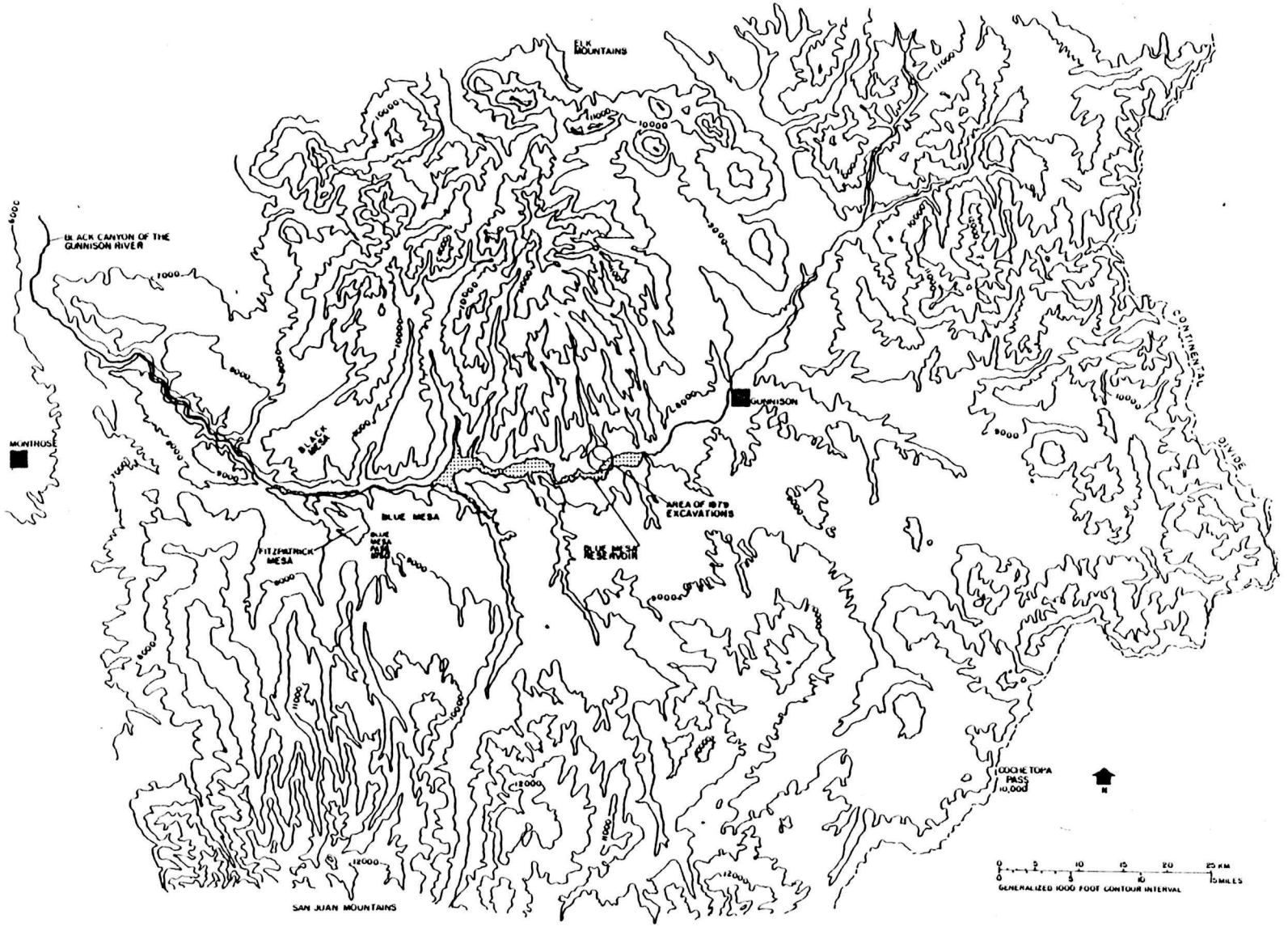


FIGURE 2 - MAP OF UPPER GUNNISON BASIN

In several locations in the Gunnison Basin the underlying strata are exposed. These exposures reveal a foundation of Precambrian metamorphic foundations that are overlain by Morrison, Dakota, and Mancos Formation sedimentary rocks. Erosion removed some of these sedimentary outcrops before volcanic activity in the area deposited West Elk Breccia across the area. Pleistocene gravels have washed in on the floodplains. All types of rock, sedimentary, metamorphic, intrusive and extrusive igneous, are found within the study area (Lister 1962:3-4; Oetking, Feray, and Renfro 1967).

Soils across most of the area are shallow and mixed with weathering bedrock. A few local areas have alluvial deposits of unknown depth.

Climate

Curecanti Recreation Area lies between the towns of Gunnison to the east and Montrose to the west. The United States Weather Bureau reports for Montrose, 5,830 feet elevation, indicate an average annual temperature of 49.5° F. and 9.08" average annual precipitation. Gunnison, upstream from Curecanti Recreation Area, at 7,694 feet elevation, is reported to average 10.59 inches of moisture annually with a 40.1° F. average annual temperature (Woodbury, Durrant, and Flowers 1962:15).

A late spring and early summer dry season is broken by midsummer to early fall thunderstorms. The greatest precipitation occurs in August (National Park Service 1976:16). The growing season is short (68 days) and the weather changes quickly and is often severe.

Flora and Fauna

The biotic communities of Curecanti were extensively studied during the initial construction phase of the three reservoirs in 1961. The following flora and fauna sections of this proposal are extracted from the published report (Woodbury, Durrant, and Flowers 1962).

The ecological communities may be divided into three zones classified by topography. These are 1) streamside zones, 2) terrace zones, and 3) hillside, talus, and upland zones. The plant communities of these zones differ mainly because of the type of water available for plant growth. The streamside communities have generous soil moisture due to percolating water levels along waterways. The terrace zones receive capillary soil moisture moving laterally from adjacent areas in addition to precipitation. The hillside, talus, and upland zones are dependent upon rain and snowfall with a small amount of runoff.

Streamside zones reflect the plentiful moisture and the effect of seasonally fluctuating water levels as an ecological perturbation. Trees are predominately cottonwoods, although in the protected side canyons Douglas fir and Blue spruce are present. A variable understory of shrubs is common. A low herbacious group of plants is found on the gravel bars and floodplains. The streamside zone includes the floodplains of the Gunnison and its tributary streams.

The terrace zones are usually treeless, with occasional conifers sporadically taking root. By far the most common plants in this community are sagebrush, rabbitbrush, saltbush, and grasses. Occasionally a few herbs are found. All sites tested during 1979 lie within this zone (Figure 3).

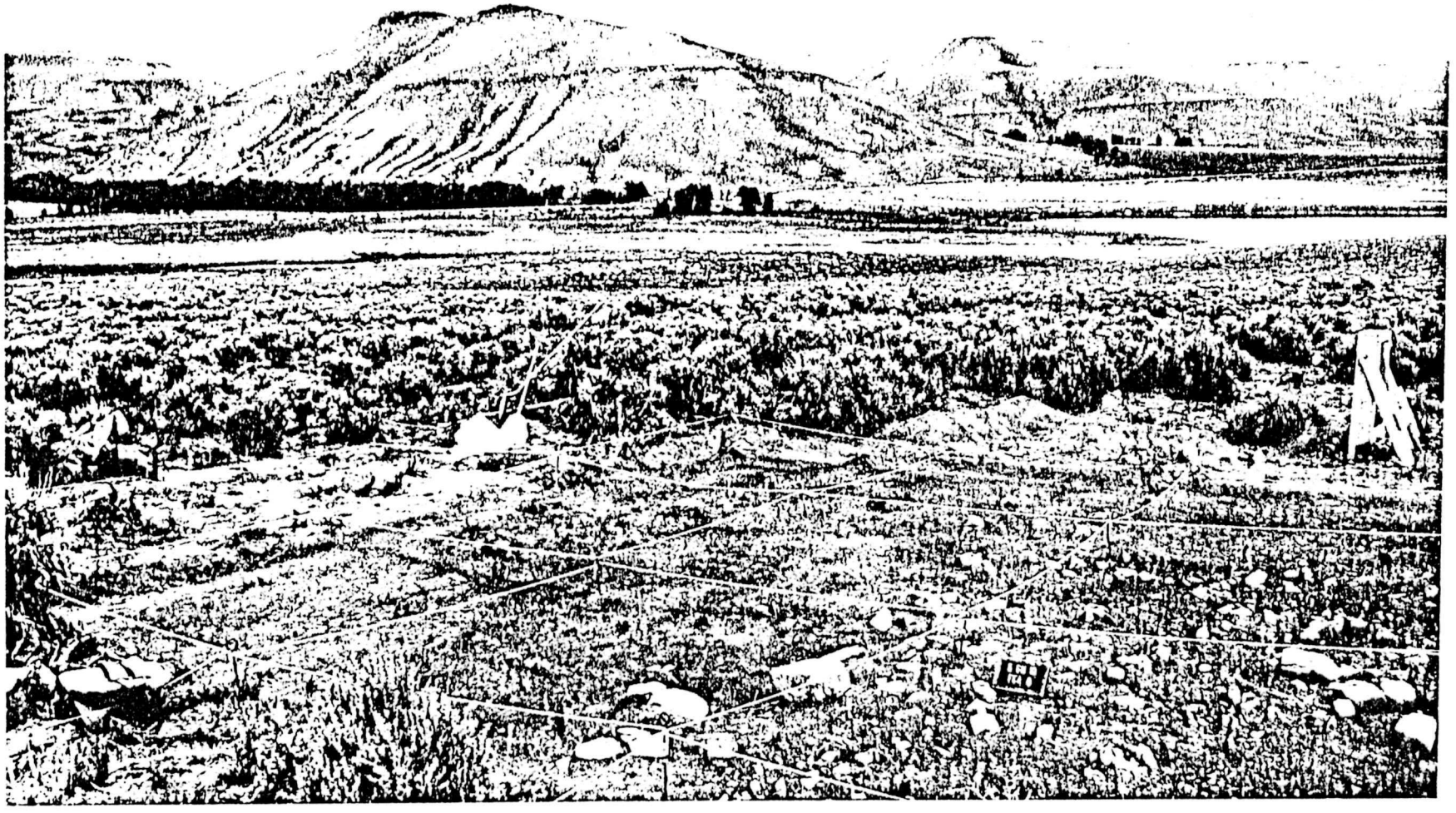


Figure 3. General overview of the Willow Creek area. Taken from 5GN10, Component E, looking northeast. Note the predominant sagebrush vegetation.

The hillside, talus, and upland zones are dominated by conifer trees, including Mountain Red juniper, Blue spruce, Ponderosa pine, and Douglas fir. Shrubs form an understory of scrub oak, serviceberry, mountain mahogany, chokecherry, currents, rabbitbrush, and sage. Grasses and forbs are scattered throughout.

The avifaunal resources of Curecanti Recreation Area are varied. Of the 165 species recorded in 1961, 71 are considered permanent inhabitants of the basin. Species present today which may have been used aboriginally include ducks, hawks, eagles, falcons, grouse, ptarmigans, owls, and flickers.

Mammals observed, collected, or reported represent 83 species. Included are 13 species of rodents, cottontail, jackrabbit, elk, mule deer and mountain sheep. Historically, bison and pronghorn were also found in the area. The Gunnison River has been known as an excellent trout stream. While several species of fish have been recently introduced, the cutthroat is the only native fish in the area.

All sites are located in the sagebrush grassland vegetation zone on terraces and are within a mile of the Gunnison River and its floodplain resources. Willow Creek runs close to sites 5GN206, 207, 208, and 10. Quartzite that is similar (if not the same) to the majority of the lithic artifacts, outcrops within a mile of all sites.

CHAPTER IV

THE RESULTS OF THE INVESTIGATIONS

5GN207

This site was recorded in 1976 (Stiger 1977) by the University of Colorado. It is an open lithic scatter on a terrace just north of and overlooking highway U.S. 50. Willow Creek is immediately west of the terrace. Vegetation on the site is the typical sagebrush-grassland of the area. Upon inspection of the site in 1979 two non-diagnostic projectile point fragments were located and collected. Also on the surface was fire-cracked rock and a possible charcoal stain. After discussion with park personnel, it was decided not to test this site because the exact location of the Park boundary line was in question. The two collected projectile points are illustrated in Figure 4.

5GN208

5GN208 was recorded in 1976 (Stiger 1977) as a dispersed lithic scatter in the open sagebrush flats (Figure 3). When it was inspected in 1979, very few flakes and one projectile point were seen on the surface. The projectile point was mapped and collected. One 2x2 meter test pit was dug at the location of a mano laying on the ground surface. One flake was found in the top 5 cm. of the excavation. Since the excavation appeared to be in nearly cultural sterile soil (no charcoal and only one flake), we stopped excavations at the 5 cm. depth. The only samples collected were the projectile point (Figure 5), the mano and the flake.

Upon continued surface inspection of the site area we located a very localized area of debitage, a projectile point and several cobbles originally thought to be manos. This area was west across an arroyo

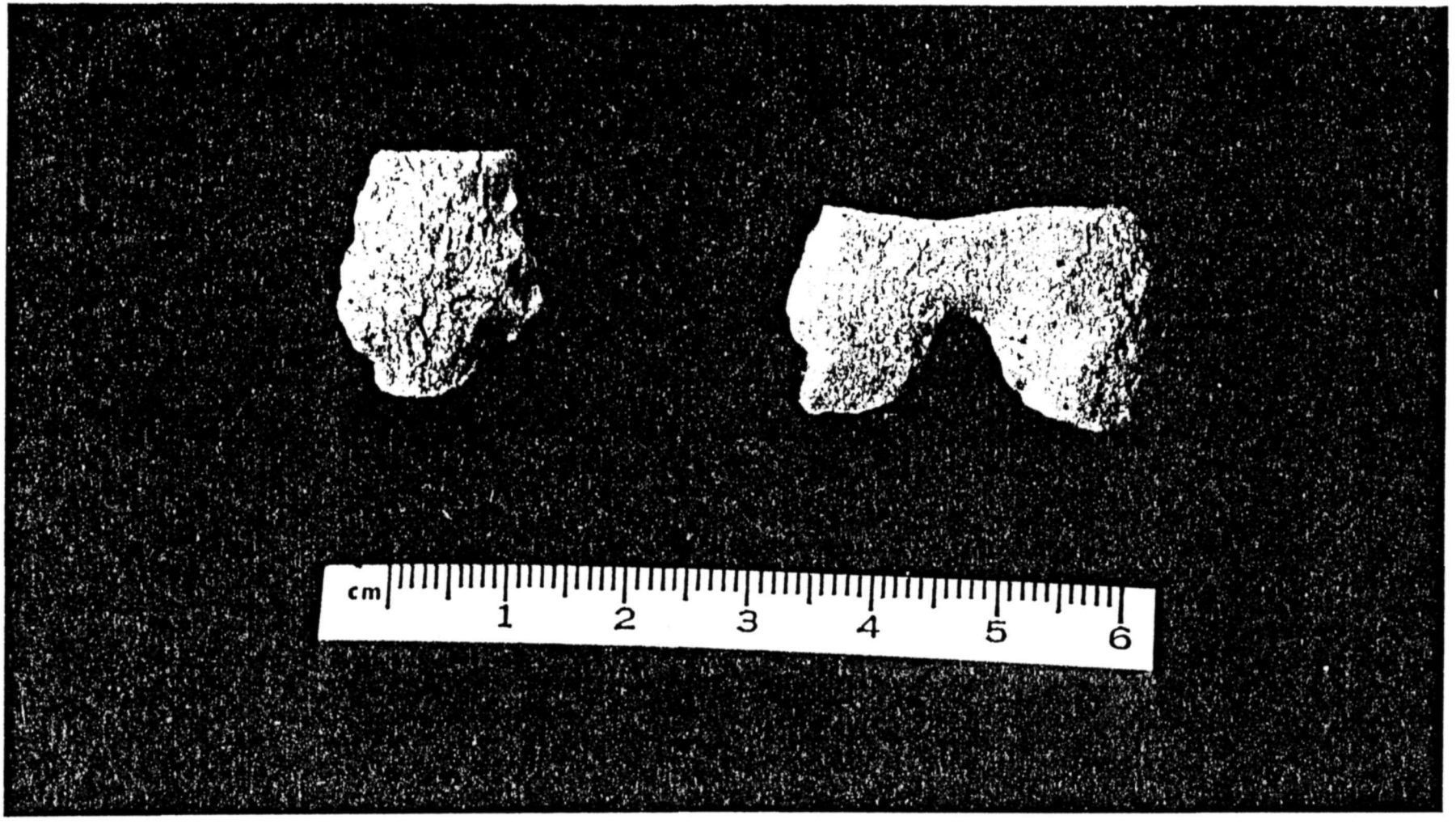


Figure 4. Flaked stone artifacts from the surface of 5GN207.

from the recorded site 5GN208. We designated the area "5GN208 west" and placed a 2x2 m. test pit at the area of concentration at the west edge of the arroyo. Excavation produced no features. Although there was scattered charcoal in the cultural fill, there was not enough for a radiocarbon sample. Cultural material extends to all edges of the test pit so we may assume a larger subsurface distribution of artifacts (Table 1).

5GN208w is at the edge of a prairie dog village. It is conceivable that the rodent activity has covered part of the site. In all likelihood the major portion of 5GN208w lies to the west of our test. The more complete flaked stone artifacts are pictured in Figure 5.

5GN247

Site 247 is a cultural deposit exposed by a road cut made before the reservoir was constructed. The road follows a downslope along a natural drainage that cuts a gap in the high rim on the north side of the Gunnison canyon. The site has been buried by sandy soil washing down from the ridge and slope above. Very little cultural material is present on the natural ground surface. However, a 25 cm. thick cultural deposit under 20 cm. of sterile sand is evident in the road cut. It appears that this deposit consists of fire-cracked rock, artifacts, and charcoal enriched soil. Based on material eroding out of the bank it appears the cultural deposit extends from about high water line to the north for about 100 meters. This site was found by Tom Euler in 1978.

The 1979 Midwest Archeological Center activities at the site consisted of facing up one 30x80 cm. profile in the roadcut (Test 1). A stratigraphic map was drawn (Figure 6) and pollen samples were taken

Table 1

Inventory of Artifacts Collected from 5GN208

5GN208 east

Description	
Groundstone	1
Debitage	1
General Surface	
Flaked Stone Artifact	1

5GN208 west

		Test Pit 1			
Description	Surface	0-5 cm	5-10 cm	10-15 cm	TOTAL
Debitage	34	337	239	46	656
Utilized Flakes	2	17	9	1	
29 Flaked Stone Artifacts	1	6	3		
10 Preforms		2			
2 Cores		2			
2 Ground Stone				1	
1					
TOTALS	37	364	251	48	700

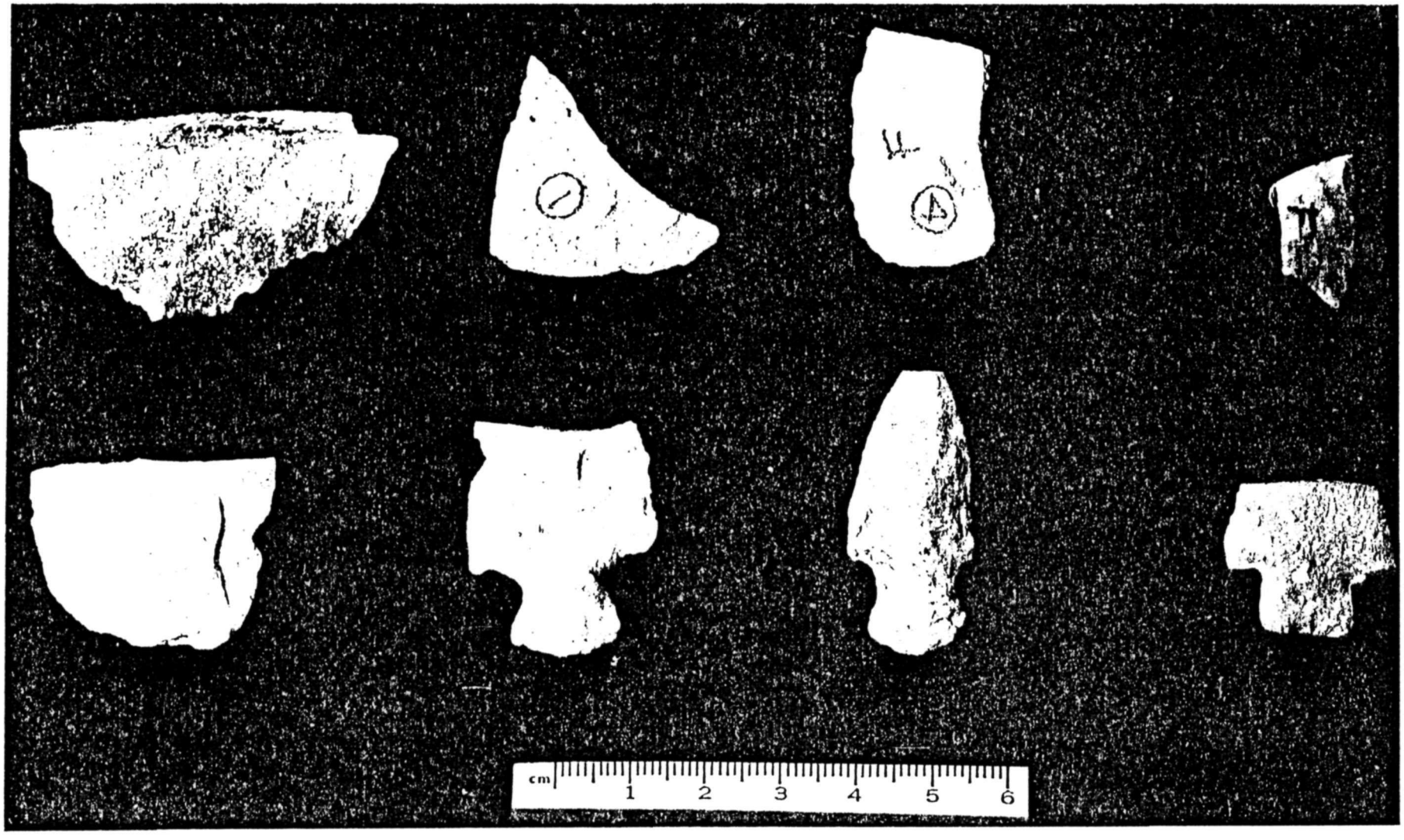
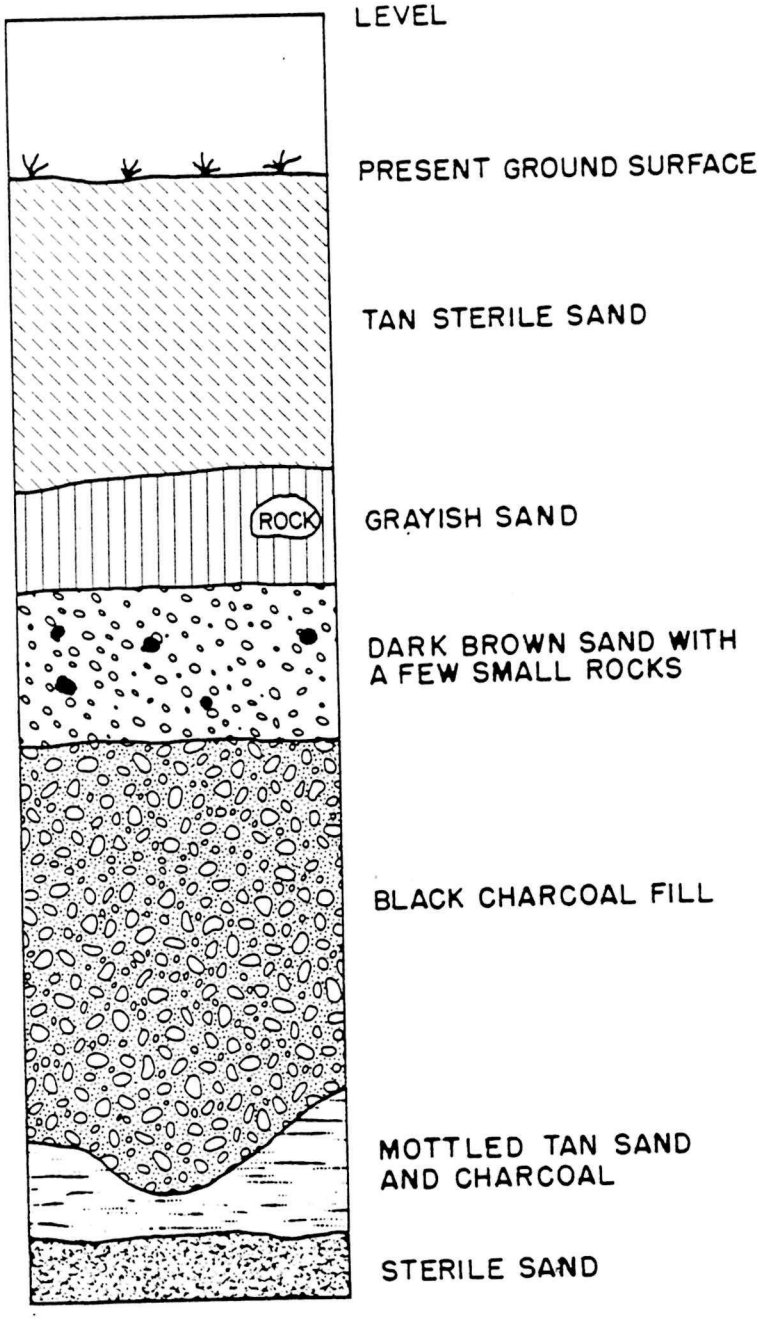


Figure 5. The more complete flaked stone artifacts from 5GN208. Object at far right bottom row is from 5GN208 east, others are from 5GN208 west.



5GN247
TEST I STRATIGRAPHY

FIGURE 6

from each stratigraphic level. During facing activities several flaked stone artifacts, flakes, radiocarbon and waterscreen samples were recovered (Table 2). Several surface artifacts were collected from the road itself. The flaked stone artifacts found during facing operations and found in the road are illustrated (Figure 7). Additional waterscreen and radiocarbon samples were taken at the north end of the site where large (3 cm. diameter) pieces of charcoal were eroding out (Test 2). Appendix B details the results of the pollen analysis.

The waterscreen sample from Test 1 contained eight non-identifiable bone fragments, two of which were calcined. Test 2 contained two non-identifiable bone fragments. Only ponderosa charcoal was identified from the two tests. Additionally, recent intrusive insect parts were found in the soil sample.

A radiocarbon age of 4357+410 (Tx-3620) on wood charcoal was obtained from Test 1. A radiocarbon age of 2204+130 (Tx-3626) was obtained from wood charcoal at Test 2. The dating of material from Test 2 has produced the most recent (by about 2,000 years) radiocarbon age of 27 samples (25 wood charcoal, 2 bone) thus far processed for Curecanti. The sample was probably contaminated since it was a surface sample and insect parts were found in the associated waterscreen sample.

A lithic scatter site - 5GN220 - is located on the level canyon rim directly above 5GN247. Inspection of the surface of 5GN220 in 1979 showed ground stone present on the surface and indicated that it may be an occupation site similar to 5GN205 (Euler 1979) and 5GN10 (this report). Possibly 5GN247 represents a trash dump from the occupants of 5GN220, 100 vertical feet above on the rim. Further work at these two sites may help explain the relationship between them.

Table 2

Inventory of Artifacts Collected from 5GN247

	TEST 1						TEST 2	Road
	Layer A	Layer B	Layer C	Layer D	Layer E	Layer F	Flotation	Bed
Debitage				15			1	
Utilized Flake				1				
Flaked Stone Artifact				2				1
Core				1				
Groundstone				1				

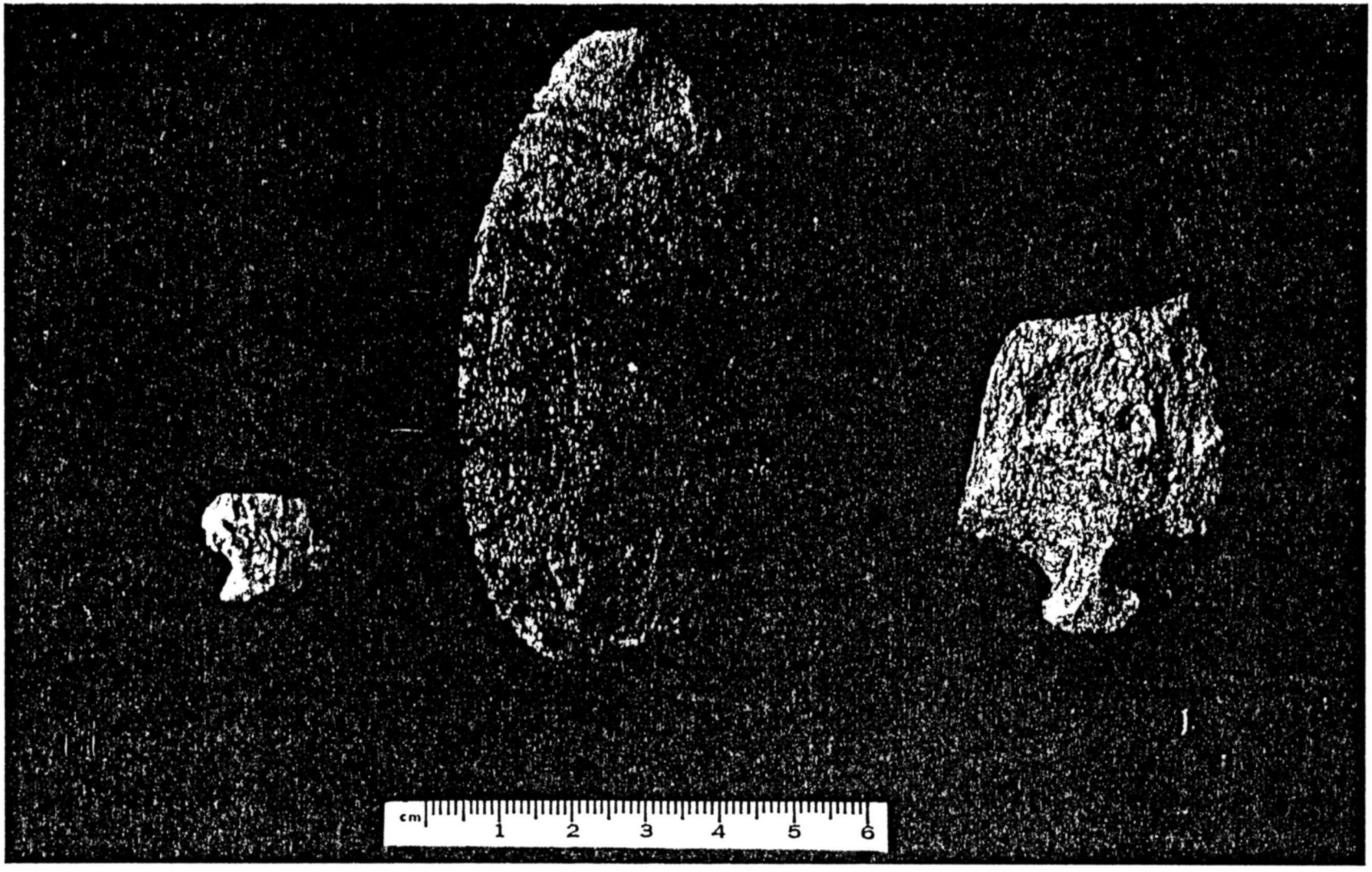


Figure 7. Flaked stone artifacts from 5GN247. Object at left came from road bed. Center and right objects came from cultural layer of Test 1 which was radiocarbon dated at 4356±410.

Site 5GN191

Although most of this site is below high water line it was not recorded until 1976 (Stiger 1977). Local residents knew of the site and had collected artifacts on it for years.

5GN191 is located on the south side of the reservoir. A high mesa directly south of the site gives the location a northern exposure. The site is on a low sandy ridge that slopes downward to the north into the now inundated Gunnison River Valley. At this point the valley is wide and not bisected by the Black Canyon.

The site was tested in 1978 (Euler and Stiger 1981) by the Midwest Archeological Center. At that time it was noted that recent reservoir fluctuations across the site had caused significant erosional destruction of features. When the site was visited in 1979 erosion was more pronounced. The lower half of the site had disappeared. Wave action had destroyed evidence of the test pits and datum stakes from previous summers.

The 1979 crew spent one day excavating and mapping at 5GN191 (Figure 8). The main objectives were to gather radiocarbon samples from unlined hearths and check the stratigraphic relationship between slab-lined and unlined hearths. We had also hoped to test another "boiling pit" as reported by Euler and Stiger 1981. The boiling pits were two stone-lined hearth-like features with tangent margins. Although some fire-cracked rock was arranged similar to the late prehistoric stone and bone-filled boiling pits found on the Northern Plains, on 5GN191 there was very little bone found in association. This would allow us to see if the "boiling pits" were in reality boiling pits or two hearths of different time periods and superimposed.

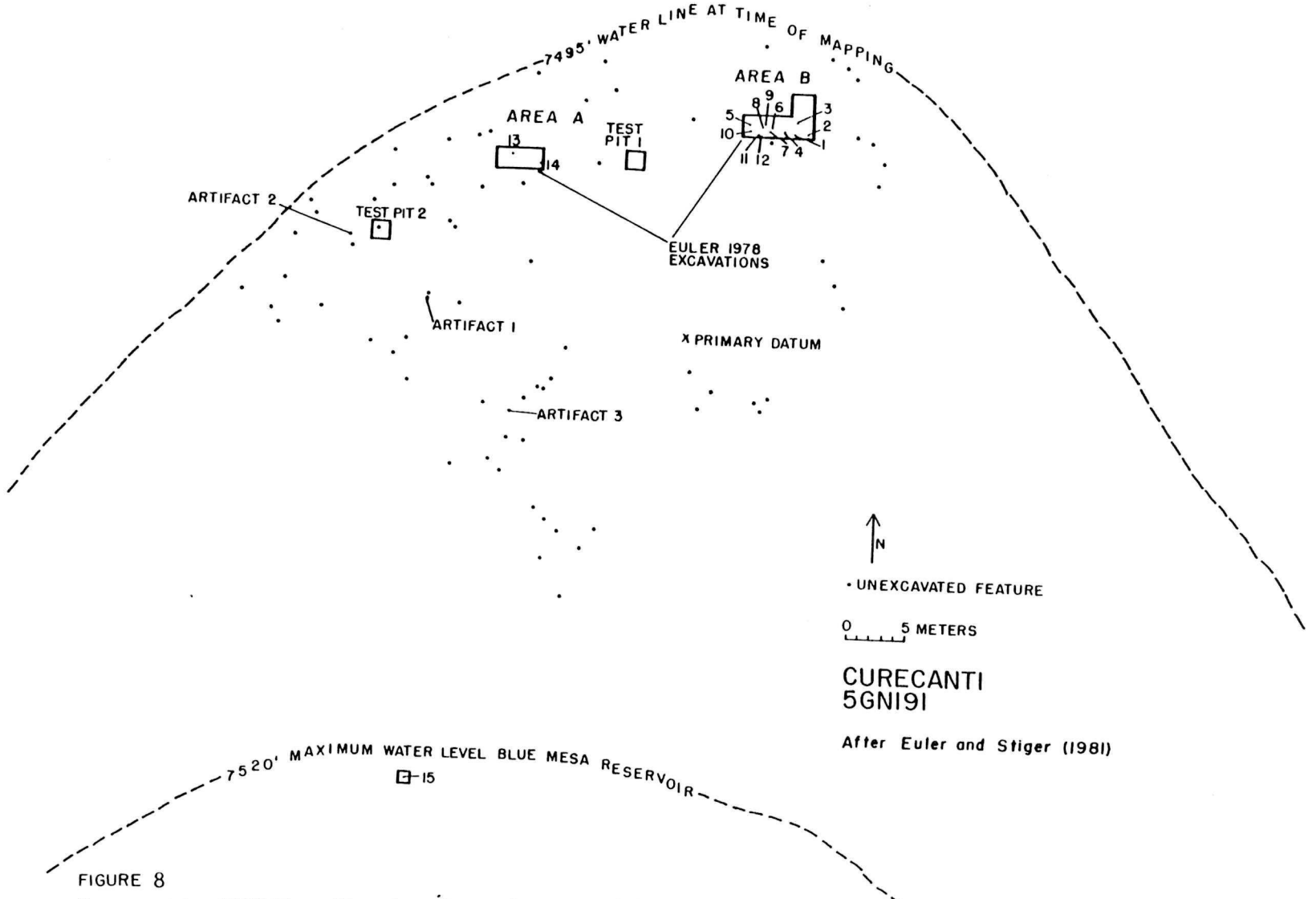


FIGURE 8

Curecanti, 5GN191. The density of exposed hearths, as well as the location of the 1979 excavations at Test Pit 1 and 2, is shown.

During 1979 we excavated two 2x2 meter test pits which were located on exposed hearths. It appeared, prior to excavation, that one hearth was part of a boiling pit complex. However, after excavation it was apparently just a single eroded hearth. Also the test pits were located in an area where soil depth was minimal and stratigraphic relationships were unclear.

Judging from less eroded areas at 5GN191 there was an approximately 10 cm. thick cultural deposit (charcoal, flakes, fire-cracked rock) between the lowest cultural stratigraphic level and the top cultural deposit in the least eroded area of the site.

Excavations did reveal four hearths (Figures 9, 10, and 11) designated Features 1-4. There were two in each test square and the tops of the fire reddened earth-lined structures were eroded by wave action. Also the hearths and surrounding area in test square one showed disturbance by cattle. Several hoof prints were punched into the soil when the earth was moist.

All hearths were lined and shallow (about 15 cm.), and the soil surrounding was burned red. The two hearths in test square one contained fire-cracked rock and charcoal stained soil (Figure 9). The fourth hearth (Feature 4) contained charcoal stained soil, chunks of charcoal and no fire-cracked rock. Feature 4 was radiocarbon dated to 7890+240 (Tx-3624). Feature 4 produced the only identifiable charcoal, and contained pinon and ponderosa pine. A pollen sample was taken from Feature 4. No bone was found in either test square. Three flaked stone artifacts were mapped and collected from the surface of 5GN191 (Figure 12).

Two additional radiocarbon samples from 5GN191 were submitted for analysis. These samples were collected in 1978 by Euler and Stiger (1981).

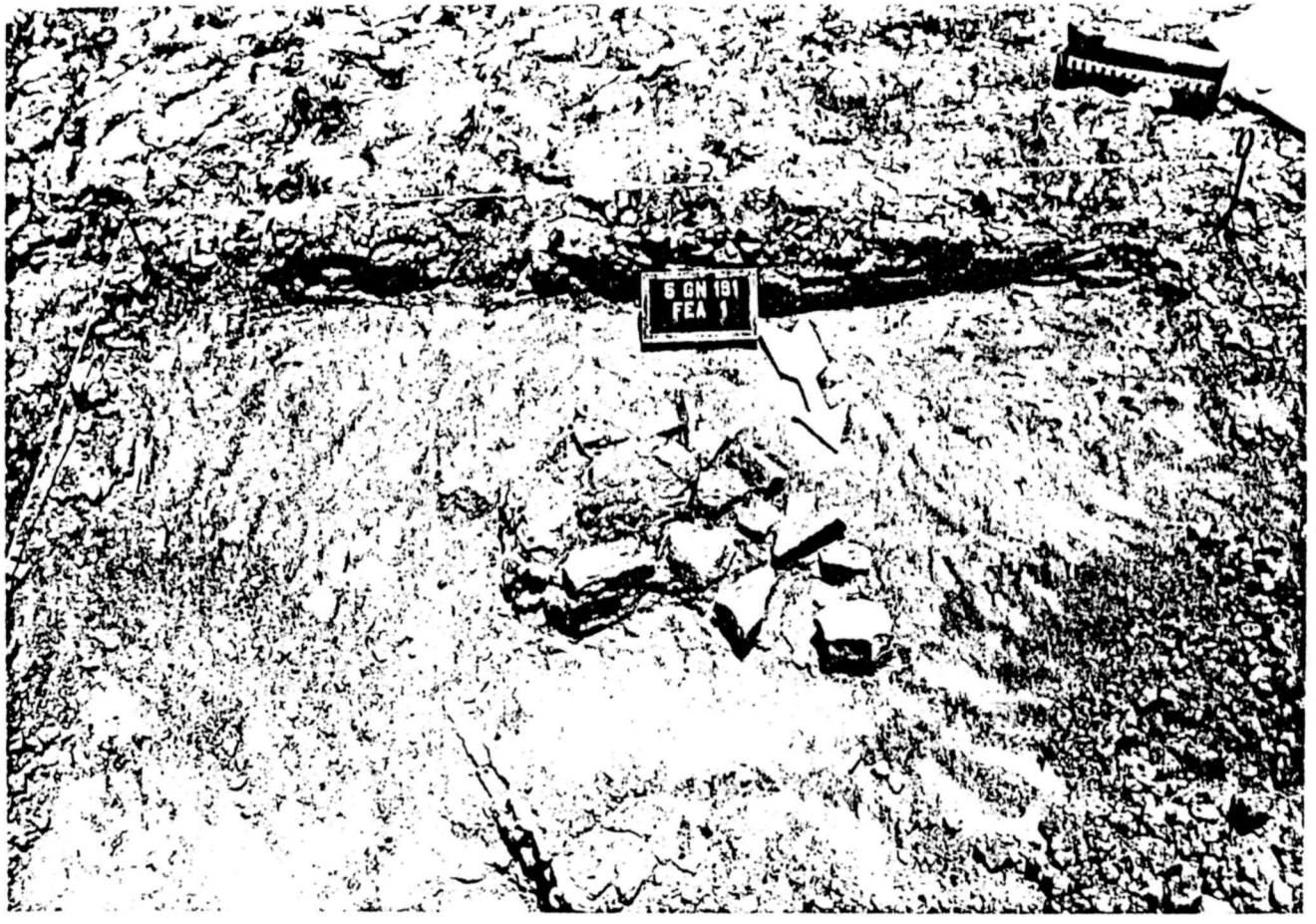
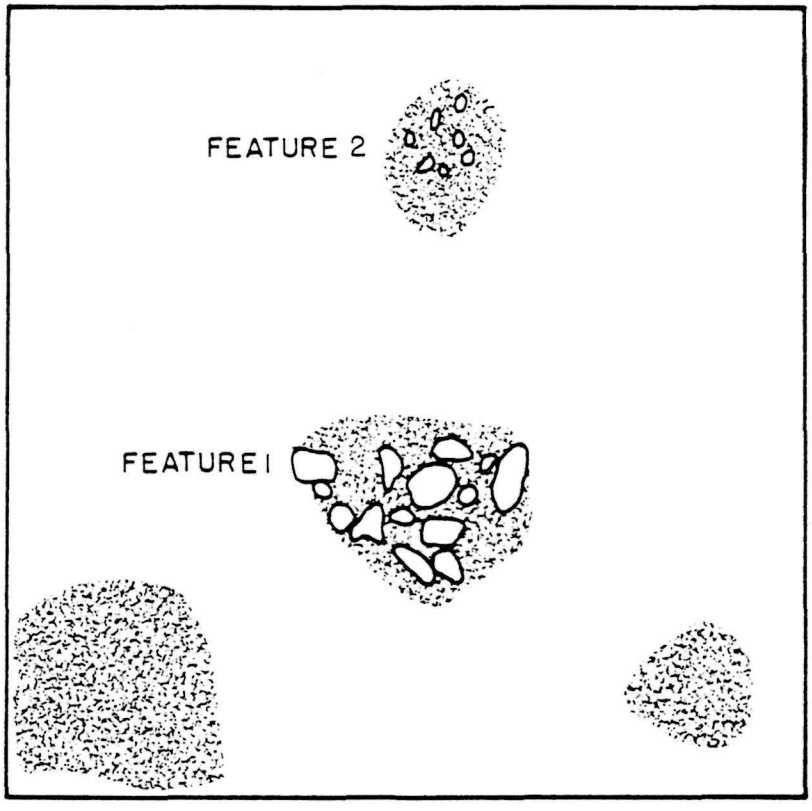


Figure 9. 5GN191, Feature 1. Note extremely disordered hearth disturbed by erosion.



5GN191
TEST PIT 1

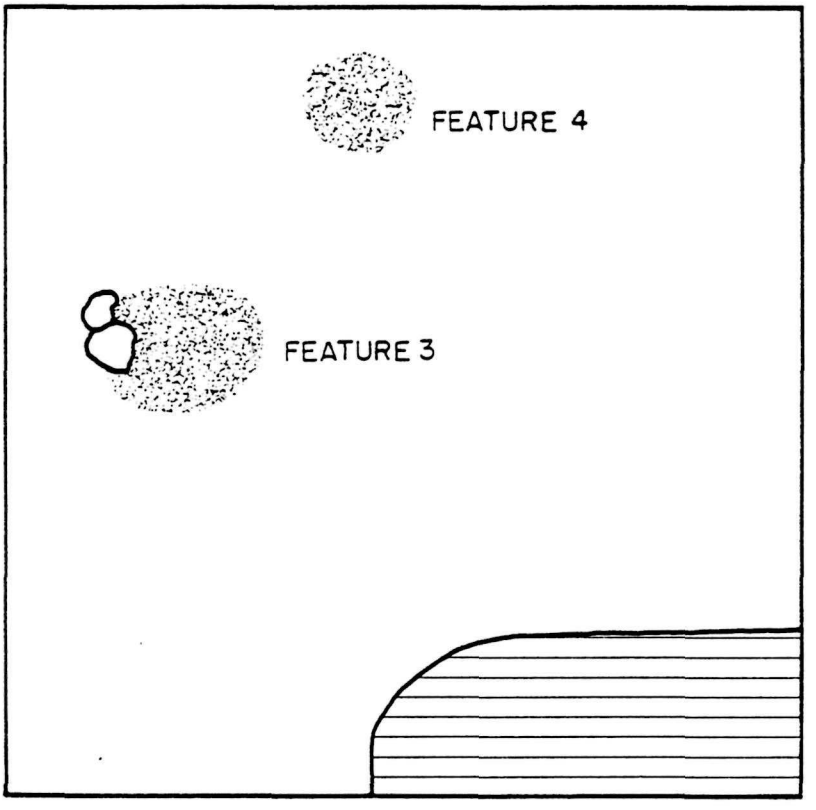
ROCKS

CHARCOAL STAINED SOIL

0 40 CM

MN

FIGURE 10



5GN191
TEST PIT 2

0 40 CM

MN

ROCKS

CHARCOAL STAINED SOIL

AREA ERODED TO STERILE

FIGURE 11

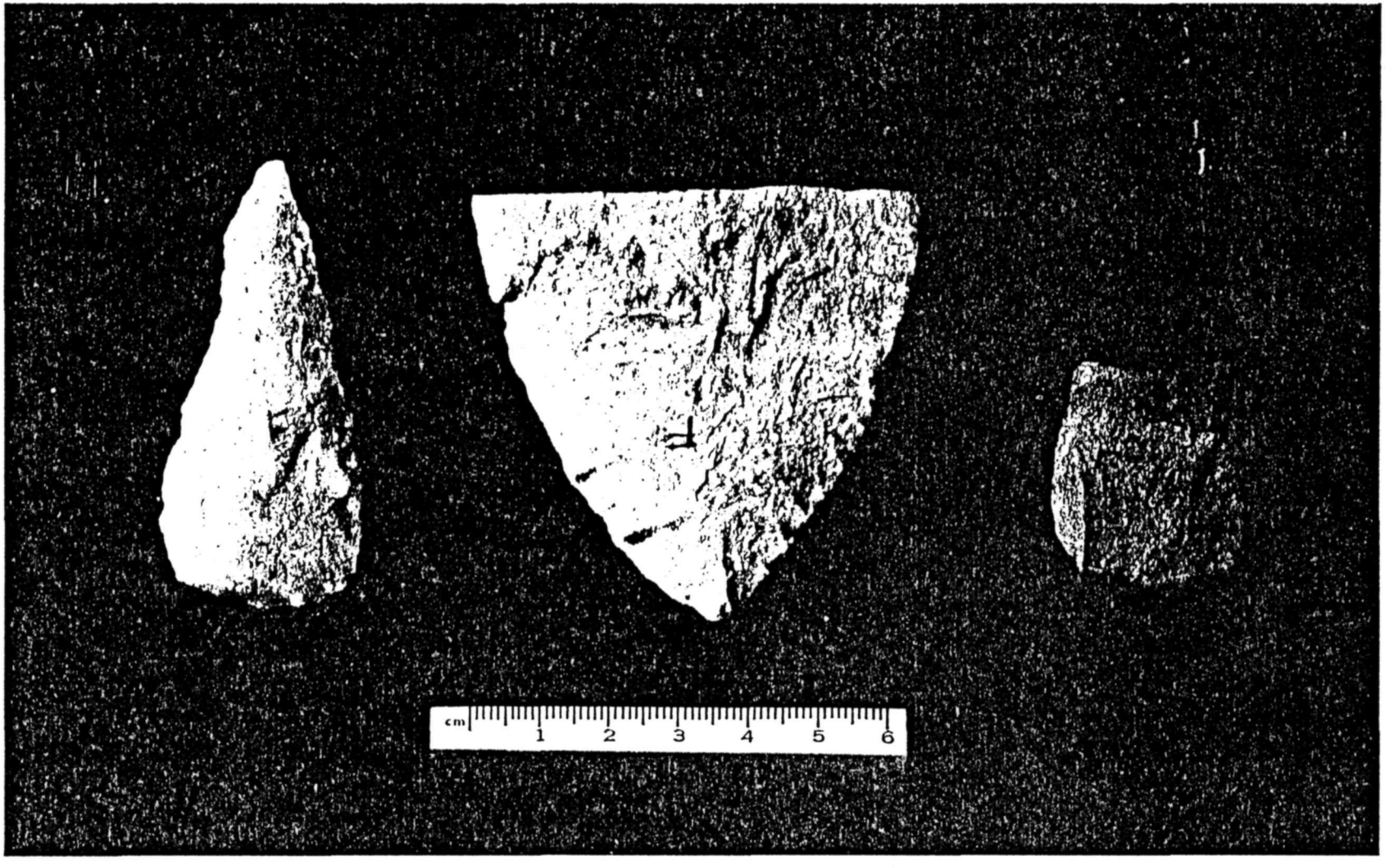


Figure 12. Flaked stone artifacts collected from the surface of 5GN191.

The charcoal was picked out of two waterscreen samples taken from two features (Features 1 and 7). These features will be suffixed - 78 to allay confusion with the 1979 feature designations. Feature 1-78 was associated with Feature 6-78 in what was reported as a "boiling pit" (Euler and Stiger 1981). Feature 6-78 was previously dated at 5861+170 (Tx-3155) (Euler 1977). The charcoal from Feature 7-78 had a radiocarbon age of 6077+950 (Tx-3646). Feature 1-78 was dated at 6747+160 (Tx-3647).

Site 5GN191 probably represents a long-term reuse of a favorable location. Why the location was favorable is not clear but appears to be due to some localized long-term resource. Occupation seems to be temporary since no habitation structures were found during the 1978 or 1979 excavations. 5GN191 has a different temporal pattern of reoccupation than other sites so far tested. Dates indicate occupation from late Paleo-Indian (8800 B.P.) times to about 5800 B.P. Three of six radiocarbon dates cluster between 5861 and 6077 B.P. The remaining three dates are approximately a millenium apart beginning at 8800 and continuing to 7890 and 6747 B.P.

Lithic debris was scarce in the 1979 excavations (Table 3). This is due to erosional destruction of the top of the prehistoric ground surface. Euler's excavations in 1978 probably better represent a non-eroded lithic assemblage on the site (Table 4). Artifacts indicate lithic manufacturing (debitage), as a major activity on the site.

Plant food grinding (ground stone) was not important. The boiling pits appear to be a contemporaneous structure but the paucity of bone seems to argue against bone grease manufacture. The few bone fragments found were well preserved. Perhaps some other plant or animal parts were being processed.

Table 3

Inventory of Artifacts Collected from 5GN191 during 1979 Investigations

	Test Pit 1	Test Pit 2	Test Pit 2 fill of feature 3	General Surface	TOTAL
	0-15 cm	0-10 cm	5-12 cm		
Debitage	54	14	4		72
Utilized Flake	5				5
Flaked Stone Artifact				3	3
TOTAL	59	14	4	3	90

Table 4

Inventory of Artifacts Collected from 5GN191 during 1978 Excavation

2256	debitage
1	utilized flake
21	flaked stone artifacts
2	cores
1	mano
2281	

Site 5GN212

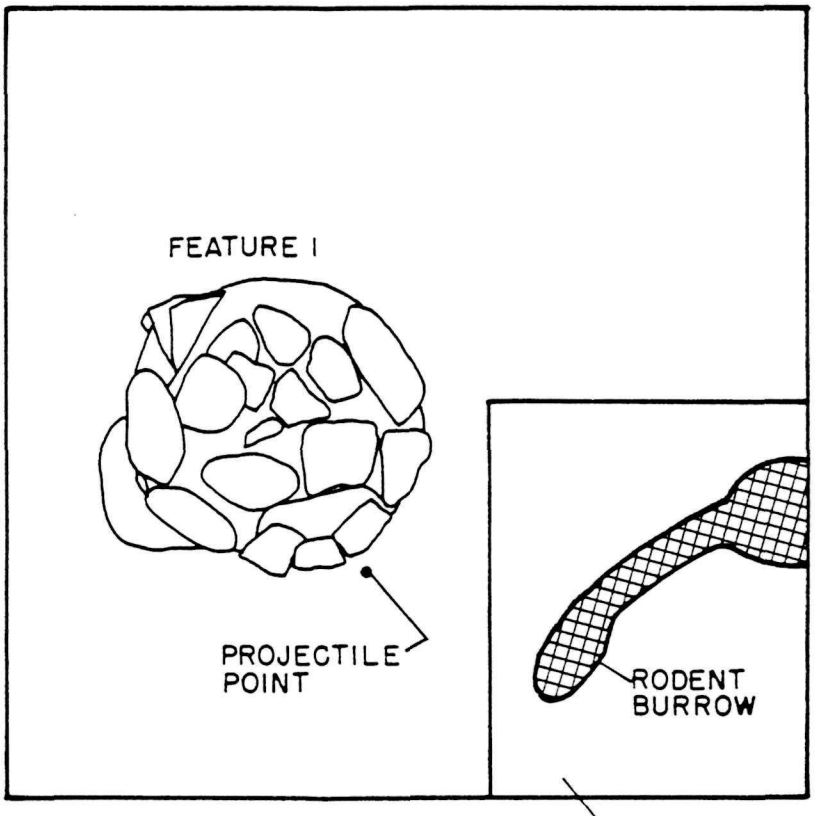
Site 5GN212 is located at the NPS development area of Iola on the south side of the reservoir. The area has been highly impacted by a now demolished settlement with ranch, post office, and automotive garage, as well as National Park Service construction (water lines, access roads, boat ramp, trailer) and unauthorized artifact collection (Stiger 1977).

The site has a slight northern exposure due to high knolls to the south. The local topography resembles a bowl surrounded on three sides by ridges. The densest surface scatter is located east of Junction Creek (Entrada) a sandstone outcrop on a slight downslope that faces north. To the south of the road the land is relatively undisturbed. Although an underground waterline is evident the major disturbance is a natural arroyo. The vegetation is predominately sagebrush with sparse grasses. The area north of the road appears to be highly disturbed. Although the vegetation is sage and grasses, it is a much more luxurient growth apparently the product of recent soil disturbance. This may be due to regrowth on the ranch site or it may be due to land leveling. The land drops a maximum of 20-30 vertical feet from one side of the road cut to the other. A concentration of artifacts is found south of the road in the undisturbed area. Scattered artifacts are found from the access road north throughout the disturbed area to the reservoir. No cultural stratigraphy was seen in the road cut.

One 2x2 m. test pit was emplaced over several upright slabs barely exposed on the surface. The slabs were south of the road and north of the water line. This was in the least disturbed area of the site.

Excavation proceeded in 10 cm. levels. It was soon apparent that the exposed slabs were part of a slab-lined hearth (Figure 13). A plan view of the test pit is shown in Figure 14. Excavation in the test

Figure 13. 5GN212, Feature 1. Hearth after excavation. Charcoal from Feature 1 was radiocarbon dated at 6283±250.



5GN212
TEST PIT I

0 20 40 60 CM

MN

FIGURE 14

pit yielded almost a thousand artifacts (Table 5). Included among the artifacts is one distinctive style projectile point (Figure 15). Wood charcoal from the hearth was radiocarbon dated at 6283+250 B.P. (Tx-3623). All pieces of wood charcoal examined were ponderosa pine. Some unidentifiable vitrified organic matter was recovered from the hearth. Additionally, four unidentified bone fragments were found in the hearth and two unidentifiable bone fragments were found in the test pit outside the hearth. One pollen sample was taken from the bottom of the hearth.

5GN212 appears to represent a hearth around which stone tool manufacturing (debitage) and maintenance activities (utilized flakes) were performed. Plant food processing (ground stone) seems to have been minimal. There was apparently some animal food consumption or processing (bone).

Site 5GN206

This site was recorded in 1976 (Stiger 1977) and is located on a ridge of bedrock that extends to the south into Blue Mesa Reservoir. The ridge terminates in a hill and saddle topographic feature located near the mouth of Willow Creek. Shallow soils are generally located on the saddle and on the side of the hill and in deeper pockets between bedrock outcrops on the top of the hill. Cultural debris is found on the hill and saddle in area of soil deposition. During periods of high water levels in the reservoir, water covers the saddle and the hill becomes an island. Consequently, the saddle and hillsides are undergoing severe erosion. There is also a fishing access road that terminates on the saddle and it is not uncommon to see cars parked on the site during low water. The probability for vandalism is quite high.

Table 5

Artifact Inventory from 5GN212

	Test Pit 1			
	Surface	0-10 cm	10-20cm	20-30 cm
Debitage	10	442	161	240
Utilized Flake	3	33	10	17
Flaked Stone Artifact	1	6	1	
Ground Stone				
TOTAL	14	481	172	257

	In 80 x100 cm test window in Test Pit 1 30-40 cm	In rodent burrow in test window 40 cm	Fill of Feature 1	TOTALS
Debitage	17		28	908
Utilized Flake	2		4	69
Flaked Stone Artifact	1			9
Ground Stone		1		1
	20	1	32	987

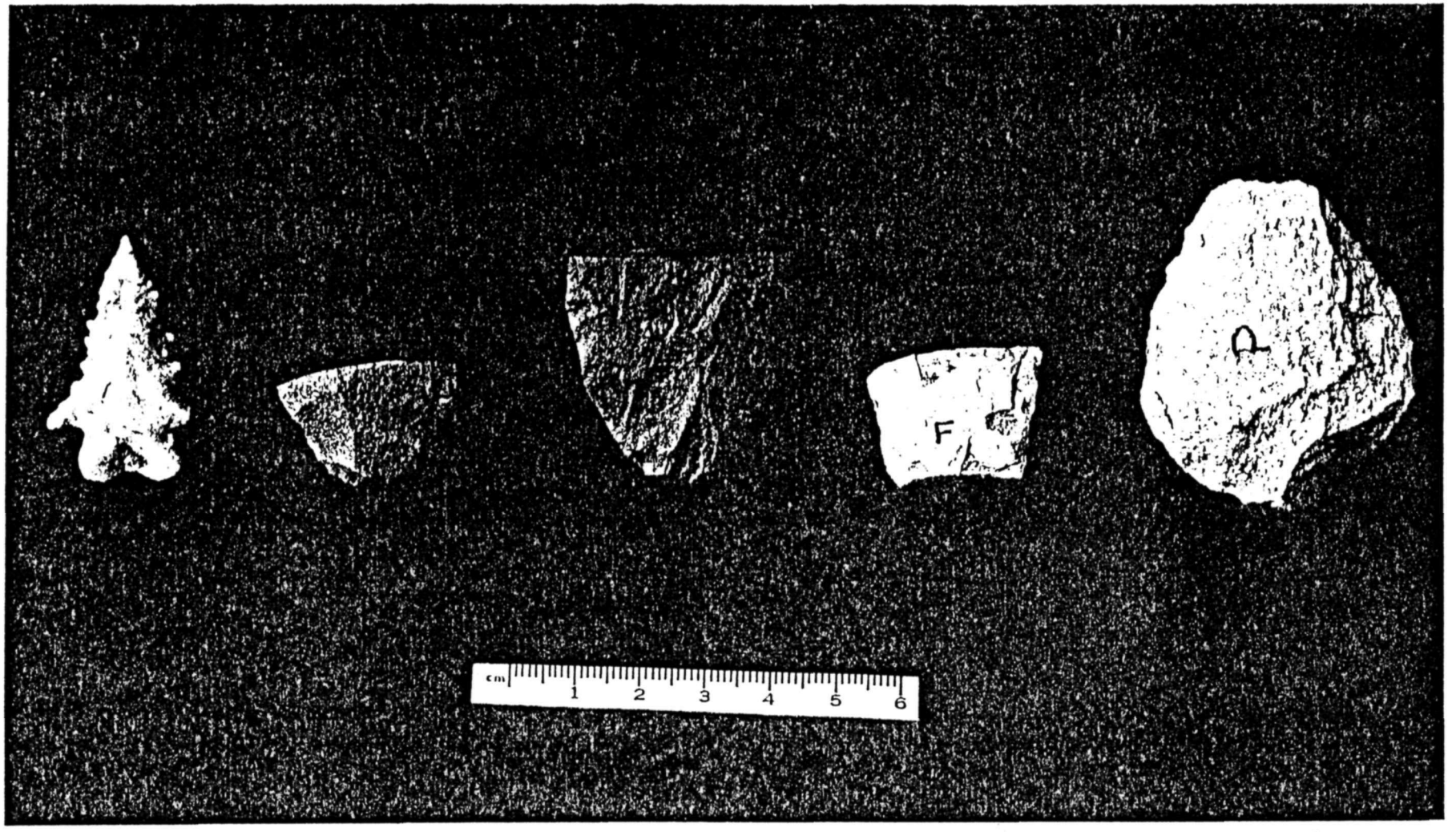


Figure 15. The more complete flaked stone artifacts from 5GN212. Object at left was 15 cm deep and 10 cm away from Feature 1, radiocarbon dated 15 6283±250.

Two 2x2 m. test pits were placed on the site. One test pit (Test 1) was located in an eroded area on the edge of the saddle where two slab-lined hearths were exposed (Figure 16). The second test pit (Test 3) was located on the hilltop in a pocket of soil. A one-meter wide 3.2 meter long test trench (Test 2) was excavated into the hillside at the location of the deepest soil. The test trench was excavated to expose the stratigraphy of the hillside and provide a pollen sample sequence.

Additionally, a partial surface collection was made on the hilltop. The island top was gridded into 10m.x10m. units in areas of very shallow soil and was surface collected. Unfortunately the water was rising and we did not get to collect the adjacent 2x2m. grid. However, we were able to get two crew members to the island for a day later in the summer via a ranger patrol boat. A 2x2m. test pit was excavated.

The interface between reservoir and hillside was collected by a non-probablistic method in order to recover artifacts that would have washed down hill into the Reservoir. Crew members walked the highly disturbed "beach" and collected artifacts that had eroded down from the hillside deposits.

Another non-probabalistic sample of lithics was recovered from the site. During our surface collection on the hilltop a man was observed collecting artifacts. After National Park Service policies and legislation was explained to him he turned his handful of lithics over to the archeologists and apologized. The 14 flakes he had collected included two utilized flakes, approximately the same percentage found in our systematic collection. This, however, brings up the point that most unauthorized collections are made in ignorance of the existing legislation. Education would probably be the most effective means of

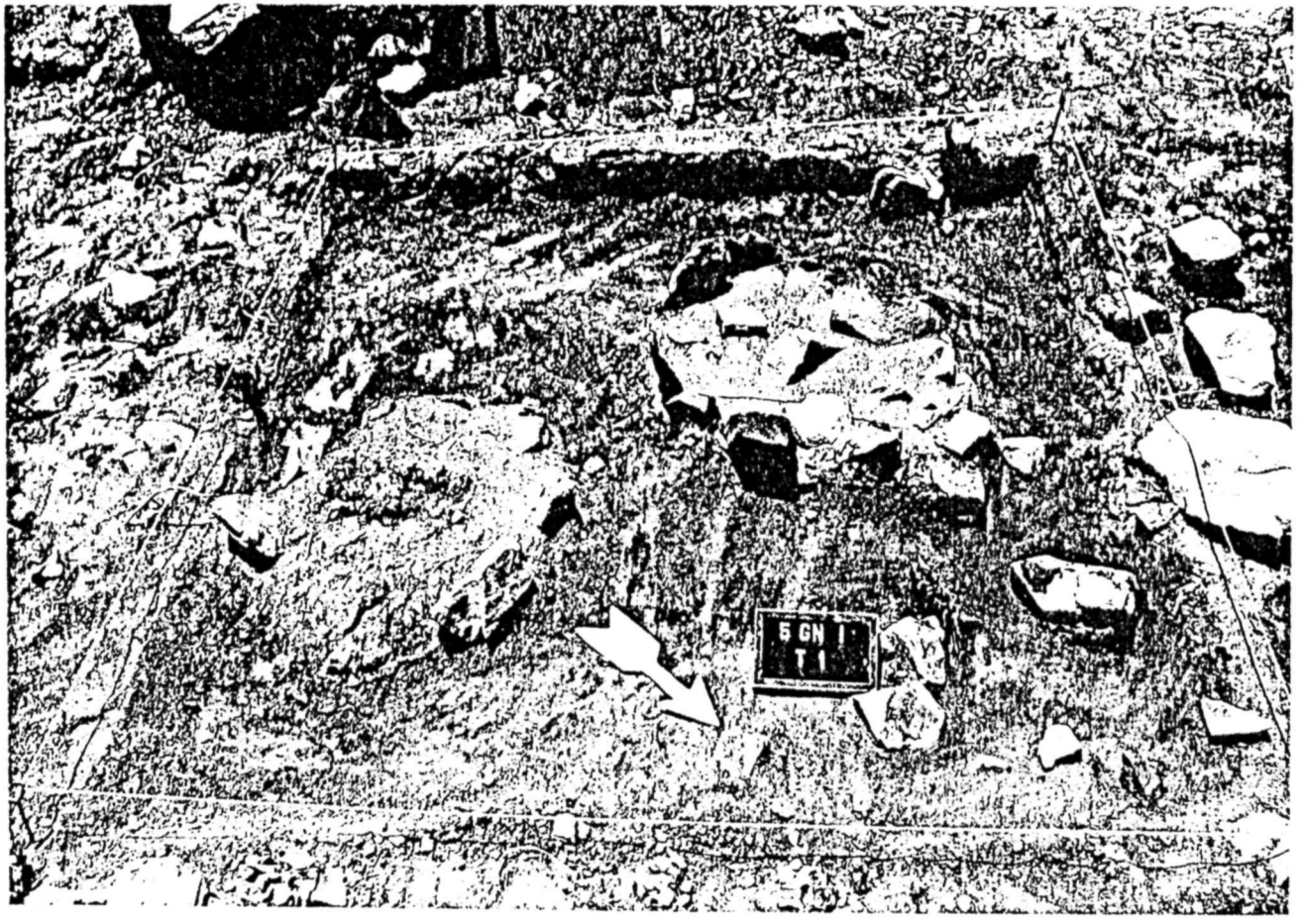


Figure 16. 5GN206, Test Pit 1 at beginning of excavation. Photoboard is incorrect.

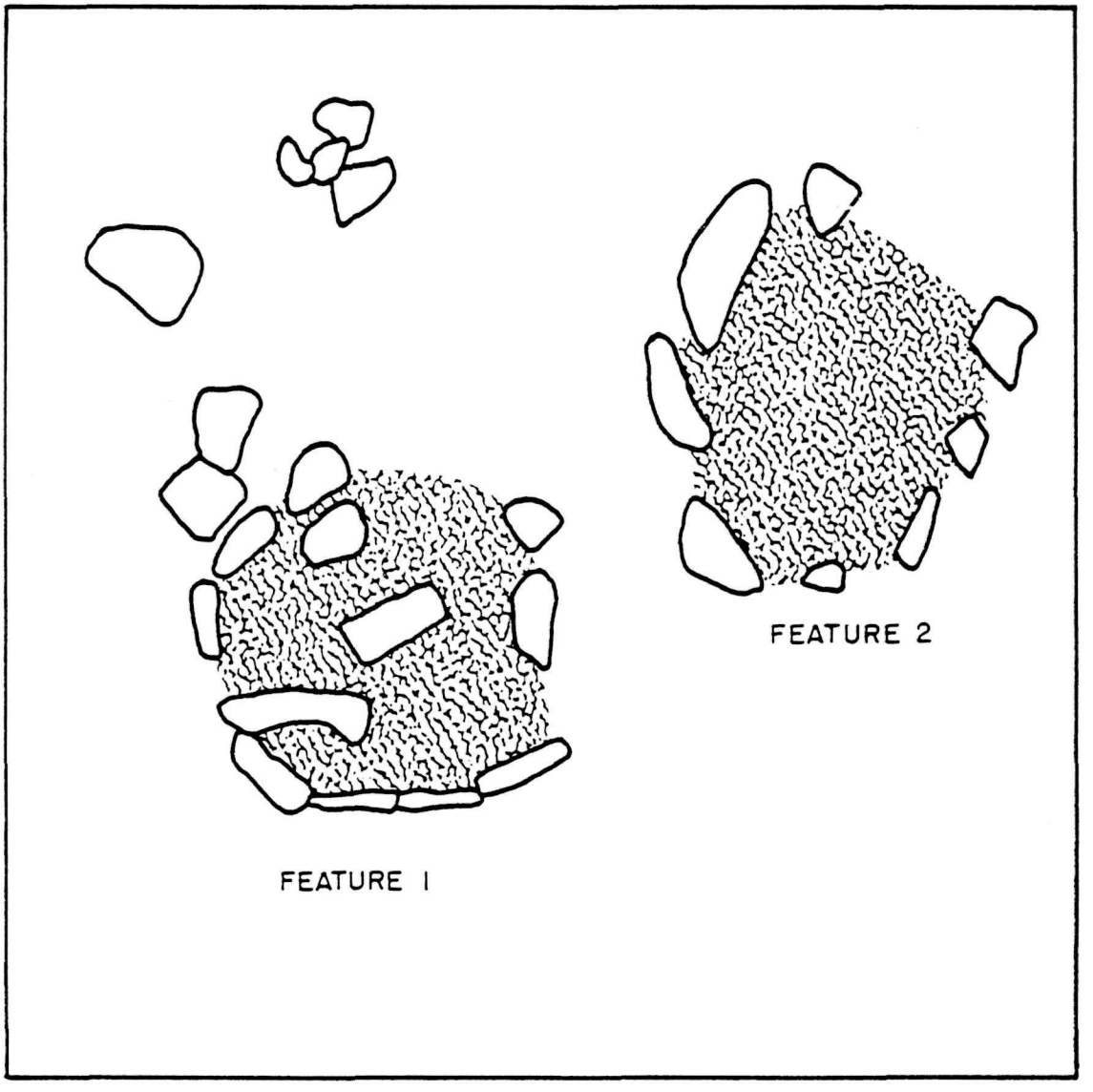
lessening the widespread illegal destruction of the archeological resources by "arrowhead collectors".

Test 1 was at the location of two hearths Features 1 and 2 (Figure 17). Both hearths were slab-lined and contained charcoal stained soil and fire-cracked rock. Both hearths were dug into culturally sterile soil and had stone slab bottoms (Figure 18). Feature 1 contained a few identifiable ponderosa pine charcoal fragments and one unidentifiable bone fragment. Two unidentifiable large mammal long bone fragments were found in Feature 2. No identifiable charcoal came from Feature 2. The only radiocarbon sample analyzed from this site is from Feature 2. It produced a radiocarbon age of 5583+160 (Tx-3622).

The trench in Test 2 allowed an examination of the stratigraphy of the hillside (Figure 19). It appears that there are two cultural levels separated by 35 cm. of sterile soil. An unlined hearth was found in the basal stratum of the trench (Feature 3). The fill of Feature 3 was charcoal stained soil and small pieces of unidentified vitrified organic material (Figure 20). The soil around the hearth was burned red.

Another hearth was seen in the stratigraphic profile (Figure 19). This was in the upper cultural layer. Since just the edge of the hearth was in the trench, the hearth was not excavated.

Three pieces of bone were recovered at 100 cm. below the surface of test trench in Test 2. Two of the bones are fish vertebrae. The third bone is the proximal half of a left femur resembling a squirrel family mammal (Emslie 1981). The rodent appeared at the time of excavation to be a recent incorporation (some flesh was still adhering to the bone) into the deposit. The squirrel bone was in the eastern end



5GN206
TEST PIT 1

0 10 20 30 CM

ROCKS

CHARCOAL STAINED SOIL

MN

FIGURE 17

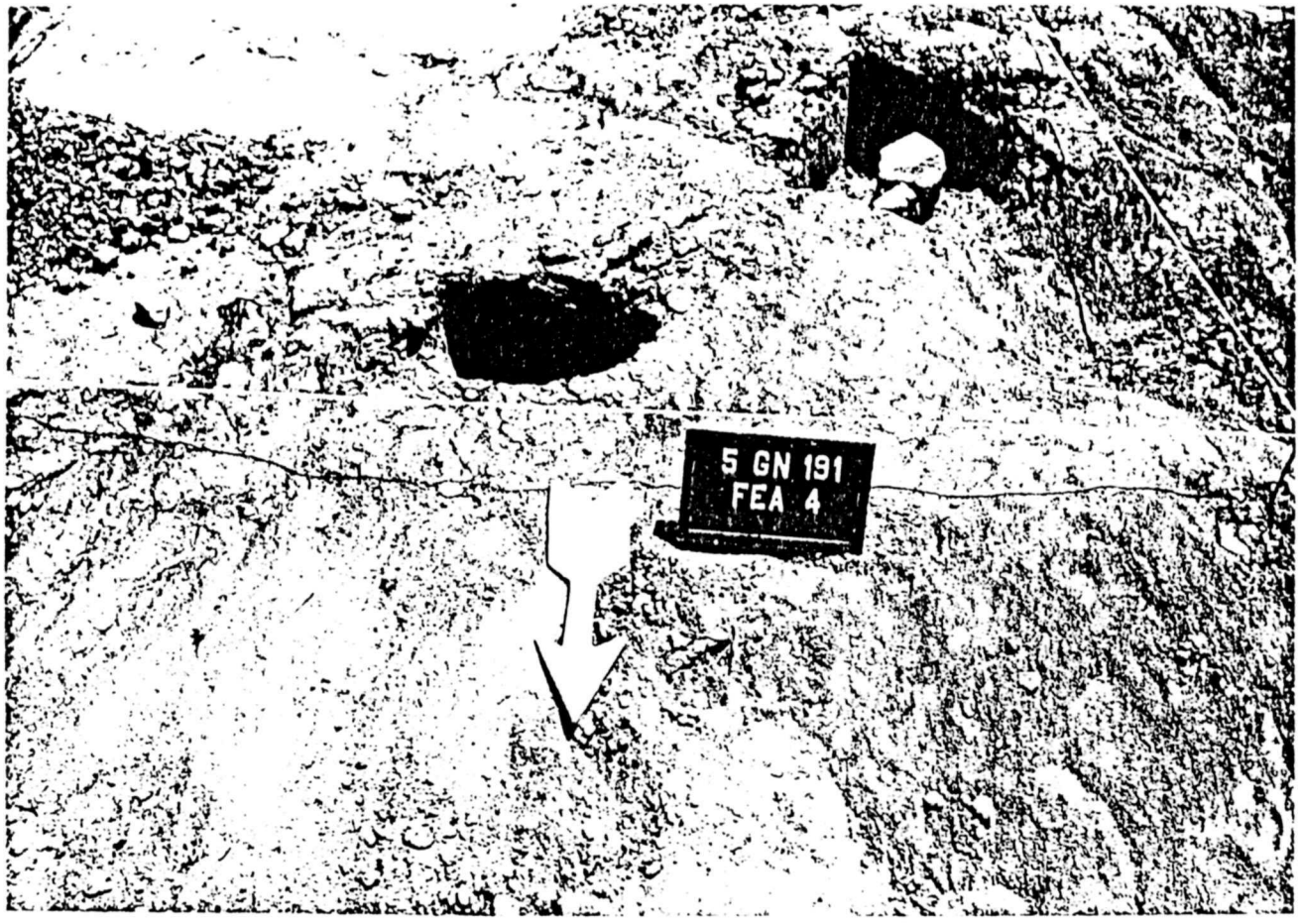
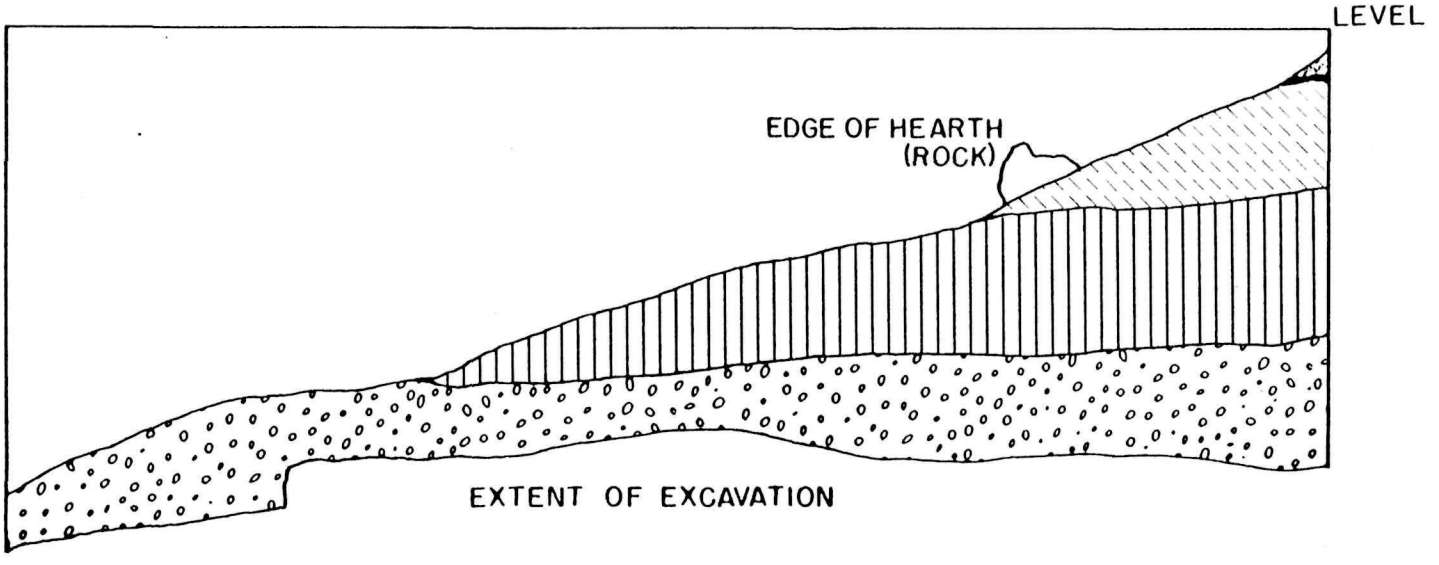


Figure 18. 5GN206, Test Pit 1, Feature 1 after excavation. Photoboard is incorrect.



VERY FINE GRAINED SAND, APPARENTLY DEPOSITED BY WIND

BAND OF SAND, APPARENTLY DEPOSITED BY RESERVOIR

DARK BROWN SOIL, SOME CHARCOAL FRAGMENTS

VERY COMPACT STERILE CLAY

LIGHT BROWN, WELL SORTED SILT & CLAY, SMALL CHARCOAL FRAGMENTS

5GN206
TEST 2 STRATIGRAPHY

0 20 40 60 80 100 CM

FIGURE 19

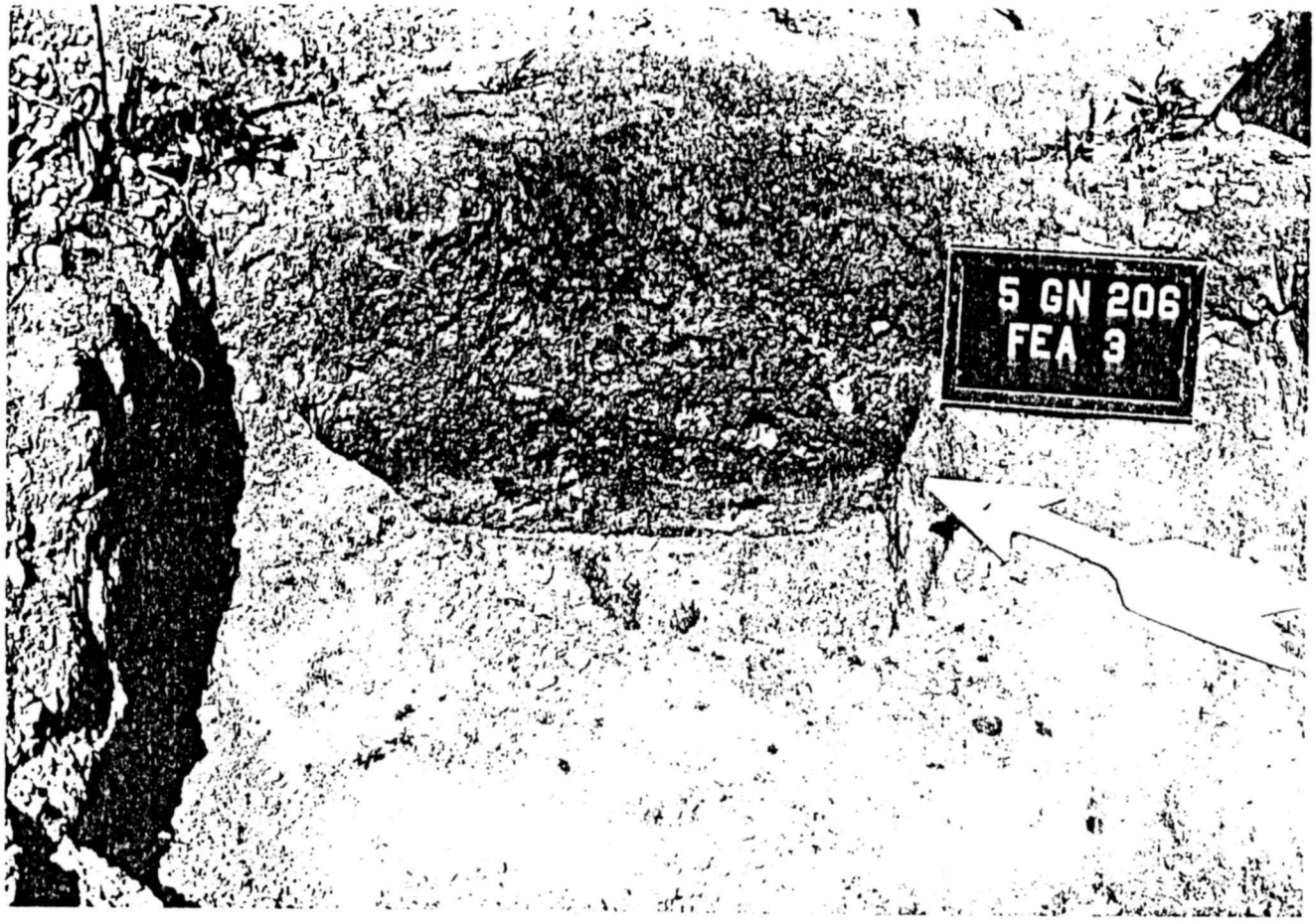


Figure 20. 5GN206, Test Pit 2, Feature 3, profile. Note stratigraphy of feature 3.

of the trench and probably was a burrowing intruder into the deep cultural deposit.

Test pit 3 was placed on top of the hill on 5GN206 and encountered no features. No radiocarbon or pollen samples were collected. No identifiable organic remains were found in the waterscreen sample. Only one unidentifiable bone fragment was recovered. In the top 10 cm. a piece of modern cloth was found. It appears that recent activities by visitors have disturbed the deposits on the hilltop area of the site. However, excavations were limited to only one 2m.x2m. test pit on the hilltop. More work is needed to determine the extent and character of the prehistoric deposit. The distribution of lithic artifacts is shown in Figure 21. The more complete flaked stone artifacts collected from 5GN206 are shown in Figure 22.

5GN206 appears to represent at least two different activity areas. The hilltop is a light lithic scatter area. More subsurface work is needed to better understand what is represented on the hilltop. The surface of the saddle area of the site is different than the hilltop and is marked by the dense lithic scatter present and hearths eroding out on the surface. The area (Test Pit 1) around the hearth (Features 1 and 2) probably was the scene of lithic manufacture (debitage), tool maintenance (utilized flakes) and some plant food preparation (groundstone). Some animal food was consumed (bone). The hillside area of Test Trench 2 may have been a trash disposal area for activities on the hilltop. There were flaked stone artifacts and an unlined hearth found 110 cm. deep in Test Trench 2. This represents one of the deepest deposits yielding cultural debris in Curecanti. No charcoal was available for radiocarbon dating.

Test Pits 2x2m

TP 3
0-10 cm
136 deb
4 utf
1 pre

TP 1 0-10 cm
174 deb
20 utf
3 flsa
1 grnd
10-20 cm
70 deb
4 utf 1 pre

Artifacts taken from
illegal collector, no provenience

12 deb
2 utf

Feature 1 Fill
46 deb
6 utf
1 pre
1 flsa
1 grnd

Feature 2 Fill
25 deb
2 utf

Hilltop Location
Only surface collection was made
Collection Squares are all 10m x 10m

CS 7 97 deb 7 utf 1 pre 1 flsa	CS 6 313 deb 20 utf 14 flsa 1 core	CS 1 189 deb 10 utf 1 pre
CS 8 55 deb 7 utf 2 pre 1 flsa	CS 5 170 deb 5 utf 1 pre	CS 2 242 deb 10 utf 15 flsa 1 core
CS 9 33 deb 8 utf 1 pre 2 flsa	CS 4 95 deb 17 utf 3 pre 3 flsa	CS 3 113 deb 6 utf 2 pre 8 flsa

Test Pit 2 1m x 3.2m

TP 2

0-10 cm	20-40 cm	40-60 cm
6 deb	23 deb	25 deb
1 grnd	2 utf	1 utf
60-80 cm	80-100 cm	100-110 cm
26 deb	15 deb	343 deb
2 utf	2 utf	47 utf
		1 pre
		18 flsa
		1 core
		1 grnd

Beach Collection
66 deb
9 utf
5 pre
4 flsa
3 grnd

Figure 21. 5GN206, artifact distribution. Test pits not shown to scale.

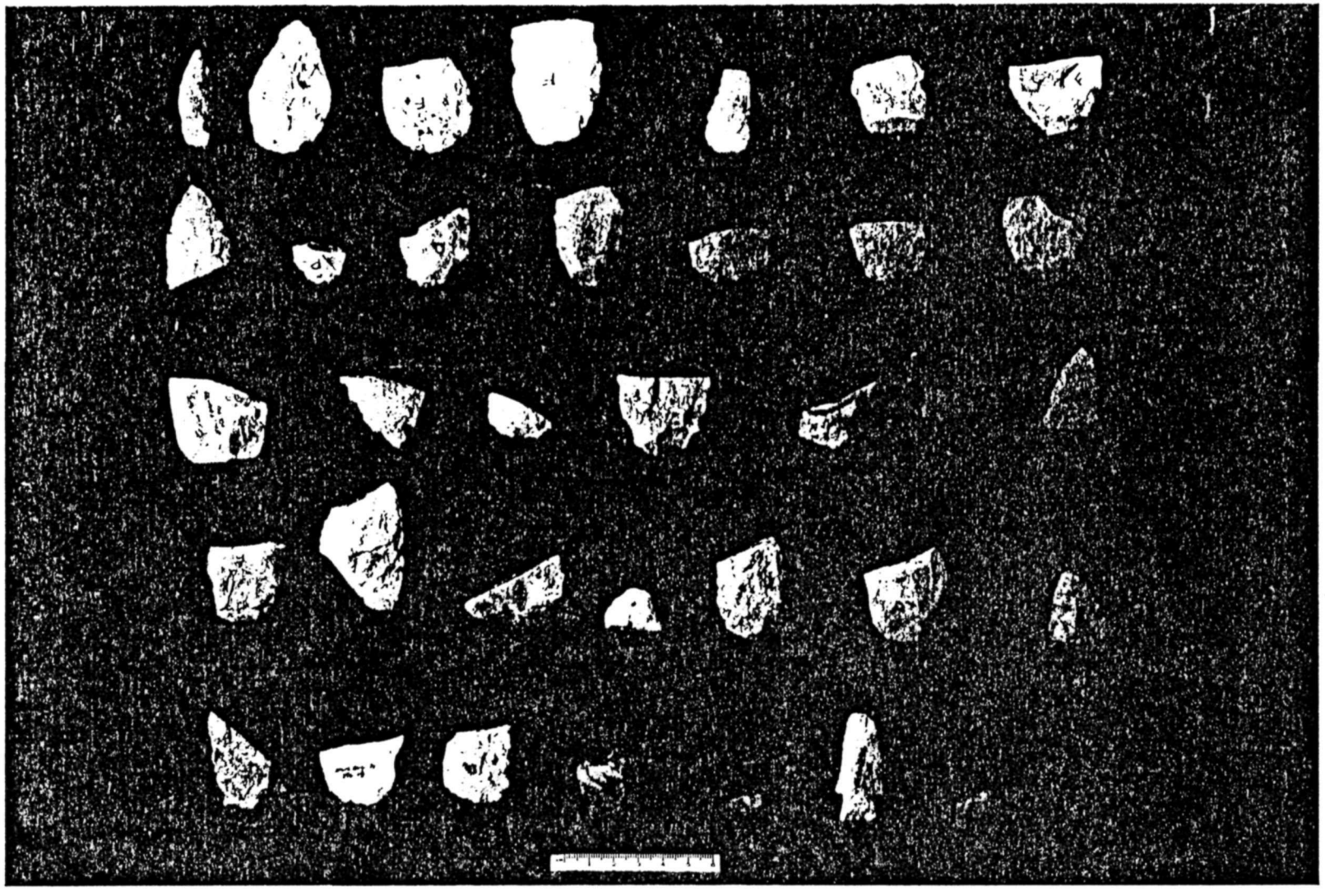


Figure 22. The more complete flake stone artifacts and preforms from 5GN206. All came from surface proveniences except: Top row fourth object, 100-110 cm level Test Pit 2; Top row seventh object, 80-100 cm level Test Pit 2; Second row fourth object, fill of feature 1; and Fourth row fourth object, 100-110 cm level Test Pit 2.

Site 5GN10

Although most of 5GN10 is above the high water line of Blue Mesa Reservoir, it was recorded during the archeological survey of the reservoir basin in 1962 (Lister 1962). No subsurface testing was done and only one projectile point and one "broken knife" were collected from the site by Lister.

5GN10 is located on the north side of the reservoir. Cultural material is scattered on the sagebrush covered surface from Willow Creek on the east to a deep unnamed drainage on the west. Most of the prehistoric material is concentated along the southern edge of a high cliff that overlooks the reservoir.

5GN10 was the scene of the major test excavations during 1979. Areas of artifact concentrations were flagged and each concentration was designated as a lettered component. The term component designates an area of the site and is not used in traditional chronological sense. Nine components were staked and lettered A through I. Components A and B were below high water line. Components C, G, H, I were not tested but surface collections, flaked stone artifacts and some ground stone fragments were mapped at these components. The artifacts collected from Component C are pictured in Figure 23.

Component A-5GN10

Component A is located on the first terrace above the flood plain of Willow Creek. The component is primarily below high water line and suffers continuing erosion from fluctuating reservoir levels and wave action. A surface collection was made (Figure 24) and two test pits were placed in an area of high artifact density. One test pit was placed in an area where very small flakes predominated and a projectile point

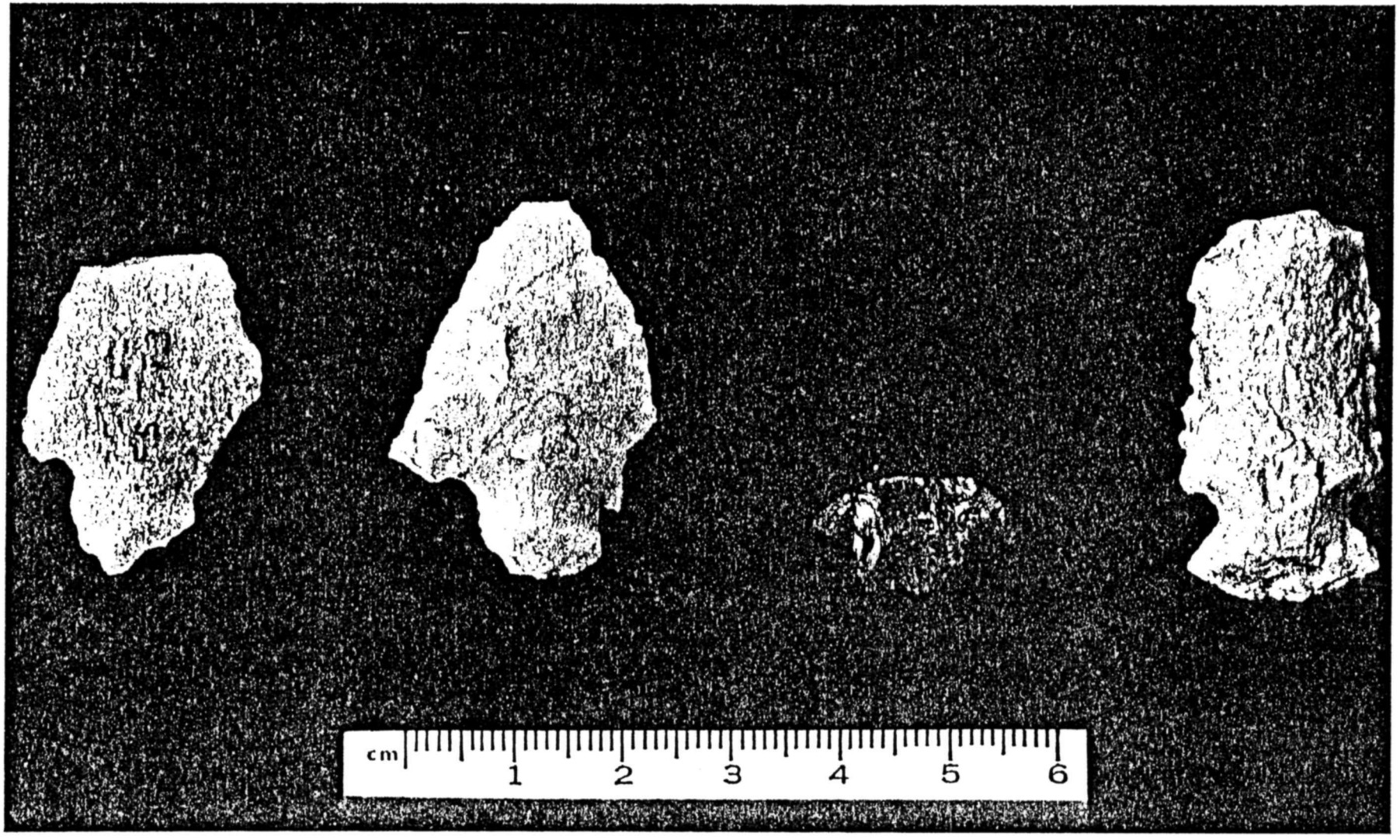
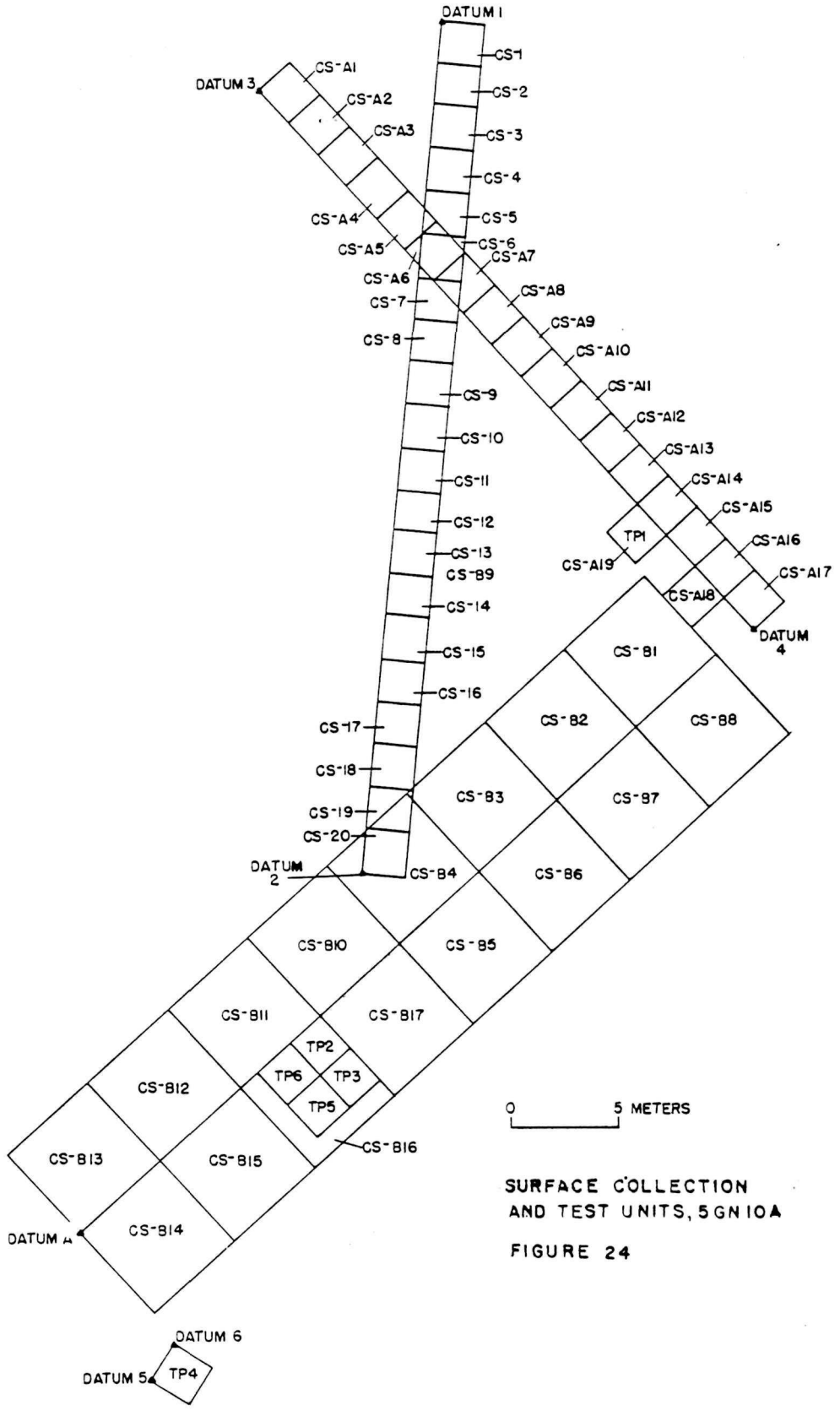


Figure 23. Flaked stone artifacts collected from the surface of 5GN10, Component C.



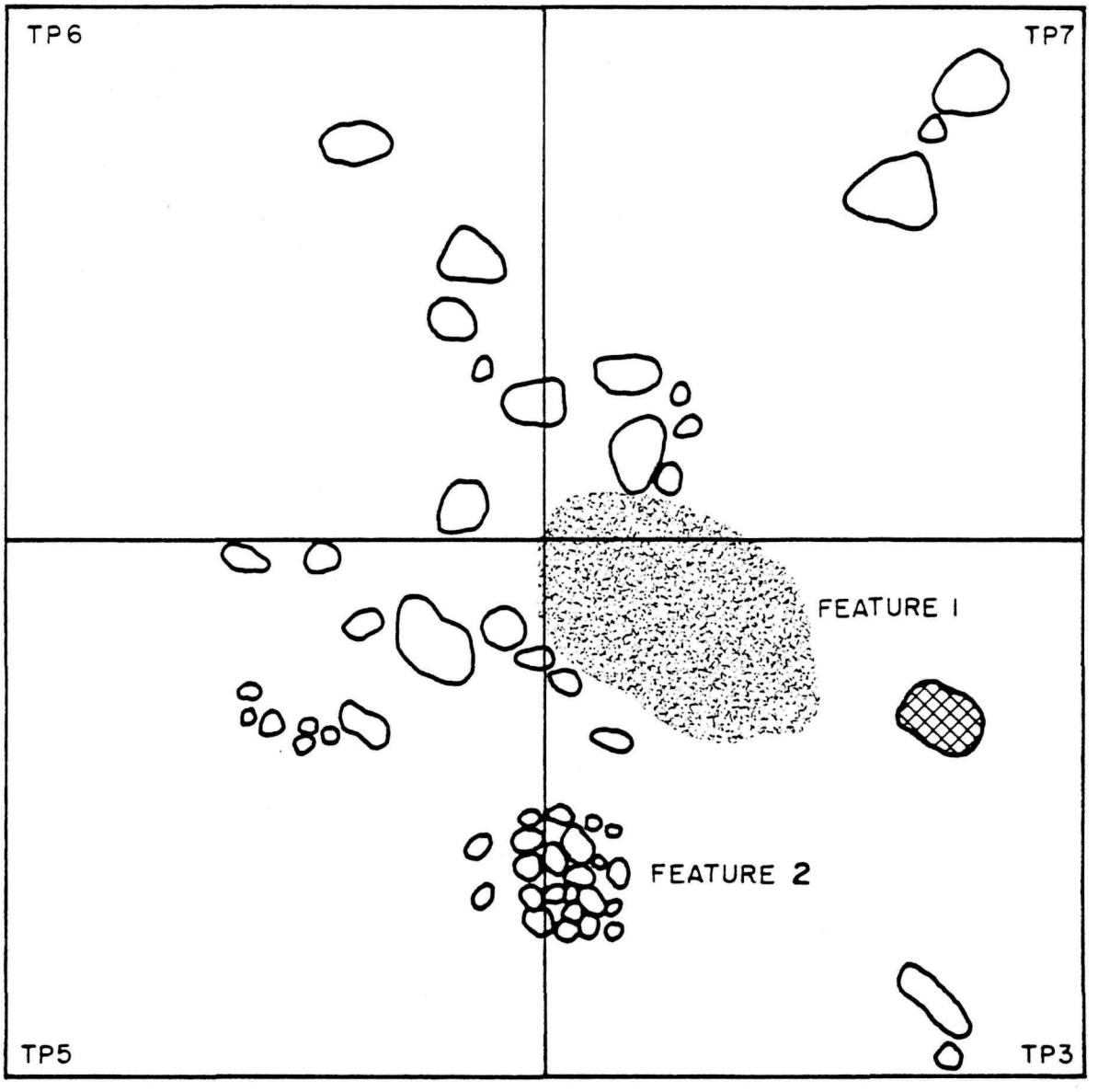
SURFACE COLLECTION AND TEST UNITS, 5GN10A

FIGURE 24

fragment was found. Four test pits were placed in an area where one ground stone artifact was located.

The only features found were in the test squares placed at the locus of surface ground stone (Figure 25). Feature 1 was an unlined hearth. There was fire-cracked rock in the bottom of the hearth. Charcoal from the hearth was radiocarbon dated at 6035+600 (Tx-3625). Pinon pine charcoal came from the hearth. No bone was found. Associated with the hearth was a 60cm. x 45cm. area of rock "paving" (Feature 2). There were no cultural remains below the paving and none of the rocks exhibited any use. However, it appeared that the rocks were purposefully placed because of their horizontal strike. Also in the area of excavation were several artifacts that seemed to be on a level with the top of the hearth and paving area. Pollen samples were taken from beneath Feature 2 and a metate on this level. Results of the pollen analysis may be found in Appendix B. The more completed flaked stone artifacts recovered from Component A are pictured in Figure 26, while frequencies of occurrence are presented in Table 6.

Component A appears to represent an area where stone tools were manufactured (debitage) and maintained (utilized flakes). Some plant food processing (ground stone) was done. Since the densest subsurface flaked stone artifact and debitage concentrations on Component A was near the hearth (Feature 1), lithic reduction activities may have been localized near the hearth. More excavation should be done on Component A away from Feature 1 to examine the subsurface distribution of artifacts across the component. This may demonstrate other activities localized in different areas on the component. It is possible that the hearth was used in heat treatment, although heat treatment has not been



5GN10
COMPONENT A
TEST PITS 3,5,6,7

ROCKS

METATE

CHARCOAL STAINED SOIL

0 50 CM

MN

FIGURE 25

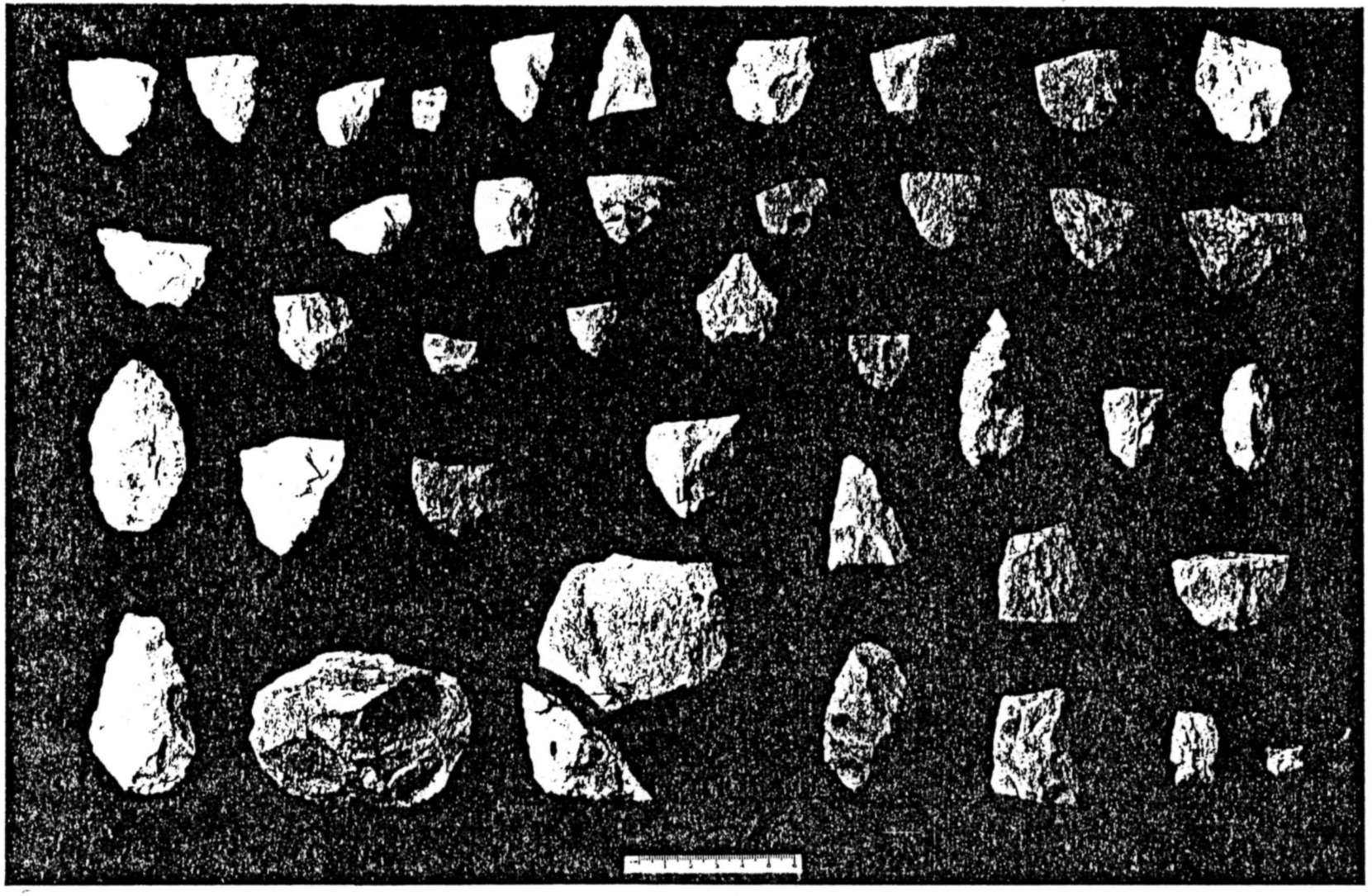


Figure 26. The more complete flake stone artifacts from 5GN10 Component A. None were in direct association with features.

Table 6

Artifact Frequencies on 5GN10, Component A[1]

Surface Collection		5x5m Squares		Excavated Material			
C.S.[2]	Specimens	C.S.[2]	Specimens	T.P.[2]	Depth	Specimens	
1	1 deb	B1	nothing	1	0-10 cm	106	deb
2	nothing	B2	38 deb			2	utf
3	3 deb	B3	77 deb			1	pre
	1 flsa		1 flsa			1	flsa
4	11 deb	B4	49 deb				
	1 flsa	B5	68 deb	2	0-10 cm	419	deb
5	10 deb	B6	60 deb			22	utf
6	18 deb	B7	47 deb			4	flsa
7	1 deb	B8	nothing				
8-16	nothing	B9	10 deb	3	0-5 cm	288	deb
17	40 deb	B10	38 deb			19	utf
18	12 deb		2 flsa			1	pre
19	4 deb	B11	1 deb			5	flsa
20	15 deb		1 pre			1	core
A1	26 deb		1 grnd				
A2	18 deb	B12	42 deb		5-10 cm	114	deb
	1 core	B13	14 deb			5	utf
A3	23 deb	B14	3 deb			2	pre
	1 utf		1 utf			3	flsa
	4 flsa		1 grnd			3	grnd
A4	59 deb	B15	4 deb				
	2 utf	B16	23 deb	4	0-10 cm	23	deb
A5	47 deb	B17	41 deb		10-20 cm	6	deb
A6	10 deb		1 flsa				
A7	nothing			5	0-10 cm	360	deb
A8	5 deb					20	utf
A9	32 deb					12	flsa
A10	56 deb						
	2 utf			6	0-10 cm	1064	deb
A11	18 deb					55	utf
A12	11 deb					3	pre
A13	14 deb					12	flsa
A14	13 deb					1	grnd
A15	14 deb						
	1 utf			7	0-5 cm	676	deb
A16	35 deb					80	utf
A17	30 deb					4	pre
A18	13 deb					11	flsa
	2 utf						
	1 pre			Fill of Feature 1			
A19	1 flsa						
					23 deb		
					3 utf		

[1] See Figure 24 for location of provenience units

[2] Abbreviations: C.S. = Collection Square; T.P. = Test Pit

empirically demonstrated at Curecanti. The presence of a core adjacent to the feature also supports the possibility of a heat treatment locus. Controlled experiments with heat treatment are necessary to resolve this question.

Preliminary analysis of available surface data indicates no other areas on Component A with artifact distributuions similar to that around Features 1 and 2. All surface ground stone was localized near Test Pits 3, 5, 6 and 7.

Component B-5GN10

Component B is located approximately 75 meters south of Component A across a small drainage that cuts through the terrace above Willow Creek. Component B is also primarily located below the high water line. By the time the crew was able to get to Component B the water level in the reservoir was approaching capacity, and excavation time was limited. Three test pits were placed over what appeared to be three eroded hearths. Two of the test pits produced well-built slab-lined hearths, Features 3 and 4 (Figures 27, 28, 29, and 30). The third test pit only produced several large rocks. These rocks were probably part of a hearth that had been destroyed by wave action. Artifact distribution in the test pits is shown in Figure 31.

None of the pollen or radiocarbon samples collected from Component B were processed. Neither of the hearths produced any charcoal large enough to be identified. The more complete flaked stone artifacts recovered from Component B are pictured in Figure 32.

Component B appears to be similar to Component A in function. Tool manufacturing and maintenance (debitage and utilized flakes) seem to be the major activities. Minor amounts of ground stone indicate

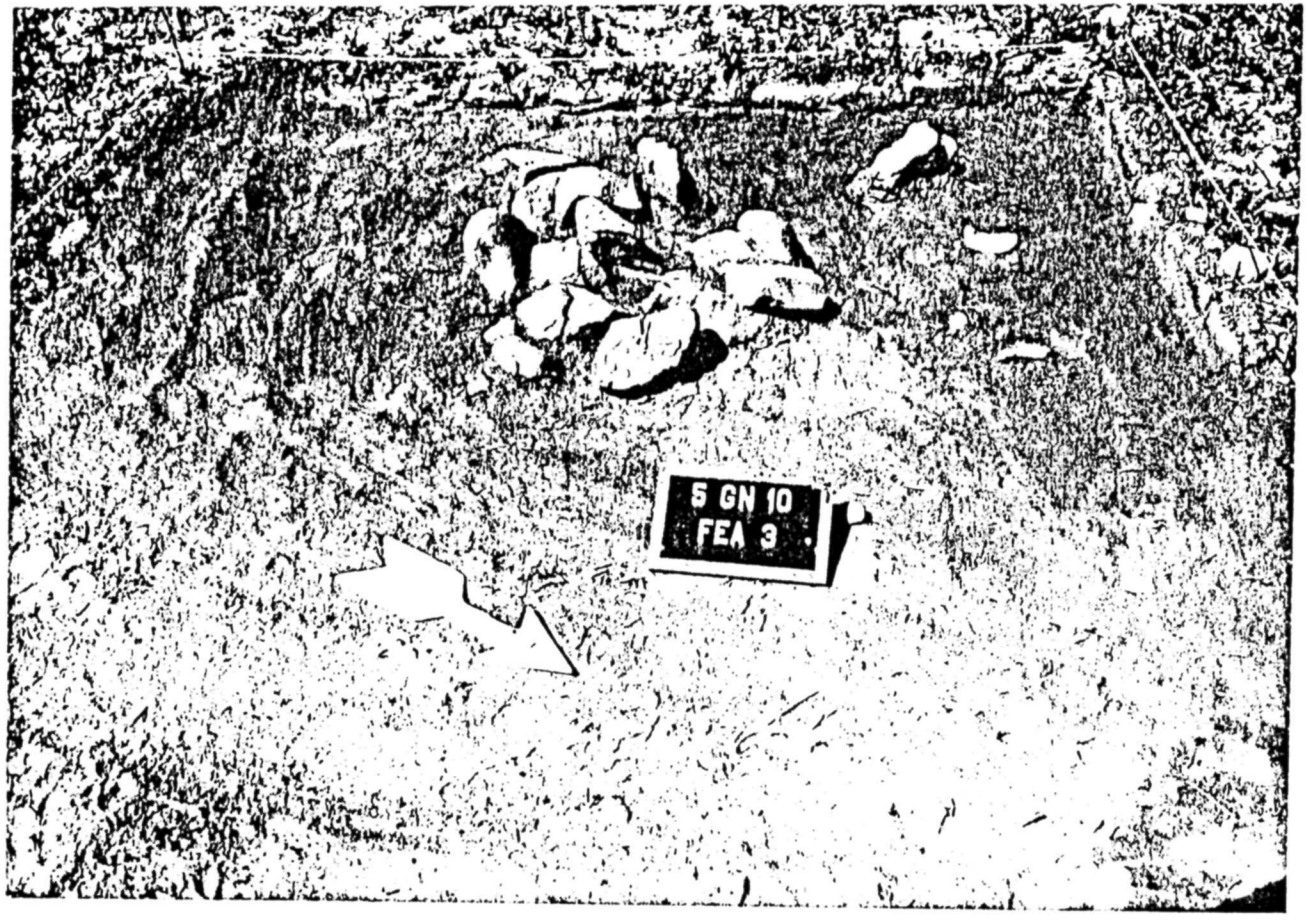


Figure 27. 5GN10 Component B Feature 3. Feature is below high water line.

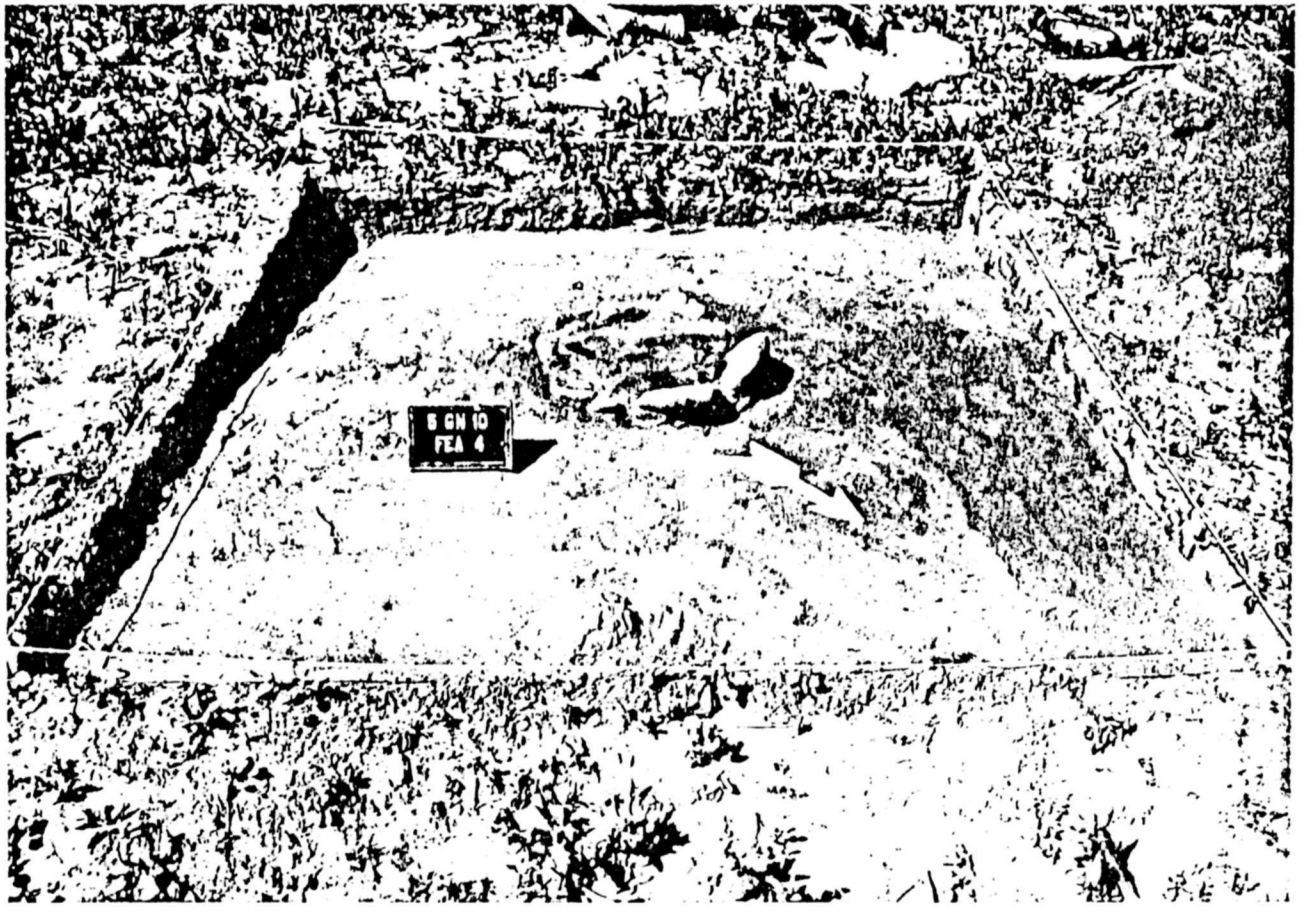


Figure 28. 5GN10, Component B, feature 4, before excavation. Feature 4 is below high water line.

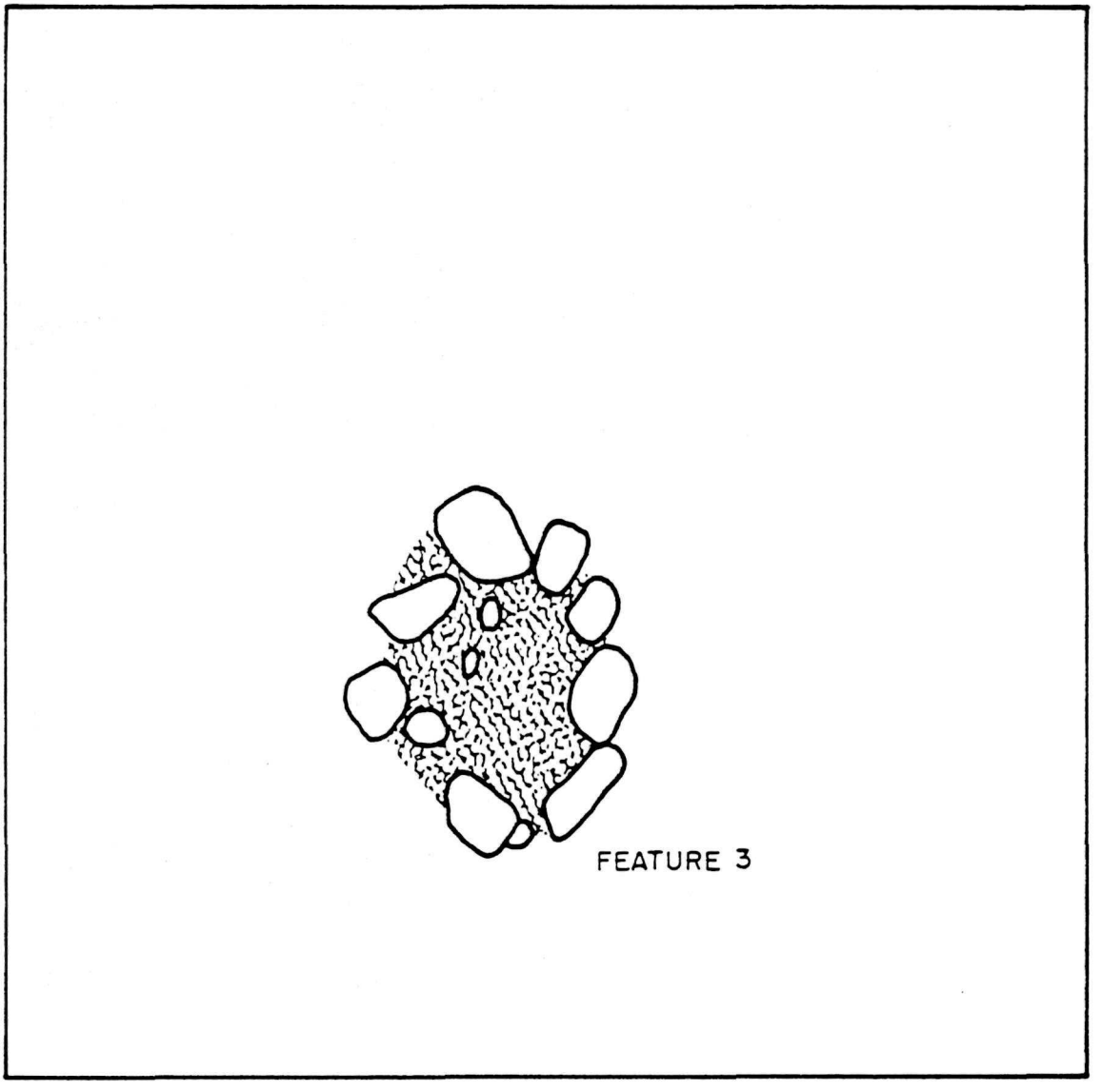

FEATURE 3
5GN10
COMPONENT B
TEST PIT 8
0 20 CM
MN
ROCKS
CHARCOAL
STAINED SOIL

FIGURE 29

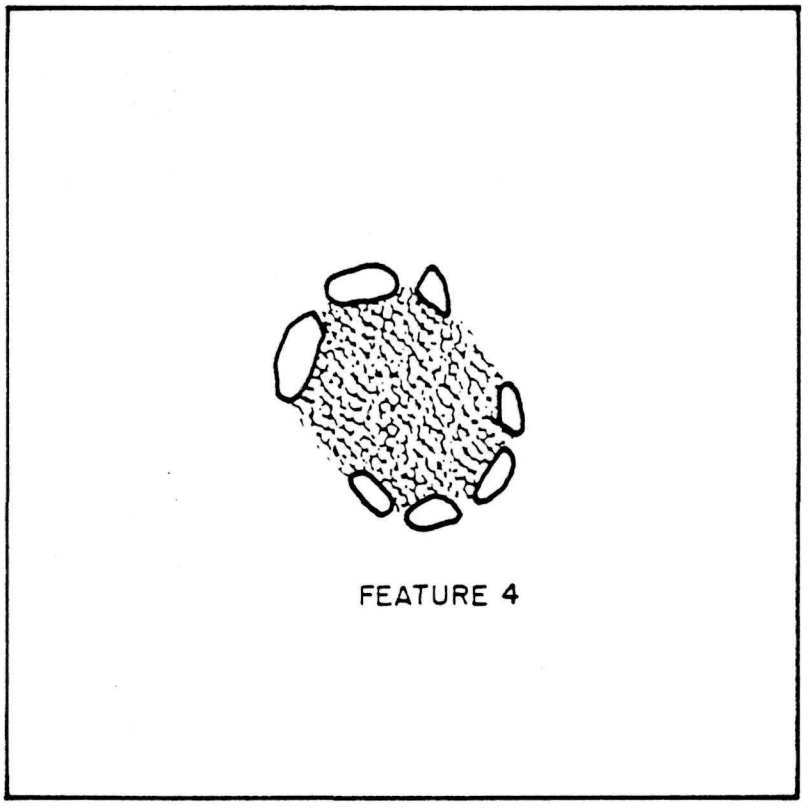

FEATURE 4
ROCK
CHARCOAL
STAINED SOIL
MN
5GN10
COMPONENT B
TEST PIT 10
0
60 CM

FIGURE 30

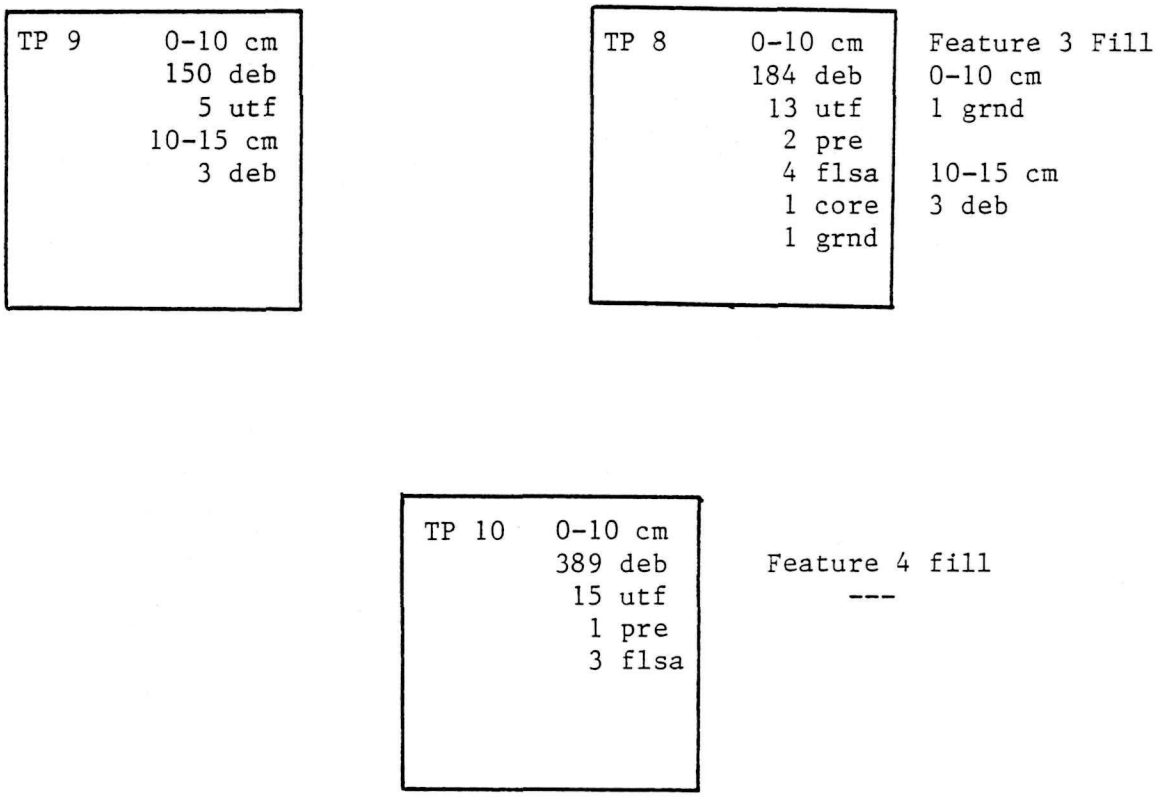


Figure 31. 5GN10, Component B, artifact distribution. Not to scale.

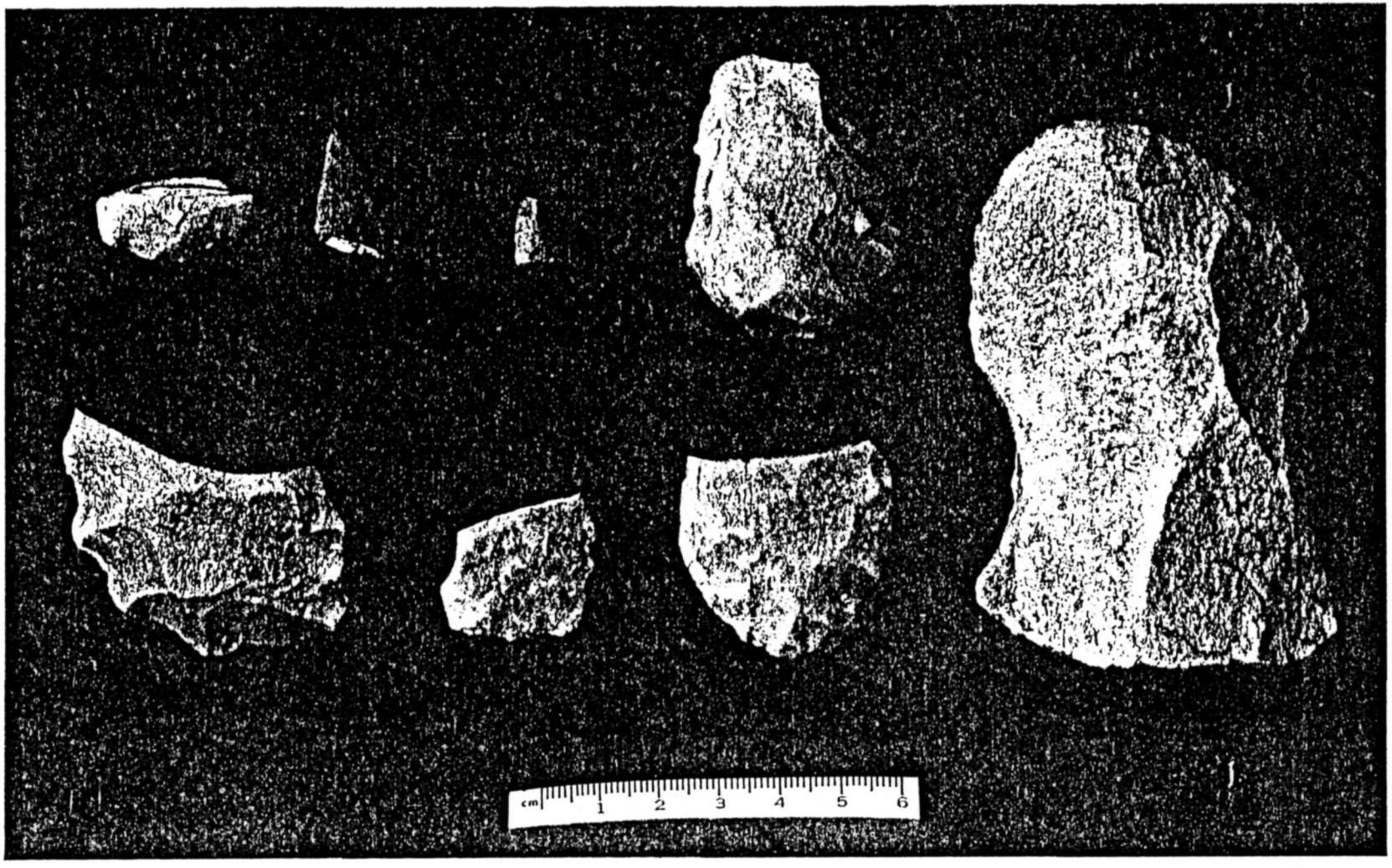


Figure 32. The more complete flaked stone artifacts from 5GN10 Component B. Two left objects on bottom rows are from 0-10 cm deep in Test Pit 10. Other objects are from 0-10 cm in Test Pit 8.

only little emphasis on processing plant foods. This processing activity supports the identification hypothesis that the Features 3 and 4 were used in food preparation. This hypothesis is also supported by the presence of fire-cracked rock which occasionally is used in "stone boiling" domestic fire features. The lack of an associated structure argues against the functional identification of these features to heat any kind of structure.

Component D-5GN10

Component D is located along the cliff edge overlooking the reservoir. Four 2m.x2m. test squares were excavated where ground stone was observed on the surface. One unlined hearth (Feature 14) and three charcoal stained pockets were located (Figures 33 and 34). These charcoal stained pockets are possibly the remnants of posts from some structure. Artifact distribution in the test pits is shown in Figure 35.

No radiocarbon or pollen samples were processed from Component D. One unidentifiable bone fragment was found in Test Pit 34, not directly associated with any feature. No identifiable organic matter was recovered. The more complete flaked stone artifacts recovered are illustrated in Figure 36.

Feature 15 was probably the remains of an unburned structure. It is not known whether the hearth is associated with this structure or not, but may be from two temporally separated occupations. Groundstone artifacts make up a relatively high percentage of the artifact assemblage. Probably plant food processing was a major activity on Component D.

Component E-5GN10

Component E is located to the west of Component D along the edge of the cliff overlooking the reservoir. Fourteen 2m.x2m. test pits

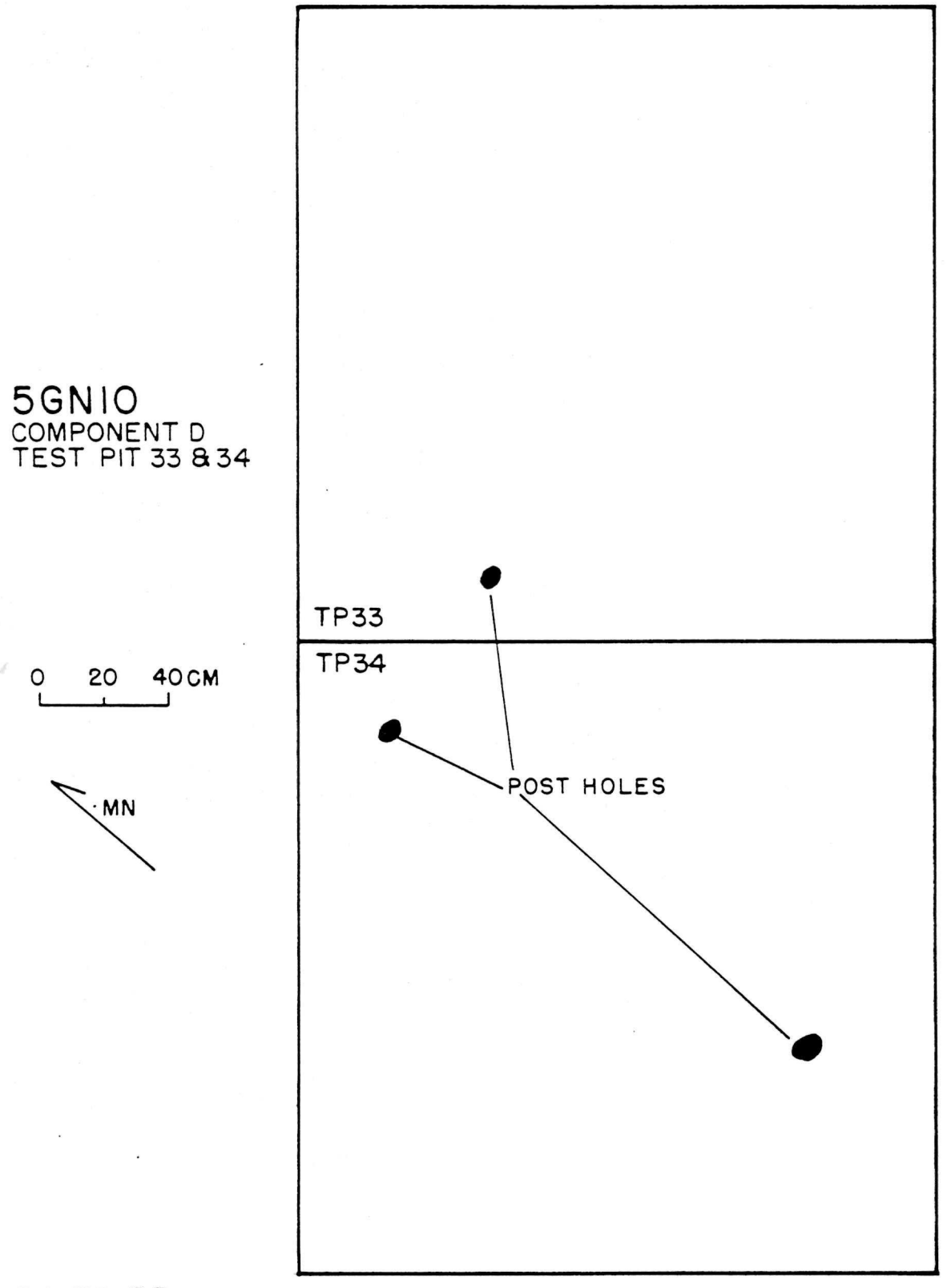
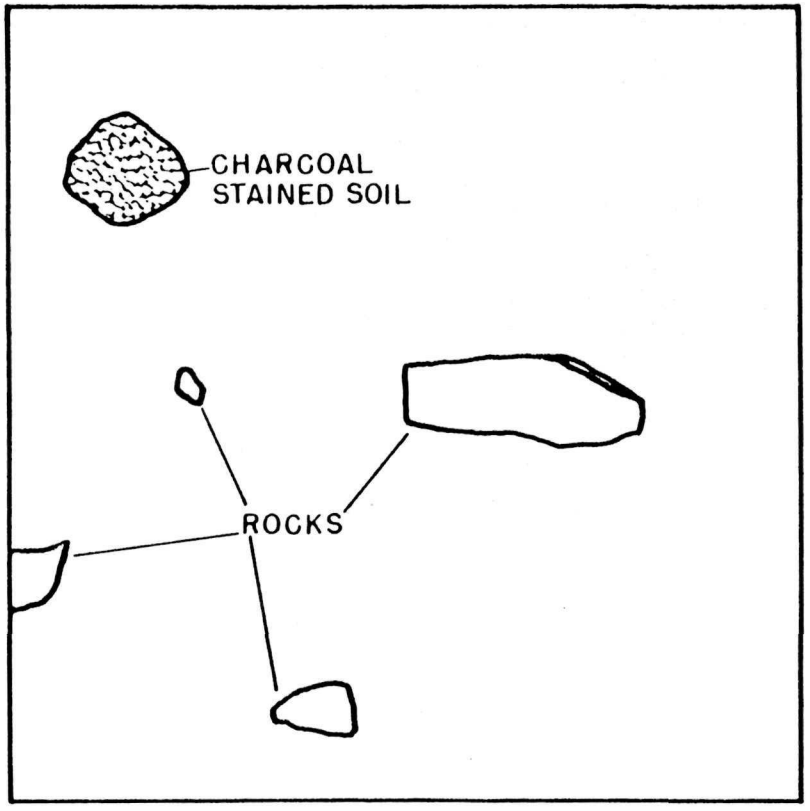

5GN10
COMPONENT D
TEST PIT 33 & 34
TP33
TP34
POST HOLES
0 20 40 CM
MN

FIGURE 33



5GNIO
COMPONENT D
TEST PIT 35

0 20 40 CM

MN

FIGURE . 34

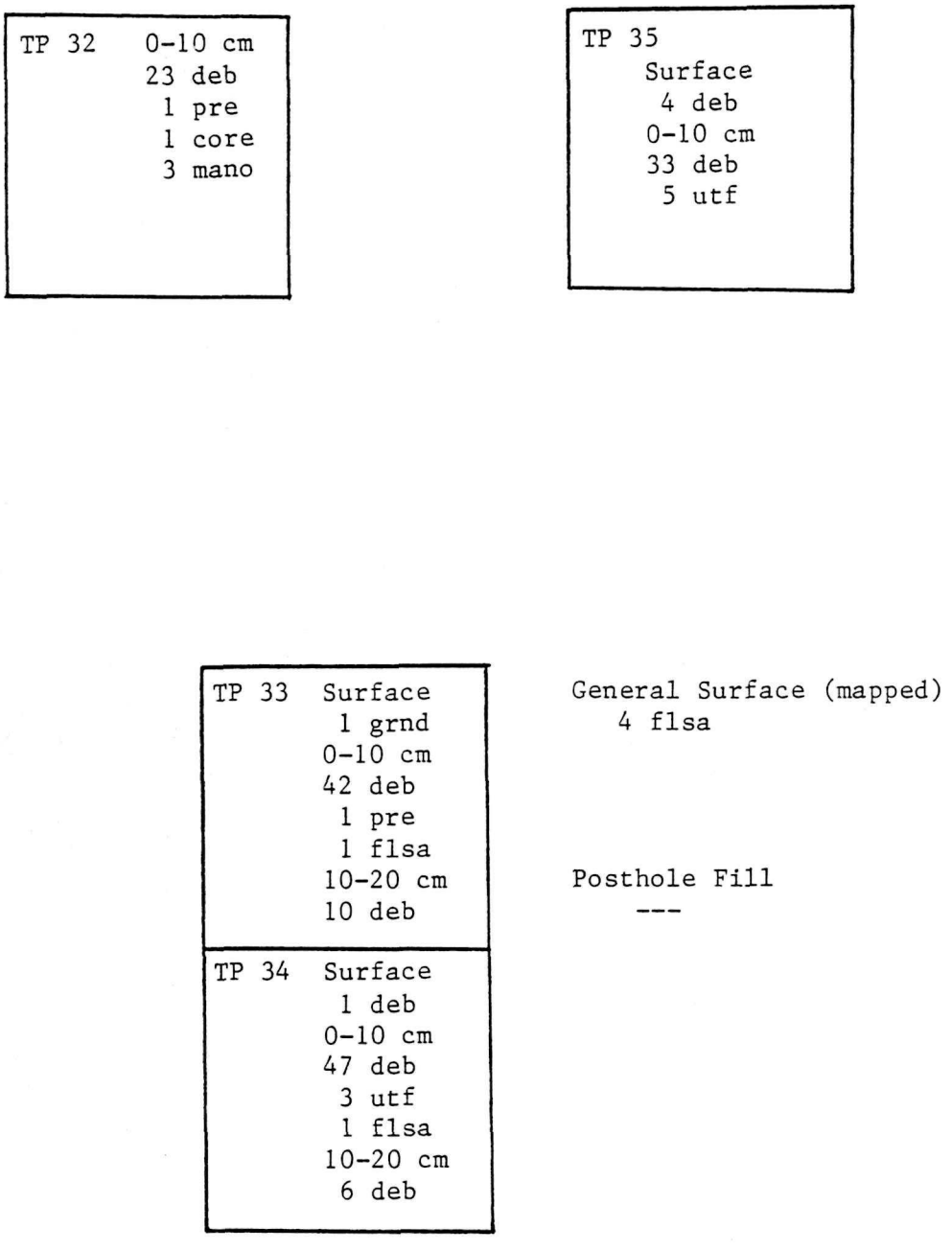


Figure 35. 5GN20, Component D, artifact distribution. Not to scale.

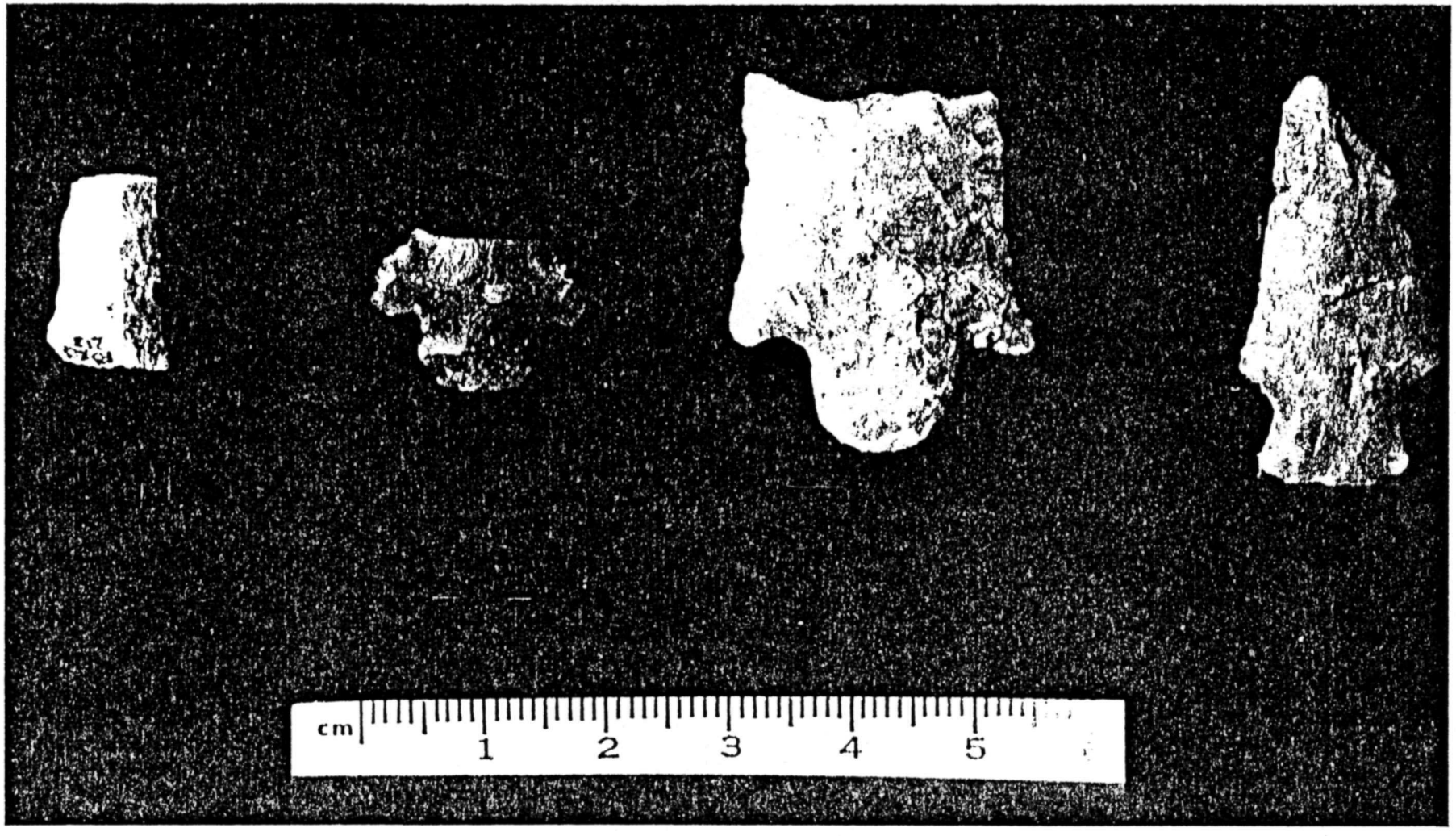


Figure 36. The more complete flaked stone artifacts from 5GN10 Component D. Far left object was found in 0-10 cm level of Test Pit 34. Other objects were surface finds.

were excavated in a block (Figure 37). One fire hearth (Feature 7) was partially exposed on the surface near several pieces of ground stone (Figure 38). This was chosen as the locus of excavation. Three additional subsurface features were found (Features 8, 12, 13).

Feature 7 is a deep slab-lined hearth (Figure 39). Several rocks were placed in the bottom as a floor for the hearth. A good radiocarbon age determination of 6056+160 (Tx-3619) was made on wood charcoal from Feature 7. Several pieces of pinon pine charcoal were identified from the feature. Twenty-four small pieces of unidentifiable bone were recovered from the hearth and most were calcined. This bone frequency is the largest from any feature encountered during the 1979 excavations. Two larger fragments of unidentifiable large mammal bone also came from the hearth. None of the pollen samples were analyzed.

Feature 8 is a large circular charcoal stain approximately 5 meters in diameter. Inside the stained area were the charred remains of four ponderosa pine poles (Figure 40). Two additional chunks of charcoal may be remnants of more poles. A 50cm. wide test trench was put through the stain. No surface resembling a "floor" could be found. No internal hearths were found.

Two radiocarbon samples from Feature 8 were analyzed. These samples produced ages of 3924+130 (Tx-3629) and 4244+90 (Tx-3630). Sample Tx-3630 came from pole number 2 and sample Tx-3629 came from pieces of charcoal picked out of the 10-15 cm. deep level across several squares of Feature 8.

All wood charcoal identified from Feature 8 was of ponderosa pine. Several pieces of unidentified vitrified matter were found. Two unidentifiable charred pine needles were taken from Feature 8. Five unidentifiable

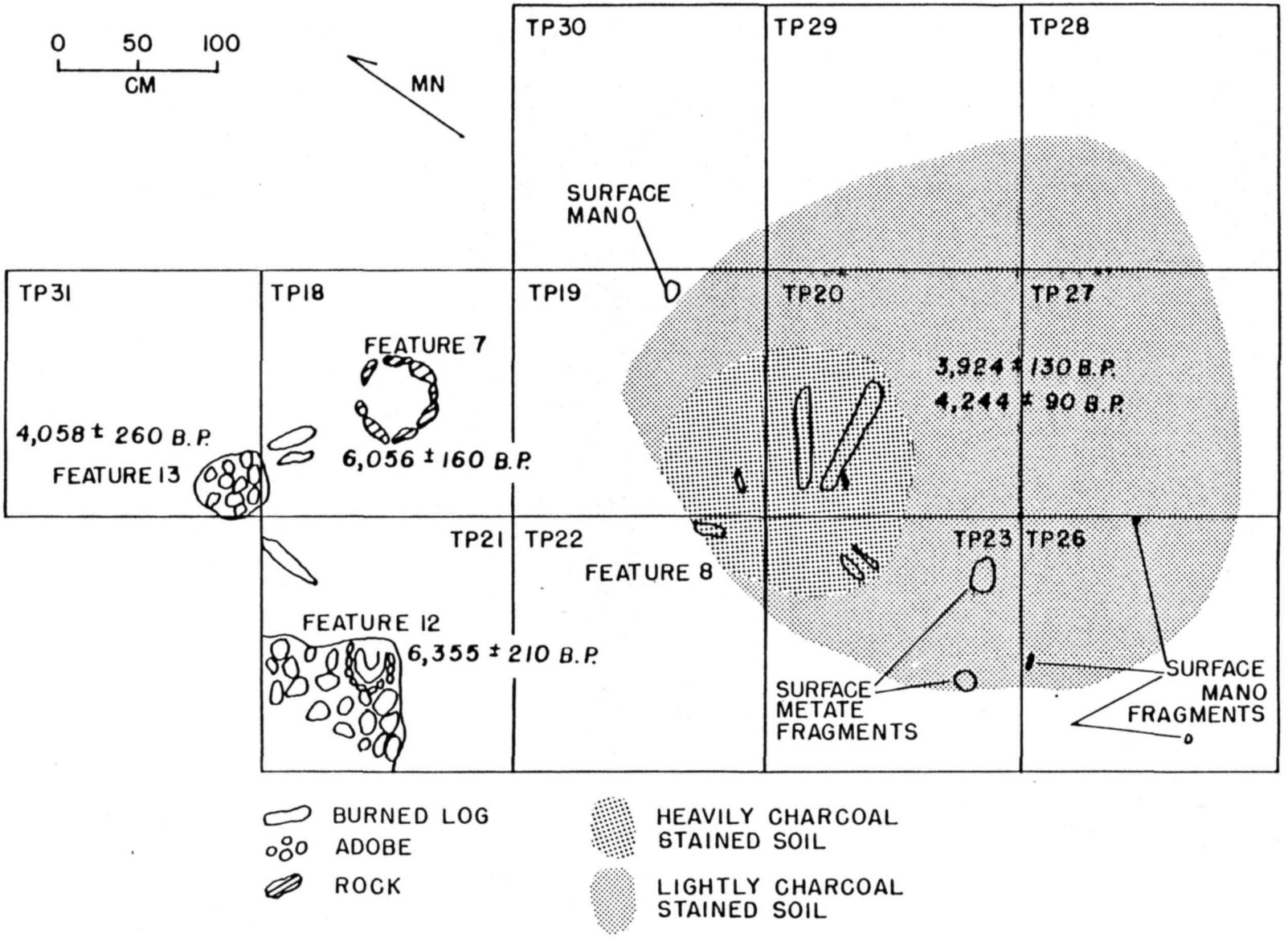


Figure 37. Plan View of Component E at 5GN10. The horizontal relationships among the four features and the associated radiocarbon dates are illustrated at an average depth of 10 cm.

Figure 38. 5GN10, Component E, feature 7, before excavation. Vegetation has been removed. Feature 7 was radiocarbon dated at 6025±160.

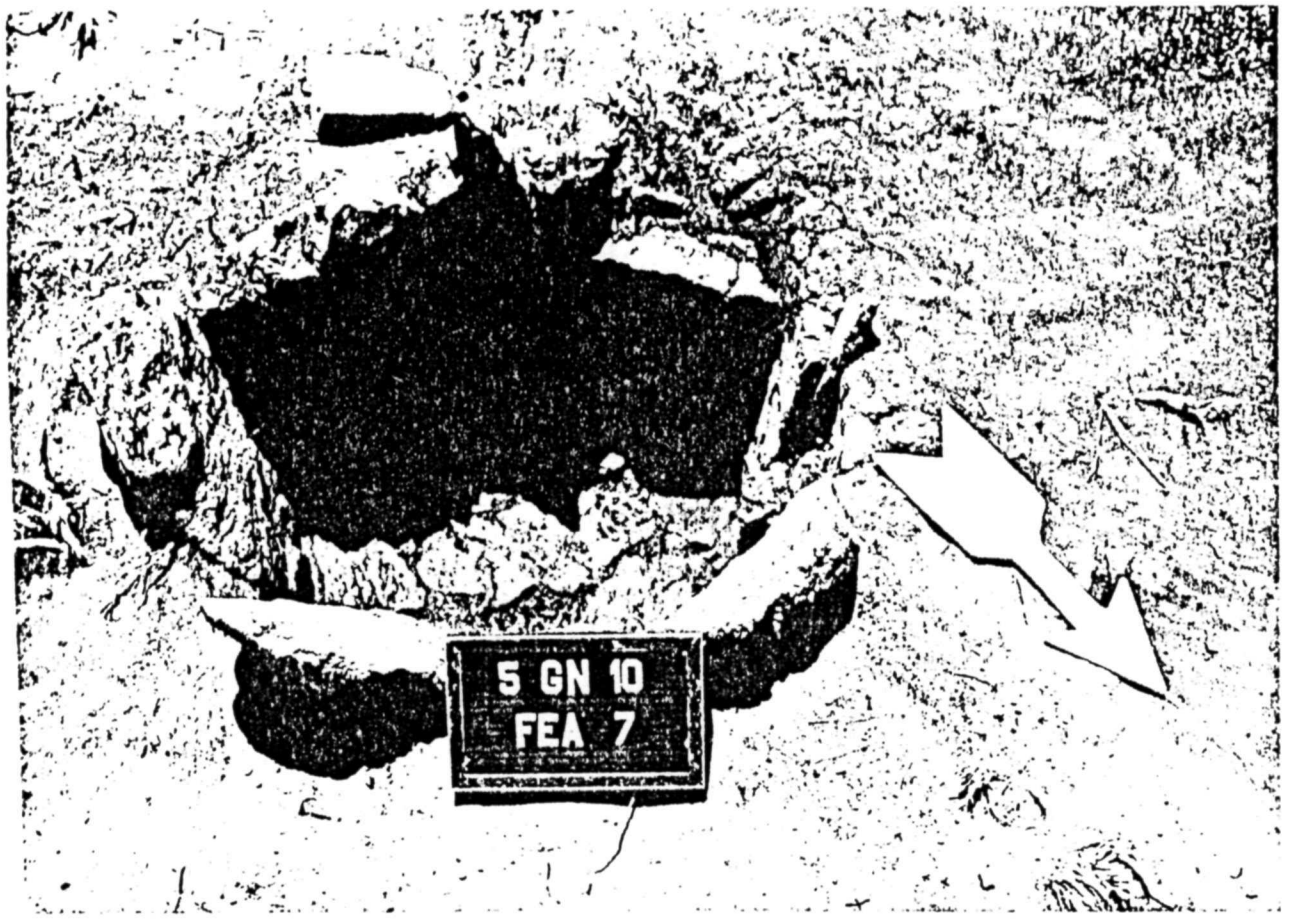


Figure 39. 5GN10, Component E, feature 7, after excavation. Note stone lined bottom.

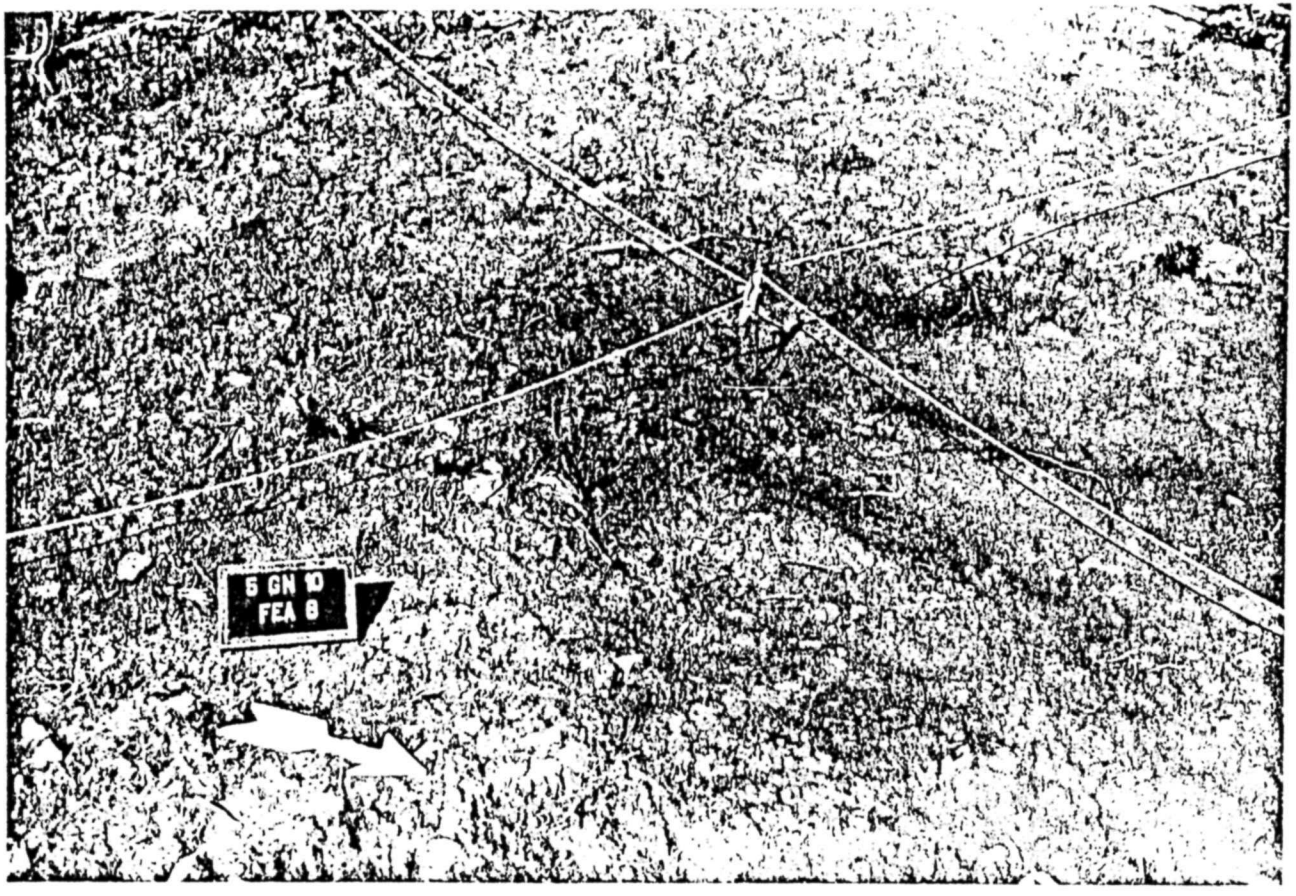


Figure 40. 5GN10, Component E, feature 8. Three charred log stains show in center of photograph. Two radio-carbon dates of 3924±130 and 4243±90 were obtained on charcoal from feature 8.

bone fragments and one unidentifiable large mammal bone fragment were recovered from Feature 8. One pollen sample was analyzed from the charcoal stain and results are reported in Appendix B.

Feature 12 is a pile of burned adobe chunks and a possible adobe collared posthole (Figure 41). Little can be said about Feature 12 at this time. The pile is deeper than 20 cm. and the possible posthole is deeper than 30 cm; but only a small portion of it has been excavated. This possible posthole has the largest diameter of any posthole excavated in 1978 and 1979. The adobe appears to be a remnant of a burned and collapsed structure. Charcoal from the fill around pieces of the adobe was radiocarbon dated at 6355+210 (TX-3621). One pollen sample taken from under pieces of adobe was analyzed and is reported in Appendix B. Feature 12 may have been associated with Feature 7, because of the generally similar radiocarbon dates. There appears to be more adobe and charcoal extending to the north and west out of Test Pit 21 (see Figure 41).

Feature 13 is another adobe concentration area with charred poles radiating outward from the adobe. This pattern suggests, like Feature 8, another burnt wicki-up structure, although it was not fully excavated or defined. A radiocarbon date of 4058 $\pm$ 260 (Tx-3631) was obtained from Feature 13. Feature 13 is probably associated with Feature 8 because of the temporal similarity and because they may represent the remains of similarly built domestic structures.

Component E appears to represent three structures, Features 8, 12, and 13. The dates from Feature 7 and 12 are closer to each other than those from other features at this component. The date from Feature 13 is bracketed by the two dates from Feature 8. This chronological

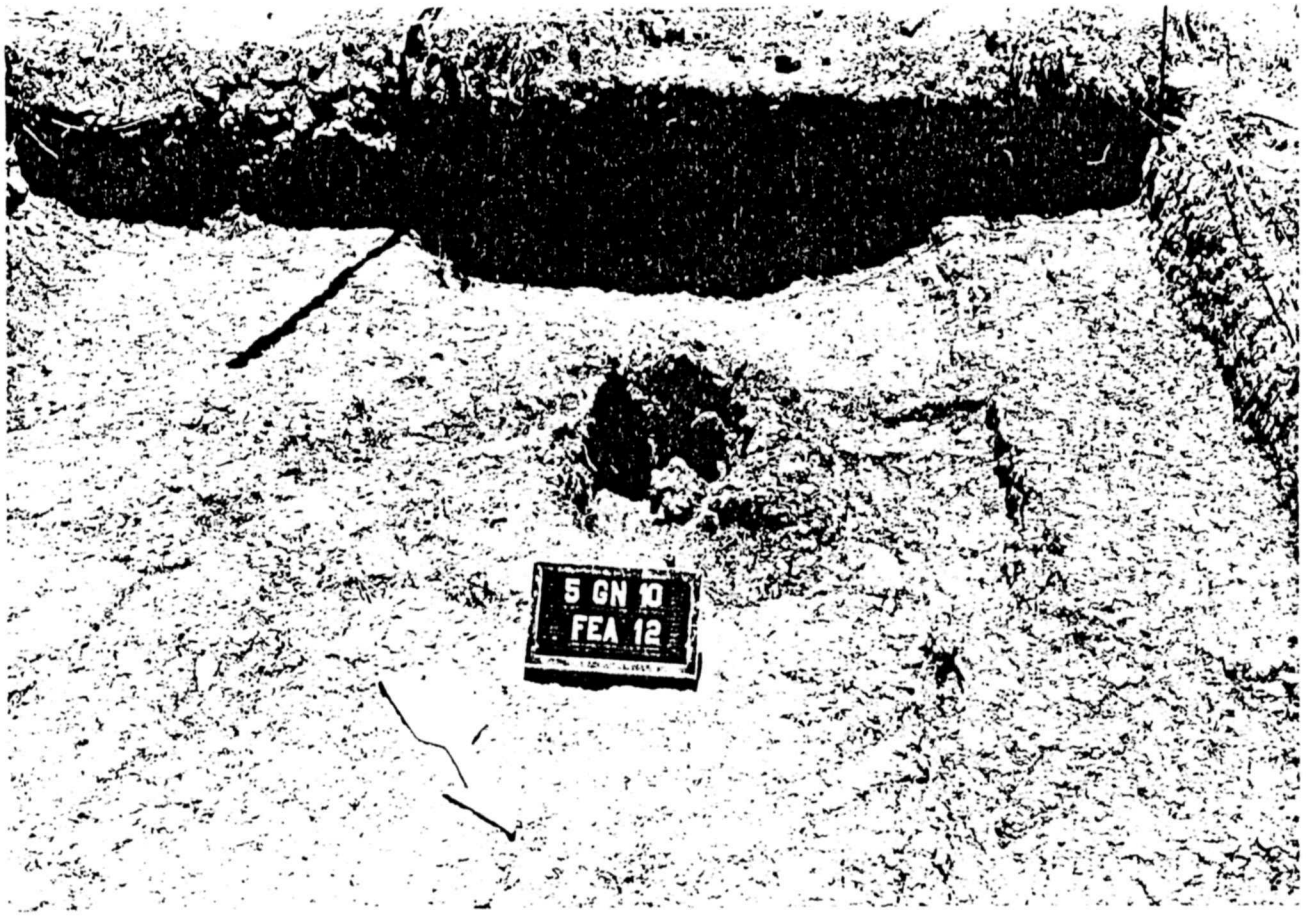


Figure 41. 5GN10, Component E, feature 12. Pile of adobe with possible posthole in center of photo. Pieces of adobe still in soil matrix to right of photo board. Charcoal from feature 112 was radiocarbon dated at 6355_210.

similarity helps to establish the paired association of the four features. Component E represents a habitation area where one of the activities was plant food processing (ground stone). Consumption and processing of animal foods at ca. 6000 B.P. is evidenced by bone fragments at Feature 7. Manufacture and maintenance of stone tools appeared to be minimal.

Component E represents a minimum of two temporally distinct occupations at approximately 6000 and 4000 B.P. These occupations are not stratigraphically distinguishable. Further work in this component is necessary to complete the excavations and to explicate the features and their inter-relationships. The artifact distribution on Component E is shown in Figure 42. The more complete flaked stone artifacts are shown in Figure 43.

Component F-5GN10

Component F is located to the west of Component E and is the highest elevation component at 5GN10. There were two exposed hearths on this component. However, eight test pits were placed away from the hearths in an area where two pieces of ground stone were located on the surface. Flaked stone densities were less than five flakes per square meter of excavated fill. No surface collection was made at Component F. One other test pit (11) was excavated on this component. It was located away from the ground stone in an area of low flaked stone density at a magnetic anomaly determined by a magnetometer. No features were located in Test Pit 11.

Eight 2m.x2m. pits were excavated in a block. Five features were found (Figure 44). Features 5 and 6 appear to be associated with each other. Feature 5 was a hearth and Feature 6 was a cyst. Construction of both these features is similar. Both are built of large stone slabs

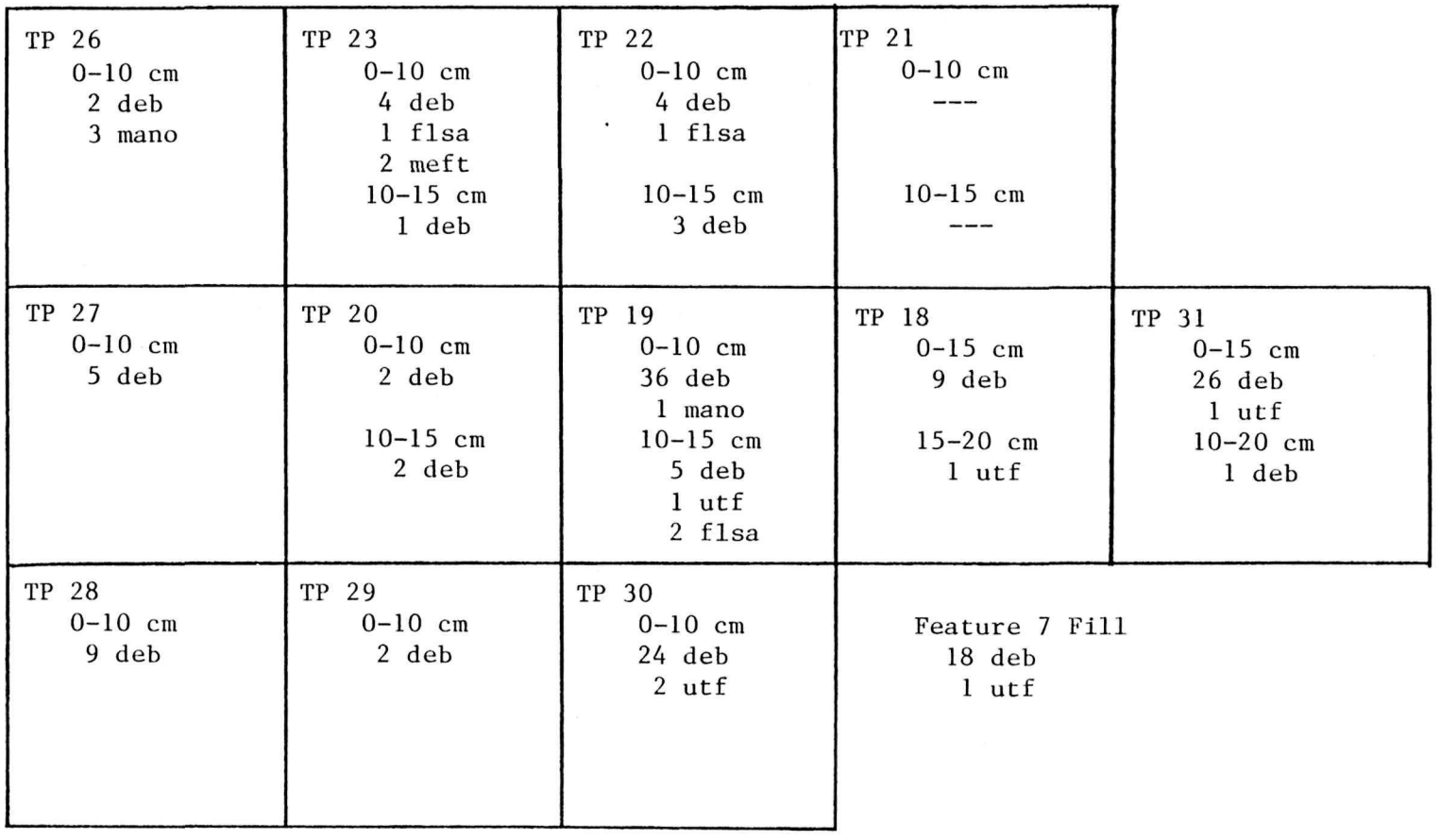


Figure 42. 5GN10 Component E, artifact distribution.

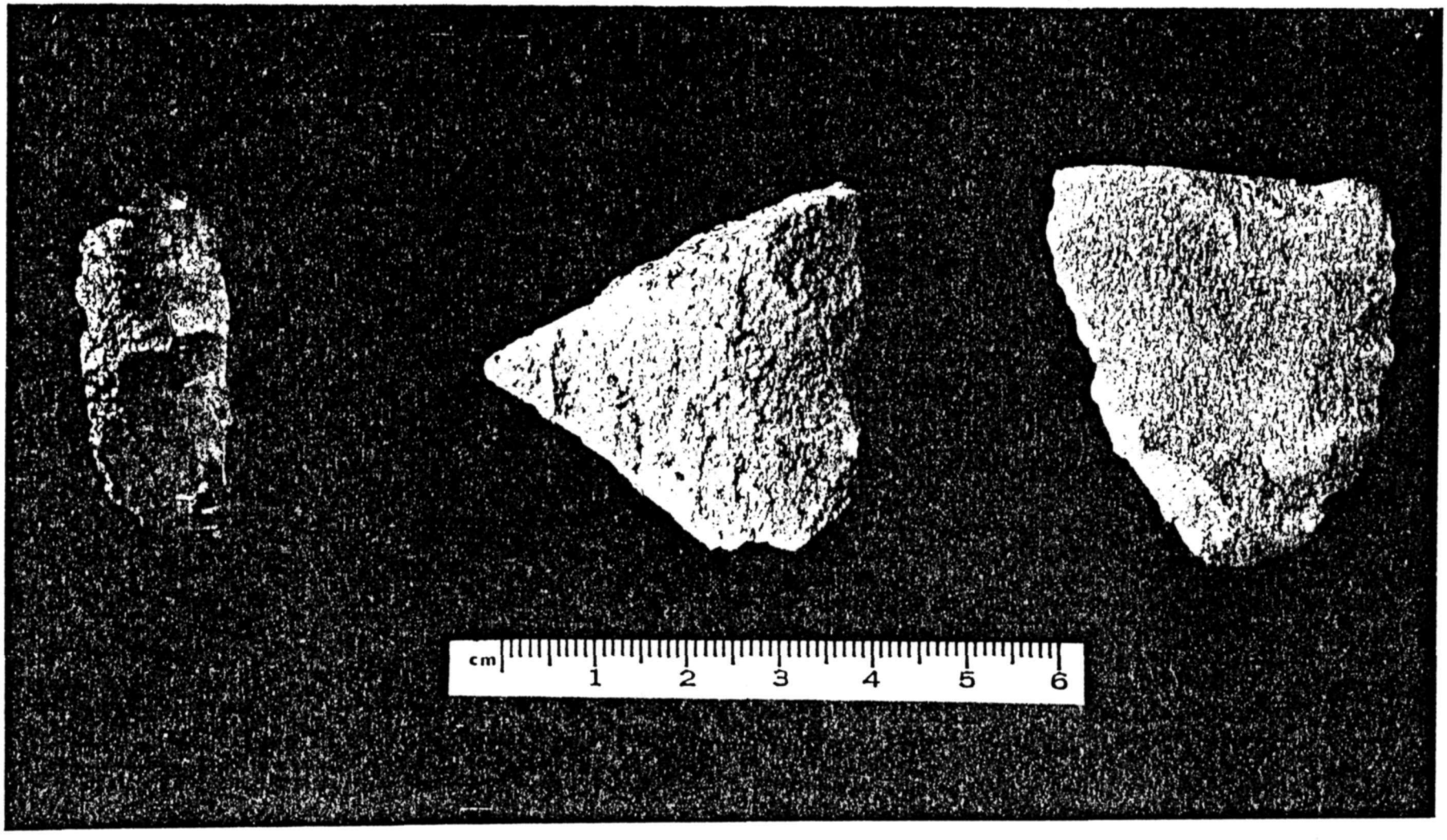
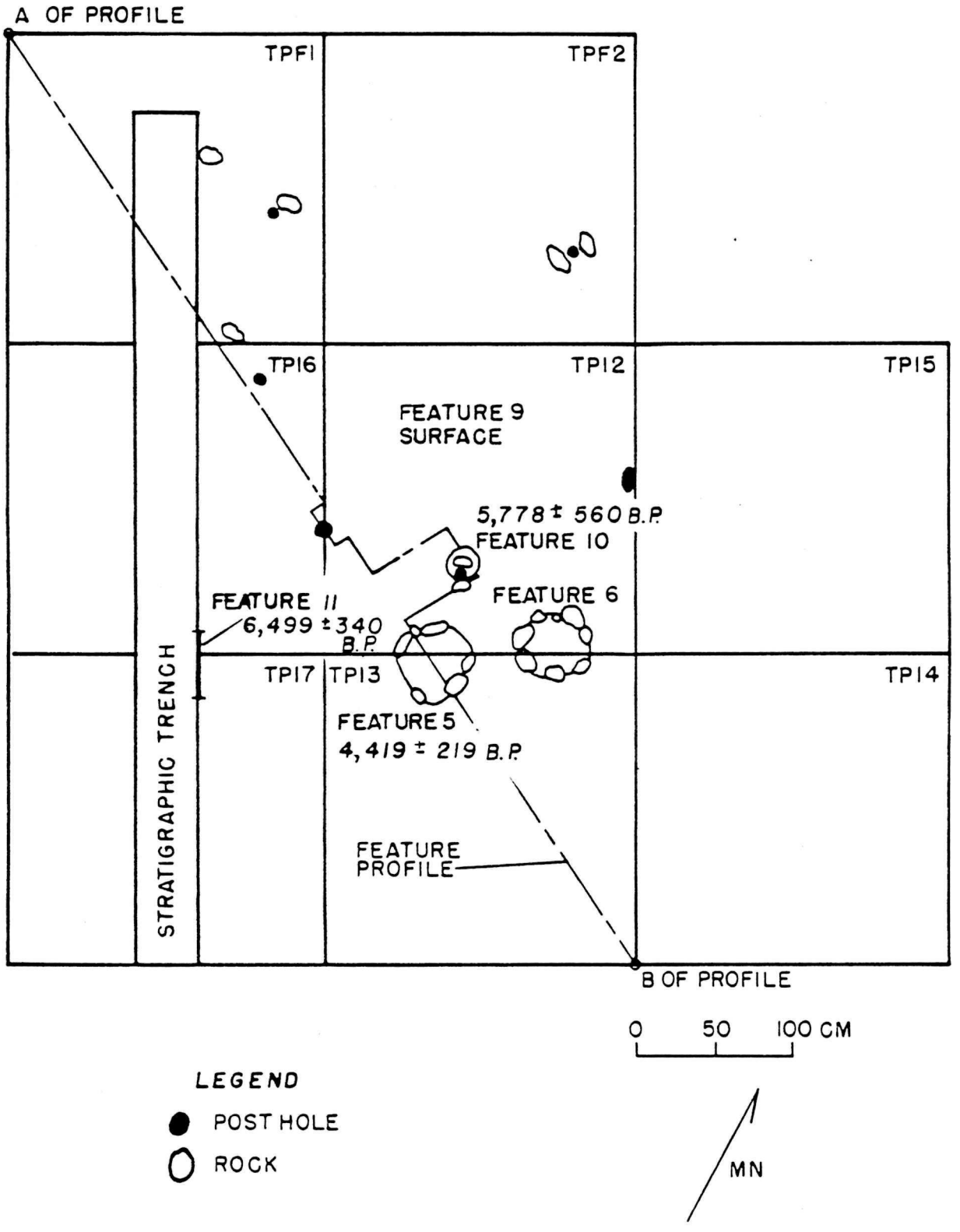


Figure 43. Artifacts from 5GN10 Component E. Object at right comes from 10 cm deep in Test Pit 23. Center and right objects come from 10-15 cm deep in Test Pit 19.



Feature 44. Plan View of Component F at 5GN10. The horizontal relationships among the five features, including the posthole pattern defining the wicki-up of Feature 9, and the radiocarbon dates are shown. The vertical relationships are presented graphically in Figs. 48-50.

set on bedrock (Figure 45). Fire-cracked rock was scattered across the top of both. The hearth contained abundant charcoal from pinyon pine. A radiocarbon date of 4419+290 (Tx-3618) was obtained from Feature 5. Three unidentifiable bone fragments, one calcined bone fragment and 12 unidentifiable large mammal long bone fragments were found in the hearth, suggesting that Feature 5 was an animal processing hearth. It may possibly have functioned as a heat treatment locus as indicated by finding two cores in the fill of Feature 5.

Feature 6, a storage cyst, contained very little charcoal. The charcoal was probably an incidental inclusion. In the bottom of the cyst were found a projectile point fragment, a mano, eight flakes, a fragmentary elk skull, and an anterior fragment of an artiodactlya thoracic vertebra (Figure 46). The skull fragments are the frontal and horn cores, probably from a male elk (Emslie 1980). A pollen sample was analyzed from Feature 6.

Feature 9 is a possible wickiup-like structure, defined by a semi-compacted floor and by a circular posthole pattern (Figure 44). The slightly compacted surface was hard to define but seemed to represent some kind of a floor or work surface with lithic material lying horizontally on the floor. There was a slight texture difference between the compacted surface and the soil lying outside the perimeter of the post holes. Three unidentifiable bone fragments and one unidentifiable large mammal long bone fragment were found in Feature 9. No charcoal was recovered from Feature 9. Only charcoal flecks or organic stained soil was present in the postholes. Pollen samples from the compact layer and from the fill above were analyzed. The results of the pollen analysis may be found in Appendix B. The southeastern posthole of this

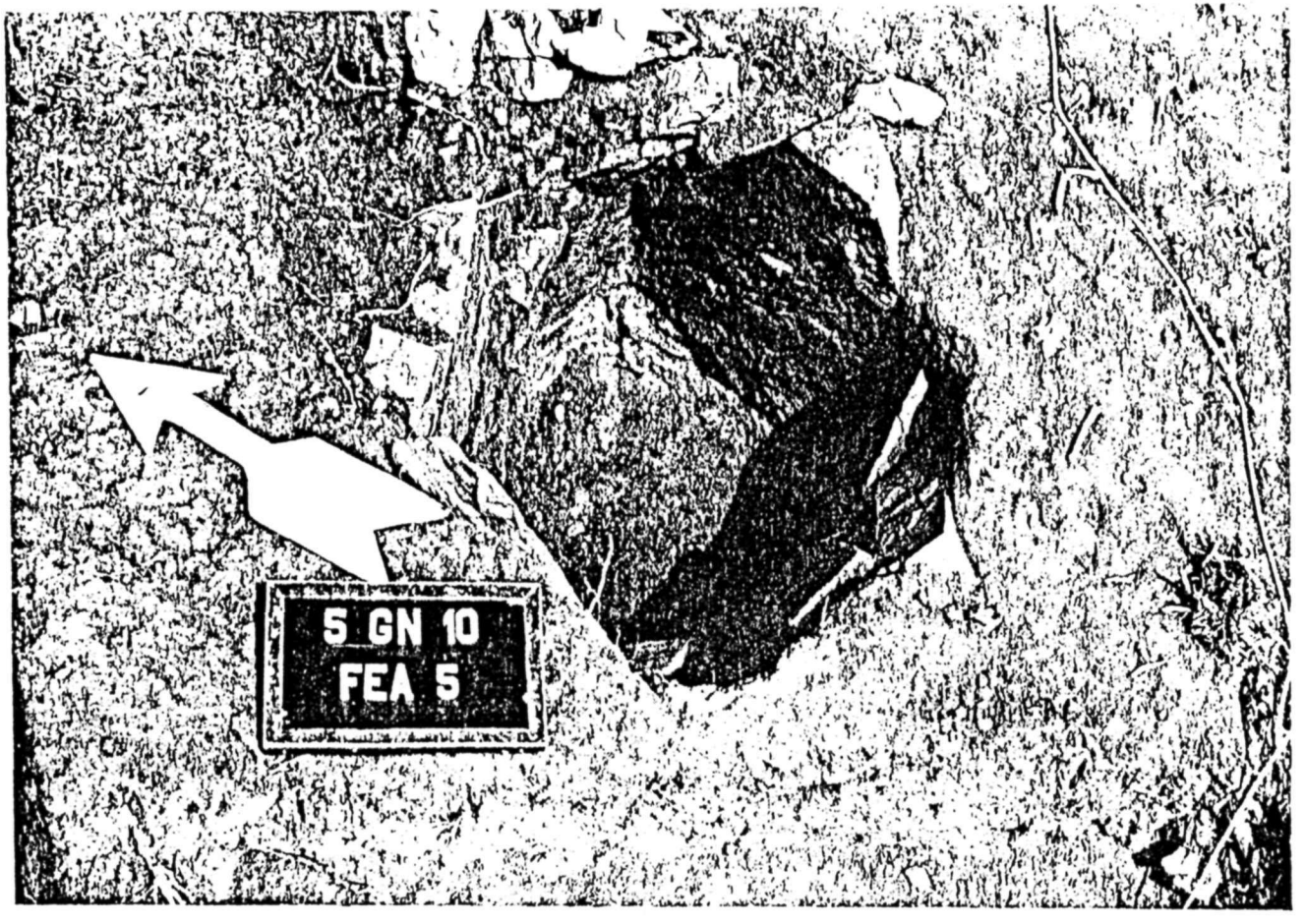


Figure 45. 5GN10, Component F, feature 5. Charcoal layers have been removed. Feature was radiocarbon dated at 4419 ± 290.

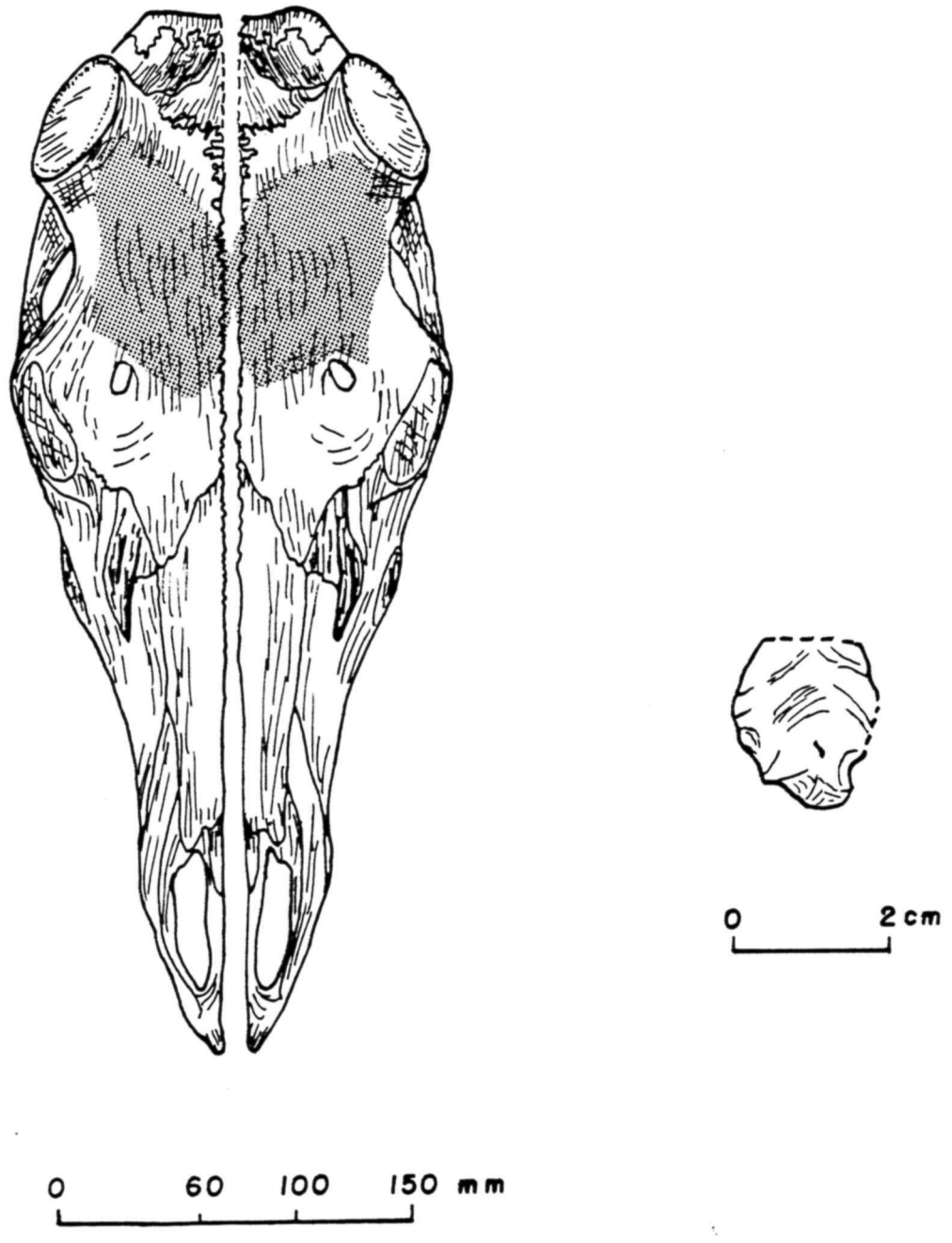


Figure 46. Projectile Point Fragment and Skull Fragment (Cervis canadensis) from 5GN10, Component F, Feature 6. The shaded areas show the location of the horn cores on the skull (after Olsen 1964:59).

feature intruded into a fire hearth which was later identified as Feature 10.

Feature 10 is the only internally stratified hearth known from the 1978 and 1979 investigations. It is a partially slab-lined hearth built on bedrock (Figure 47). The bottom of the hearth is lined with small rock slabs. The upper portion of the sides of the hearth are made of fire-reddened earth. There are two levels of charcoal in the hearth separated by nearly sterile soil (Figure 48). A radiocarbon sample from the upper charcoal layer was dated at 5778+560 (Tx-3628). Pinon pine charcoal came from this feature. The upper charcoal level contained the intrusive skeleton of a deer mouse (Emslie, personal communication). Pollen samples were analyzed from Feature 10 and the results may be found in Appendix B.

Feature 11 is a shallow, poorly defined hearth that was discovered in the test trench and not excavated. Fire-reddened soil discontinuously lined base of the feature. The lining is probably the unintentional result of fire and the native soil into which the fire pit was dug. Fill of the hearth is a patchy charcoal rich dark soil. A radiocarbon date of 6499+340 (Tx-3627) was determined on wood charcoal from Feature 11. No bone was found or pollen samples analyzed from the hearth.

As a result of the 1979 excavations, Component F represents a residential structure (Feature 9) that stratigraphically post-dates the more recent utilization of the fire hearth (Feature 10). It may be possible that this undated Feature 9 is contemporaneous with Feature 5, dated at 4419 B.P. and also with Feature 6, that is stylistically similar to Feature 5. A third occupation period is represented by the 7th millenium date from Feature 11. Major activities on this site were

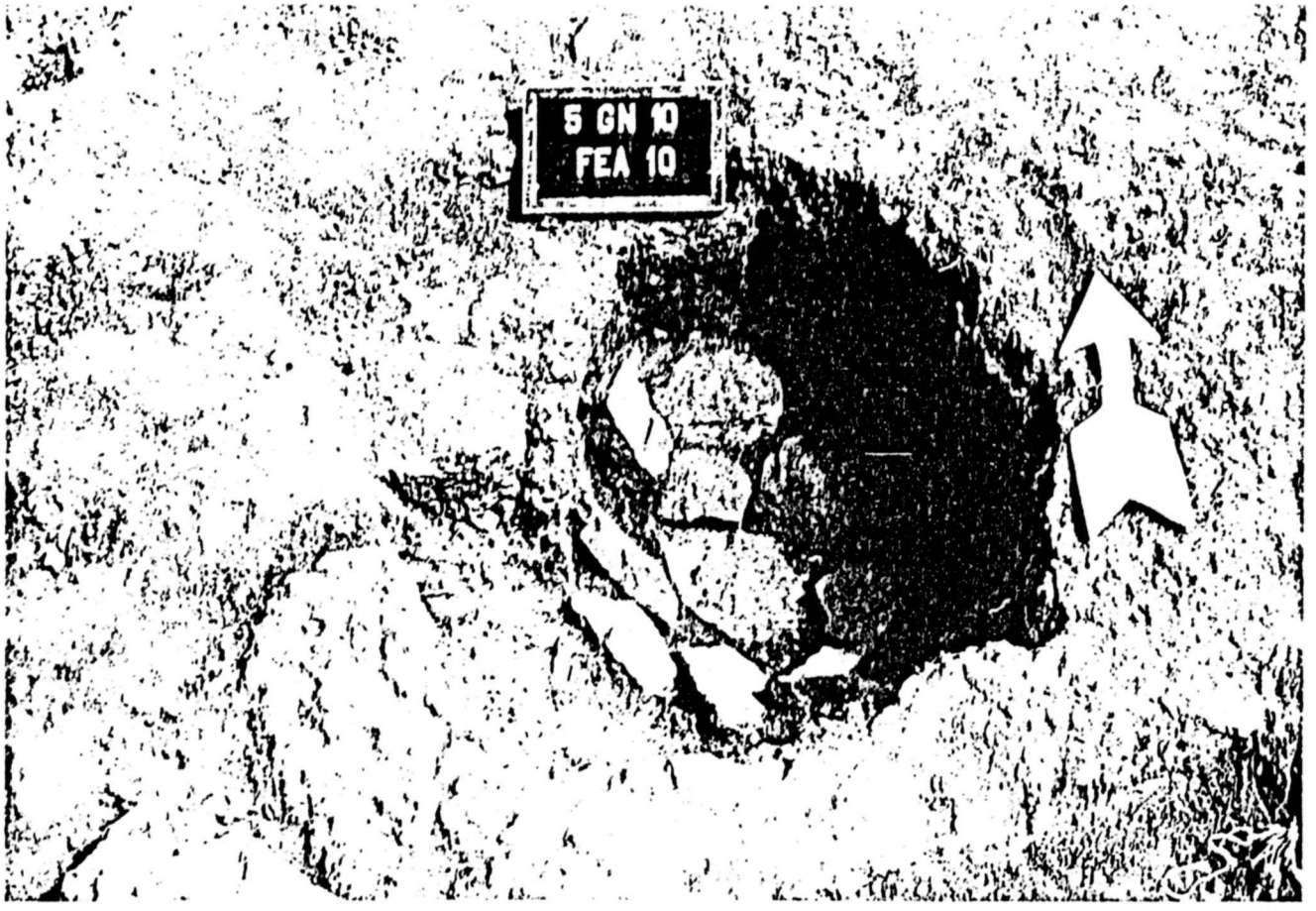
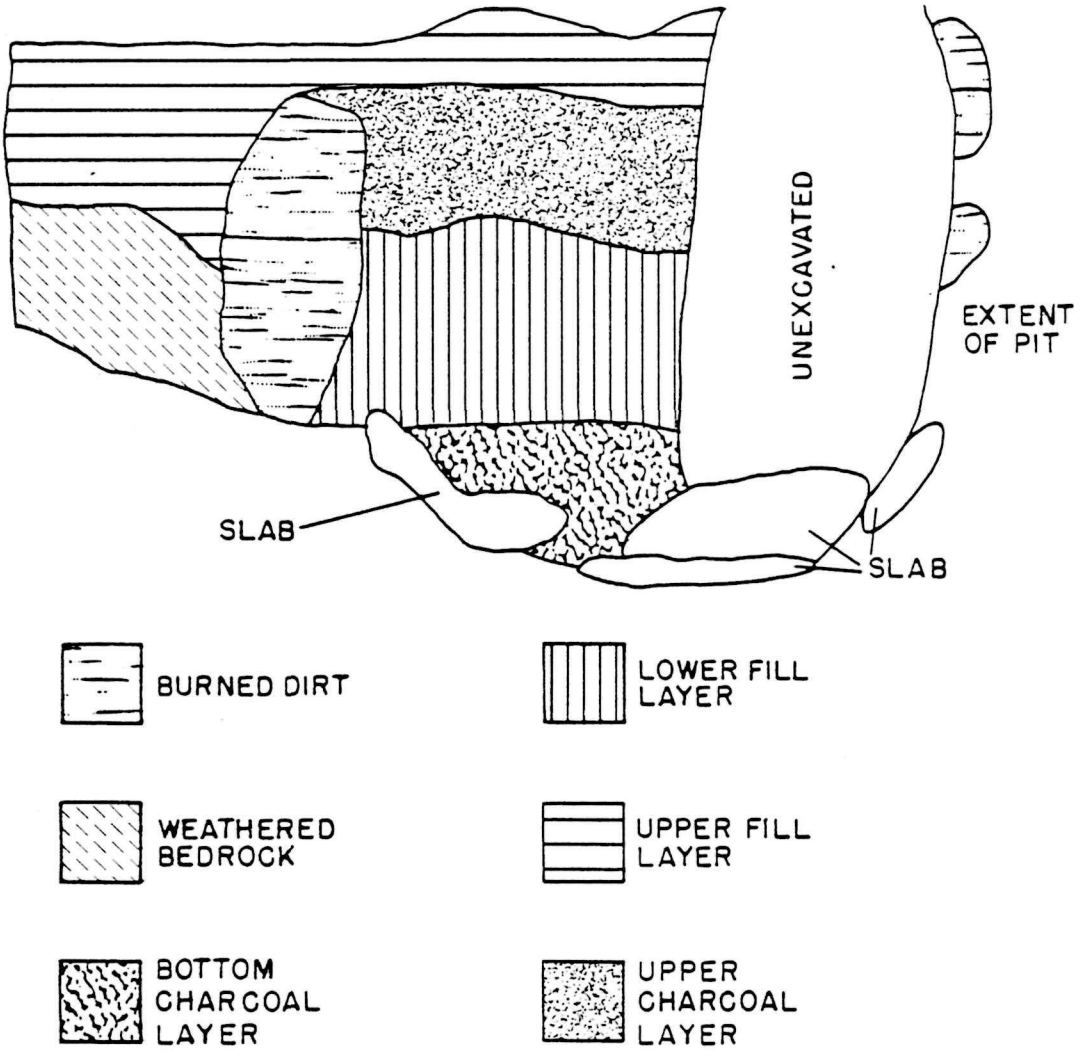


Figure 47. 5GN10, Component F, Feature 10. View into hearth after excavation. Top charcoal layer in feature 10 was radiocarbon dated at 5780_560.



5GN10
COMPONENT F
FEATURE 10 PROFILE

0 10 CM

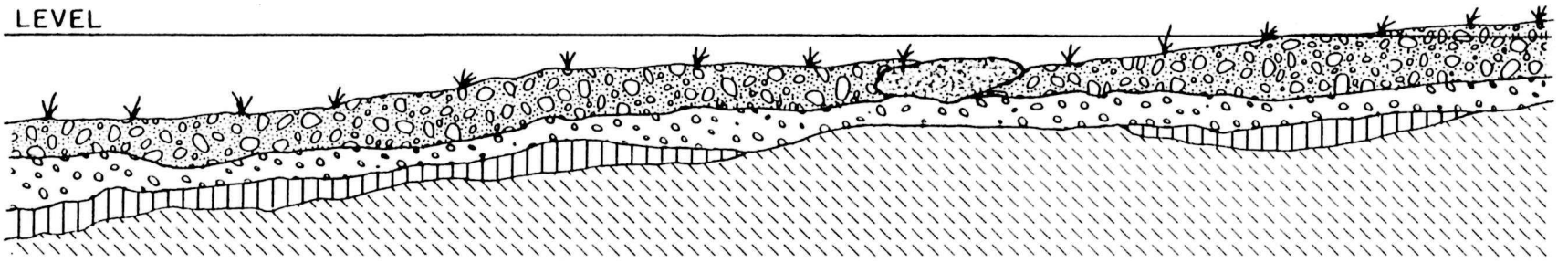
FIGURE 48

apparently plant food processing (ground stone) and animal processing or consumption (bone). Feature 5 may be multi-functional. It is clearly an animal processing hearth and it is also possible that it may have been used as a heat treatment locus. The consumption of prickly pear cactus dates to the pre-5780 B.P. time as indicated by pollen from the lower level of Feature 10.

The artifacts in Feature 6 appear to be a cache of salvageable tools and usable materials. Caching of fragmented lithic and faunal resources is known ethnographically (Binford, personal communcation). The mano is complete. The projectile point could be reworked at a future time. The mountain sheep skull may have been part of hunting decoy costume or the horns may have served as a raw material to make selected tools at their habitation site. The items may have been stored for reuse for an intended future re-occupation of the site.

Because of similarities in construction and proximity, it seems that several temporally distinct occupations are represented at Component E. Features 5 and 6 are probably contemporaneous at about 4400 B.P. Radiocarbon evidence indicates Features 10 and 11 probably are from separate, successively earlier occupations. Superposition indicates that Feature 9 is later than Feature 10 and may possibly be contemporaneous with Features 5 and 6.

A trench was dug to bedrock along the west edge of the excavation block on Component E. This trench was excavated to enable inspection of the natural stratigraphy (Figure 49). A profile of cultural features across the test block was drawn (Figure 50). As can be seen in Figures 51 and 52, the depth of features below the present ground surface is generally independent of the radiocarbon age of the feature. The structure



CHARCOAL CONCENTRATION, FEATURE II

TOP FILL LAYER WITH CHARCOAL FLECKS, MOSTLY A SILT

GREEN MINERAL IS PRESENT, BASICALLY THE SAME AS TOP LAYER

CHALKY, WEATHERED BEDROCK, POCKETS ARE FRIABLE, INTERSPERSED WITH LIGHT COLORED SAND

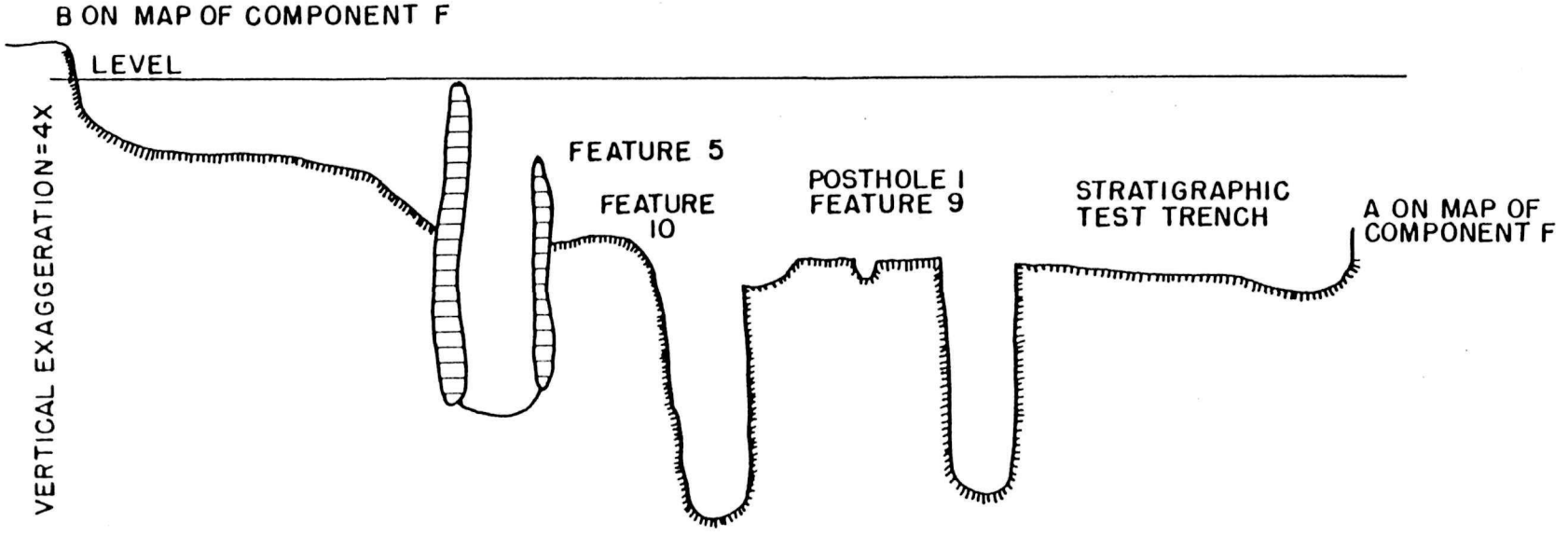
BEDROCK

PRESENT GROUND SURFACE

0 50 100 CM

WEST PROFILE OF NATURAL STRATIGRAPHY TEST TRENCH
COMPONENT F
5GN10

FIGURE 49



5GN10
COMPONENT F
PROFILE ACROSS EXCAVATION

0 80 CM HORIZONTAL SCALE

0
20 CM VERTICAL SCALE

EXCAVATED SURFACE
PRESENT GROUND SURFACE
SLAB

FIGURE 50

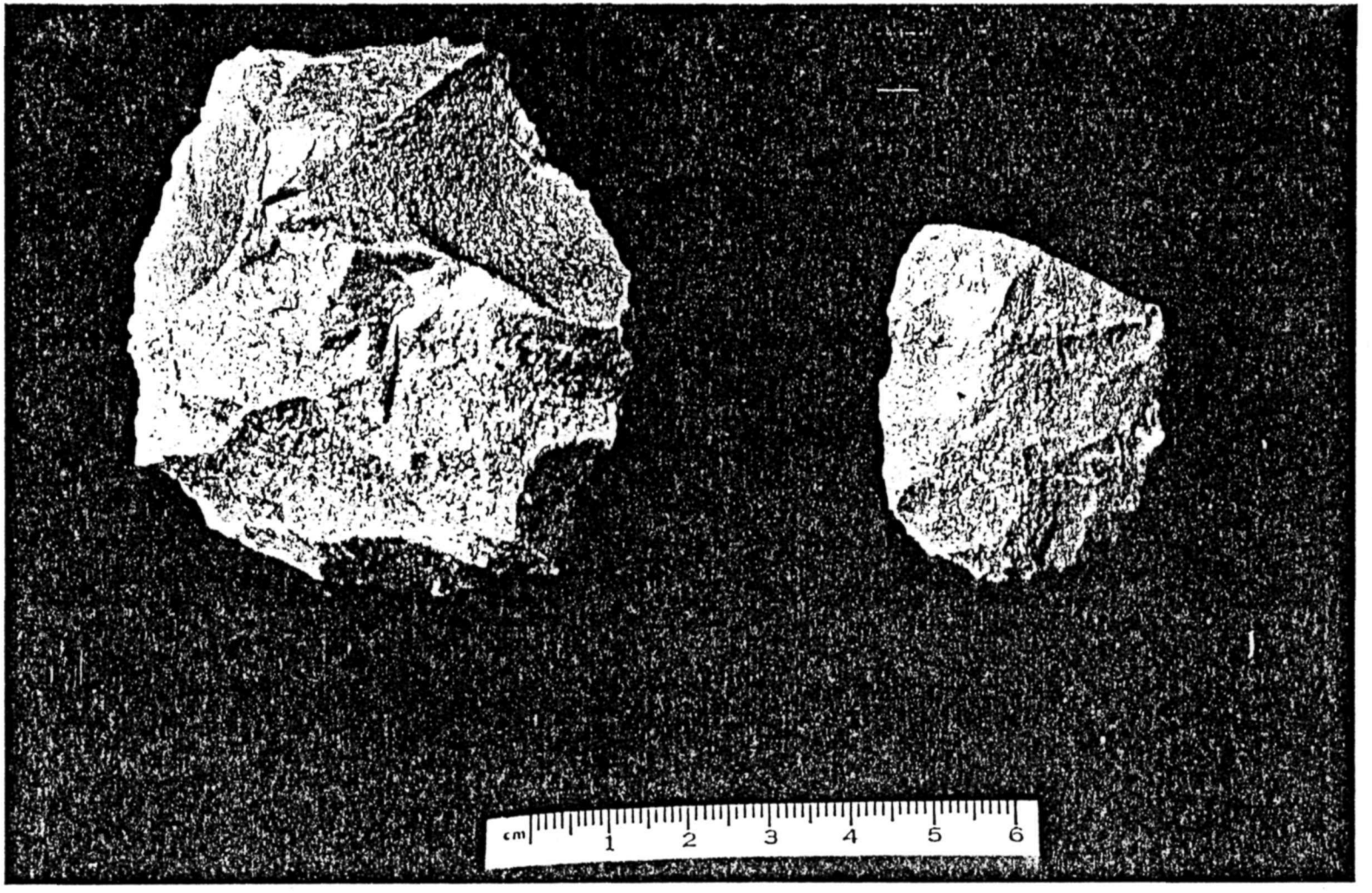


Figure 51. Artifacts from 5GN10 Component F. Object at left is from feature 5, 20 cm depth. Object at right is from Test Pit 14, 0-10 cm depth.

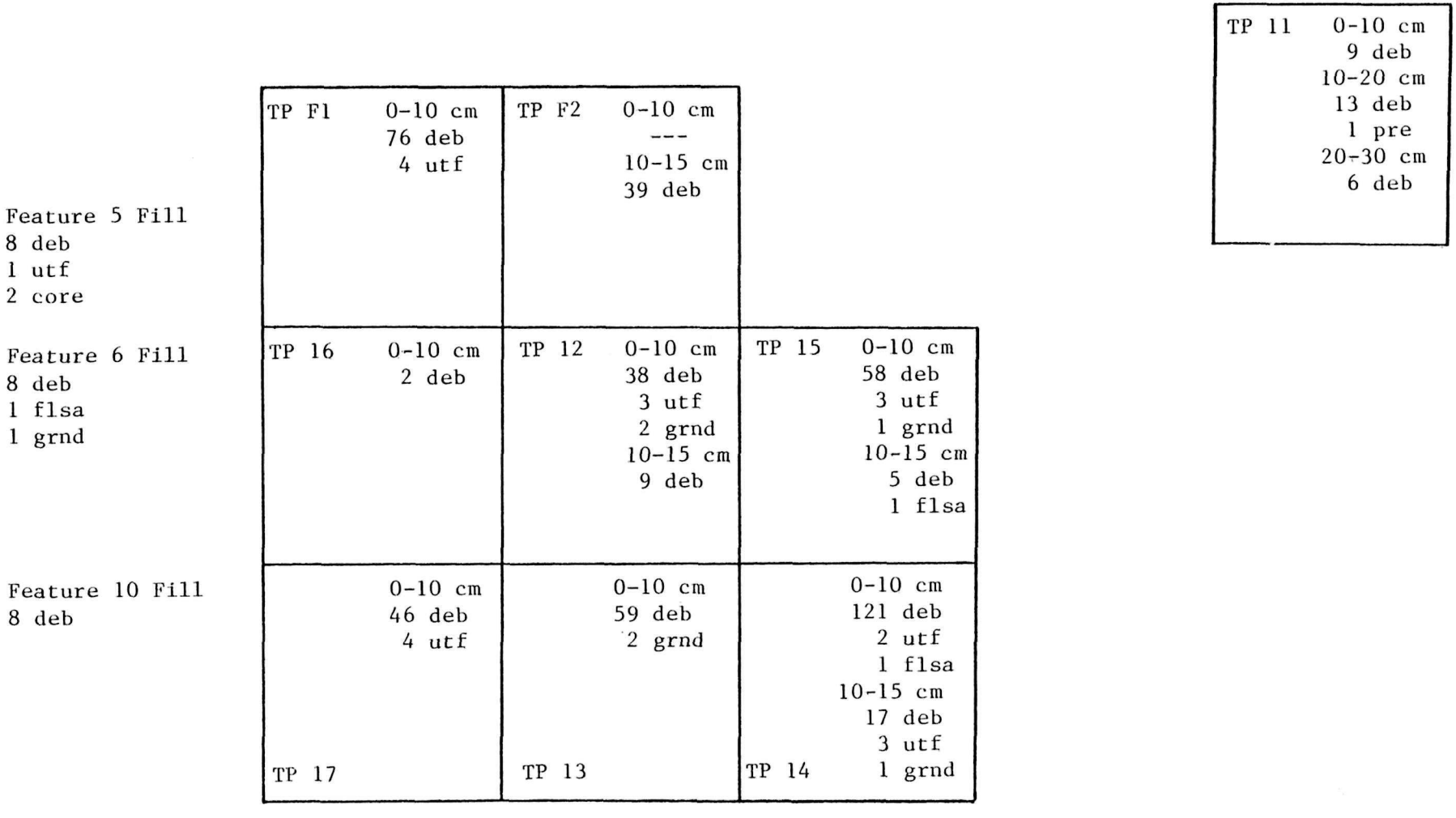


Figure 52. 5GN10, Component F, artifact distribution. Test Pit 11 not shown to scale.

represented by Feature 9 must be later than 5780 B.P., the date from the intruded hearth (Feature 10). The more complete flaked stone artifacts found on Component E are pictured in Figure 51. The artifact distribution on Compnent F is shown in Figure 52.

Summary

Archeological work was done at seven archeological sites in Curecanti during 1979. At 5GN207 work was limited to the surface collection of two artifacts since the land ownership was uncertain. Work was minimal at 5GN247 because of time constraints. The test pits at 5GN191 were placed in highly eroded areas of the site. It is suspected that the major portion of the upper artifact bearing level of 5GN191 was destroyed by wave action. The other four archeological sites, 5GN208, 5GN10, 5GN206 and 5GN212 were examined by use of one to 35, 2m x 2m excavation test pits per site.

Two categories of topographic site location were recognized in the field. These two categories are ridge top sites and lowland sites. The ridge top sites are located close to bedrock outcrops and soil depth is shallow across these sites. The lowland sites are located off of ridge tops in areas of deeper soil deposits overlying bedrock. On a geological map these lowland locations are all marked as Pleistocene deposits; ridgetop locations are labelled otherwise. The tested areas in the ridge top category are Components D, E, and F of 5GN10. The lowland type sites tested are 5GN10 Components A and B, 5GN206, 5GN212 and 5GN208.

Flaked and ground stone assemblages from the two occupations differed (Table 7). The lowland sites produced a lower ground stone to flaked stone ratio, lower percentage of chert, and higher density of flaked

Table 7

Material Culture Differences in Lowland and Ridgetop Occupation

	% Chert	Groundstone/ Flaked Stone	Number of Flakes Recovered	Number of Excavated 2m x 2m Test Pits	Average Number of Flakes per 2m x 2m Test Pits	Number of Bone Fragments
Lowland Sites						
5GN10 Comp A	1.73	.12	3363	7	480	-
5GN10 Comp B	2.98	.26	773	3	258	1
5GN208w	1.28	.14	700	1	700	-
5GN212	1.97	.01	1018	1	1018	6
5GN206 Test Pit 1	1.86	.53	376	1	376	7
Ridge Top Sites						
5GN10 Comp D	10.16	2.26	177	4	44	1
5GN10 Comp E	7.98	3.68	163	12	14	32
5GN10 Comp F	3.38	1.13	622	9	69	20

stone artifacts, cores and debitage. This seems to indicate a lesser importance of ground stone, probably used in plant food preparation on the lowland sites. More stone artifact manufacture, evidenced by a higher density of debitage, seems to have been done at the lowland sites.

The reason for the slightly higher incidence of chert on the ridge top sites is not clear. Although no source area surveys have been done, chert source areas are presumed to be located quite distant from the sites. Perhaps the cherts are indicators of long range logistic mobility. More research is needed to delineate chert source areas and generate testable hypotheses explaining the difference in raw material use.

All four definite and one possible wicki-up structures are found in ridge top locations only at 5GN10. Two of the five structures (Features 8 & 13, Component E) are dated in the period from 3924 to 4058 B.P. The third definite structure (Feature 12 from Component E) is from the seventh millenium B.P. The fourth definite structure (Feature 9, Component F) and the possible structure at Component D are undated. Ponderosa pine was found primarily in wicki-ups and apparently poles were used for construction. The adobe with log impressions was packed into the cribbing around the base of the ponderosa poles. One of the clearest patterns resulting from the 1979 investigation is the dominant association between pinyon pine charcoal and hearths at both ridge top and lowland sites. The selective use of certain kinds of trees for wicki-up construction and for fire making seems to be established as early as the later parts of the fifth millenium at 5GN10. The differential use is probably caused by the comparative structural and combustion properties of the two resources. Two examples of cactus came from ridge

top sites, while a third specimen of cactus comes from 5GN247, a lowland midden site that may be a trash dump for the immediately adjacent ridgetop habitation site, 5GN220. If cactus was exploited, this food resource may have been processed at ridgetop sites. The cactus came from a house dated to ca. 4000 B.P. The best evidence for association between houses and features is chronological. Features 7 and 12 at Component E are respectively radiocarbon dated at 6056 and 6355 B.P.; the former feature is probably an animal processing or consuming locus. Feature 5 at Component F is the best candidate for a multi-functional fire feature at which animal processing/consuming and lithic reduction (possibly including heat treating) were performed. Lithic reduction probably occurred around Features 1, Component A, and Feature 4, Component B, as well as in other non-hearth areas. It may be possible that older hearths are unlined, although the small sample precludes definition resolution. Feature 10 at 5GN10 is unique because it is internally stratified and probably a double-episodic hearth.

There is little horizontal segregation of cultural components (Willey and Phillips 1958) among the tested sites, i.e., radiocarbon dates of various ages are found within the same areas of sites. The fortuitous discovery of single component areas and of deep stratified soil deposits commonly found in lowland areas (e.g. 5GN206 and 5GN247) would represent two possible solutions to this problem.

CHAPTER V

Research Interpretations

The four hypotheses given in the introduction will be evaluated using information recovered from the archeological sites just described. The environmental chronology will be examined by comparing the dated archeological environmental assemblage (Appendices A, E, and D) to the modern assemblage (Woodbury, Durant and Flowers 1962). The cultural chronology will be viewed by contrasting the composition of the variously dated artifact and feature assemblages (Appendices A, C, and F). Site structure will be studied by comparing surface cultural remains to subsurface cultural remains (Appendices C and F). Site function will be investigated by comparing artifact and feature distributions across environmental space (Appendices C, D, E, and F). These hypothesis will be quantitatively tested on a presence or absence criterion and there will be no statistical testing.

Hypothesis Evaluation

Evaluation of Hypothesis I: Environment

The 1979 excavations produced minimal faunal remains. Both the mouse (Peromyscus maniculatus) and bighorn sheep (Ovis canadensis) identified from the archeological sites are found in the area today. The plant remains, although limited, are of major ecological import. The charcoal of pinyon pine (Pinus edulis) was found in five cultural contexts dated from approximately 7900 to 4400 years BP. Also a carbonized seed of hedgehog cactus (Echinocerus sp.) was found amongst charcoal dated at approximately 4100 BP. (figure 58). Neither the pinyon nor the hedgehog cactus are found in the upper Gunnison basin today (Woodbury, Durant,

and Flowers 1962). Two plant species were present in the Curecanti Basin prehistorically that do not grow there today. Therefore, for the time period of approximately 8,000 to 4,000 years ago Hypothesis Ia (environmental stability) is rejected and Hypothesis Ib (environmental change) is accepted.

Some discussion of the pollen evidence of the prehistoric environment is necessary to explain the discrepancy between the palynologist's (see Appendix B) and archeologist's interpretations. (Editor's note: The following discussion was written in Fall, 1980, after Stiger received Scott's pollen report.)

Two types of pollen samples were taken in the field. The first type was an ethnobotanical pollen sample. These were collected from the soil immediately below metates. It was hoped that these samples would produce pollen that had adhered to the grinding stones as a product of aboriginal use and indicate economic plant species. However both metates from which samples (No. 229 and 73) were taken were partially exposed on the surface. No definite economic pollen was found and the pollen counts probably represent "pollen rain" trapped in the top 10 cm. of soil.

The second type of pollen sample taken in the field was an environmental pollen sample. These samples should have produced pollen counts representing "pollen rain" during deposition of the sediments. Almost all environmental pollen samples were taken in stratigraphic sequences so that comparisons between different levels would indicate directional change in "pollen rain."

First and foremost among the problems barring accurate interpretation by the palynologist concerns the archeological provenience of

most samples. Almost all samples that produced pollen are from culturally sterile deposits. Samples from features with undoubtedly associated dating are generally palynologically sterile. Two exceptions are pollen samples 214 and 424. Sample 214 is from the bottom level of a stratified hearth (Feature 10 at 5GN10). The upper level of the hearth produced a radiocarbon date of 5780 ± 560. The only other pollen sample from an undoubtable archeological context is sample 424. This sample comes from the floor of Feature 1, a wicki-up-like structure at 5GN205 dated at approximately 4500 BP. All of the other samples that produced pollen come from the upper levels of stratigraphic columns with no definite direct cultural associations. This includes pollen sample 360 from the fill immediately above the burned superstructure of Feature 1 5GN205, not a floor as repeatedly reported by Scott.

This leaves the problem of trying to relate the remaining countable pollen samples to the historical record of the environment. These other samples (Nos. 1, 3, 4, 5, and 357) are from variable depths, all above sealed cultural contexts. Since all features during the 1979 field season were overlain by approximately the same amount of fill, it was considered that perhaps a relatively recent (post 4000 BP.) period of erosion/deposition had occurred. An inspection by a soils geologist (Joseph Danni) has confirmed that in the last hundred years the erosion/deposition rate has apparently been accelerated due to livestock activity. For this reason it is suggested that no samples from undated fill provenience locations can be used for dated environmental reconstruction. These samples may be related to old deposition but most likely represent pollen rain since the late 1800's. It is not suggested that the palynologist's reconstruction of environmental stability is wrong; only that

it probably represents the environmental reconstruction of the last one hundred years, an hypothesis the archeologist is in agreement with.

If the two samples with undoubted cultural associations are examined then two facts come to light. The first is that they are high in pine pollen percentages. The sample (424) from 5GN205 is 64 per cent pine pollen. Sample 214 from 5GN10 is only slightly over 20 per cent pine. However, if one excludes the Opuntia pollen which is definitely not environmental background pollen (Opuntia is zoophilous); the Pinus percentage is 33 per cent of the remaining pollen. These two samples are higher in pine pollen than any other pollen samples from the 1978 or 1979 excavations.

The second fact about these two samples is that the palynologist tries to explain the high pine percentage away with ethnobotanical excuses (in construction or fuel use of pine). Unfortunately it has yet to be shown that use of pine wood in these ways introduces pollen into an archeological feature.

Surface pollen samples from locations in or near pine forests in the western U.S.A. produce 16½%-30% pine pollen (Scott 1976a, 1976b, 1977, 1978). This would appear to be less than the percentages found in dated contexts in Curecanti. Perhaps the Curecanti pollen indicates a dense prehistoric forest.

Site 5GN189 (Euler 1979) has produced a most interesting pollen sequence. The levels since 15000 BP are dominated by oak (Quercus) and "poorly preserved tricolpate" (probably Quercus; L. Scott p.c.). These levels are also contaminated by Neotoma feces which contains 73 percent Quercus pollen (Appendix B). It appears then that a majority of pollen in 5GN189 is contributed by woodrat feces. It is suggested

that before any environmental reconstruction be done on the basis of 5GN189 pollen that the samples be recounted such as Kelso (1970) has done with samples from Hogup Cave that have been contaminated with cultural Cheno-Am pollen. Preliminary percentages redone (without the two pollen type) on the upper levels of 5GN189 indicate 5-10 percent pine pollen from the cave. This is a percentage similar to the Meadow Valley Wash site (Madsen 1973) located near a contemporary pinyon forest.

This section concerning pollen then can be summarized that the palynologist fails to understand the correct provenience of the pollen samples and that the dating of the upper fill pollen producing levels is unclear. These ambiguities preclude any scientific accuracy in the interpretations of the appendix on pollen in this report.

The final point to be made in this discussion is the lack of linking arguments in the use of pollen data for archeological studies. Perhaps the pollen appendix for this report is a perfect example of the need for middle range theory in scientific archeology. While Scott's counts of pollen can be considered empirical fact, the meanings associated with these data are subject to differing interpretations. It is extremely easy to support pet theories when cosmic interpretations may be assigned to data such as high pine pollen can be expected in hearths and structures where pine timber has been used. Such an interpretation may be considered a pipedream of prehistory unless there is some empirical reason or previous research to suspect that prehistorically timber has been a pollen transport. Another question arises as to what distinguishes "contamination" by modern pollen in pollen sample 2 (5GN205) The palynologist should state the indicators of the contamination in the sample.

There is no link between palynological archeological statics and the real world, this is sloppy science. Scott (personal communication)

suggests that the prehistoric population was hauling pinyon firewood in from outside the Gunnison Basin. This is a valid alternative explanation. The attempt by the palynologist with the a priori assumption of no environmental change to account for pinyon wood in hearths and high pine pollen counts in the only cultural proveniences has generated three necessary alternative hypotheses. Thus, the theory is determining the interpretations. All must be true to account for the archeological facts. These hypotheses are people are hauling pinyon 25 miles up the Black Canyon to burn in hearths in Curecanti, that buring pine wood yields pollen in hearths, and that building a structure of pine logs puts pine pollen on a floor. There is no independent evidence for any of this. Alternatively I suggest only that more pine (specifically pinyon) was growing and burned in the area. I think the single last hypothesis is most logically economical.

Evaluation of Hypothesis II: Cultural Chronology

All Curecanti radiocarbon dates obtained so far, with one exception, have yielded dates of approximately 4000 BP or older. The one exception is probably a bad date (see discussion in description of 5GN247). Almost if not all prehistoric occupation in the surveyed and tested areas in Curecanti appears to be pre-4000 years old. The Curecanti sequence does not represent a stable, non-specialized, accretional cultural adaptation. It appears that the Curecanti material represents an adaptation to something absent in the area from 4000 BP. Hypothesis II a (non-specialized adaptation) is rejected and Hypothesis II b ("specialized adaptation") is accepted. This specialized adaptation subject as discussed in the "Implications and Conclusions" section tents to negate Jennings' concept of a generalized Desert Archaic adaptation.

Evaluation of Hypothesis III: Relationship of Surface to Subsurface Remains

The original plan for the 1979 testing in Curecanti called for a randum subsurface test of systematically surface collected sites. However, a rapidly rising reservoir and being short on field time forced us to abandon our original strategy. From the previous summer's excavation results it appeared that subsurface features were positively correlated with the distribution of ground stone on the site. It was judged, in the field, desirable to gather material for radiocarbon dating and information on features. For this reason the locations of ground stone were intensively excavated. It still appears that there is a relationship between groundstone and features on a site; however, the work done during 1979 will not allow us to test this relationship. It is recommended that in the future procedures be followed that would allow a valid testing of these distributions. While it appears that features are associated with ground stone it would be important to find out if theere are not features to be found in areas where there is no ground stone. These problems are left to future workers in the area.

Evaluation of Hypothesis IV: Site function

We can define two different types of locations for Curecanti sites investigated during 1979. The first location is a ridge top. Soils are generally shallow. Bedrock is exposed in places along the ridges. The second topographic location is off the ridge top in deeper soil, generally along side stream or drainages of the Gunnison River. Some larger sites, e.g., 5GN10 and 5GN206, have areas in both types of locations. However, it appears that there are functional differences at sites located in the two topographic situations. Site 5GN10 will be used as an illustrative example for this functional difference.

Components D, E, F of 5GN10 are the only ridgetop components investigated in 1979. Twenty-six 2m x 2m test squares were excavated, and five hearths, one cyst, postholes and adobe were found. The postholes and adobe appear to be remnants of habitation structures. Fifty-two bone fragments were found as well as an intrusive mouse skeleton. Lithic artifacts recovered are tabulated in Table 8.

Components A and B of 5GN10 are located just above the floodplain of Willow Creek. The two components are in relatively deep soil in a "lowland" topographic situation. Ten test squares were excavated and three hearths were found. No bone was recovered. Lithic artifacts recovered are tabulated in Table 8. The percentage composition of the flaked stone assemblage is remarkably consistent.

The differences in the artifacts found on ridge and lowland components are obvious in Table 7. The sheer numbers of lithic specimens found in the lowland components is staggering, especially, since over 99% of the artifacts came from the top 10 cm of excavation. The major difference in composition between the assemblages is an eleven fold increase in the percentage of ground stone on the ridge top sites.

It appears that the ridge top sites are places of habitation (structures), plant food consumption (ground stone) and animal food consumption or processing (bone fragments). The lowland sites seem to be related to shorter term occupation (hearths but no structures), little consumption of animal food (no bone), minor plant consumption (ground stone), and major emphasis on tool manufacture and maintenance (lithic debris).

An additional site type may be represented at 5GN247 (this report) and 5GN204 (Euler and Stiger 1981). These sites appear to be trash dumps probably from ridge top habitation sites and contain bone, lithics,

Table 8

A. Lithic Assemblage Composition from 5GN10
Ridge Top Components (D, E, F)
26 excavated 2m x 2m test pits

Artifact Category	Number	Percent of Total	Average No. per test pit
Debitage	913	92.41	35.12
Utilized Flakes	39	3.95	1.5
Preforms	4	.41	.15
Cores	3	.30	.12
Flaked Stone Artifacts	12	1.22	.46
Ground Stone Artifacts	17	1.72	.65
Total	988	100.01	38

5GN10 Lowland Components (A, B)
10 excavated 2m x 2m test pits

Artifact Category	Number	Percent of Total	Average No. per test pit
Debitage	3824	92.32	382.4
Utilized Flakes	239	5.77	23.9
Preforms	15	.36	1.5
Cores	2	.05	.2
Flaked Stone Artifacts	56	1.35	5.6
Ground Stone Artifacts	6	.15	.6
Total	4142	100.00	414.2

and charcoal, as well as abundant amounts of fire cracked rock. Although none have yet been extensively excavated, these dumps would appear to be the best opportunity to study the subsistence remains from a ridge top site. Large dumps such as 5GN247 would indicate an extended occupation of the ridge top sites or a long term multiple reuse of these sites. The deposition of trash at these dump sites may account for the absence of cultural debris on habitation sites.

Sites other than 5GN10 investigated during 1979 that fall into the ridge top site category are 5GN206 (hill top area) and 5GN207. Sites other than 5GN10 investigated during 1979 that fall into the lowland site category are 5GN206 (saddle area), 5GN208, 5GN212, and 5GN191. Summaries of data from these sites are included in Table 7.

Implications and Conclusions

The archeological sites tested during 1978 (Euler) and 1979 at Curecanti represent a prehistoric cultural adaptation to the area during the Altithermal time/climatic period (Antevs 1948). During the Altithermal period (8000 - 4000 B.P.) the vegetal environment was different than the modern one. There appear to be two major possibilities for the change in vegetation. The first possibility is that the climate is different today than during the Altithermal. The modern climate would then be seen as prohibiting the pinyon and hedgehog cactus from growing in the upper Gunnison basin. The second possibility is that, while the climate has changed, the major limiting factor is the topographic situation of the Curecanti area (Stiger 1980).

Pinyon pine and hedgehog cactus presently occur outside of the upper Gunnison basin in areas of comparable elevation and climate to Curecanti. In addition, a group of small mammals has been noted as

being absent from the Gunnison basin where suitable habitats could be found (Dr. D. A. Armstrong, personal communication). Interestingly the pinyon pine, hedgehog cactus and small mammals presently absent from the basin all have maximum distributional elevations below 8500 to 9000 feet elevation (Armstrong 1972; Harrington 1964). Almost all living plants and animals found in Curecanti (Woodbury, Durant and Flowers 1962) have maximum distributional elevations over 9000 feet.

It has been suggested that the basin topography of the Gunnison area and the cliffs of the Black Canyon have limited biotic access into the Gunnison Basin. The presence prehistorically of at least a few species of plants and possibly some animals that are absent today has two implications. One, something had to let the species into the basin and two, something had to kill them off and keep them out of the basin. It has been suggested that this environmental change is the result of fluctuating elevational limits of life zones caused by climate change (Stiger 1980). These climate changes correspond to those of the Altithermal and the "Little Ice Age" (Antevs 1948, Matthes 1939). The pinyon-juniper zone would have to have risen approximately 500 to 1000 feet to get the life zone "over the hump" of the lowest basin rim (to the west). This would have allowed the pinyon-juniper zone to spill into the upper Gunnison basin. This rising of life zones would have taken place sometime before 7900 B.P., the earliest dated pinyon charcoal found in the Curecanti excavations. Researchers working with dead trees in California have found an approximate 500 foot elevational rise in treeline sometime before 7400 B.P. This high California tree line lasted until about 4200 B.P. (La Marche 1973, La Marche and Mooney 1967). The latest well-dated site in Curecanti dates to about 4100 B.P.

A downward shift in life zones corresponding with Matthes' (1939) "Little Ice Age" could explain the absence of post-Altithermal sites in Curecanti. If the prehistoric human niche was closely adapted to some element or elements in a particular environment and that environment changed sufficiently or became extinct, then abandonment of that locality might be necessary. Human reoccupation of the area would come about only with the adaptation to a new niche or the return of the critical elements.

During the "Little Ice Age" if the upper limit for pinyon would have dropped below 7200 feet, the lowest elevation in the upper Gunnison basin, then at that time pinyon pine would have disappeared from the Basin. This upper limit for pinyon may be set by annual precipitation amounts. At around 15 inches per year ponderosa gains an advantage over and out competes pinyon (Woodbury 1947). Regardless, at some time around 4000 B.P. the pinyon zone levels may have dropped below 7200 feet in elevation. At no time since then has the environmental situation been lenient enough to allow pinyon pine back into the upper Gunnison basin. The discovery of more recent, post-4000 B.P. sites without pinyon pine would support this conclusion.

The fluctuating environmental zone model proposed here has some interesting implications for archeological research outside of the Curecanti area. Bettinger (1975) has done interesting research on lithic scatter sites in Owens Valley, California. By mapping typologically dated surface material across the valley, Bettinger has reconstructed settlement patterns through time. Bettinger then relates these to modern vegetation zones and hypotheses about the changing prehistoric land use, including the inception of pinyon collecting about 600 A.D. The

Curecanti material indicates that the modern vegetation zones may not reflect prehistoric ones. While Bettinger (1975) acknowledges the rise in Altithermal life zones he ignores the possible drops during the "Little Ice Age". Since most of Bettinger's sites fall within the "Little Ice Age" the reconstructed sequence of Owens Valley settlement patterns with respect to life zones may be questioned.

A final caution on environmental reconstruction is concerned with the use of pollen information. In Curecanti all camp or habitation sites so far investigated have been shallow. Sites of all ages are buried beneath approximately 10 cm of fill. Artifacts, apparently associated with features, are found on the surface and in fill. It would appear that the deposition of this top 10 cm occurred sometime after the last occupied sites at 4000 B.P. Since there is yet no way of dating this top fill we cannot be certain what time period the pollen in it comes from. Also, since there are artifacts on top of it, I suggest that the assignment of pollen from fill to any specific time period be viewed with extreme caution. The stratigraphy, rate of deposition and temporal association of natural fill on the sites in the Gunnison basin are not yet clear.

The subsistence-settlement pattern in Curecanti appears to be similar to that of the proto-historic Ute of Western Colorado. Buckles working 50 miles west of Curecanti on the Uncompahgre Plateau excavated several standing wickiup villages (Buckles 1971:627-659). These sites bear many similarities to the Curecanti ridge top sites. All of the Uncompahgre sites were located in areas with pinyon pine. Structures consisted of poles set on the ground in tipi fashion. Flaked stone artifacts were rare and a few pieces of ground stone were found. Floors were

generally poorly defined. Many pieces of highly fragmented bone were found. Buckles (1971:650) speculates that the wickiups were not long term habitations because of the paucity of trash or that trash was dumped off the site.

It is suggested here that the Curecanti ridge top sites represent an adaptation similar to the Uncompahgre sites. These sites are probably geared for the exploitation of pinyon nuts. Pinyon nuts were an important resource for many historic native people in the western United States (Steward 1938). This pinyon exploitation pattern was present in Eastern California as early as 4500 B.P. (Thomas 1971). In Curecanti remnants of structures are dated from about 6355 B.P. (5GN10 Component E, feature 12) to about 4100 B.P. (5GN10 Component E, feature 8). This pattern may extend back to Paleo-Indian times in Western Colorado. A ridge top site that yielded groundstone and a Clovis point has been reported 20 miles northeast of Curecanti (Carpenter, Donaldson, and Williams 1976). Although no subsurface work has been done, the author has seen the site and it is similar in some respects to the Curecanti ridge top sites. A few Paleo-style points have been found in Curecanti on ridge top sites. None have been investigated. A hearth partially excavated in 1978 (Euler 1979) was radiocarbon dated at 10,094 $\pm$ 830 B.P. (Tx-3154) from a hearth located on a ridge top at 5GN205. On this same ridge, a wicki-up like structure was dated at about 4500 B.P. (Euler and Stiger 1981). The old hearth was just at the edge of the excavation unit. Whether there was an associated structure is not known. More work in the area around the hearth is needed. Although as of yet inconclusive there is the possibility for the pinyon exploitation pattern to extend back into Paleo-Indian times. More work is needed to study

the geographical and temporal distribution of pinyon pine and Paleo-Indian sites.

It is offered as an hypothesis that the reason for few if any prehistoric sites in Curecanti after 4000 B.P. is that there was a local extinction of pinyon Pine during the "Little Ice Age". If any later prehistoric sites are found it is suggested that they be intensively studied to define the local environment and subsistence strategy.

All of the fauna thus far recovered from two seasons of excavation have been highly fragmented. One jawbone of woodrat (Neotoma sp.) and several fragments of elk (Cervis canadensis) are the only faunal remains thus far identified from undoubtably cultural contexts (Emslie, personal communication; Euler and Stiger 1981; Appendix D this report). Many of the unidentifiably fragmented large mammal bones may be of mountain sheep size. 5GN191 (Euler and Stiger 1981; this report) may be an example of a salt lick hunting and butchering camp. This is the only lowland site in Curecanti tested thus far that has shown a long period of intensive use. A few bone fragments, one identifiable as mountain sheep (Emslie 1981), and many fragmented stone tools were found among the eighty-seven hearths. One quarter of a mile to the south is a slow spring. Although the spring water may have brought game to the location, the permanent Gunnison River one mile away would seem to negate this attraction. Further investigation of 5GN191 and the spring area itself would prove beneficial to understanding this site. Additionally, survey work in high elevation areas may yield evidence of local game drive systems. Some consideration should also be given to the possible effects of the Altithermal and "Little Ice Age" on grazing range and mountain sheep productivity. A better grasp of prehistoric man-sheep relations will aid in the understanding of the archeological remains in Curecanti.

Management Recommendations

All of the sites tested thus far in Curecanti have yielded significant information or have the potential to yield significant information on the regional prehistory. Curecanti appears to present an excellent and rare opportunity to observe an adaptation of man to a changing high altitude environment. The apparent absence of sites after 4000 B.P. gives the archeologist a chance to see the remains of this ancient culture without the disturbance caused by later prehistoric occupation. Curecanti is one of the few regions where a temporally restricted occupation has occurred. The singular importance of the Curecanti archeology is the combined presence of hunter-gatherer peoples and residential structures spatially separated in a manner that is very conducive to scientific inquiry. Specific management requirements for the seven archeological sites investigated during 1979 are as follows:

5GN207: The Curecanti boundary line should be examined to see if this site is within National Park Service jurisdiction. If it is within jurisdiction, testing is needed to determine its National Register status. This site should be protected and avoided until these determinations are made. The site has the potential to yield information concerning the initial occupation of the Curecanti Basin. Its environmental position along a secondary stream distantly removed from the Gunnison River enhances its uniqueness within the Curecanti subsistence-settlement system.

5GN208: Surface indications will not be useful to determine the extent of this site. Any construction in this area should be preceeded by archeological testing. No National Register

determination can be made based on the limited testing already done. There could be substantial subsurface remains. Archeological base maps should have the location of 5GN208w. added to reflect the location of these test squares.

5GN247: This site has the potential to yield information on subsistence activities because of the thick midden deposit and because of its possible relations to the occupation site, 5GN220. The date of 4357±410 (Tx-3620) indicates an Altithermal occupation. For the above reasons, this site is recommended for nomination to the National Register of Historic Places. 5GN247 represents an extensive subsurface deposit that has been partially exposed by a roadcut. The deposits could be impacted by road maintenance, visitation, and erosion. Road maintenance, closing of the road, and bank stabilization and/or emergency mitigation are recommended mitigation procedures.

5GN191: This site has yielded radiocarbon dates from 8807±100 (Tx-3149) to 5861±170 (Tx3155). It appears to represent long term repeated occupation for the purpose of exploiting a localized resource. Nomination to the National Register is recommended due to the extensive number of hearths. Euler (1979) mapped 84 hearths on the surface of 5GN191 with many more subsurface hearths recovered through excavation. The number of hearths and time depth of 5GN191 makes this site unique amongst investigated Curecanti sites. 5GN191 is currently undergoing extensive erosion from fluctuating reservoir levels. Unless some

stabilization of the deposits are instituted immediately the site will be totally destroyed. If stabilization cannot be done soon or effectively, then mitigation is necessary.

5GN212: Parts of this site have been intensively damaged by construction. This site can yield significant information because of its south bank, lowland location. More testing is needed on this site to determine the extent of damage. There are probably intact areas south and north of the access road. However, the area north of the access road should be tested to see if there are any valuable remains intact. After this is done, sufficient information will allow an accurate National Register determination.

5GN206: This site has important remaining deposits. The area below high water line is undergoing erosion. The remaining deposits should be either stabilized or mitigated by excavation. Nomination of this site to the National Register is recommended.

5GN10: This site covers an extensive area and there are large areas that are relatively undisturbed. 5GN10 appears to have several locations which were selected for habitation over a long time period. This is unique amongst sites so far investigated in Curecanti. In the areas tesated there are still features that have not yet been fully excavated. This site should be nominated for the National Register. Since components A and B are below

high waterline, they are undergoing erosion. I recommend stabilization or mitigative excavation for these components.

A final recommendation for the entire Recreation Area is that of an interpretive program for the visitor. An experimental tour and evening talk program was tried in Curecanti during the summer of 1979. There was a genuine public interest in archeology.

One of the more destructive forces to Curecanti archeology is the illegal surface collection and pot hunting that is widespread in the area. An appreciation of archeology by the public is probably the best way of combatting this problem and providing recreational opportunities at the same time. I would encourage more interpretive programs in Curecanti.

An interesting value of archeology to the natural sciences is that of demonstrating the history and potential of the Curecanti ecosystems. Derivation rates of varieties and races of plants and animals may be tested. A minor change in climate or the human introduction of species from outside the basin may vary the composition of the future local flora and fauna. The reestablishment of a pinyon-juniper forest may have impact on run off, game animal production, and other forest products. These possibilities for applied archeological research should be of interest to the scientist and manager alike.

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Appendix A

1978-1979 CURECANTI RADIOCARBON DATES

Site	Feature	Lab. No.	[1]Corrected Ages (Half Life 5730 Years) Date B.P.[1]
5GN247	Test 1	Tx-3620	4357±410
	Test 2	Tx-3626	2204±130
5GN191-79	Feature 4	Tx-3624	7890±240
5GN191-78	Feature 1	Tx-3647	6747±160
5GN191-78	Feature 7	Tx-3646	6077±950
5GN212	Feature 1	Tx-3623	6283±250
5GN206	Feature 2	Tx-3622	5583±160
5GN10 Component A	Feature 1	Tx-3625	6036±600
Component E	Feature 7	Tx-3619	6056±160
	Feature 8	Tx-3629	3924±130
	Feature 8	Tx-3630	4244±90
	Feature 12	Tx-3621	6355±210
	Feature 13	Tx-3631	4058±260
Component F	Feature 5	Tx-3618	4419±290
	Feature 10	Tx-3628	5778±560
	Feature 11	Tx-3627	6499±340
5GN189	.92-1.32 mbd	Tx-3632[2]	14,935±610
	1.32-1.72 mbd	Tx-3633[2]	12,154±1700[3]
5GN191-78	Feature 3	Tx-3152	5984±120
191-78	Feature 6	Tx-3155	5861±170
191-78	Feature 11	Tx-3149	8807±100
5GN200	Tp-2 charcoal	Tx-3153	4656±120
5GN205 Component D	Feature 1	Tx-3154	10,094±830
Component G	Feature 1	Tx-3150	4563±300
	Feature 1	Tx-3157	4398±90
	Feature 1	Tx-3151	4697±80
	Feature 2	Tx-3156	7271±110

2 These samples were bone; all others were wood charcoal
3 Samples below this line were reported in Euler and Stiger 1981.

APPENDIX B

PALYNOLOGICAL INVESTIGATIONS IN THE CURECANTI BASIN, COLORADO

by

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INTRODUCTION

Test excavations were conducted by the National Park Service in the Curecanti National Recreation Area in Colorado during the summers of 1978 and 1979. Analysis of 30 pollen samples from six different prehistoric sites was undertaken in conjunction with the test excavations at Curecanti during 1979 to determine the significance of some of the archeological sites in the area. This data will also be compared with the data generated by the analysis of pollen samples from the 1978 field season. The sites analyzed for pollen data during the two year period include a cave, 5GN189, which was test excavated and samples for pollen at 10 cm. intervals; 5GN191, a series of firepits; 5GN205, a wickiup-like structure; 5GN206, a trash area; 5GN212; 5GN10, a scattered site along a ridge containing multiple dwellings and firepits; and 5GN247, a probable trash area. Analysis of pollen samples from these archeological sites was undertaken to provide environmental data where possible, and to search for culturally significant changes in the pollen record in areas of human activity.

These sites provide a unique opportunity to evaluate sites ranging from 10,000 BP to post-Altithermal in a single locality for their various ecological components. There have been no published reports dealing with the analysis of pollen from archeological sites of this antiquity on the Western Slope of the Rocky Mountains in Colorado. Pollen studies of equivalent age have focused on reconstructing past environments in alpine areas of the La Plata and San Juan Mountains in southwestern Colorado (cf. Petersen and Mehringer 1976; Andrews et al. 1975; Maher 1961, 1963; Petersen 1975). Pollen studies from archeological sites in western Colorado, excluding those dealing with the areas of the Anasazi,

are generally limited to sites dating to the late Archaic and Fremont periods of occupation (cf. Scott 1978a, 1978b, 1979, 1980). Palynological studies in progress near DeBeque and Crested Butte by this author date to 7,000 BP and 5,000 BP respectively, and are the only studies of sufficient age for comparison with the Curecanti material.

In general, this study attempts to define environmental and economic parameters for the sites from Curecanti. Correlation of the pollen data from these sites with radio-carbon diates will assist in the definition of possible environmental changes. Integration of the pollen data from the 1978 excavations at Curecanti with the current material will be facilitated by the review of this data in summary form. Correlation between the data from Curecanti and other palynological studies of similar age in western Colorado will also be attempted in order to further refine the interpretations concerning the environment and economic plant use.

METHODOOLOGY

The pollen was extracted from soil samples taken at various archeological sites in the Curecanti Basin. A chemical preparation based on flotation was selected for the removal of the pollen from the large volume of soil and clay with which they were mixed.

Hydrochloric acid (10%) was used to remove calcium carbonates present in the soil, after which the samples were screened through 150 micron mesh. Zinc bromide (density 2.0) was used for the flotation process. All samples received a short (5 to 15 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles, followed by an acetolation for removal of organic matter.

A light microscope was used to count the pollen to a total of 200 pollen grains. Poorly preserved or disintegrated pollen grains have been included in the total pollen count and are represented at the right side of the pollen diagram (Figures 1 and 2).

DATA AND INTERPRETATIONS

5GN10

Site 5GN10 is represented by a collection of artifacts and features scattered over a ridge. Excavation revealed metates, hearth, and evidence of dwellings. Pollen analysis of samples from the various components of this site yielded mixed results. Generally speaking, hearths did not yield good pollen; whereas samples associated with metates or floors (Table 1) were more likely to yield pollen. Component F, dated 4418 ± 290 BP and 5780 ± 560 BP was the only area to yield pollen from a hearth. The hearth associated with this component dated to 5780 ± 560 BP and contained abundant evidence of Opuntia pollen (40%), although most of the pollen grains were fragmentary. The large quantity of Opuntia pollen in this sample indicates the possibility that the residents of this site may have been baking the spines off the cactus to prepare them for eating. This hearth also contained a higher quantity of pine pollen than did a floor and floor fill sample from this component. Approximately one-third of the pollen present in this sample (excluding the Opuntia pollen) is pine pollen, while pine pollen contributes less than 10% of the pollen in the floor and floor fill samples. This rather large quantity of pine pollen may be indicative of the use of pine as a fuel in the hearth.

Figure 1. Pollen diagram of sites 5GN10 Components A, E, and F; 5GN205, 5GN206, and 5GN247 (all open sites).

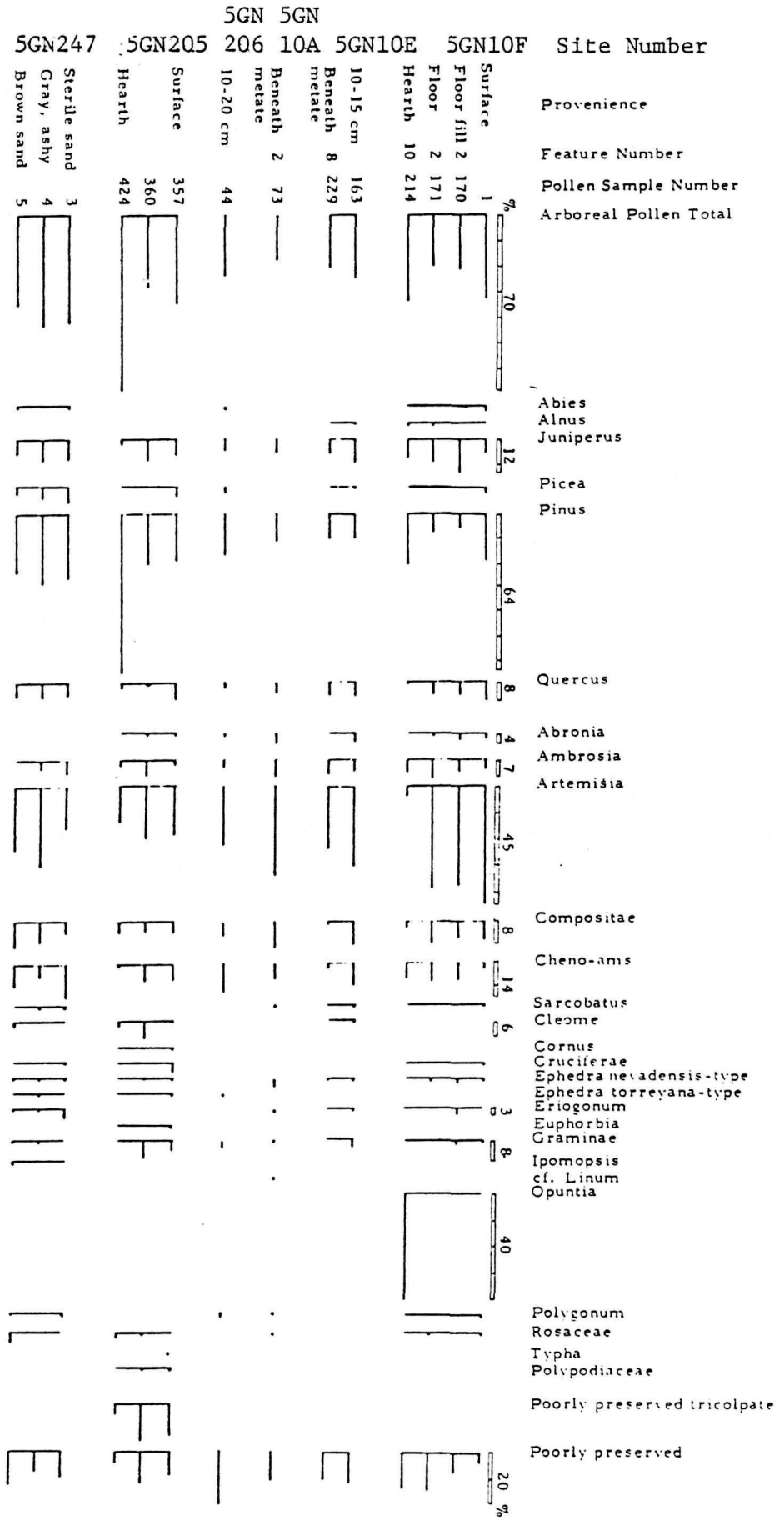
5GN247
5GN205
5GN 206
5GN 10A
5GN10E
5GN10F
Site Number
Provenience
Feature Number
Pollen Sample Number
Arboreal Pollen Total
Sterile sand
Gray, ashy
Brown sand
Hearth
Surface
10-20 cm
Beneath metate
10-15 cm
Beneath metate
Hearth
Floor
Floor fill
Surface
3
4
5
424
360
357
44
73
2
229
8
163
214
10
2
171
2
170
1
%
70
Abies
Alnus
Juniperus
12
Picea
Pinus
64
Quercus
8
Abronia
4
Ambrosia
7
Artemisia
45
Compositae
8
Cheno-ams
14
Sarcobatus
Cleome
6
Cornus
Cruciferae
Ephedra nevadensis-type
Ephedra torreyana-type
Eriogonum
3
Euphorbia
Graminae
8
Ipomopsis
cf. Linum
Opuntia
40
Polygonum
Rosaceae
Typha
Polypodiaceae
Poorly preserved tricolpate
Poorly preserved
20
%

Figure 2. Pollen diagram of the stratigraphic deposits in the cave, site 5GN189.

+ indicates pollen type observed outside 200-grain count, or pollen type observed in a sample with insufficient pollen to count.

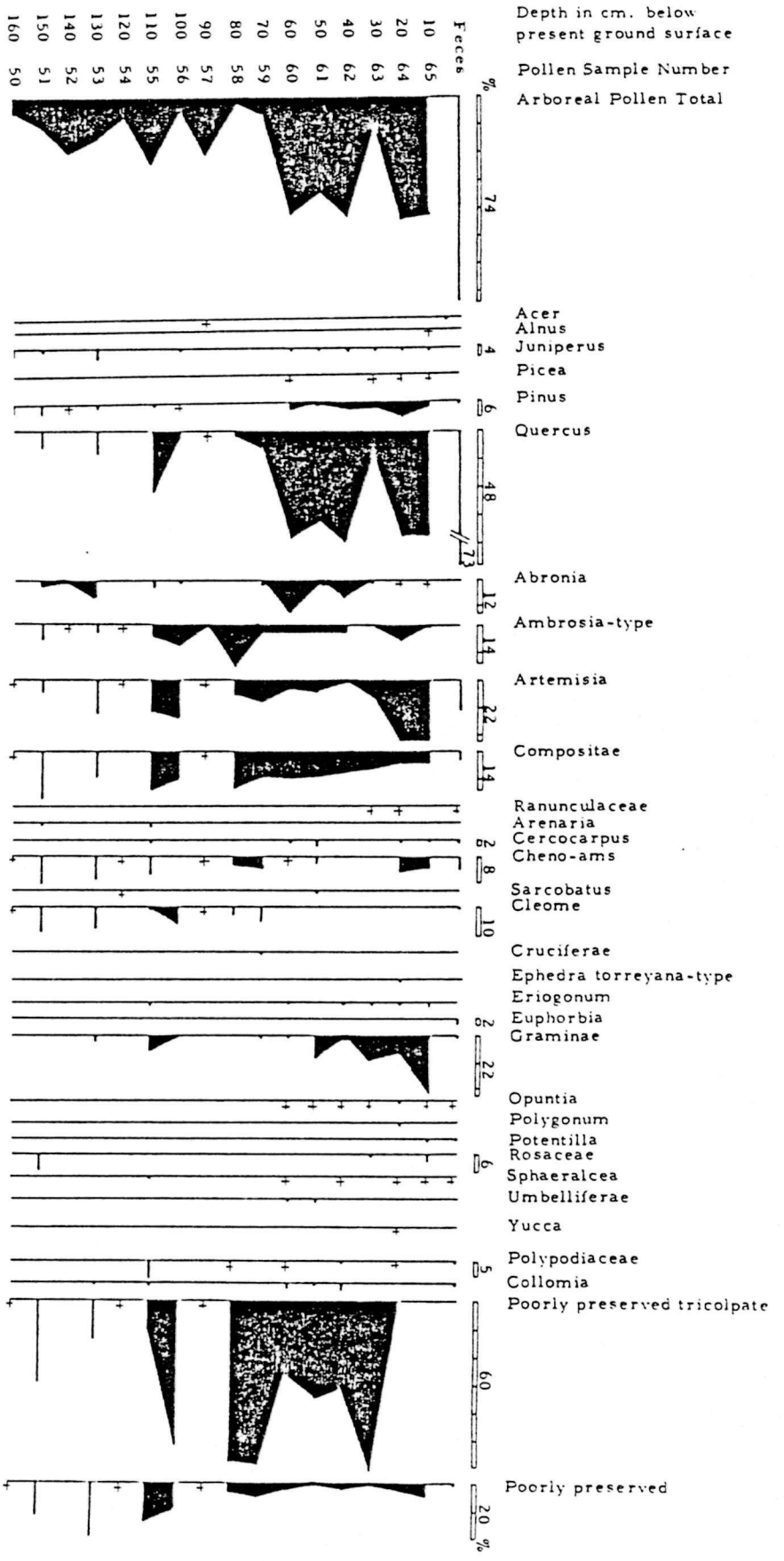
Depth in cm. below present ground surface
Pollen Sample Number
Arboreal Pollen Total
Feces
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
%
74
Acer
Alnus
Juniperus
4
Picea
Pinus
6
Quercus
48
73
Abronia
12
Ambrosia-type
14
Artemisia
22
Compositae
14
Ranunculaceae
Arenaria
Cercocarpus
Cheno-ams
2
8
Sarcobatus
Cleome
10
Cruciferae
Ephedra torreyana-type
Eriogonum
Euphorbia
2
Graminae
22
Opuntia
Polygonum
Potentilla
Rosaceae
6
Sphaeralcea
Umbelliferae
Yucca
Polypodiaceae
5
Collomia
Poorly preserved tricolpate
60
Poorly preserved
20
%

TABLE 1

Provenience of Pollen Samples Analysed

Pollen Sample No.	Depth in cm. below present ground surface	Radio-carbon date	Comments
5GN189 (excavated 1978)			
Feces	10-30		Woodrat contaminated
65	10		Woodrat contaminated
64	20		Woodrat contaminated
63	30		Woodrat contaminated
62	40		Woodrat contaminated
61	50		Woodrat contaminated
60	60		Woodrat contaminated
59	70		
58	80		Pleistocene horse
57	90		bones found in these
56	100		levels.
55	110		
54	120		
53	130		
52	140		
51	150		
50	160		
5GN191 (excavated 1978 and 1979)			
6			Feature 1, not countable
11			Feature 4, unlined hearth, not countable
22			Samples 22-25 are from
23			slab-lined firepits.
24			All contained charcoal,
25			none were countable
5GN205 (excavated 1978)			
357	0		Present ground surface
360	7.5	4398± 90 BP	Occupational level
423	19-23	4562±300 BP	Not countable
424	23-38	4696± 80 BP	Occupational level
425	35-45		Arch. sterile, not countable
2		10094±830 BP	Hearth, contaminated pollen
3			Burned adobe, not countable
5GN212 (tested 1979)			
10		6283±250 BP	Under rock in bottom of hearth, F 1, not countable

TABLE 1 (Continued)

Pollen Sample No.	Depth in cm. below present ground surface	Radio-carbon date	Comments
5GN206 (excavated 1979)			
23	20	5582±160 BP	Under rock, not countable, F 2
44	10-20		Stratigraphic trash, not
46	30-40		countable
48	50-60		"
50	70-80		"
52	90-100		"
5GN10 Component A (excavated 1979)			
73			Under metate
74		6035±210 BP	Feature 2, hearth, not
		Feature 1	countable
5GN10 Component E (excavated 1979)			
163	10-15		
238	20	6355±210 BP	Beneath adobe, not countable
229		3924±130 BP	Beneath metate, feature 8
		4243± 90 BP	
5GN10 Component F (excavated 1979)			
1	0		Present ground surface, general ridge
125	46	4418±290 BP	Bottom of firepit, F 5, not countable
133	42		Feature 12, not countable
170			5 cm above floor
171			Floor
214		5780±560 BP	Feature 10, bottom charcoal
214	40		Feature 10, hearth, fill
5GN247			
3			Top sandy soil, sterile
4			Greyish ashy sand
5			Dark Brown sand
6,12		4356±410 BP	Charcoal lens, not countable
7			Mottled sand, not countable
8			Lowest sterile sand, not countable

Other samples from this component contained no Opuntia pollen. A floor sample and a sample taken 5 cm. above the floor (floor fill) also contained sufficient pollen for analysis. These two samples were almost identical to one another in pollen content. Therefore, no implications of cultural activity can be drawn, since the floor and fill above the floor were virtually identical in their pollen content.

Two pollen samples from Component E also contained pollen. One sample was taken 10-15 cm. below the present ground surface, and the other beneath a metate. These samples were fairly similar to one another with respect to arboreal pollen content. The sample taken 10-15 cm. below the present ground surface contains more different types of pollen than does the one taken under the metate. The sample taken under the metate (feature 8) does not contain a unique assemblage of pollen, and therefore probably reflects pollen deposited on that surface prior to the metate's placement on that spot. It does not contribute any information regarding the use of this metate. Two radio-carbon samples from feature 8 at this component yielded dates of 3924 $\pm$ 130 BP and 4243 $\pm$ 90 BP, while a third radio-carbpn sample from this component yielded a date of 6355 $\pm$ 210 BP.

Component A of 5GN10 also yielded a sample taken under a metate (feature 2). This sample contained more pollen types than the one associated with the previous metate. Levels of both Compositae and Chenoam pollen are also higher than with the other metate. There is also evidence of Sarcobatus, Eriogonum, Graminae, and cf. Linum pollen, which were not observed in the other metate sample. These pollen types do not occur in larger frequencies than in other samples from the Curecanti area, however, so it is not possible to ascertain whether their presence

is due to use of the metate to grind plants or to wind transport of the pollen. The only pollen noted in this sample which has not been noted elsewhere in the samples from Curecanti is the cf. Linum pollen from this metate sample. There is no direct evidence available to date the metate under which the pollen sample was taken. Feature 1 from this component was radiocarbon dated to 6035±600 B.P. A direct relationship has not yet been established, however, between feature 1 and 2, where the pollen sample was taken.

5GN206

A deep trash area was sampled stratigraphically for pollen at 5GN206. Pollen samples were taken every 10 cm. from the surface to a depth of 130 cm. Analysis of five samples from the trash and one sample taken under a rock in feature 2 yielded very little pollen. Only the sample taken 10-20 cm. below the present ground surface in the trash deposit yielded sufficient pollen to analyze. The samples taken 50-60 cm. and 70-80 cm. below the surface also contained a moderate amount of pollen, but most of the pollen had disintegrated so that it was not recognizable. The pollen content of sample 44, taken 10 cm. below the present ground surface in the trash deposit is very similar to that of the modern surface sample taken along the ridge on which site 5GN10 is located. The trash deposit is located downslope from the ridge and is just below the high water mark of the Blue Mesa Reservoir. The main difference between the sample from the trash deposit and the modern surface sample is that the trash sample contained more Cheno-am pollen and less Artemisia pollen than did the surface sample from the ridge.

5GN205

This site was excavated during the 1978 field season and several pollen samples were analyzed with the material from that season. A radiocarbon date from the fill of a hearth (10,094±830 B.P.), which had not previously been sampled for pollen, lead to the resampling of the hearth and a portion of adobe from the structure associated with the hearth. Unfortunately, even the lower levels of the hearth had been thoroughly contaminated with modern pollen during the year which it had been exposed to the elements. The pollen sample from a piece of adobe from the structure associated with this hearth contained no pollen.

Three pollen samples taken during the 1978 excavations, however, did yield sufficient pollen for analysis. Radio-carbon dates were also obtained from two posts and yielded dates of 4398 ± 90 BP and 4696 ± 80 BP, which are presumed to correspond temporally with pollen sample 424 from an occupational level. It should be noted that these dates, and all of the radio-carbon dates used in this report have been corrected to a half-life of 5730 years.

Analysis of the material collected during the 1978 excavations yielded a rather dramatic decrease in arboreal pollen, almost entirely Pinus pollen, from the lowest occupational level (pollen sample 424), to the present ground surface. While this decrease in pine pollen may be due to environmental changes; if pine had been used in the construction of this structure, an increase amount of Pinus pollen would be expected on the floor. It should also be noted that this site is the only one to show a decrease in arboreal pollen through time in the Curecanti Basin.

The non-arboreal portion of the pollen record for this site indicates moderately high percentages of Artemisia, with steady contributions of Ambrosia, Compositae, and Cheno-am pollen. The remainder of the non-arboreal pollen occurs in relatively small percentages. The Graminae pollen is represented in the upper two samples, but not in the lower occupational sample.

The only possible economic indicator for this site is the occurrence of larger amounts of Cleome pollen, 6%, and comes from 7.5 cm. below the present ground surface. This is well within the occupational level. It may be indicative of the use of this plant by the people responsible for the building of this structure. Cleome is noted for its use both as a food and a paint for ceramic vessels in the southwest (Whiting 1939, Robbins et al. 1916). However, in a non-ceramic society, its utilization would probably be limited to consumption as a food. Cleome is a versatile food source, since the leaves and seeds are both edible. The Navajo eat both the leaves and seeds and also use the leaves as a deodorant (Vestal 1952: 29). In addition, the plant may be boiled and the residue dried to facilitate storage for consumption at a later time (Robbins et al. 1916:58-59).

5GN191

Two pollen samples were selected from 5GN191 for analysis from fea-tures 1 and 4. Neither sample contained sufficient pollen for analysis.

5GN212

A single pollen sample was analyzed from 5GN212. This sample was taken under a rock in the bottom of a hearth, and unfortunately did not contain sufficient pollen for analysis.

5GN247

This site is a stratified trash site which yielded pollen in its upper three levels. Palynological investigation of this site is preliminary in an effort to establish a sampling design for pollen analysis in connection with future excavation of the site. A charcoal lens immediately below the lowest level containing pollen yielded a radio-carbon date of 4356±410 B.P. The three samples from this site contain more arboreal pollen than do most of the other samples from Curecanti, with the exception of site 5GN205. This is probably due to a difference in pollen rain in different areas of the Curecanti Basin. Preliminary examination of the pollen record at this site is encouraging in the upper levels. The lower levels of the site, however, did not yield sufficient pollen for analysis. The pollen record in the upper levels of this site contains very consistent pollen frequencies. The arboreal pollen frequency remains relatively stable, and the Artemisia pollen declines only slightly in the uppermost level, apparently giving way to an increase in Cheno-am pollen. This consistence in the pollen record from this site indicates the probability that the environment in the Curecanti Basin has been relatively stable since 4356 BP to modern times.

5GN189

Site 5GN289 is a south-facing cave with an approximate elevation of 8,000 feet. The cave was test excavated and sampled for pollen at 10 cm. intervals. The excavations in the cave produced bone between 0.80 and 1.00 meters below present ground surface, which has been identified as Pleistocene horse. The only lithic debris which can be positively ascribed to human activity, however, occurred between 10 and 30 cm. below present ground surface.

The upper levels of the cave were contaminated by woodrat activity, making any interpretations from those samples suspect. Beginning at approximately 30 cm. below present ground surface the pollen began to show signs of deterioration. Evidently the micor-environment within the cave was not entirely suited to pollen preservation. This deterioration of the pollen grains made positive identification of many of the pollen grains difficult, resulting in the lumping of pollen grains in arbitrary categories designated "poorly preserved". There is, however, one important occurrence in the levels below the woodrat disturbance. Probable Cleome pollen was noted in most levels from 70 cm. to 160 cm. below the present ground surface. The presence of probable Cleome pollen, from an insect-pollinated plant, would lend considerable support to any evidence of human utilization of the cave. The plant is edible and fairly versatile, since both the greens and seeds may be eaten.

Due to the apparent deterioration of several pollen types within the cave deposits, environmental reconstruction or assessment is extremely difficult. There was, however, little apparent deterioration of Pinus pollen, which remains relatively constant throughout the diagram. The consistent low frequencies of Pinus pollen in the stratigraphic column from the cave suggest that pine has not been a major component of the environment in the Curecanti Basin while these deposits were accumulating.

Paleo-Environment

The vegetation of Curecanti Basin prior to the filling of Blue Mesa Reservoir has been recorded as dominated primarily by sagebrush (Artemisia). Grasses and perennial herbs are also frequent on less exposed slopes. Trees and shrubs occur only in areas where more ground moisture is available (Flowers 1962).

Pollen samples from dated archeological sites in Curecanti Basin (3924 BP to 6355 BP) contain relatively constant frequencies of Artemisia pollen. This stability of Artemisia frequencies in the pollen record appears to indicate that the environment has probably been dominated by sagebrush since at least 6,000 BP, as it is today. Grasses and herbs also contributed to the prehistoric pollen record, as they do in the samples from the present ground surface. The low arboreal pollen frequencies from the stratigraphic deposits in the cave also suggest that the arboreal or tree population has not changed significantly in the Curecanti Basin since those sediments were deposited.

Other archeological pollen studies in progress by this author near Crested Butte and DeBeque in western Colorado overlap the sites in Curecanti in date. Pollen analysis at Alkali Creek near Crested Butte indicates that the environment in that location has also been dominated by Artemisia for the past 5,000 years. Artemisia pollen averages 45 to 50% at Alkali Creek, which is even higher than at Curecanti. The arboreal pollen is also relatively low at Alkali Creek, as it is at Curecanti. The pollen record at DeBeque Rockshelter is not dominated by a single element, but rather exhibits fluctuations in both the Juniperus and Pinus pollen frequencies. The combined arboreal pollen frequencies, however, exhibit very little change throughout the pollen record, indicating that the environment around the DeBeque Rockshelter may not have been severely affectd by the hypothesized Altithermal drought.

There is considerable debate concerning the nature and magnitude of climatic changes in the last 10,000 years. Both pollen and geological evidence have been used to suggest that climatic fluctuations have occurred. Many authors differ in describing the conditions of climatic change

and in assigning time tables to those changes. Following the last major glaciation, an Altithermal period os proposed by Antevs (1955). This period was, reportedly, the warmest period in the northern hemisphere since the retreat of the ice sheet (Wedel 1961:18-19) and is usually described as being both warm and dry. Martin and Mehringer (1965:443) note that the climatic fluctuations during the Pleistocene appear to have been relatively minor and probably took the form of vertical displacements of vegetational zones. Swanson (Martin and Plot 1973:79) observes major fluctuations in the environment in the last 10,000 years, with a particular shift toward aridity at 7,000 years BP. He attributes the change in man's adaptive strategy from big game hunting to a more generalized economic pattern to this phenomenon, which upset the local habitats. Benedict (1979) hypothesized two periods of drought during the Altithermal, extending from 7,000 to 6,500 BP and 6,000 to 5,500 BP. Jennings (1964:150) and Martin and Mehringer (1965) earlier argue that no important changes have occurred in the environment in the Great Basin and in the Southwest. It should also be noted that climatic changes do not always take the same direction over large areas and, thus, will not produce the same results everywhere. There will probably be many areas where very little change is noted (Bryson et al. 1970:72).

The Altithermal ended around 4,500 BP and in the Rocky Mountains a resurgence of glacial activity began (Porter and Denton 1967), accompanied by cooler summer temperatures and possibly more moist conditions. Petersen and Mehringer (1976:287) noted a retreat in the timberline in the San Juan Mountains, which appears to correlate well with the end of the Altithermal and beginning of cooler summer temperatures. The advance and retreat of the timberline is temperature-controlled.

During the Altithermal they also noted an advance in the timberline. Porter and Denton (1967) also reported that isolated neoglacial advances occurred in the Rockies around 2,700 BP, as well as several times in the last several centuries.

Palynological studies of the paleo-environment conducted in the mountains of Colorado have sampled areas which are readily susceptible to environmental change. The ecotones chosen for paleo-environmental study are selected for their ability to respond to climatic change, and are usually relatively sensitive. The archaeological sites in Curecanti Basin, however, are not located in an environmentally sensitive area. The sagebrush dominated vegetational community at Curecanti is a much more resistent area to environmental change that are areas along the timberline. It is probable that the natural resistence of hardy plant communities, such as sagebrush communities, to climatic fluctuations contributes to the stability of such environments, and hence results in a pollen record showing little or no environmental change.

Economic Data

There is evidence in the pollen record of the presence of a variety of plants in the environment which may have been utilized as a part of the resource base. There is, however, very little evidence of the use of any of these plants in the pollen record at Curecanti. The pollen present throughout most of the pollen samples may be attributed to wind transportation of the pollen from elements within the environment. One exception to this is noted, however, in pollen sample 214 taken in the bottom of a hearth at 5GN10 Component F. This sample contained large quantities (40%) of fragmentary Opuntia pollen. It is possible that this large quantity of Opuntia pollen represents the burning off

of cactus spines in the hearth in preparation for eating the cactus. The practice of burning off cactus spines has been documented among the Navajo and Hopi by Vestal (1952) and Whiting (1939) respectively. The Paiutes were also noted to have eaten Opuntia (Bye 1972; Euler 1966).

Although many plants in the environment could have been used by the aboriginal occupants of these sites, the presence of most of the pollen in the samples may be attributed to deposition by natural factors, such as wind transportation. For instance, the Paiutes are known to parch, grind and eat grass seeds (Bye 1972; Euler 1966). Grass is wind pollinated, and several species of grass are ubiquitous elements of the environment at Curecanti. Cleome is noted to grow in the Curecanti Basin, but is insect-pollinated rather than wind pollinated. The presence of Cleome pollen in samples from occupational levels may be connected with utilization of this plant, rather than just indicative of its presence in the environment, due to the limited nature of the dispersal of Cleome pollen grains. Both the leaves and seeds of Cleome may be eaten (Vestal 1952; Harrington 1967).

SUMMARY AND CONCLUSIONS

Pollen samples from seven archeological sites in Curecanti National Recreation Area were analyzed to provide environmental data relating to the period of occupation of the sites, as well as cultural data. Several sites located on a ridge above the present Blue Mesa Reservoir were studied, as well as a cave, which was located in a volcanic outcrop above Blue Mesa reservoir. It was hoped that the stratigraphic samples from the cave would produce environmental data over a reasonably long period of time.

Environmental reconstruction based on data from the cave is somewhat tenuous due to the apparent deterioration of several pollen types within the deposits. There appeared to be little deterioration of the pine pollen, however, which remained relatively stable throughout the pollen record. The low frequencies of Pinus pollen present in these sediments may indicate that the pine population within the Curecanti Basin has not varied significantly during the period of time represented by the stratified deposits within the cave. The consistency in the pine pollen frequencies helps to support the hypothesis that the vegetation in the Curecanti Basin has not changed significantly in the last 6,000 years, but has been continuously dominated by sagebrush, as it is today.

Site 5GN10 yielded some interesting results from the various components examined. Radio-carbon dates ranging from 3924 $\pm$ 130 BP to 6355 $\pm$ 210 BP were obtained at this site. Large amounts of Opuntia pollen were noted in one hearth, indicating the possibility that cactus was prepared for eating by burning off the spines in the hearth. Other hearths examined did not yield pollen data. Examination of samples

associated with metates did not yield more economic data, with the possible exception of the presence of cf. Linum pollen in one of the samples. General environmental data from this site indicates that most of the elements of the present environment were also present during the occupation of these sites. Artemisia appears to be the dominant local vegetation at the time of occupation of the site, as it is today.

Site 5GN247 was examined as a preliminary analysis to guide future research. The arboreal pollen frequency at this site is higher than most of the samples at 5GN10. This may be due to locational variations rather than temporal fluctuations, since the two sites appear to overlap in time.

Site 5GN205, a wickiup-like or lodge structure located on the terrace above Blue Mesa Lake provided three samples yielding countable pollen. Pinus frequencies show a decrease from past to present. The remainder of the pollen percentagnes remain fairly stable, with the exception of the Cleome frequency. This pollen type shows its greatest frequency at 7.5 cm. below the present ground surface, possibly indicating that the plant was used as a food item by the inhabitants of this structure. Site 5GN205 shows probable utilization of Cleome by the inhabitants of the site, but no other probable food items were noted.

The presence of probable Cleome pollen was also noted in the cave deposits at and below 70 cm. If there is evidence of artifacts of human origin discovered at these levels, the presence of Cleome in the cave would provide supportive data concerning its utilization. However, herbivorous animals may have used this cave as shelter through time, leaving their feces to become part of the fill. Although no fecal matter was encountered below 60 cm., it is possible that the deterioration

of animal fecal matter may have introduced Cleome into these strata of the cave.

The environmental data from these sites at Curecanti indicates that Artemisia has been an important component of the environment since at least 6,000 years ago. The consistence in the pollen record from the sites at Curecanti suggests that the environment during the occupation of these sites was very similar to that prior to the filling of Blue Mesa Reservoir. Because the arboreal pollen frequency does not fluctuate significantly during the period of occupation of these sites, there probably has been no significant change in the tree population. Specifically, there is no evidence to indicate that pinon was an abundant part of the environment during the occupation of these sites. If it was an important resource for the aboriginal inhabitants of these sites, it was probably collected outside of the Curecanti Basin.

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REPLY TO STIGER'S COMMENTS

By Linda J. Scott

June, 1981

Modifications in the interpretations of the pollen record are dictated by interpretive changes concerning the provenience of some of the pollen samples made by the archaeologist following completion of the pollen report and during analysis of archaeological remains from the Curecanti National Recreation Area. A response to Stiger's critique of the pollen appendix should also be prefaced with a statement of the chronology of the availability of information to the palynologist. The provenience information as presented in Table 1 in the pollen appendix is complete as provided by the archaeologist (Mark A. Stiger) following excavation of the site. These proveniences were re-interpreted after the pollen report had been written and accepted by the National Park Service. If provenience interpretations are changed after the completion of the pollen report, the report cannot be expected to reflect these changes.

Stiger states that the pollen samples are of two kinds--ethnobotanical and paleo-environmental. He states that samples taken from the soil under metates "would produce pollen that had adhered to the grinding stones as a product of aboriginal use and indicate economic plant species. However, both metates from which samples (#229 and #73) were taken were partially exposed on surface." (Stiger, this volume p 97). Definite association of surface artifacts with subsurface occupational features is difficult, at best. Therefore, selection of these surface artifacts as the primary source of economic information related to the subsurface prehistoric occupation of this site is assuming a relationship that may or may not exist. Metate washes would have a greater chance

of yielding pollen directly associated with economic activity on the metate than would a soil sample taken under the metate. Surface artifacts may also have been moved since their utilization, and pollen remaining in the soil beneath the artifact cannot be assumed to be exclusively representative of economic activity connected with the artifact.

Pollen sample #360 was initially reported by the archaeologist as a floor provenience, but has subsequently been changed to "fill immediately above the burned superstructure of feature 1". Changes in provenience designation such as this nullify any assumptions that the samples correspond directly to the occupation of the site. Interpretation of the pollen record cannot be made if the provenience of the pollen samples is not established relative to the occupational sequence. The issue in conflict between the palynologist and archaeologist centers around the assigning of proper provenience information prior to analysis. Unless this crucial step is taken, analysis cannot proceed. All specialists working with samples removed from the ground by archaeologists must trust that the information provided concerning those samples is accurate and complete.

Stiger's citation of pine pollen frequencies from surface pollen samples located in or near pine forests or isolated stands of pine in the western United States (all of which I analyzed in the past) have been quoted erroneously. Although I was not provided with a bibliography with Stiger's critique, I have checked the pine pollen frequencies from sites located in or near environmental zones containing pine. The pine pollen frequencies vary from 10-70% (Scott 1976a, 1976b, 1977a, 1978, 1979), not from 16 1/2-35% as Stiger indicates. Pine pollen was also noted to vary from 12% to 40% in surface samples from an arid grassland

west of Chaco Canyon in New Mexico (Scott 1977b). The nearest source of pine pllen to that area is the Chuska Mountains to the west. There is no magic pine pollen frequency which is indicative of pine forests in the vicinity of the sample. Determination must be made at each site or environmental zone dependent on many factors, including the composition and density of the flora, wind patterns, and topography. Pine does not grow in stands of uniform density for the convenience of scientists studying various problems. Most important in determining the threshold of pine pollen indicative of an open vs. a forested environment are modern data from the immediate area of study. Pollen samples from the present ground surface were collected along the ridge at site 5GN10 Component F and near 5GN205. The vegetation in the vicinity of these sites is dominated by sagebrush. Many grasses and small herbs were also noted. Both of these pollen samples from the modern surface contain approximately 20% pine pollen--from ecozones totally void of pine at the present time. Unfortunately, the archaeological research design did not include transect sampling of the nearest stands of pinon at the extreme western edge of Curecanti Recreation Area.

Citation of personal communication information should be confined to communication between two individuals, not portions of conversations with a third party. The result is erroneous citations, such as that by Stiger in reporting that I suggest the prehistoric population was hauling pinon firewood from outside the Gunnison Basin. It is far more probable that the aboriginal inhabitants were exploiting large stands of pinon pine outside the Gunnison Basin for pinon nuts, which are readily gathered in a short period of time and easily transported. Firewood was probably procurred wherever possible and was probably not restricted to pinon pine.

Contamination of sample #2 from 5GN205 was recognized under the microscope by the presence of fresh pollen grains that showed no signs of deterioration in an area where extreme deterioration of the pollen is a severe problem.

Interpretation of the paleo-environment on the basis of only two pollen samples is shaky, at best. But when these samples are from cultural contexts the interpretations become even more suspect. Sample #214 represents a hearth at 5GN10 Component F. The adjusted pine pollen frequency in this sample (after the exclusion of Opuntia pollen) is 33%--approximately one and one-half times that of the modern surface samples. This author has noted several cases where hearths contain higher frequencies of pine pollen than surrounding samples (Scott 1977b, 1980), and Hevly (written communication R. Hevly to J. Mueller, May 16, 1981) also notes this phenomenon. In fact, pollen entrapment in bark has been studied and reported in Science (Adam, Ferguson, and LaMarch, 1967). Therefore, the interpretation of a hearth sample in strictly paleo-environmental terms is unreliable. The same can be said of a single floor sample within a structure. Many factors influence pollen accumulation within enclosed structures, including the tendency for wind-transported pollen to be over-represented (Dr. R. W. VanNorman and Dr. Delbert Wiens, personal communication). This structure was reportedly constructed using pine poles. If this is the case, interpretation of large quantities of pine pollen within the structure may be indicative of the use of unpeeled poles, the storage or utilization of pine within the structure, possibly for fuel, or the increased accumulation of wind transported pollen within the structure. It is also possible that this sample could reflect paleo-environmental change,

but a model of paleo-environmental change cannot rest on the evidence of a single sample.

Even though these two samples are the only samples that may be assigned to a definite cultural association with these sites, they cannot be used alone for interpretation of the paleo-environmental record due to their cultural contexts. Good paleo-environmental data can be obtained from an open deposition, preferably acultural, that can be dated. The best candidates for such study are bogs and lake deposits. In the absence of such deposits in this area, caves may provide satisfactory data, but care must be taken to avoid depositional sequences including evidence of woodrat activity or other disturbance and mixing of the deposits.

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APPENDIX C

The Curecanti Lithic Assemblage

by Kellie Masterson

This appendix is in two parts. The first part covers the inventory analysis done on all lithic artifacts during the 1979 season. The second is a more detailed study of the flaked stone artifacts.

Inventory Analysis

Introduction

The inventory analysis was designed to fulfill three functions:

1) It provides the MWAC laboratory supervisor with an accurate list of specimens for curation purposes.
2) It provides a broad scale data base from which smaller samples may be drawn in order to deal with specific research questions.
3) It provides some data for certain research questions (e.g., see Stiger, 1980, this volume).

The inventory does provide a list of general artifact and raw material classes by field specimen (F.S.) number or provenience unit. This was the most basic and necessary information required by the Park Service. Moreover, the inventory analysis was designed to be carried out with a minimum of effort by minimally trained personnel. Analytical decisions are broken down into a series of yes or no questions based on simple observations. This makes the inventory analysis a relatively simple, repeatable operation.

The Methodology

Two observations were made on the artifacts analyzed during the inventory analysis: the artifact form and the raw material class.

The number of items in each artifact class of a particular raw material was counted. Items of chert were also color coded at the request of the project supervisor. All data thus obtained was coded onto forms. A detailed discussion of the form and the methodology employed is on file at the Midwest Archeological Center, Lincoln, Nebraska. Definitions and procedures are outlined in these laboratory notes.

A flow chart diagraming the analytical decisions made by an analyst during the inventory analysis has been drawn (Fig. 1). A discussion of the general artifact classes follows.

Debitage - non-utilized flakes or flake fragments assumed to be the by-products of tool manufacture or core reduction. The absence of definite wear on any edge or surface is necessary for inclusion into this class.

Utilized flakes/tools - this category includes those flakes or flake fragments showing some use wear with or without prior intentional modification of the edge by retouch flaking or grinding. The attributes of the original flake must be retained for inclusion into this class. Also subsumed under this heading are those flakes which show evidences of platform preparation or other marks of manufacture rather than use wear (actually the two are often indistinguishable). Utilized cores are included in this category as well.

Preforms - the first shaping of a finished tool. A preform is an unfinished, unused form of the proposed artifact. It is larger than and without the refinement of the completed tool. It is thick with deep bulbar scars and has irregular edges. The method of manufacture is not important to its initial identification. It may show evidences of platform preparation.

Flaked Stone Artifacts - any artifact which has been completely modified by flaking or grinding, showing extensive morphological change and retaining few, if any of the original flake attributes.

Core - any nodule of rock from which flakes have been removed, the desired by-product being flakes.

Ground Stone - in general, any non-crypto-crystalline material showing signs of grinding, and occasionally pecking.

Other - a catchall category for any form which does not fit the established classes. Most commonly the artifacts included in this class are those which show no sign of human modification but which cannot be dismissed as non-cultural.

The Results

The results of the inventory analysis are summarized on the following tables (Tables 1-10).

TABLE 1

Site 5GN10, Component A

Material type

Artifacts Form	Quartzite	Chert	Other	Totals
Debitage	4043	103	4	4150
Util Flk/tool	217	2		
Pref	15			
Flk st art	66			
Core	3			3
Grnd st			6	6
Other		6	30	36
TOTALS	4344	111	40	4495

TABLE 2

Site 5GN10, Component B

Artifact Form	Material type Quartzite	Chert	Other	Totals
Debitage	707	22		729
Util flk/tool	32	1		33
Pref	3			3
Flk st art	7			7
Core	1			1
Grnd st			2	2
Other		1	4	5
TOTALS	750	24	6	780

TABLE 3

Site 5GN10, Component D

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	155	15		170
Util flk/tool	8			8
Pref	2			2
Flk st art	3	3		6
Core		1		1
Grnd st			4	4
Other			1	1
TOTAL	168	19	5	192

TABLE 4

Site 5GN10, Component E

Artifact Form	Material Class Quartzite	Chert	Other	Total
Debitage	141	11	2	153
Util flk/tool	4	1		5
Prof.	1			1
Flk st art	2	1		3
Core				
Grnd st			6	6
Other			3	3
TOTAL	148	13	11	172

TABLE 5

Site 5GN10, Component F

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	570	20		590
Util flk/tool	26			26
Pref	1			1
Flk st art	3			3
Core	1	1		2
Grnd st			7	7
Other			3	3
TOTALS	601	21	10	632

TABLE 6

Site 5GN191

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	70	2		72
Util flk/tool	5			5
Pref				
Flk st art	3			3
Core				
Grnd st				
Other			1	1
TOTALS	78	2	1	81

TABLE 7

Site 5GN206

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	2270	28		2298
Util flk/tool	184	7		191
Pref	19	2		21
Flk st art	72	5		77
Core	2	1		3
Grnd st			8	8
Other			4	4
TOTALS	2547	43	12	2602

TABLE 8

Site 5GN208

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	651	6		657
Util flk/tool	27	2		29
Pref	2			2
Flk st art	10	1		11
Core	2			2
Grnd st			2	2
Other			7	7
TOTALS	692	9	9	710

TABLE 9

Site 5GN212

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	916	19	4	939
Util flk/tool	69	1		70
Pref				
Flk st art	9			9
Cores				
Grnd st			1	1
Other			1	1
TOTALS	994	20	6	1020

TABLE 10

Site 5GN247

Artifact Form	Material Type Quartzite	Chert	Other	Totals
Debitage	11	5		16
Util flk/tool		1		1
Pref				
Flk st art		1		1
Core	1			1
Grnd st			1	1
Other			2	2
TOTALS	12	7	3	22

Flaked Stone Artifact/Preform Analysis

Introduction

After analyzing the entire collection I was struck by the apparently large number of preforms and flake stone artifacts as compared to true tools, 30% (231) to 70% (586). This seemed rather high especially since a rough count of utilized flakes and tools from 5GN206 revealed that out of a total of 191, 131 (approximately 70%) were resharpening flakes. On the basis of this survey it seemed that the primary tool form on the Curecanti sites was the flaked stone artifact. In order to answer this question, I had to look at the production sequences of these tools to determine whether the flakes I examined were actually a product of the manufacture of tools. Thus this study is an attempt to examine the production sequences of the flaked stone artifacts and preforms.

Another purpose of this study is to describe all flaked stone artifacts and preforms in greater detail than is done on the inventory forms in Tables 1-10. This description falls far short of that done on other collections however. No attempts have been made to do elaborate studies of flaking patterns, platform types or wear patterns. A monolithic typology for either the projectile points, bifaces or preforms is not the goal of this analysis. To do so would require exhaustive analyses to separate art technological stylistic, and post-modification variables on the order of Knudson (1973). I am not qualified to carry out such a study.

The Analysis

The analysis examined a number of attributes, a number of which I discarded due to the difficulty of observation. Originally I looked at the production stage of the artifact, hafting modifications, basal shape, implement condition, presence of wear, and the traditional tool category. I excluded from my final analysis the hafting modifications and basal shape. I simplified the categories for production stage (flaked stone artifact/preform) and implement condition (broken/whole). The others remain the same.

An analysis of this sort is difficult. Even exercising extreme care, categories are often vague and ill-defined. Attributes are hard to define explicitly in terms of specific values. This situation is not clarified in the literature. Most studies of production sequences tend to devolve into a morass of poorly defined terms and even more poorly thought out ideas. Apparently the expertise and intuition of the analyst is the most important factor in an analysis of this sort.

Subjectivity rather than objectivity appears to be the hallmark of these studies including this one.

One of the major problems is distinguishing manufacturing marks from use wear. There are no consistent guidelines to be found in the literature despite the furor over Nance (1971). This has greatly hindered this analysis. An attempt on my part to establish some criteria for distinguishing manufacturing and use wear degenerated as quickly into an intuitive judgement. My decisions may have been correct but the replicability of the analysis is questionable.

The Results

A total of 231 flaked stone artifacts were examined. Of these 45 (19%) were preforms. The majority of both flaked stone artifacts and preforms were of quartzite (43 preforms, 96%) 175 flaked stone artifacts, 94%). The percentage of chert in this sample is slightly higher than in the rest of the collections reflecting its specialized use as a tool material. Only 10% (23) of the artifacts could be considered complete. Approximately a third each of the remainder was broken into bases, tips or midsections (69, 60, and 68 respectively). The remaining 11 fragments either represent unidentifiable pieces or are longitudinal sections. There is no difference between flaked stone artifacts and preforms in their breakage patterns. There is also no difference between the breakage patterns of chert and quartzite tools although the small sample size prevents a rigorous analysis.

Of the use categories, 23 can possibly be considered as projectile points on the basis of hafting modifications, size, or the observed wear. Of these seven are chert. The remaining flaked stone artifacts can be divided into undifferentiated scrapers (on the basis of specialized

morphology and unifacial wear) 3, bifacially flaked knives (on the basis of a lack of specialized hafting modifications and bifacial wear) 99, bifacially flaked drills (on the basis of morphology and specialized wear) 2, and unknown functions, 59. These last are too finely flaked to be included in the preform category yet show no definite use wear. They may be a more refined and unrecognized type of preform. Two scrapers are chert as well as one drill tip, and one knife fragment.

No morphological study was done on the projectile points. There was not a large enough sample to warrant such a study. However, if the collections from several years of excavations were combined a typological study might be feasible.

Conclusions

As with most preliminary studies, the only conclusions that I can draw would be cautionary ones or very tentative ones. I do not think that this study is a very rigorous one. An attempt was made to establish specific, mutually exclusive categories for an attribute analysis but these did not hold up under a critical analysis. Therefore I hate to draw any definite conclusions about the collections themselves. However, some observations may be noted, as tentative and unsubstantiated as they are. As such they may furnish ideas for future studies.

Primarily, the Curecanti collections seem unusual in that the major tool form is the bifacially flaked stone knife. Curecanti differs in this respect from other collections such as the San Miguel River survey collections (H. Wollcott Toll III, personal communication) and the Black Canyon collections (Stiger and Carpenter 1980). This is borne out by the relatively high number of flaked stone artifacts and resharpening

flakes. This bifacially flaked tool is relatively unformal. It comes in a wide range of sizes and stages of production. In this respect it appears to be a serendipitous tool, certainly highly functional but with a sufficiently wide range of uses so that its form is not highly regulated. It is probably used for many of the functions that might be carried out by more specialized tools such as scrapers although this is highly speculative and is not based on a thorough analysis of the flake tools.

Little more can safely be said about the collections. More thorough studies should be done including one which would examine the collections from a curated versus a non-curated view point. This may explain the absence of the missing artifact types that were expected in this assemblage. Curecanti lithics may be aberrant only in that the sites excavated were aberrant.

Appendix D

Faunal Remains Recovered from 1979[1] Curecanti Excavations

5GN206

F.S. 8 Feature 1 fill
1 bone fragment

F.S. 12 Feature 2 0-20 cm
2 large mammal long bone fragments

F.S. 42 North corner of test pit 1
1 calcined bone fragment

F.S. 26 Test Trench 100 cm level
1 cf. Sciruidae proximal half of left femur
2 fish vertebrae

F.S. 58 Test Pit 3 5-10 cm
1 bone fragment

5GN212

F.S. 2 Feature 1 30 cm
2 bone fragments

F.S. 6 Feature 1 25 cm waterscreen
2 bone fragments

F.S. 10 Test Pit 1 20 cm
1 bone fragment

5GN247

F.S. 2 Test 1
3 bone fragments (1 calcined)

F.S. 13 Test 1 waterscreen
5 bone fragments (1 calcined)

F.S. 11 Test 2 waterscreen
2 bone fragments

5GN10

Component B F.S. 87 Feature 3 0-10 cm waterscreen
1 bone fragment

Component D F.S. 213 Test Pit 34 0-10 cm
1 bone fragment

Component E F.S. 145 Feature 7 40 cm waterscreen
8 bone fragments (some calcined)

F.S. 146 Feature 7 50 cm waterscreen
14 bone fragments calcined
F.S. 147 Feature 7 0-50 cm waterscreen
2 large mammal bone fragments
F.S. 247 Feature 8 waterscreen
1 large mammal bone fragment
F.S. 197 Feature 8 Test Pit 23 10-15 cm
1 bone fragment
F.S. 275 Feature 8 Test Pit 19 10-15 cm
3 bone fragments

[1] Includes bone found in waterscreen samples

F.S. 155 Feature 8 Test Pit 26 10 cm
1 bone fragment
F.S. 251 Test Pit 31 20 cm
1 bone fragment
F.S. 257 Test Pit 21 10-20 cm
1 bone fragment

Component F F.S. 124 Feature 5 18-20 cm
12 large mammal lone bone fragments

F.S. 110 Feature 5 10-15 cm
1 calcined bone fragment
F.S. 123 Feature 5 15-20 cm waterscreen
1 bone fragment
F.S. 126 Feature 5 waterscreen
2 bone fragments
F.S. 136 Feature 6 Fill
Artiodactyla: Anterior fragment thoracic vertebra
F.S. 139 Feature 6 Bottom
1 Ovis canadensis frontal of skull with horn cores (male?)
F.S. 187 Feature 10 0-40 cm waterscreen
most elements of a skeleton of Peronmyscus moniculatus
F.S. 175 Test Pit F-2 0-10 cm
1 large mammal long bone fragment
F.S. 176 Test Pit 12 0-10 cm
2 bone fragments
F.S. 103 Test Pit 12 10-15 cm
1 bone fragment

Appendix E
Waterscreen Results

Site Number	Component	Field Sample No.	Feature No.	Depth	Amount Screened (liters)		Material Recovered*
5GN10	Component A	F.S. 81	Feature 1		1.5		Pinyon charcoal 6,036
	Component B	F.S. 87	Feature 3		1.0		1 bone fragment
		F.S. 93	Feature 4		.95		
	Component D	F.S. 265	Feature 14		1.7		
	Component E	F.S. 146	Feature 7	50 cm	2.0	6,056	Pinyon charcoal 14 bone fragments
		F.S. 145	Feature 7	40 cm	1.4	6,056	Pinyon charcoal, vitrified organic matter 8 bone fragments
		F.S. 236	Feature 8	TP-26	1.0	3,924	Ponderosa charcoal, vitrified organic matter 1 carbonized seed of *Echinocerus* sp.
		F.S. 165	Feature 8	TP-19	2.3	3,924	Ponderosa charcoal (posts 3 & 4), vitrified organic matter
	Component F	F.S. 123	Feature 5	15-20 cm	.5		Vitrified organic matter, 1 bone fragment
		F.S. 126	Feature 5	30 cm	1.0	4,419	Pinyon charcoal, 2 bone fragments
		F.S. 131	Feature 6	26 cm	.4		
		F.S. 136	Feature 6	44 cm	.4		
		F.S. 187 #2	Feature 10	C-40 cm	4.0	5,773	Pinyon charcoal, vitrified organic matter, intrusive mouse skeleton
		F.S. 187 #1	Feature 10	40 cm	4.5		
5GN191	TP-2	F.S. 14	Feature 3		.9		
	TP-2	F.S. 12	Feature 4		1.1	7,390	Pinyon charcoal

Appendix E
Waterscreen Results

Site Number	Component	Field Sample No.	Feature No.	Depth	Amount Screened (liters)		Material Recovered*
Ponderosa							
5GN206	Test 1	F.S. 9	Feature 1		1.0	---	Ponderosa charcoal
	Test 1	F.S. 11	Feature 2		.8		
	Test 2 (?)	F.S. 34	Feature 3		.35		
	Test 3	F.S. 58	Dark Layer	15-20 cm	1.6		Vitrified organic matter, 1 bone fragment
5GN212		F.S. 6	Feature 1	25 cm	1.1	6,077	Pine charcoal, 2 bone fragments
		F.S. 2	Feature 1	30 cm	1.3	6,747	Ponderosa charcoal, vitrified organic matter, 2 bone fragments
5GN247	Test 1	F.S. 13			.85	?	Ponderosa charcoal, vitrified organic matter, carbonized cactus needle(?), 5 bone fragments
	Test 2	F.S. 11			1.2	?	Ponderosa charcoal, Recent intrusive beetle parts, 2 bone fragments

* Identified charcoal was collected as a C^{14} sample during the collection of waterscreen sample in the field. Radiocarbon dates (years B.P.) are listed next to the "Amount Screened" column.

APPENDIX F

FEATURE DATA

Feature Data

5GN212 - Feature 1

Definition - Feature 1 was a rocklined hearth 65 cm in diameter. Six upright slabs outlined the feature. The top of several slabs were exposed on the surface. The bottom of the hearth was 30 cm deep. Three slabs measured approximately 20 cm x 30 cm x 8 cm. Three other smaller slabs measured 15 cm x 15cm x 5 cm. Eleven rocks approximately 10-15 cm in diameter lined the bottom of the hearth.

Character of fill: The top 10 cm of fill was sterile. Below was an 8 cm thick layer of dark soil with some charcoal present. The bottom 12 cm was a dark, charcoal layer, several burned rocks, bone fragments and flakes were found in the bottom charcoal layer.

5GN191 - Feature 1

Definition - Feature 1 was an eroded hearth exposed on the surface. Rocks lined part of the north side and bottom of the hearth. The hearth was roughly circular in outline, varying from 40 to 60 cm in diameter. Feature 1 was approximately 15 cm deep; however, the top portion of the hearth had probably been lost to erosion. Sandy soil around the hearth was burnt red.

Character of fill: The fill was charcoal flecked dark soil from surface to 15 cm deep. Feature 1 contained fire cracked rocks.

Feature 2

Definition - Feature 2 was a highly eroded hearth. All that remained was a cluster of cobbles approximately 25 cm in diameter lying on burned earth. Little charcoal was present.

Character of fill: There was little fill in this feature. Apparently erosion had destroyed all but the bottom of the hearth.

Feature 3

Definition - Feature 3 was a hearth that was defined at the surface by a partial ring of fire reddened earth. The fire reddened soil extended to a depth of 13 cm. No bottom to the hearth was found.

Character of fill: Two fragments of fire cracked rock were located in the reddened soil that filled the hearth. A few flakes were found in the hearth. No charcoal was found.

Feature 4

Definition - Feature 4 was a small unlined hearth 27 cm in diameter and 16.5 cm deep. The walls of the hearth were burned soil. The hearth appeared to be on the lowest cultural layer on site.

Character of fill: The top few centimeters were washed soil recently deposited by reservoir. The bottom 15 cm was charcoal stained sandy soil. No artifacts were found and no fire-cracked rock was present.

5GN206 - Feature 1

Definition - Feature 1 was an eroded slab-lined hearth 70-75 cm in diameter. The top of the slabs were 10 to 15 cm above the present ground surface. The bottom of the slabs were 20 cm below present ground surface. The hearth was built into sterile soil. The bottom was unlined.

Character of fill: The hearth was full of dark charcoal stained soil and fire cracked rock. Many lithics were found.

Feature 2

Definition - Feature 2 was a slab lined hearth 75 cm in diameter. The top of the slabs were 10-15 cm above the present ground surface. The bottom of the slabs were 20 cm below present ground surface. Erosion had removed some upright slabs. The bottom of the hearth was slab lined. The soil beneath the bottom was sterile.

Character of fill: The fill of feature 2 was a dark charcoal stained soil. Several pieces of fire cracked rock were present. A few lithics were found in the hearth.

Feature 3

Definition - Feature 3 was an unlined hearth 50-64 cm in diameter that erosion had exposed on the surface. The soil around the hearth was discontinuously fire-reddened. Several pieces of fired soil were found in the hearth. Evidently the burned soil had come from the lining of the pit.

Character of fill: The fill was a dark charcoal stained soil. No fire-cracked rock was found. Several chunks of charcoal were found.

5GN10 Component A

Feature 1

Definition - Feature 1 was an unlined hearth. Outline of the hearth was roughly circular 60-66 cm in diameter. The top of the charcoal stain was 10 cm below the modern surface. The bottom of the hearth was 28 cm below the present ground surface. The hearth was built on a sterile yellow clay soil.

Feature 2

Definition - Feature 2 was a 60-45 cm diameter circular area of rocks laying flat on sterile soil. Rocks were of a uniform size about 20 cm x 12 cm.

Character of fill: There was 10 cm of sterile fill on top of the feature.

Component B

Feature 3

Definition - Feature 3 was a 60 cm diameter circular hearth. Cobbles and slabs lined the hearth. The tops of slabs were exposed 6 cm above

the present ground surface. The bottom of the hearth was 25 cm below present ground surface.

Character of fill: There was a 3 cm thick layer of sandy fill deposited by wave action in the interior of the hearth. Beneath the sandy layer was a 10 cm thick deposit of dark charcoal stained soil and fire-cracked rock. The bottom 12 cm was a charcoal rich layer. Below the hearth was a sterile clay deposit.

Feature 4

Definition - Feature 4 was a 52-59 cm diameter circular slab-lined hearth. Some charcoal staining but no slabs were exposed on the surface.

Character of fill: The fill was charcoal stained soil from surface to 22 cm below present ground surface. There was some fire cracked rock present. Below the hearth was sterile silty clay.

Component D

Feature 15

Definition - Feature 15 was an apparent culturally compacted surface. This surface appeared to be slightly different in texture and compactness than the soil lying above it. Several flakes and rocks were found lying on the surface. One good shallow 10 cm diameter posthole (filled with charcoal) was found on the feature. Two additional possible postholes were found on feature 15. The entire feature was not excavated.

Character of fill: The fill consisted of 20 cm of lightly compacted soil with very sparse flakes and little charcoal.

Feature 14

Definition - Feature 14 was a shallow unlined hearth. Charocal was exposed on the surface. Feature 14 was 44-46 cm in diameter and 23 cm deep below present ground surface.

Character of fill: Fill was a dark charcoal stained soil with a few chunks of charcoal. One flake was found in the hearth.

Component E

Feature 7

Definition - Feature 7 was a deep slab lined hearth. The tops of the slabs were exposed on the surface and were covered with lichin growth. The hearth was circular, 66-72 cm in diameter. The rock lined bottom of the hearth was 40 cm below present ground surface. The side slabs measured approximately 45 cm x 30 cm x 7 cm. The bottom rocks were approximately 7 cm x 12 cm in size.

Character of fill: The top fill was 5 cm of loose sterile fill overlying 10 cm of sterile firmly packed sand and silt. The bottom consisted of about 15 cm of dark grey ashy fill with charcoal and charcoal staining on top of a 10 cm thick layer of dense charcoal deposits. No fire cracked rock was contained in feature 7.

Feature 8

Definition - Feature 8 was a 5 meter diameter roughly circular charcoal stain. Several fragmentary charred logs about 8 cm in diameter were found radiating out from near the circle of the feature. No floor surface was defined as the feature was not fully excavated. Top of the charcoal stain was 5 cm below present ground surface. The bottom of the charcoal stain was 20 cm below present ground surface.

Character of fill: The top 5 cm of fill was a brown sterile soil. The charcoal stain was extremely chunky charcoal in a charcoal stained soil matrix. Several pieces of vitrified organic matter were found.

Feature 12

Definition - Feature 12 is a pile of adobe chunks. The adobe has been burned. Both brick red (oxidized) and black (reduced) colored adobe was found. Several pieces of adobe had smooth surfaces indicating they had been worked while wet and were not just burned earth. Several pieces had impressions of posts. Possibly some of the adobe was *in situ*. Some pieces of adobe were collected. Most of the adobe was left in place. Most of the feature has not been excavated. The extent of the feature has not been defined.

Character of fill: Five centimeters of sterile fill overlay the feature. Several pieces of charcoal were found among the chunks of adobe.

Feature 13

Definition - Feature 13 was a dark stained area with adobe chunks and a possible burned post. This feature was found near the end of the season and was not totally excavated or defined.

Character of fill: There was a 10 cm layer of sterile soil overlying the feature. Excavation did not determine the depth or extent of the feature.

Component F

Feature 5

Definition - Feature 5 was a 44-48 cm diameter slab-lined fire hearth. The tops of the slabs were 2 cm below modern ground surface. Nine stone slabs made up the sides of the hearth and rested on bedrock 46 cm below present ground surface.

Character of fill: The top layer of soil was a 10 cm thick brown sterile soil. Below the sterile lay 22 cm of burned red soil. The bottom 12 cm was dark black soil with a heavy concentration of charcoal pieces. No fire cracked rock was found in the lower levels; however, there

was a scattering of fire cracked rock in the top 7 cm over and around the hearth.

Feature 6

Definition - Feature 6 was a slab lined cyst. The cyst was circular 35-55 cm in diameter. The tops of the slabs were 2 cm below the modern ground surface. The bottom of the slabs rested on bedrock 53 cm below the present ground surface. There was no fire reddening of the soil in or around feature 6.

Character of fill: The upper fill consisted of 10 cm of loose brown sterile soil. The lower level was compacted brown soil 43 cm thick. Very little charcoal was present. Several artifacts were apparently cached in the bottom of the pit.

Feature 9

Definition - Feature 9 was a slightly compacted surface similar to Component D, feature 13. The surface appeared to be delineated by three easily defined postholes and three poorly defined postholes. The well defined postholes were approximately 8 cm in diameter and 5 cm deep. The surface was 12 cm below modern ground surface. The roughly circular area measured 1.95 meters north-south by 2.65 meters east-west.

Character of fill: The fill was 12 cm of loosely compacted brown soil with a few lithics. The soil was sterile below the more compact surface.

Feature 10

Definition - Feature 10 was a hearth 42-50 cm in diameter. The top of the hearth was 13 cm below modern ground surface. The bottom of the hearth was 48 cm below modern ground surface. The bottom 10 cm was lined with small (10 cm x 2-5 cm) slabs set on bedrock. Above the slabs the hearth is unlined and the earth was burned red.

Character of fill: The bottom 10 cm was filled with black charcoal stained soil. Above this level and above the lining slabs was a 10-13 cm thick greenish sandy fill. Little charcoal was found in the sandy layer. Above the sandy layer was another charcoal stained fill 8-10 cm thick. A higher layer had chunks of charcoal in it and produced the radiocarbon sample. Feature 9 lay above the upper layer of feature 10, separated by 1-3 cm of sterile brown fill.

Feature 11

Definition - Feature 11 was a shallow unlined hearth cut by a stratigraphic test trench. Feature 11 was not excavated except for being cross-sectioned by the trench. The hearth was 10 cm below modern ground surface and was 53 cm across and 10 cm deep.

Character of fill: The fill of the hearth was charcoal stained soil with chunks of charcoal. Overlying the hearth was 10 cm of brown sterile soil.